Flight Training in the First World War and its Legacy

By Mr Trevor Nash

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Abstract: By the middle of the Second World War, the Royal Air Force was employing an extremely sophisticated training process that in many ways, has provided the global model for modern air forces to train their aircrew today. This process did not evolve overnight but had its roots in the training methodologies that were developed during the First World War. Although a number of authors have condemned these early training methods, it must be remembered that training was developing in parallel with evolving tactics, rapidly improving aircraft performance and general understanding of aeronautics and the application of air power. Like aviation itself, training during the First World War developed at a fast pace and saw new and innovative developments such as the creation of a formalised training structure, purpose designed training aircraft and the use of overseas training locations to counter poor weather and a lack of airfields at home. Perhaps more importantly, the experiences of the First World War highlighted that the production of aircrew to meet the requirements of an industrialised war needed massive resources and a dedicated focus. It became clear that the 'training pipeline' was a dynamic concept that demanded major resources to ensure its functioning success.

Introduction

By the middle of 1942 the Royal Air Force's (RAF) operational training process and organisation was well established and few changes were made between then and the end of the Second World War. The process and organisation of operational training in 1942 was exemplified by the use of overseas training due to a lack of facilities in the UK, airspace restrictions and reduced training opportunities caused by inclement weather; the use of specialist schools for teaching specific tasks; the use of dedicated training aircraft types; and a growing recognition of the benefits of using Synthetic Training Equipment (STE).[1] Although many might assume that the training model adopted by the RAF in the Second World War was new, many concepts were initially developed during the First World War although like most conflicts, many historical lessons had been forgotten or ignored during the period of expansion and the early years of the war. In 1940 for example, many senior officers realised the resources and time required to undertake this training. In a memorandum from the Directorate of Staff Duties (DSD) to the Director of Postings in January 1940, the author highlighted that it was, 'essential for us to maintain an operational training organisation on a very large scale if we are to provide crews who are capable of operating modern aircraft satisfactorily.'[2] This recognition was not always widespread. In January 1942, the Air Officer Commanding 6 Group Bomber Command, Air Commodore F. MacNeece Foster wrote that Air Marshal Sir Arthur Harris, soon to be appointed as AOC-in-C Bomber Command, 'frequently complained that the shaft of all our training organisations ... was very thick and the actual spearhead of operational effort was very small.'[3] As was to be expected perhaps, there was always conflict between the desired output standards of a 'training pipeline' and the input resources and time required to achieve that output. This paper will focus on many of those issues with reference to the operational training that was developed during the First World War and where appropriate, highlight where lessons were learnt or how experience shaped later training. As such, the major analysis will focus on the First World War. Consideration of how operational training developed within the RFC, RNAS and RAF and how many 'lessons learned' shaped later RAF training methodologies will be addressed by four key areas. The first will focus on the tactics and technologies that altered the way operational training was conducted during the First World War and their direct impact on the 'training pipeline'. Secondly, training organisation and policy issues will be analysed before looking at the methodologies of training that were used during the First World War. Finally, this paper will consider the logistics of training, including training aircraft, the availability of airfields to conduct operational training and the use of overseas training locations.

Technical and Tactical Issues

When the Royal Flying Corps (RFC) and Royal Naval Air Service (RNAS) deployed to the continent in August 1914 following Britain's declaration of war against Germany, aviation was in its infancy; the first heavier than air flight only having taken place just over 10-years earlier and the first crossing of the Channel just five years previously.[4] Although basic theoretical aeronautical science had advanced rapidly throughout the late-nineteenth and early-twentieth

century, the reliability and capability of technology to deliver robust aircraft and engines to study these theories in greater depth was a major retardant to aeronautical development.[5] Like the Wright Flyer of 1903, both Germany's Etrich Taube and Britain's Sopwith Tabloid aircraft that were deployed to France in 1914, used wing-warping compared to the use of ailerons that were becoming available and increasingly being adopted as a more efficient form of control.[6] By the end of the war however, the performance of aircraft such as the SE5A, Bristol F2B and Albatross D. VII was unrecognisable compared to those deployed in 1914.[7]

The technical improvement to aircraft and their tactical employment during the First World War had a significant impact on training. Firstly, technical improvements led to increased performance and payload, specifically speed, the maximum ceiling of the aircraft and the ability to carry increased types and weights of weapons. In turn, technical enhancements provided opportunities for aircraft to adopt new roles; a legacy mirrored in the different type of aircraft missions flown during the Second World War.[8] These new roles demanded specific types of training, for example, in night flying to counter Zeppelin and Gotha raids against Britain.[9] Initially, the role of the aircraft was limited to reconnaissance although the military was well aware of what could theoretically be undertaken once aircraft performance had improved.[10] This was apparent in the *RFC Training Manual* that was published in June 1914 which stated that although an aircraft's 'chief use is reconnaissance...other duties of aircraft in war' included fighting against other aircraft, transport of people and messages, ground attack and miscellaneous duties including cooperation with artillery.[11] Even before the release of this manual, Major Frederick Sykes, then commander of the RFC's Military Wing, said that aeroplanes would be employed, 'in fighting off the opposing aeroplanes...'[12] The problem that was faced by the RFC and RNAS was a lack of any real knowledge as to how to employ and operate aircraft with any certainty due to performance limitations. This conundrum was summarised in the *Naval Air Service Manual 1915*, written in November 1914 that declared:

> It must be borne in mind that the whole subject [military aviation] is at present in a very experimental stage and that it is impossible in many cases to lay down hard and fast rules of procedure. Every effort must be made by all concerned to improve existing methods until some measure of finality may be reached...Chapters on wireless, night flying, and workshops will be added as further experience is gained.[13]

If nothing else, this excerpt highlights explicitly the recognised need to create a robust training system to provide improved operational capability. As the First World War progressed, technological innovation and specialised designs such as the scout and the bomber, ensured that the aircraft had become 'an integral part of the way wars were fought'.[14] Although the RFC was initially tasked with carrying out reconnaissance, by 1915 improvements to aeronautical technology had begun to shape tactics. Despite Trenchard's memorandum of 1916 that called for incessant offensive action to control the air, it had been recognised for a number of years that conducting aerial reconnaissance was predicated on achieving 'command of the air'.[15] The RFC's reconnaissance activities in the first six months of the war had always been

conducted with an eye to destroying enemy aircraft that tried to interfere with the mission and as such, assorted weapons including revolvers, hand grenades and rifles had been used to try and destroy enemy aircraft when the two sides met although as Morrow has stated, such encounters were usually 'indecisive'.[16] This situation changed in the summer of 1915 when Germany deployed the Fokker E-1 Eindecker with its synchronised Parabellum machine gun that fired through the propeller disc.[17] The great benefit of this design was that if the pilot fired when directly laterally in-line with his target, he did not have to worry about calculating deflection. As Biddle so accurately observed, the 'air war demanded specialization' and '[a]irplanes created a need for other airplanes....'[18] This observation has also been echoed by Grattan who said that, 'technology was the principal driver of the development of tactics and strategy in the air war' and to this may be added developments in training, the symbiotic sibling of tactics and technology, that was needed to prepare aircrew for conducting new roles in higher performance aircraft.[19] As the Germans took a technological advantage with the Fokker Eindecker, the British had to respond with a more capable counter platform or tactic; a trend that was to continue throughout the war with the technological and tactical advantage tipping between the combatants during the course of the conflict.[20] As Pugh has pointed out, if an air force aspires to control the air, that air force needs the resources with which to achieve that aim and here, aircraft output and aircrew training became vital; a process that created a significant model for the RAF during the Second World War.[21] This model, later referred to as the training pipeline, was shaped by policy to determine the output standards and training methodologies; resources, such as instructors, aircraft, airfields and curricula; as well as factors such as wastage, weather, and changing output requirements in terms of numbers and standards. The context of how the air war was being fought undoubtedly altered the way that training was being undertaken as did the doctrinal development associated with the use of air power. This provided a major legacy for later operational training that can be seen by the use of specialist training schools that evolved during the inter-war years.

The focus on increased and improved training was initially sharpened in May 1915 when the number of pilots per squadron was increased from 12 to 15 but the major catalyst was the growing emphasis on what Brooke-Popham referred to in his February 1915 report as 'Fighting Hostile Aeroplanes in the Air'.[22] The catalyst for this change of tactical emphasis was not, as many authors have written, the Fokker Eindecker as this aircraft only began to appear from August 1915.[23] The major driver behind Brooke-Popham's report was the growing incidence of aircraft attacking each other over the front. This report was supplemented by a re-issued RFC Training Manual that featured a section on aerial combat.[24] These events must also be put into the context of the BEF's spring offensive, notably the battles of Neuve Chappelle and Ypres in March and April respectively and later, the Battle of Loos in September.[25] These offensives called for a more aggressive and proactive approach from the RFC.[26] The new tactics, combined with a greater emphasis on offensive operations, highlighted some serious flaws in training.[27] As Morrow saw it, 1915 was a watershed in aerial warfare with air arms becoming 'more sophisticated' and performing separate and distinct roles.[28] As a result, a number of major initiatives were established to prepare better pilots and observers

for operational service and a range of emerging novel tactics. For example, the way that tactics and technology were altering training can be seen in May 1915 when pilots and observers underwent systematic machine gun training using the Lewis Gun for the first time. The Machine Gun School was established at Dover in May before moving to Hythe in November.[29] Ironically, the importance of training pilots and observers in the use of the machine gun was forgotten in the inter-war years as the role of air gunner and observer were considered part-time roles to be filled by ground crew despite the importance attached to this type of training during the First World War.[30]

There was also an increased emphasis on formation flying which was a result of Trenchard's memorandum of 14 January 1916 that was promulgated to squadrons later that same month and that stated that all reconnaissance aircraft must be escorted by at least three scouts.[31] The pressure to produce more pilots and observers crystallised in 1916 due to two significant factors, one strategic and one tactical. The first was the Somme offensive and the second was the appearance of the first German *Jasta* in August 1916.[32] Unlike the RFC's policy of trying to maintain air supremacy over the complete front and fight the air battle beyond the German lines, the German approach saw them avoid contact unless they had the tactical advantage. *Jastas* were used to gain localised air supremacy for a given tactical objective whilst the RFC's approach, epitomised in Trenchard's *Future Policy in the Air* memorandum of September 1916, was of 'incessant offensive'.[33]

The results of this offensive air policy, and a key indicator of how tactics influenced training output, was an increase in the attrition of pilots and aircraft; between July and December 1916, the RFC had lost 499 pilots and observers killed or missing, 250 wounded and 250 removed from service due to 'unsuitability, physical or nervous debility.'[34] This position, Pugh has argued, saw the RFC's capability 'eroded in 1916' and that it continued to 'flag' into 1917.[35] Pugh has stated that this was due to the RFC's inferior aircraft and the increased effectiveness of German tactics and air power. Casualties were so high during the period from the opening battles of the Somme offensive in July 1916 until the Battle of Arras in April and May 1917 through until the German attacks beginning in March 1918 that the length of flying training courses was cut and output standards reduced just to meet the wastage rate of service squadrons.[36] Even in November 1916, scout pilots were 'sufficiently trained only to take off and land without damaging their machines.'[37]

Not all legacies are positive and the period from July 1916 to the end of the war marked a phase of the war where Trenchard's policy of 'incessant offensive' led to poor decision making by a number of senior RFC/RAF officers as training courses were cut to meet increased demand due to aircrew casualties. Barker has argued that failing to train aircrew sufficiently, 'amounted to culpable if not criminal negligence.'[38] Although strong words, Barker's assertion does stand up to examination. Aircrew training during the Second World War was not as frenetic and allowed aircrew to be held in pools and this meant that there was no time pressure to cut corners within the training pipeline. All training is a balance between quality and quantity and

this balance had clearly become mismatched from July 1916 onwards.[39] The result was that the training system was graduating aircrew which in some cases, had their training records falsified.[40] Although Morley argues this falsification argument strongly, some errors may have been put down to lax administration. Both Second Lieutenants G.W.T. Garwood and L.H. Mackay were certified as having flown the BE2c but on arrival in France, told their respective Commanding Officers that they had never flown the aircraft.[41] Second Lieutenant C.F.A. Portal's report card showed that he had fired both the Lewis and Vickers machine guns during training but he had only in fact fired a .303 Lee Enfield rifle.[42]

These training shortfalls were being addressed on a daily basis by Squadron Commanders in France as new pilots were posted in. There are numerous examples of Squadron Commanders writing to Wing and Brigade Commanders about the poor state of training. In March 1917 for example, 3 Brigade wrote to HQ RFC in the Field about the lack of training for observers.[43] Another notable assessment of the state of training was made by Major Learmount, Officer Commanding 22 Squadron to Headquarters 9 Wing.[44] Learmount complained that of five pilots posted to 22 Squadron: none had any practical gunnery training; two had crashed during their first week with the squadron and finally; all five had little experience on the Bristol F2B's Rolls-Royce engine. The OC noted that, 'casualties are directly the result of inexperience and it stands to reason that pilots with no experience cannot put up a decent fight against the pick of the German Flying Corps.' From the perspective of operational squadrons, there was a 'training gap' that they felt should be addressed within the 'training pipeline' at home and not by operational squadrons in the field. Learmount's complaint was picked up by Trenchard who told him that it, 'was not possible to do the amount of training at home that would be desirable if time permitted...' and as the squadron commander, it was up to him 'to overcome these difficulties.' Rather icily, Trenchard tells Learmount and Commander 9 Wing to report to him at HQ RFC on 'the first day' that weather permits flying. It would appear that in this case, constructive feedback was not valued from operational squadrons, the ideal source in fact to provide validation for the training process. Instead, as Trenchard highlighted, operational squadrons were blamed for training failures, a point raised again in March 1918, when 12 and 13 Wings were told, 'Flight Commanders are not paying sufficient attention to the instruction of young pilots, fresh from home.'[45] The fundamental issue highlighted by this argument as far as the training pipeline is concerned is that of the delivery of quantity over quality. The training pipeline was under tremendous pressure to deliver replacement pilots that, as Learmount argued, quality was suffering.

Organisation and Policy

When the RFC was formed in 1912, the Military and Naval Wings received their pilots from the Central Flying School (CFS).[46] With deployment to the continent in August 1914, CFS was closed and many civilian flying instructors joined the RFC or RNAS and thereby denuded the flying training system of its experienced instructors.[47] The instructor cohort was only re-built when some of the pilots from the initial squadrons sent to France in August returned to England for a period of rest in the winter of 1914. The belief that the war would be a short one

created a vacuum in the pilot training organisation and policy development process for the first few months of the war. The paradox is that although both Jones in the *The War in the Air* and Barker's observations on the 'paralysis' of the RFC's training system at the beginning of the war were correct as far as CFS was concerned, these comments did not acknowledge the War Office's recognition that the RFC needed a formalised training structure.[48] As aircraft departed for France, the RFC formed a Reserve Aeroplane Squadron (RAS) at Farnborough with the sole aim of training pilots. Although having airfields as well as the RAS, there was still no practical training programme in place. The first major expansion took place in November 1914 when the initial RAS became No.1 RAS and No.2 RAS was formed at Brooklands. In addition to providing training, these squadrons were also tasked with creating operational squadrons and in January 1915, No.1 RAS formed the nucleus of 10 Squadron.[49] By the end of 1915 there were 17 RASs but perhaps, potentially more importantly, from November 1914, the RFC had restructured into a number of Wings.[50] The fact that training was initially afforded a low priority is perhaps understandable given the belief that the 'war would be over by Christmas.'[51] RASs would now come under the control of Administration Wing, commanded by Lieutenant Colonel E.B. Ashmore to provide centralised control of training. Unfortunately, it would appear that pilot training was still inadequate and haphazard despite this centralised control.[52] Jones stated that training was being provided by RASs, CFS and civilian flying schools but there was no central flying training syllabus or standardised instructional policy.[53] Due to the lack of capacity at CFS, RASs were now providing advanced as well as basic training. It is salutatory to reflect that by the end of 1915, 17 RASs plus the CFS were supporting the RFC's 12 squadrons in France; a clear indication of the scale of the training resources required to support operational squadrons in the field.[54] This realisation that operational squadrons demanded massive investments in a training organisation was a clear legacy of the First World War although this lesson was often forgotten during the period of the expansion schemes and into the Second World War.

With the restructuring into Wings, Fourth Wing was created with its headquarters at Netheravon to coordinate the activities of the RAS training squadrons.[55] Throughout 1915, additional Wings were formed in the UK and each became responsible for initially, two RASs.[56] By September 1915 prior to the Battle of Loos, the RFC in France comprised three Wings totalling 12 squadrons of around 160 aircraft.[57] This structural change was reinforced with command changes during August 1915 when Henderson, the RFC GOC in France and Director General Military Aeronautics in the War Office and replaced as RFC GOC by Trenchard, the commander of the First Wing.[58] During this same re-shuffle, Lieutenant Colonel C.J. Burke, the commander of the Second Wing, was sent to Canada to discuss pilot training in the Dominion.[59] This Canadian initiative will be discussed later but it is interesting to note that the War Office was sufficiently prescient in 1915 to realise that the production of sufficient pilots was a key requirement in prosecuting the war.

The shortage of instructors and training aircraft was compounded by the lack of a, 'definite air service policy as to what the Army wing [RFC] has to do...' and what policy that was present,

was 'haphazard'.[60] Lord Derby's observation neatly identified the challenge to a nation that aspired to deliver a coherent national strategy but lacked the organisational support structure with which to do so; in this case, a robust training pipeline and an industrial system that could deliver aircraft and engines of the right quality, in sufficient numbers in a timely manner.[61] Pugh has stated that this lack of strategic control by the respective politico-military organisations that were active during the war, chronologically the Air Board, Joint War Air Committee and Air Council, was due to a lack of 'executive authority' and that the Air Council in particular, 'was superfluous'.[62] Although 1915 saw the RFC take a number of steps to improve the training of pilots and observers, it still lacked an effective training system and as the tempo of expansion grew, the RFC was subjected to increased pressures to produce additional aircrew. Although not generally recognised as such, Brigadier-General John Salmond provided a significant force for training evolution when he instigated major changes to the RFC's training system following his appointment as commander of V (Training) Brigade in February 1916.[63] Indeed, the rapid rate of expansion of training can be seen in the structural changes that occurred in the first half of 1916. Salmond had only been in post for three weeks when V Brigade was subsumed into VI (Training) Brigade and four months later, VI Brigade was re-titled the RFC Training Brigade.

Salmond made an immediate impact and sped up the delivery of training aircraft to the RASs by ending the process whereby all aircraft had to undergo acceptance testing at Farnborough irrespective of where they were constructed. From April 1916, aircraft were sent directly to the RASs and Aircraft Inspectorate Department (AID) engineers undertook the acceptance tests *in situ*.[64] Salmond also created structural change to training with the establishment of additional Schools of Military Aeronautics; the enhancement of RASs as Elementary and Higher Training Squadrons; increasing minimum solo hours flown from 15 to 20; creating the RFC Officer Cadet Battalion (later Officer Cadet Wing); establishing a School of Night Flying in Hounslow in April 1916; and that same month, forming a School of Military Aeronautics in Egypt.[65] These structural changes were all reflected in the RAF's training policy in the Second World War, especially as far as underpinning the establishment of specialist ground schools and the use of overseas training centres; the latter exemplified by the British Commonwealth Air Training Plan (BCATP). Despite Salmond's efforts, the output standard of the pilots arriving in France was being heavily criticised and this was mainly due to a need to cut corners to speed up the transition through the 'training pipeline' to replace casualty wastage.[66]

As the RFC grew, changes were made to the training organisation. On 1 January 1917, the activities of the Training Brigade were decentralised into three geographic regional Areas, and later, five numbered areas.[67] The Training Brigade remained with a headquarters function and was made a Training Division in August 1917. Within these areas, the former RAS, now renamed Training Squadrons, were located at what were termed Training Depot Stations (TDS), each comprising three training squadrons, but despite the re-organisation, the air service still lacked a, 'definite training programme'.[68] From early 1918, all of the RFC/RAF training activity was coordinated by a Director of Training in the Air Ministry. These massive alterations

to the training organisation are likely to have created confusion and a challenge to policy makers and policy recipients alike. Policy was transient due to a 'need for standardisation' and technological improvements to aircraft; an issue that also had to be addressed during the early years of the Second World War.[69] The common link here was the need for growing numbers of aircrew during both wars and the pressure that this exerted on the training pipeline. As discussed earlier, this challenge of managing the resources within that training pipeline were exacerbated by changing aeronautical technologies and tactics.

Training Methodologies

Although Sturtivant has argued that prior to the declaration of war in August 1914, 'the training and facilities and experience offered by the CFS had proved adequate', the problem of training sufficient pilots for the RFC was identified well over a year before.[70] The initial process, which may be justly described as haphazard, saw potential pilots either undertake a flying course at a civilian flying school and obtain their Royal Aero Club certificate before attending a military flying training course at CFS or undertake *ab initio* training at CFS before acquiring a certificate. CFS was created to provide pilots for both the Naval and Military Wings of the RFC although Barker has stated that the Royal Navy established its training centre at Eastchurch 'independently and without authority' in 1912 as a 'brazen act of unilateralism'[71] The growing gulf between the Military and Naval Wings did cause severe dislocation in terms of planning and equipment procurement with the split finally sealed on 1st July 1914 when the RNAS formally came into existence.[72]

It is important to understand that in its early days, CFS did not have the function of the modern CFS to act as the centre of excellence for training and standards. The early CFS was solely a training provider and as has been shown above, had great difficulty in maintaining throughput of students due to aircraft availability issues. For example, on 8 July 1913, CFS had 36 aircraft on charge of which 16 were serviceable.[73] This whole question of aircraft serviceability plagued the RFC throughout the war and had serious implications for the provision of training aircraft. In October 1917 for example, the Middle East Brigade had around 550 aircraft on charge of which only 218 were airworthy.[74] The impact on the production of pilots within the training pipeline would have been clear.

To overcome a lack of resources at CFS in 1913, some students were being sent directly to RFC Military Wing squadrons to undertake basic training before being sent to CFS to complete their courses. In January 1913, Colonel J.E.B. Seely, the Secretary of State for War said that '... [t]his has been done in order to obtain the number of trained officers we require as expeditiously as possible.'[75] The problem with this approach was that it reduced the time and resources for squadrons to undertake operational and experimental work and meant that squadrons could not concentrate on specific unit operational training. This in-squadron training was sustained throughout the interwar years and only stopped with the creation of Operational Conversion Units (OCU) in 1940. It also added the task of training CFS students that had only been taught 'the elements of handling an aeroplane in the air, landings and simple cross-country flying'.[76]

This level of poor training was partially due to the lack of a specific training aircraft with dual controls.[77] The problem was also exacerbated by the variety of different aircraft types on charge at CFS; these included tractors, pushers, biplanes and monoplanes.[78] The number of aircraft available for training was again reduced when the RFC Military Wing decided to ground all monoplane aircraft following a series of accidents in 1912.[79] As well as the problems of pilots' assimilating the nuances and foibles of each aircraft type, the challenges of spares holdings and maintenance must have caused problems for the ground staff and again, reduced aircraft availability. Finally, the other consideration that perhaps influenced the RFC approach to training was that the role of early aircraft was purely reconnaissance and therefore the pilot ostensibly only needed to take-off, fly a set course and then land; training objectives therefore, were few and relatively simple.

By mid-1917, the RFC's pilot training system had evolved into a process that many air forces would recognise today. In June 1917, the RFC had a total of 5,841 pilots under training all of which were at various stages on the eight-month 'training pipeline'. The first two months were spent in a Cadet Battalion – later to become a Cadet Wing – to undertake basic military training. This was followed by an eight-week technical ground school phase at a School of Military Aeronautics. Once completed, the students would then attend a four-week elementary flying training course followed by eight weeks at a Higher Training Squadron for advanced training. The final four weeks would be spent at a gunnery school before graduating as a qualified pilot prior to being posted to France.[80] Of these 5,841 pilots, Jones argued that only around 4,650 would ever reach a squadron due to being killed in training, general unsuitability or illness.[81] By any standard, this wastage rate of around 20 per cent was a massive drain on the training system. The system and structure was certainly in place but the RFC still lacked a clear method of training that was standardised and universally used throughout the service. One of the major legacies that this left for the RAF was the need to develop an improved aircrew selection process to reduce psychological and physiological wastage.[82] Another major failing was found within the instructor cadre who were still generally employed on rest from active service; they may have been experienced pilots but they were not trained instructors.

The significant change to pilot training, and one which created a lasting legacy, was implemented by Major Robert Smith Barry. In his book, *Pioneer Pilot*, Tredrey paints a picture of Robert Smith Barry, a former commanding officer of 60 Squadron, as a man who single-handedly, changed the way that the RFC, and later the RAF, carried out flying training.[83] Tredrey's narrative is a compelling one that has been taken up by a number of later authors including Barker who referred to this 'daring and spectacular airman' as being 'contemptuous of the whole basic philosophy and psychology of the training organisation' and therefore developed 'revolutionary training methods'.[84] Steel and Hart said that Smith Barry 'developed a completely new method of flying instruction' that 'produced a greater number of better-trained pilots who were not fatally surprised when they moved onto the next stage of their flying education in...high-performance' service aircraft.[85] Smith-Barry was certainly a dynamic

force in focusing a new approach to training but to place all of the credit at his feet does an injustice to officers such as Salmond, Brooke-Popham and Longcroft as well as numerous squadron commanders that called for changes to the training process from 1915 onwards.[86] The myth that surrounds Smith Barry was probably initiated by Jones in *The War in the Air* in which he stated that:

> Before the era of the Gosport school, the training of pilots in England fell short of the requirements of air warfare on the Western Front. In too many instances, pilots had to complete their education on active service.[87]

Although Jones' comment as to pilot training falling short of frontline requirements is patently true, the establishment of the school at Gosport in July 1917 (becoming the School of Special Flying in May 1918[88]) could not immediately change pilot training overnight.[89]

One method of assessing the overall effectiveness of the Smith Barry reforms to pilot training is to consider casualty rates and accidents. As far as the former were concerned on the Western Front, the RFC/RAF officers and NCOs killed, wounded, missing and PoW figures for 1916, 1917 and 1918 were 985, 3,633 and 4,580 respectively.[90] Given these figures need to be considered alongside the expansion in aircraft, and therefore personnel, from 34 squadrons in October 1916, to 46 squadrons in April 1917 to around 108 in November 1918, the continued rise in casualties is still significant.[91] Aircraft losses at No.5 Fighting School are also worth considering and provide a case in point. The attendance at a Fighting School occurred at the end of flying training and so in theory, pilots should be able to operate their aircraft safely and effectively on arrival at the school. The casualty figures for 6 September – 21 November 1918 highlighted many examples of poor airmanship and skill levels. In all there were 29 accidents in that 10 week period that included taxying into parked aircraft, stalling and spinning on take-off and landing, undershooting the runway, stalling and crashing whilst turning down-wind, mid-air collisions, numerous heavy landings and landing 'outside the aerodrome and [running] into a ditch.'[92] Perhaps even more telling about the overall state of training and pilot competency are the accidents that occurred after the Armistice. The number of deaths and injuries caused by air crashes in France from 12 November 1918 to 5 April 1919 were considerable. In the last 19 days of November alone, 30 pilots and observers were killed or injured in 23 crashes.[93] In December there were 27 accidents killing or wounding 32 aircrew; January 1919 saw 16 accidents, killing or wounding 18; and from 1 February until 5 April 1919 when the records cease, there were 33 accidents that killed or wounded 34. Although weather might have played a part during the winter of 1918/1919 and aircraft maintenance issues, the number of accidents cannot be put down to these factors alone.

It took time for the initial batch of instructors to be trained under the Gosport system and for their knowledge to percolate to pupils in the rapidly expanding RFC/RAF. Where Smith Barry's changes really impacted the training legacy left for the later RAF was in his use of a single training aircraft equipped with dual controls, the Avro 504.[94] Previously, pilots had

trained on a number of different aircraft types during their basic training before moving on to a 'service type'.

In terms of the pilots' training experience pre-Gosport, the example of one pilot is reflective of many. Lieutenant J.J. Breen applied to transfer to the RFC from the Royal Irish Regiment in October 1915.[95] After a successful interview at the Air Board, Breen was accepted and sent to 3 RAS at Shoreham where he flew solo after 45 minutes. At the end of November he was sent to Netheravon to complete his training on four aircraft types before being posted to France 'at the beginning of 1916.' Breen was clearly not impressed with the training that he had received.

> The whole training [sic] was of the most haphazard variety. There was of course no method of verbal communication between instructor and pupil in the air and I do not even remember that any adequate lectures on the theory of flight, were ever given. One picked up what one could by observation and asking questions...If subsequent experience has impressed one thing more than another upon my mind, it is the absolute necessity for careful, systematic and individual instruction for pupils in the initial stages of their flying career.[96]

Breen's 45 minutes before going solo was around the norm for military pilot training in 1914-15. Flight Sub Lieutenant T.V. Lister RNAS commenced his flying training at Hendon and took his first flight on 24 November 1914. After four flights of 15, 10, 10 and 20 minutes he was sent solo.[97] After 3 hours and 30 minutes at Hendon flying the Bristol Boxkite, Lister was sent to the CFS where he completed a further 19 hours and 38 minutes on two further aircraft types before being posted to Calshot to undergo seaplane training in March 1915. He arrived in his first squadron in Dover with over 34 hours in his log book. Considering that Kennett has argued that RFC pilots were sent to the front with 'as little as 4-5 hours' it is worth considering whether the RNAS had adopted a different training system and if so, why?[98] It is highly likely that the main reason was the much smaller structure of the RNAS, the generally much reduced pilot wastage rates when compared to the RFC and the need to train pilots for specialist tasks such as flying seaplanes which demanded increased flying experience and therefore, more flying hours. The other factor was that the RNAS was a much smaller organisation than the RFC and it is likely that this environment created an emphasis on quality rather than quantity as was the case with the RFC.

In further moves to alter the training status quo and overcome the experiences of pilots such as Breen, Smith Barry also introduced the 'Gosport Tube' to allow instructors to communicate with pupils, a formal set of instructional procedures and terminologies, the so-called 'Gosport Patter', as well as the creation of a 'wing examining officer' to check and maintain flying instructor standards.[99] Napean Bishop, an observer of Smith Barry at Gosport, has stated that one of the other major innovations that was instigated by Smith Barry was an increase in aerobatic flying, 'particularly as regards spinning, a thing which up until then had been regarded as a 'killer''. Smith Barry's approach to training was certainly robust and structured

but it could not be universally adopted immediately and its adoption was a slow process as instructors were trained and the Avro 504s procured.

It was not until August 1915 that observer training was improved significantly with the introduction of formalised qualification tests that included gunnery, artillery observation, photography and Wireless Telegraphy.[100] Prior to this, observers were largely volunteers and were given on the job training within operational squadrons however some formal training was conducted in 1914.[101] The realisation of the importance of the observer's role was further recognised with the establishment of the Wireless School at Brooklands and by the creation of the School of Military Aeronautics at Reading in December 1915.[102] This school was primarily aimed at pilots and designed to provide technical ground instruction prior to flying training. However if space permitted, observers were allotted a place. Although clear steps had been taken to improve the professional training of the observer in 1915, a contemporary account does offer criticism of the training. Lieutenant P.S. Jackson-Taylor applied to join the RFC in September 1914 and was eventually accepted for observer training in November 1915.[103] After attending Reading he was sent to the School of Aerial Gunnery at Hythe where he was trained in the use of the Lewis and Vickers machine guns. Jackson-Taylor complained of pupils only firing 100 rounds and the difficulty of flying due to unserviceable aircraft as well as the training being too theoretical and technical 'rather than the practical aspects' needed at the front.

The problem of transmitting a new training methodology however, was aggravated by the changing structure of the RFC and the lack of direct control by the Training Division and later, its abolition in May 1918.[104] In April 1918, the UK was divided into five administrative areas that were sub-divided into groups that also included training units. Following the disbandment of the Training Division, training was coordinated from the Air Ministry's Directorate of Training with some responsibilities devolved to Areas, now no longer numbered but known by geographic locations.[105] Because of this split responsibility, there was a 'need for standardisation' in training which was still lacking.[106] The size of the training coordination challenges presented to the RFC/RAF during this period from late 1917 to the end of the war in November 1918 was reflected in the massive training estate; 383 airfields and numerous depots and schools were operated by the RAF at the end of June 1918.[107]

Logistics – A Means to Train

In August 1914, the combined strength of the RFC and RNAS was 2,073 officers and men; by November 1918, this figure had grown to 291,175.[108] In terms of RFC squadrons, the four that were sent to France in August 1918 had grown to 108 by the end of the war.[109] If home defence, training and overseas squadrons are taken into account, this figure rises to approximately 390.[110] This massive growth in manpower and squadrons during the First World War, and the concomitant need to match training and resources to achieve aircrew output, would cause the same challenges to the RAF during expansion and the early years of the Second World War. The logistics of providing resources such as training aircraft,

accommodation and airfields became critical from the Battle of the Somme onwards. Despite the growth of airfields in Britain, the RNAS opened a training centre at Vendome in France in November 1916. This new training centre was first mooted in March 1916 when Captain Vaughan-Lee, RNAS Director of Air Services said that poor weather in Britain was, '...causing a very serious interference with the training of pilots...'[111] Vendome graduated an average of 15 pilots per month and these included students from the RNAS, RFC, US Army and French Navy.

As the pressure on the RFC's training resources in Britain increased throughout 1916, a number of overseas training venues started to produce pilots and observers. In April 1916 the W.O. decided to open a flying training school in Egypt. Three UK-based training squadrons each provided a flight to act as a nucleus for squadrons in Egypt and all were in country by August 1916.[112] The establishment of a technical school at Heliopolis followed what was eventually to become No.3 School of Military Aeronautics whilst in December, another flying training school was opened at Ismailia and a further school established at Suez in January 1917. From January 1917, Jones stated that 60 pupils per month were being sent to Egypt and after 15 hours solo, were returned to the UK for final training.[113] Pupil numbers increased yet again with the opening of No.3 Cadet Wing in October 1917 so that in 1918, the flying training system in Egypt graduated 2,164 pilots.[114]

Britain's other major overseas training facility was located in Canada and pilot training commenced there in January 1917.[115] Like Egypt, Canada had its own School of Military Aeronautics and Cadet Wing to provide basic military training and ground school instruction prior to the commencement of flying training.[116] This training was conducted from eight airfields but it was found that in the winter of 1917-1918, flying had to be curtailed which resulted in training being moved to three airfields in Texas. By the end of the war, Canada had graduated over 2,500 pilots and Jones stated that in 1918, 200 pilots per month were being sent to Britain from Canada.[117] Although this number pales when compared to the 131,500 aircrew trained in Canada during the Second World War as part of the BCATP, this early experience clearly provided a legacy that was revisited and exploited 20 years later.[118] Canada highlighted a major issue with Britain's 'haphazard' policy towards its air services. Unlike the RFC, the RNAS commissioned its pupils and so Canadians opted for the RNAS due to increased pay and status, instead of the much needier RFC. This, according to Jones, resulted in a glut of pilots in the RNAS and a shortage in the RFC.[119]

In a move to address directly the issue of the logistics needed to support the 'training pipeline', a Training Expansion Committee was established and this organisation held its first meeting on 19 June 1918.[120] The main task of the Training Expansion Committee was to find resources to increase flying training output to meet a need for 341 operational squadrons that were demanded by 30 September 1919.[121] At the inaugural meeting, Brigadier–General T. Hearson highlighted the need to match each operational squadron 'one for one' with a training squadron. As discussed above, by the end of the war, the RAF's training squadrons had parity in this 'one for one' goal but the lesson writ large was that training needed massive resources and

logistical support to enable it to maintain operationally effective service squadrons. Perhaps the parlous nature of generating such numbers of aircrew is highlighted in the minutes of the third meeting of the Training Expansion Committee held on 4 July 1918 which stated, 'that a separate mortuary building be provided at all Aerodromes, the building to be as inconspicuous as possible.'[122]

The Training Expansion Committee was replaced by the Accommodation Committee in October 1918 but the organisation had completed very valuable work in highlighting the shortfall in resources and logistics required to undertake training. In July 1918 for example, the committee reported a shortage of Schools of Aerial Gunnery and Fighting stating that 'four more are required'; that six day bombing and one night bombing school needed to be established; and that two additional 'Schools for Instructors' were required. The committee also required the building of new accommodation at Hythe, New Romney, Eastchurch and Manston to increase the throughput of observers.[123] This logistic experience provided a legacy that again reinforced the knowledge gleaned throughout the First World War that effective operational training demanded a massive investment in training.

Conclusion

In considering the operational training legacy left by the RFC, RNAS and RAF as the RAF expanded and then entered the Second World War there are clearly many aspects that provided direct experience and benefit. Perhaps the major legacy was recognition that to train sufficient aircrew to sustain a nation engaged in industrialised warfare demanded a fully functioning, well-resourced and robust training organisation. That training organisation should employ a systematic approach to training and here, albeit not initially as far reaching as many claim, Smith Barry's School of Special Flying provided the genesis for that change. The other major legacy that was not drawn upon during the inter-war years but that was recognised during the Second World War was that the 'training pipeline' was a dynamic environment and was affected by changing tactics, technologies, resources and wastage – both to personnel and aircraft. Given the small size of the RAF during the interwar years this was not surprising but like the First World War, the scale of the Second World War demanded increased emphasis on training and aircrew production. Unlike the latter stages of the Second World War when there was a surfeit of aircrew and where the curriculum provided phases such as elementary, advanced, operational conversion and increased numbers of specialist flying courses, the First World War training pipeline was always under pressure to address quantitative output to meet aircrew wastage rates and as a result, qualitative standards regularly suffered. Unfortunately, in a race to maximise output, initial training frequently had serious shortcoming and operational squadrons were forced to make up the shortfall in standards by closing the training-gap. The training process did fundamentally work during the First World War but as this paper has highlighted, there were serious shortcomings in the terms of the quality of output. Despite these problems, the RNAS/RFC/RAF had provided a large training legacy from its experiences that to a greater or lesser degree, established a basis for future training. It must be recognised that this was a major achievement considering the

nascent state of military aviation in 1914 and the major technological advances to aircraft during the First World War.

Notes

[1] TNA PRO AIR 10/5551, *Flying Training, Volume I, Policy & Planning*, is an AHB Narrative that provides an overview of training between 1939-1945.
[2] TNA PRO AIR 2/4168, *Memorandum Air Commodore R.P. Willcock, DSD to Air Vice-Marshal Babington, Director of Postings*, dated 25 January, 1940.
[3] TNA PRO AIR 14/10, *Aircraft Crews and Policy, Memorandum from AOC 6 Group to AOC-in-C Bomber Command* dated 13 January, 1942.
[4] C. Gibbs-Smith, *Aviation – An Historical Survey From its Origins to the end of World War II* (London: HMSO, 1970) pp.100-101, provides a description of Orville Wright's first powered flight on 17 December 1903.
[5] See for example, A. Clarke, *Aces High* (London: Fontana, 1974) p.15 and p.22.
[6] See C.H. Gibbs-Smith, *Aviation*..., p.153 for the Taube's wing-warping technology and p.167 for the Sopwith Tabloid.
[7] See for example, R. Grattan, *The Origins of Air War* (London: Tauris Academic Studies, 2009) Table 3.1, 'Improvements in Aircraft Performance, 1914-18', p.65.
[8] See for example, J. Terraine, *The Right of the Line* (Ware: Wordsworth, 1997) for a description of the different roles undertaken by RAF aircraft during 1939-1945.
[9] TNA PRO AIR 1/823/204/5/42, contains a series of correspondence between the W.O. and RFC on night flying training.
[10] D. Edgerton, *England and the Aeroplane* (London: Penguin, 2013) p.16.
[11] FAAM, *Royal Flying Corps Training Manual, Part II (Military Wing) 1914*. W.O.1893.
[12] F.H. Sykes, 'Military Aviation' in *The Aeronautical Journal*, July 1913, p.130. Interestingly, Sykes spoke about the importance of gaining 'command of the air' and that; 'The side which losses the command of the air will labour under the disadvantages of defensive action.'
[13] FAAM, *Naval Air Service Training Manual 1915* (London: HMSO, November 1914)
[14] P. Hart & N. Steel, *Tumult in the Clouds* (London: Hodder & Stoughton, 1997) p.xi.
[15] Colonel J.D. Fullerton spoke of the need to 'obtain command of the air' and the requirement for 'high-speed flying machines armed with light guns' as early as 1906. RUSI lecture, *Recent Progress in Aerial Navigation* delivered on 15 November 1906. TNA PRO AIR 1/725/114/2.
For Trenchard's policy, see RAFM MFC 76/1/4, *Future Policy in the Air*, dated 22 September 1916.
[16] J. Morrow, *The Great War in the Air*, (Washington: Smithsonian Institution Press, 1993) p.116.
[17] Ibid.
[18] T. Davis Biddle, 'Learning in Real Time: The Development and Implementation of Air Power in the First World War' in S. Cox & P. Gray (eds) *Air Power History: Turning Points from Kitty Hawk to Kosovo* (London: Frank Cass, 2002) p.14.
[19] R. Grattan, *The Origins*..., p.85.
[20] P.Hart & N. Steel, *Tumult*..., p.108 discusses the arrival of the DH2 in early 1916 to challenge the Fokker Eindecker for 'supremacy'.
[21] J. Pugh, *The Conceptual Origins of the Control of the Air: British Military and Naval Aviation,*

1911-1918 (University of Birmingham: PhD Thesis, 2012) p.61.
[22] TNA PRO AIR 1/746/204/3/22, Brooke-Popham's report on aerial combat *Fighting Hostile Aeroplanes in the Air* dated 1 February 1915. Brooke-Popham wrote this report when he was CO of 4 Squadron.
[23] A. Clark, *Aces High*, pp.51-53.
[24] TNA PRO AIR 10/180, *RFC Training Manual Part II*, A.P.144.
[25] C. Cruttwell, *A History of the Great War 1914-1918* (Oxford: Clarendon Press, 1934) provides an overview of the battles and events of the First World War.
[26] R. Barker, *The Royal Flying Corps in World War I* (London: Robinson, 2002) p.73 and p.78.
[27] H.A. Jones, *War in the Air Vol.II* (Oxford: Clarendon Press, 1922) refers to pilot training measures in 1915 as 'inadequate', although acknowledging that by the autumn specialization in training had begun, pp.293-294.
[28] J. Morrow, T*he Great War...*, p.129. The author also states that 'technological and industrial mobilization...became crucial' to enable increased aircraft performance.
[29] H.A. Jones, *War in the Air Vol.II* (Oxford: Clarendon Press, 1922) p.293-294.
[30] TNA PRO AIR 41/4, *AHB Narrative, Aircrew Training 1934-1942*, pp.37-38.
[31] TNA PRO AIR 1/2161/209/4/26, *Memo Commander 2 Wing to Squadrons*, dated 18 January 1916.
[32] A. Clark, *Aces High*, p.45. *Jasta* is an abbreviation of *Jagdstaffeln* or fighter squadrons.
[33] TNA PRO AIR 1/718/29/1, Trenchard, *Future Policy in the Air*, dated 22 September 1916.
[34] R. Barker, *The Royal Flying Corps...*, p.223.
[35] J. Pugh, *The Conceptual Origins...*, p.264.
[36] During this three-year period, RFC/RNAS/RAF casualties killed, wounded and missing were: 1916 – 985, 1917 – 3,633 and 1918 – 4,580. TNA PRO AIR 1/39/15/7, *RFC/RAF Casualty Figures 1914 – 1918*.
[37] TNA PRO AIR 1/997/204/5/1241.
[38] R. Barker, *The Royal Flying Corps...*, p.220.
[39] A. English, *The Cream of the Crop* (Montreal: McGill-Queen's university Press, 1996) p.41.
[40] R. Morley, *Earning Their Wings: British Pilot Training, 1912 – 1918* (University of Saskatchewan: MA Dissertation, 2006) p.70.
[41] TNA PRO AIR 1/15/40/218 contains correspondence and affidavits from both pilots and from their commanding officers to HQ RFC.
[42] TNA PRO AIR 1/2306/228/11/1, 'War Experiences of Second Lieutenant C.F.A. Portal, September 1922'.
[43] TNA PRO AIR 1/1135/204/5/2224, Letter, 3 Bde to HQ RFC in the Field, dated 15 March 1917.
[44] TNA PRO AIR 1/1135/204/5/2224, Letter OC 22 Sqn to HQ 9 Wg, dated 14 September 1917.
[45] TNA PRO AIR 1/1135/204/5/2224, letter 3 Bde to 12 and 13 Wings dated 18 March 1918.
[46] R. Morley, *Earning Their Wing*, p.23 and pp.34-5.
[47] R. Barker, *The Royal Flying Corps...*, pp.210-11.
[48] Ibid. p.146 and p.211.
[49] R. Sturtivent, 'British Flying Training in World War I' in *Cross & Cockade* Vol.23, No.1, 1994, pp.18-19.
[50] H.A.Jones, *The War in the Air Vol.III* (Oxford: Clarendon Press, 1931) p.288.
[51] C.R.M.F. Cruttwell, *A History of the Great War 1914-1918* (Oxford: Clarendon Press, 1934) pp.7-11.

[52] Ibid, pp.293-294.
[53] P. Hart & N. Steel, *Tumult*..., p.92.
[54] R. Barker, *The Royal Flying Corps*..., p.109.
[55] Ibid, pp.67-68.
[56] R. Sturtivent, 'British Flying Training...', pp.18-45. The author gives details of the formation of 5th, 6th, 7th and 8th Wings that all formed in the UK during 1915.
[57] R. Barker, *The Royal Flying Corps*..., p.109.
[58] *Oxford Dictionary of National Biography*.www.oxforddnb.com (accessed on 3 November 2016). The ODNB biographer, Richard Smith, says Henderson found the challenge of his employment too much and returned to London because both roles 'placed a strain on his health.'
[59] Ibid, pp.87-88.
[60] Hansard, www.hansard.millbanksystems.com/lords/1916/may/24/the-air-service (accessed 11 November 2014). The Earl of Derby in the Lords Debate 23 May 1916, 'The Air Service'.
[61] Hansard and the War Cabinet minutes provide a valuable insight into the problems of aircraft production throughout the war. Problems centre on aircraft design, raw materials, production resources and industrial disputes. See for example CAB/23/2/41 and CAB 24/27/23, War Cabinet Minutes from meetings on 20 April and 22 September 1917 respectively on the problems of aircraft production.
[62] J. Pugh, *The Conceptual Origins*..., p.117-119.
[63] H.A. Jones, *The War in the Air, Vol III*, p.295.
[64] J. Morrow, T*he Great War*..., p.167. Morrow argued that this approach effectively doubled the number of training aircraft available to the RFC.
[65] H.A. Jones, *The War in the Air, Vol V*, p.449.
[66] H.A. Jones, *The War in the Air, Vol. III*, pp.297-298.
[67] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on RFC Organisation and Training 1917*.
[68] TNA PRO AIR 1/28/15/1/132, Minutes of the first Training Expansion Committee, 19 June, 1918.
[69] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on RFC Organisation and Training 1917*.
[70] R. Sturtivent, 'British Flying Training...' p.18.
[71] R. Barker, *The Royal Flying Corps*..., p.13.
[72] The Admiralty Circular letter in which the official creation of the RNAS was announced is reproduced in S.W. Roskill (ed), *Documents Relating to the Naval Air Service, Vol .I, 1908-1918* (Navy Records Society, 1969), p.156.
[73] TNA PRO AIR 1/686/21/13/2252.
[74] TNA PRO AIR 1/408/15/240/2, *Strength of 'Planes and Pilots, Middle-East Brigade from October 1916, Egypt*.
[75] www.hansard.millbanksystems.com/written-answers/1913/jan/14/royal-flying-corps (accessed 26 November 2014).
[76] H.A. Jones, *The War in the Air, Vol.III*, p.292.
[77] P. Hart & N. Steel, *Tumult*..., p.77.
[78] R. Sturtivent, 'British Flying Training...' p.18.
[79] M.C. Fox, *To Rule the Winds – Volume 1: Prelude to Air War – The Years to 1914* (Solihull: Helion & Company, 2014) pp.144-147. Fox describes the ban on monoplane aircraft as a 'crisis' due to

the number of accidents and mid-air disintegrations associated with design.
[80] H.A. Jones, *The War in the Air, Vol. V* (Oxford: Clarendon Press, 1935) p.425.
[81] Ibid, p.426.
[82] A. English, *The Cream...*, See Chapter 2.
[83] F.D. Tredrey, *Pioneer Pilot – The Great Smith Barry Who Taught The World How to Fly* (London: Peter Davies, 1976).
[84] R. Barker, *The Royal Flying Corps...*, see pp. 171, 189 and 301.
[85] P. Hart & N. Steel, *Tumult...*, see pp.89 and 92.
[86] Salmond commanded the RFC Training Brigade and later, the Training Division and provided senior officer support for Smith-Barry. Longcroft was GOC the Training Division after Salmond. Brooke-Popham was central in defining scout tactics.
[87] H.A. Jones, *The War in the Air*, Vol.V, p.434.
[88] F. Tredery, *Pioneer Pilot...*, p.95.
[89] Smith-Barry wrote two papers outlining his approach to flying training in November and December 1916 respectively. He took over command of 1 (Reserve) Squadron – also referred to as No.1 (Training) Squadron - at Gosport in January 1917 from where a number of student pilots graduated. In July 1917, 27 and 55 Training Squadrons merged with 1 Squadron to form a Training Depot Station that latterly became the Gosport School of Special Flying that mainly concentrated on the training of flying instructors.
[90] TNA PRO AIR 1/39/15/7 *RFC/RAF Casualty Figures 1914-1918*.
[91] TNA PRO AIR 1/2432/306/1, *Air Ministry Report No.9 Fortnight Ending 4th November 1918 – Summary of Work Carried Out by the Royal Air Force in Various Theatres*. This report shows the RFC's strength on the Western Front as 85 squadrons and five special duty flights. In addition, the Independent Force had nine squadrons.
[92] TNA PRO AIR 1/2045/204/374/9, *No.5 Fighting School, 38 Training Wing Royal Air Force, Casualty Reports 6th September – 21st November 1918*.
[93] TNA PRO AIR 1/969/204/5/1102, *Summary of Accidents Royal Air Force*.
[94] O. Thetford, *Aircraft of the Royal Air Force since 1918* (London: Putnam, 1976) pp. 44-47. Thetford said that the Avro 504, 'laid the foundations of systematic flying instruction...evolving methods which became the basis of the R.A.F.'s Flying Training School syllabus for many years afterwards.'
[95] NAL, AP1308, Sqn Ldr J.J. Breen, 'War Experiences' in *A Selection of Lectures and Essays from the Work of Officers Attending the Fifth Course at the Royal Air Force Staff College 1926-27*, April 1928.
[96] Ibid.
[97] FAAM, Flying Log Book of Flt. Sub-Lt. T.V. Lister.
[98] L. Kennett, *The First War in the Air*, 1914-1918 (New York: The Free Press, 1991) p.122.
[99] NAL, C. Napean Bishop, *Smith-Barry and the Gosport School of Special Flying, 1917/1918*. This was a lecture presented to the Royal Aeronautical Society on 26 November 1962.
[100] AHB, *The Royal Air Force in the Great War* (London: IWM, 1996) p.74. This book is a reprint of the original AHB *AP125 A Short History of the Royal Air Force in the Great War* that was published in 1936.
[101] TNA PRO AIR 1/683/21/13/2234, War Office letter nominating 10 officers for specialist

observer training dated 6 July 1916.
[102] H.A.Jones, *War in the Air, Vol.II*, p.293-294. Jones refers to Reading as the School of Instruction.
[103] NAL, AP1308, *A Selection of Lectures and Essays from the Work of Officers Attending the Fifth Course at the Royal Air Force Staff College 1926-27*, issued April 1928. Flight Lieutenant P.S. Jackson-Taylor, 'War Experiences 1914-18' pp.37-42.
[104] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on Training – RFC and RAF*.
[105] South East, South West, Midland, North East and North West areas.
[106] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on Training – RFC and RAF*.
[107] TNA PRO AIR 1/2432/306/1. These airfields covered a combined land area of 55,821,830 acres.
[108] H.A. Jones, *The War in the Air, Vol.VI Appendices* (Oxford: Clarendon Press, 1937) Appendix XXXV, *Strength of British Air Personnel August 1914 and November 1918*.
[109] TNA PRO AIR 1/2432/306/1, *Summary of Work Carried out by Royal Air Force in Various Theatres of War – A.M. Report Fortnight Ending 4th November 1918*. There is much confusion about the total number of RAF squadrons available at the end of the war. The figure of 108 comes from 85 former RFC squadrons and five independent flights, three former RNAS squadrons in the Dunkirk Wing plus nine squadrons from the Independent Force at Ochey.
[110] www.airwar1.org, accessed on 20 February 2015.
[111] TNA PRO AIR 1/678/21/13/2085, AHB - *Summary Notes on Training of R.N.A.S. Personnel 1914-1918*.
[112] R. Sturtivant, 'British Flying Training...' pp.18-45. pp.20-21. Aboukir is often referred to as Abu Kir.
[113] H.A. Jones, *The War in the Air, Vol.III*, p.450.
[114] H.A. Jones, *The War in the Air, Vol. V*, Appendix X 'Statistics for the Training Brigade in Egypt, 1918'.
[115] R. Morley, *Earning Their Wings...*, p.89.
[116] AHB *The Royal Air Force in the Great War*, p.249.
[117] R. Morley, *Earning Their Wings...*, p.89. See also H.A. Jones, *The War in the Air Vol. V*, pp.466-7.
[118] www.rafmuseum.org.uk/research/online-exhibitions/taking-flight/historical-periods/first-world-war-flying-training.aspx. Accessed on 18 March 2015.
[119] H.A. Jones, *The War in the Air, Vol. V*, pp.458-9.
[120] TNA PRO AIR 1/28/15/1/132, The Committee held its ninth and final meeting on 30 September 1918.
[121] TNA PRO AIR 1/28/15/1/132, *Minutes from the Training Expansion Committee fourth meeting held on 12 July 1918*.
[122] TNA PRO AIR 1/28/15/1/132, *Minutes from the Training Expansion Committee third meeting held on 4 July 1918*.
[123] TNA PRO AIR 1/28/15/1/132, *Minutes from the Training Expansion Committee fourth meeting held on 12 July 1918*.