

The Royal Naval Air Service and Anti-Submarine Warfare in the North Sea, 1917 – 1918¹

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ABSTRACT

This paper examines the role of the Royal Naval Air Service in the anti-submarine warfare and convoy protection campaigns of 1917-1918. During this crisis of the naval war, Britain's naval aviators carried out coastal air patrols, directly bombed Germany's submarine bases in Belgium, and flew aerial escort missions in support of merchant convoys. These operations are rarely considered in the literature on anti-submarine warfare, but form an integral component of the Royal Navy's holistic approach to defeating Germany's U-boats, and ultimately directly contributed to the allied victory in the First World War.

Germany's unrestricted submarine offensive of 1917-1918 represented the greatest threat to Britain's command of the sea during the First World War. The Battle of Jutland, the only major encounter between dreadnought battle fleets between 1914-1918, decided the outcome of the conflict at sea so far as Germany's High Seas Fleet was concerned. Unrestricted submarine warfare, the submarine (U-boat) blockade of Britain's merchant shipping, was now resumed by Germany's naval leadership in the belief that their submarines represented the only means of defeating Britain in 1917. The details of the events which followed, from skyrocketing merchant shipping loss rates to the introduction of convoy escort and the suppression, although not complete victory, over the U-boats is well known. Less well known is the contribution of the Royal Naval Air Service (RNAS) to the efforts to defeat the U-boats.² Popular accounts

¹ A version of this article was presented at the McMullen Naval History Symposium, United States Naval Academy, Annapolis, 14-15 September 2017.

² The most thorough accounts of the RNAS contribution to ASW are those of John Abbatiello, *British Naval Aviation and the Anti-Submarine Campaign, 1917-1918*, (PhD Thesis, King's College London, 2004), & John Abbatiello, *Anti-Submarine Warfare in World War I: British Naval Aviation and the Defeat of the U-Boats* (New York: Routledge, 2006). Also significant is the work of Christina Goulter, 'The Royal Naval Air Service: www.bjmh.org.uk

tend to ignore the anti-submarine role played by Britain's naval aviation, or mention it only in passing.³ Combined with the ongoing maritime archaeological debate regarding the number of submarines sunk by aircraft during the First World War, the near invisibility of the RNAS in the popular perception of the U-boat crisis has led to a distorted view of the Admiralty's response.⁴ Anti-submarine warfare (ASW) was not at first the top priority of the Admiralty's Air Department, although the RNAS steadily grew in size and capability between 1914-1916. The significance and scale of the naval aviation response to unrestricted submarine warfare increased dramatically in 1917 when new aircraft, weapons, and techniques became available to the Naval Air Station (NAS) commanders around Britain's coasts. This paper investigates the RNAS contribution to ASW, specifically examining three aspects of the RNAS effort in the North Sea during the final phase of unrestricted submarine warfare: the 'spider web' air patrols, convoy escort missions, and the bombing of the submarine bases on the Belgian coast. The article concludes that the RNAS played a significant role as part of the Royal Navy's holistic response to the 1917 crisis, only to be consumed by the creation of the Royal Air Force (RAF) in 1918.

Britain, at the outbreak of the First World War, seemed powerless to prevent Germany's U-boats from sinking warships or merchant shipping at will. The reality of the submarine threat was dramatically demonstrated by the high-profile torpedoing of the armoured cruisers *Aboukir*, *Hogue*, and *Cressy*, by U9 on 22 September 1914,⁵ and the U-boat threat was soon expanded to merchant shipping by Germany's response to Britain's blockade, by the declaration of a war zone around Britain on 4 February

A Very Modern Force', in *Air Power History: Turning Points from Kitty Hawk to Kosovo*, ed. Sebastian Cox and Peter Gray (New York: Frank Cass Publishers, 2002), pp. 51–65, & Christina Goulter, *A Forgotten Offensive: Royal Air Force Coastal Command's Anti-Shipping Campaign, 1940-1945*, Kindle e-book (Abingdon: Routledge, 2013), chapter 1.

³ Robert Massie, *Castles of Steel: Britain, Germany, and the Winning of the Great War at Sea* (New York: Ballantine Books, 2003), pp. 715-39. Geoffrey Bennett, *Naval Battles of the First World War* (London: Penguin Books, 1968), p. 267.

⁴ Richard Layman, *Naval Aviation in the First World War: Its Impact and Influence* (London: Chatham Publishing, 1996), appendix 2, p. 211. Dwight Messimer, *Find and Destroy: Antisubmarine Warfare in World War I* (Annapolis: Naval Institute Press, 2001), pp. 136-9. See also, John Terraine, *Business in Great Waters: The U-Boat Wars, 1916-1945*, Kindle e-book (Barnsley: Pen & Sword Military, 2009), part 1, chapter 3, loc. 1668-1705. Innes McCartney, *The Maritime Archaeology of a Modern Conflict: Comparing the Archaeology of German Submarine Wrecks to the Historical Text* (PhD Thesis, Bournemouth University, 2013), volume 1.

⁵ Julian Corbett, *Naval Operations* (Uckfield: The Naval & Military Press Ltd, 1920), vol. 1, pp. 174-5.

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1915.⁶ By striking at Britain's oceanic supply lines, the traditional *guerre de course*, the U-boats could potentially impact Britain's ability to carry on the war. In February 1915, however, there were hardly more than 20 U-boats available,⁷ and American protests following the sinking of *Lusitania* on 7 May 1915, and *Arabic* on 19 August, successfully curtailed this first U-boat threat in the Atlantic and North Sea, while submarine operations were refocused on the Mediterranean.⁸

On 25 April 1916 the U-boats were withdrawn from commerce raiding altogether for work with the High Seas Fleet.⁹ Following the Battle of Jutland, and Admiral Scheer's August sortie, it became clear to Germany's naval leadership, Chief of the German Naval Staff Admiral von Holtzendorff foremost amongst them, that the only chance of defeating Britain in 1917 lay with the resumption of unrestricted submarine warfare, regardless of the consequences for neutral opinion.¹⁰ British and allied merchant shipping losses began to climb in September, reaching more than 300,000 tons, a rate which was maintained until unrestricted warfare was formally recommenced in February 1917, when losses spiked to over 500,000 tons,¹¹ and it was not long before the United States declared war against Germany on 6 April, the same month in which loss rates peaked at 834,549 tons (between January and the end of April 1917 Britain's total mercantile tonnage had fallen from 16,591,000 tons to 15,874,000 tons, losses that did not stabilize until March 1918 when 14,425,000 tons remained).¹² The American declaration of war freed the Admiralty from its concerns regarding the legal and material practicalities of convoys, the first of which began to cross the Atlantic in May.¹³

⁶ Arthur Marder, *From The Dreadnought to Scapa Flow [FDSF]* (Barnsley: Seaforth Publishing, 2013), vol. 1, p. 344.

⁷ Marder says 22 U-boats were available in February 1915, Marder, *FDSF*, volume 2, p. 345. Corbett says 24, Julian Corbett, *Naval Operations*, volume. 3, p. 142. Gibson & Prendergast say 20, R. H. Gibson and Maurice Prendergast, *The German Submarine War, 1914-1918*, Revised edition (London: Naval & Military Press, 2003), p. 32.

⁸ Julian Corbett, *Naval Operations*, vol. 3, pp. 141-2.

⁹ Tim Benbow, *Naval Warfare 1914-1918*, Kindle e-book (London: Amber Books Ltd, 2011), chapter 6, loc. 2972. Marder, *FDSF*, vol. 2, p. 348.

¹⁰ Henry Newbolt, *Naval Operations* (Eastbourne: The Naval & Military Press Ltd, 1928) vol. 4, p. 233.

¹¹ Duncan Redford and Philip Grove, *The Royal Navy, A History Since 1900* (New York: I. B. Tauris, 2014), p. 81.

¹² Redford and Grove, *The Royal Navy*, p. 81. Ernest Fayle, *Seaborne Trade* (London: John Murray, 1920), vol. 3, appendix C, p. 470.

¹³ Newbolt, *Naval Operations*, vol. 5, appendix B, p. 403.

The Admiralty, Air Department, and the 1917 reforms

The Admiralty was now under the leadership of First Sea Lord Admiral Sir John Jellicoe, whose primary task was to reduce the unsustainable merchant shipping losses.¹⁴ Jellicoe introduced a range of measures, from administrative reforms, such as the introduction of the Anti-Submarine Division (ASD) of the Naval Staff, to material improvements including arming merchant ships, improved mines, and mass produced depth-charges.¹⁵ New aircraft, seaplanes, flying boats and non-rigid airships played their part, carrying out routine patrols to locate and suppress U-boats operating in the North Sea, English Channel, and the Atlantic approaches. Routine patrols, even by unarmed aircraft or airships, had the impact of denying U-boats access to the surface, forcing them to run submerged on batteries and thus reducing their effectiveness.

At the Air Department, First Sea Lord Jellicoe removed Rear-Admiral Vaughan-Lee, the Director Air Services (DAS), who had been a proponent of the Royal Navy's long-range bombing efforts,¹⁶ and replaced him with Commodore Godfrey Paine, formerly the commandant of the Central Flying School, Upavon, and RNAS Cranwell. Paine's background in training and connections with the old Royal Flying Corps (RFC) Naval Wing made him ideally suited to the task of preparing the RNAS for its renewed role combating Germany's unrestricted submarine war. As Jellicoe recalled, Commodore Paine, 'devoted much energy to the provision of suitable aircraft,' fitting with Jellicoe's general expansion of all ASW measures.¹⁷ On 10 January 1917 Commodore Paine was given a seat on the Admiralty Board as the Fifth Sea Lord, responsible for all naval air matters, keeping him in close touch with Jellicoe.

To specifically address the submarine crisis, Jellicoe appointed Rear-Admiral Alexander Duff to head the new Anti-Submarine Division (ASD) of the Naval Staff. Rear-Admiral Duff, shortly after assuming office in January 1917, conducted an, 'exhaustive survey' of anti-submarine methods, and concluded that two lines of policy should generally be

¹⁴ A. Temple Patterson, ed., *The Jellicoe Papers* (London: Spottiswoode, Ballantyne and Co. Ltd., 1968), vol. 2, p. 111.

¹⁵ John Jellicoe, *The Crisis of the Naval War* (London: Cassell and Company, Ltd, 1920), pp. 42-70.

¹⁶ A. D. Harvey, 'Subjective Impressions in the Archives: Britain's National Archives as a Source for Personal Accounts, and Personal Opinions, of Air Warfare 1914-1918', in *Cross & Cockade International*, Vol. 43, No. 3 (Autumn 2014), p. 204. See also, Admiralty document on RNAS bombing, 25 February 1916, The National Archives, Kew [TNA] ADM 1/8449/39A.

¹⁷ Admiralty Board Minutes, Wednesday 31 January 1917, TNA ADM 167/51. Jellicoe, *Crisis of the Naval War*, pp. 52 & p. 140.

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followed. First, increased air and surface patrols to locate and hunt the U-boats, and second, new measures to protect the nation's merchant shipping.¹⁸ For the RNAS this meant more aircraft patrols from the coasts, working in conjunction with Royal Navy destroyers and other escorts patrolling established sea lanes.¹⁹ Jellicoe's objective was to keep the shipping lanes clear as cargo and passenger ships were especially vulnerable to Germany's short-range coastal (UB) and minelaying (UC) type submarines during their final approach to the United Kingdom.²⁰

Indeed, the trade routes converging along the west coast of Britain and Ireland were particularly exposed early in 1917 as no air stations had yet been constructed there. Vice-Admiral Lewis Bayly, the C-in-C of Ireland's Queenstown district, had in fact opposed an Admiralty proposal to build air stations on the southern coast of Ireland even in the closing months of 1916.²¹ Jellicoe realised that his predecessors, First Sea Lord Sir Henry Jackson and First Lord Arthur Balfour, who favoured a decentralized system of command, had overlooked the submarine threat.²² To systematically carry out the aerial reconnaissance and surface ship patrols around the coasts of England, Wales, Scotland and Ireland, required cooperation between the Navy's various district commands and their associated RNAS station commanders. On 11 March 1917 Jellicoe therefore instructed Commodore Paine, along with Rear-Admiral Duff and the Operations Division of the Staff, to devise a scheme for centralizing and standardising airship and aircraft patrols on both the east and west coasts.²³

Jellicoe's method was to set policies which could be carried out by the Navy's regional groups, such as the C-in-C Portsmouth, C-in-C East Coast of England, or the C-in-C Plymouth, each naval command supported by RNAS stations which were formed into supporting groups. Plymouth, for example, was supported by the RNAS South-West Group, which was formed on 3 April 1917 under the command of Wing Captain

¹⁸ H. A. Jones, *The War In The Air [WIA]*, (Uckfield: The Naval & Military Press Ltd, 1934), vol. 4, p. 46.

¹⁹ Newbolt, *Naval Operations*, vol. 5, p. 1.

²⁰ Jones, *WIA*, vol. 4, p. 45.

²¹ Layman, *Naval Aviation*, p. 31.

²² N. A. M. Rodger, *The Admiralty* (Suffolk: Lavenham Press Limited, 1979), p. 132. See also, Jellicoe to Beatty, 25 January 1917, #28 in Temple Patterson, *The Jellicoe Papers*, vol. 2, p. 140.

²³ Air Ministry, Air Historical Branch, the RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign, TNA AIR 1/677/21/13/1902, p. 11. Jones, *WIA*, vol. 4, p. 48.

Eugene Gerrard, with his headquarters at Devonport.²⁴ Wing Commander A. W. Bigsworth, likewise, controlled the air stations at Portland, Bembridge, Newhaven and, in France, Cherbourg, collectively reporting to the C-in-C Portsmouth.²⁵ Wing Captain Lambe continued to command the Dover and Dunkirk forces, while Wing Commander C. R. Finch-Noyes headed the East Coast Group. RNAS Felixstowe, under Wing Commander J. C. Porte, had previously been attached to the Harwich command, and RNAS Great Yarmouth under Wing Commander Charles Samson, was attached to Lowestoft.²⁶ Vice-Admiral Bayly's Queenstown district was soon joined by the United States Navy under the leadership of Captain Hutch Cone, USN, who headed that country's naval aviation programme.²⁷ Four USN naval air stations and one kite-balloon station were soon under construction in Ireland.²⁸

Reforms to improve intelligence collection and dissemination were also made, and in May 1917 it was arranged that a central plot at the Admiralty would collect all the information collected related to submarine movements, so that reports could be rapidly dispatched directly to the air station commanders.²⁹ The original communication lines between the coastal air stations and the Admiralty had been established by the former Director of the Air Department (DAD) Commodore Murray Sueter in 1915 as part of the Air Department's responsibilities for Britain's air defence, but it was now necessary to expand the network, and coordinating the 1917 effort fell to the versatile Commander Hugh Williamson, a former submariner who had learned to fly and was to be intimately involved in anti-submarine developments throughout 1917 and 1918.³⁰ Williamson, in June 1917, introduced the Anti-Submarine Division's Anti-Submarine Reports (ASRs), which collated all the information on enemy submarine encounters into monthly briefings.³¹ Hydrophone experiments, the direct precursor to Asdic, were also carried out with hydrophone equipped airships, but were abandoned when seaplanes were found to be a more useful platform.³² Although

²⁴ Abbatiello, *British Naval Aviation*, p. 138.

²⁵ Abbatiello, *Anti-Submarine Warfare*, p. 89. Abbatiello, *British Naval Aviation*, p. 140.

²⁶ Abbatiello, *Anti-Submarine Warfare*, p. 90.

²⁷ William Sims, *The Victory at Sea*, (Annapolis: Naval Institute Press, 2016), p. 330.

²⁸ Ibid.

²⁹ Jones, *WIA*, vol. 4, p. 50. Malcolm Llewellyn-Jones, *The Royal Navy and Anti-Submarine Warfare, 1917-1949* (New York: Routledge, 2006), p. 8.

³⁰ Abbatiello, 'Doctrinal Innovation in the Royal Naval Air Service: Samson, Longmore, and Williamson', *Journal of the Australian Naval Institute*, Headmark, No. 132 (June 2009), p. 42.

³¹ Abbatiello, *British Naval Aviation*, p. 145.

³² Willem Hackmann, *Seek & Strike: Sonar, Anti-Submarine Warfare and the Royal Navy, 1914-54* (London: Her Majesty's Stationery Office, 1984), p. 68.

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the hydrophones became increasingly useful in 1918, visual patrol remained the essential function of the RNAS and RAF until the end of the war.

The spider web, convoy escort, and bombing at source

With the organisational and intelligence groundwork laid, RNAS aircraft offered the most rapid possible response to submarine sightings, although it remained tactically difficult to attack an alert U-boat before it could submerge. Improved flying boats of the 'America' model, known as H-4 ('Small America') and H-8 ('Large America') were imported from the United States for use by RNAS Felixstowe's Wing Commander John Cyril Porte, another of the Navy's pioneering submariners who transitioned to the RNAS and had worked for Glenn Curtiss before 1914.³³ The H-8s were found to be underpowered, however, and so were equipped with 250-hp Rolls Royce engines instead, the improved flying boats now designated H-12s.³⁴ These machines offered a powerful ASW patrol and hunting capability that had otherwise been lacking. The multi-engine flying boats were suitable for searching large areas of ocean over many hours, and, although long patrols could be exhausting for the crews, the flying boats possessed both the speed and payload required to carry out attacks against submarines caught in the open. Wing Commander Porte continued to engineer improvements, and new RNAS variants began to enter service late in 1917. The F2A model, powered by two 345-hp Rolls-Royce engines and equipped with half a dozen Lewis guns and up to 500 lbs. of bombs, could patrol for up to six hours.³⁵ The advanced F3 and F5 models could carry more than 900 lbs. of bombs and, in gunship-like fashion, experiments had been carried out with the 6-pdr Davis recoilless gun, which would have been employed for anti-submarine work in conjunction with hydrophone technology late in 1918, had the war continued.³⁶ The F3s, with their greater range but slower top speed, were more usefully deployed in the Mediterranean, such as from the RNAS base at Malta, where 18 were built between November 1917 and the end of the war.³⁷

³³ Philip MacDougall, *When The Navy Took To The Air: The Experimental Seaplane Stations of the Royal Naval Air Service* (Croydon: Fonthill Media, 2017), p. 63. Layman, *Naval Aviation*, p. 82.

³⁴ Alfred Price, *Aircraft versus Submarines: The Evolution of the Anti-Submarine Aircraft 1912 to 1972* (London: William Kimber, 1973), p. 17.

³⁵ Owen Thetford, *British Naval Aircraft since 1912*, 4th ed. (London: Putnam, 1978), pp. 192-6.

³⁶ H. F. King, *Armament of British Aircraft, 1909-1939* (London: Putnam & Company Limited, 1971), p. 183. Director Air Services Commodore Godfrey Paine to Admiralty, Royal Naval Air Service, Policy and Development, 21 January 1917, TNA ADM 1/8478/10, p. 3.

³⁷ Thetford, *British Naval Aircraft since 1912*, p. 197.

RNAS Felixstowe became the operational centre for the newly devised North Sea 'spider web' patrols, first flown on 13 April 1917.³⁸ This system involved rotating patrols conducting simultaneous survey over the North Sea for five hours or longer.³⁹ U-boat and enemy surface contacts were plotted at Felixstowe, buttressed by Direction Finding (D/F) signals intelligence reported by the Admiralty's Room 40,⁴⁰ and additional flying boats were dispatched to investigate U-boat reports.⁴¹ Similar patrols were implemented along the Atlantic approaches as well as on the east coast of Scotland. Flying boats also patrolled the English Channel and Dover barrage. A handful of successful actions accumulated in coastal waters during April and May 1917, and, between April and June, on at least 13 separate occasions, U-boats were attacked by Felixstowe, Killingholme, Calshot and Tresco based flying boats.⁴²

On 24 April an unknown submarine, mistaken for *UB39*, was located and attacked with 100 lb. bombs dropped from a Calshot H-12, and, with the assistance of a destroyer, the U-boat was damaged.⁴³ Less than a month later on 20 May, Flight Sub-Lieutenants C. R. Morrish and H. G. Boswell, in H-12 flying boat No. 8663, successfully dropped their 230 lb. bombs on a U-boat, believed to be *UC36*, most likely sinking it.⁴⁴ On 27 or 29 May, following a report provided by the destroyer *HMS Acton*, H-12 No. 8656, piloted by Lt W. L. Anderson, sighted and attacked with their four 100 lb. bombs a U-

³⁸ Jones, *WIA*, vol. 4, p. 54.

³⁹ *Ibid*, pp. 53-4. Brad King, *Royal Naval Air Service, 1912-1918* (Aldershot: Hikoki Publications, 1997), p. 105. Theodore Douglas Hallam, *The Spider Web* (Driffield: Leonaur, 2009), p. 30.

⁴⁰ Patrick Beesly, *Room 40: British Naval Intelligence 1914-1918* (London: Hamish Hamilton Ltd., 1982), pp. 254-5.

⁴¹ Abbatiello, *British Naval Aviation*, p. 141.

⁴² Ray Sturtivant and Gordon Page, *Royal Navy Aircraft Serials and Units, 1911-1919* (Tonbridge: Air Britain (Historians) Ltd, 1992), pp. 140-2.

⁴³ Jones, *WIA*, vol. 4, p. 55. McCartney, *Maritime Archaeology of a Modern Conflict*, p. 160. Messimer, *Verschollen: World War I U-Boat Losses* (Annapolis: Naval Institute Press, 2002), p. 161.

⁴⁴ Jones, *WIA*, vol. 4, p. 54. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 141. McCartney, *Maritime Archaeology of a Modern Conflict*, p. 57. David Hobbs, *The Royal Navy's Air Service in the Great War* (Barnsley: Seaforth Publishing, 2017), p. 243. Tomas Termote, *Krieg Unter Wasser: Unterseebootflotille Flandern, 1915-1918*, Kindle e-book (Hamburg: E. S. Mittler & Sohn, 2015), loc. 6361.

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boat which may have been *UC66*, north of the Isles of Scilly.⁴⁵ *UC1* was credited destroyed by flying boat No. 8689 on 24 July south west of the North Hinder light vessel,⁴⁶ and, on 29 July, No. 8676 was credited with destroying *UB20* (which had earlier been damaged by an air raid against Bruges),⁴⁷ however in this case a minefield may also have been the cause.⁴⁸ Results diminished after these initial successes as the coastal U-boat crews adjusted their tactics. On 22 September, however, Flight Sub-Lieutenants N. A. Magor and C. E. S. Lusk in Curtiss H-12 No. 8695, successfully bombed and destroyed *UB32* with two 230 lb. bombs off the East Hinder.⁴⁹ *UC6* was also credited as destroyed by flying boat No. 8676, which bombed a submarine near Thornton Ridge on 28 September, although loss to a mine the day prior in the Thames estuary was the submarine's probable fate.⁵⁰

These flying boat victories are significant as they demonstrate the utility of routine air patrols as well as the activity of the RNAS pilots and airmen carrying them out. Although on their own these few successes were not enough to contain the submarine threat, they are representative of the Royal Navy's increasing proficiency in aerial ASW.

Ultimately the deciding factor in the submarine war was the introduction of convoys, beginning in May 1917, which secured the crucial war supplies from submarine attack.⁵¹ First Sea Lord Jellicoe's concerns about the validity of convoy theory, to which he was initially sceptical, rested on calculations concerning the number of available destroyers

⁴⁵ McCartney, *Maritime Archaeology of a Modern Conflict*, pp. 139, p. 160 & p. 171. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 140. See also, South West Approach: German Submarines, 25-31 May, 1917, TNA ADM 137/1314.

⁴⁶ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 142. Eberhard Moller and Werner Brack, *The Encyclopedia of U-Boats From 1904 to the Present Day*, trans. Andrea Battson and Roger Chesneau (London: Greenhill Books, 2004), p. 44. Jones, *WIA*, vol. 4, p. 65.

⁴⁷ Termote, *Krieg Unter Wasser, UB-Boote*, loc. 4687.

⁴⁸ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, pp. 141-2. Messimer, *Verschollen*, p. 141. Jones, *WIA*, vol. 4, p. 65. Gibson and Prendergast, *German Submarine War*, p. 372.

⁴⁹ Abbatiello, *Anti-Submarine Warfare*, p. 1. Moller and Brack, *The Encyclopedia of U-Boats*, p. 45. Price, *Aircraft versus Submarines*, p. 23. Robert M. Grant, *U-Boats Destroyed: The Effect of Anti-Submarine Warfare, 1914-1918* (London: Putnam & Company Limited, 1964), p. 63.

⁵⁰ Messimer, *Verschollen*, p. 243. Moller and Brack, *The Encyclopedia of U-Boats*, p. 54. Termote, *Krieg Unter Wasser, UC-Boote*, loc. 6023.

⁵¹ Benbow, *Naval Warfare 1914-1918*, Kindle e-book, chapter 6, loc. 3144.

per potential merchant ship convoy, the vastness of the ocean requiring coverage, and the diplomatic relationship with America, relevant concerns that were, however, displaced by worsening circumstances as merchant shipping losses accumulated. Gradually the Navy's regional commanders began to endorse the escort of merchant ships in their area of operations. Commodore Reginald Tyrwhitt of the Harwich Force, for example, wanted the North Sea trade with Holland escorted.⁵² The Vice-Admiral Orkneys and Shetlands favoured escorts over patrols, while Vice-Admiral Stuart Nicholson, the C-in-C East Coast of England, endorsed escort as the appropriate response for the most valuable cargo.⁵³ Grand Fleet C-in-C Admiral Sir David Beatty likewise favoured North Sea escorts.⁵⁴ The arrival of Admiral William Sims, USN, who wholeheartedly endorsed the creation of Atlantic convoys, in conjunction with adjusted calculations by the Naval Staff as to the exact number of sailings required to supply the war effort, pushed convoys to the fore, and they were introduced on a rolling basis beginning in May and June.⁵⁵

The introduction of convoys required devising specialised roles for the RNAS. Abbatiello identified four convoy types for which the RNAS provided air cover.⁵⁶ In general, although the details were often left to the district commanders and their RNAS group counterparts, standard models did emerge. Airplanes were grouped into staggered flights, flying convoy cover during daylight hours. It was discovered that airships were especially well suited for sweeping the ocean ahead of convoy routes,⁵⁷ and, beginning in July 1917, kite-balloons (towed spotting balloons fitted with telephone communication), were also integrated into the convoy's toolset.⁵⁸

In September 1917 Wing Captain Gerrard's South West Group, reporting to the C-in-C Plymouth, produced orders that took convoy escort into account, primarily focusing on airships.⁵⁹ Wing Commander Charles Samson, newly returned from his tour in the eastern Mediterranean and appointed in command of RNAS Great Yarmouth, also recalled that '[p]rotection of our shipping against attack from

⁵² Nicholas Black, *The British Naval Staff In The First World War* (Rochester: Boydell & Brewer Inc., 2011), p. 179.

⁵³ Ibid.

⁵⁴ Abbatiello, *British Naval Aviation*, p. 138.

⁵⁵ Sims, *The Victory at Sea*, pp. 114-6.

⁵⁶ Abbatiello, *Anti-Submarine Warfare*, pp. 109, 118.

⁵⁷ Jones, *WIA*, vol. 4, pp. 59-60.

⁵⁸ Abbatiello, *Anti-Submarine Warfare*, p. 116.

⁵⁹ Ibid, p. 119. SW Group Patrol Orders, 1 September 1917, TNA AIR 1/644/17/122/292.

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submarine and aircraft' was his number one priority.⁶⁰ The RNAS made its most significant contribution in terms of improving convoy protection, and at relatively little cost: only a handful of merchant ships in convoy and provided with air escort were sunk during the war. Of the 17,082 ships convoyed on the Atlantic route from May 1917 until the end of the war, only 167 were lost,⁶¹ to which Marder was apt to observe that of all the home and overseas convoys, only five ships were sunk when both air and surface escort were provided.⁶² Aircraft and airships in this regard certainly acted as a force multiplier, improving the effectiveness of the already successful convoys. This is even more striking considering that merchant protection missions occupied only a small portion of the total RNAS ASW effort. By March 1918 the Air Department estimated that only 7% to 20% of total patrols conducted had been devoted to directly protecting merchant shipping, the majority of hours flown had been standard air patrols.⁶³

While the airplanes, flying boats, kite-balloons, airships and blimps were achieving their ASW patrol and convoy escort successes, the situation at RNAS Dunkirk, also in Wing Captain Lambe's area of responsibility, was somewhat different. Here the task was U-boat base bombing. An increase in U-boat activity during the summer and fall of 1916 prompted Vice-Admiral Reginald Bacon, the C-in-C Dover, to authorize limited bombing raids against Ostende and Zeebrugge, two of the three U-boat bases in Belgium,⁶⁴ and the third base at Bruges was added to the target list in February 1917.⁶⁵ By March 1917 over six tons of bombs had been dropped on Ostend, Zeebrugge, Bruges, and the Ghent aerodrome when bombing was halted due to poor weather.⁶⁶ On 10 June 1917, with the 'spider web' patrols in full swing and convoy escort operations underway, Lambe wrote a letter to Bacon expressing his concern that the enemy's concentration of submarines at Bruges, combined with the arrival of German aircraft reinforcements, meant that air patrol and anti-submarine missions off the enemy's coast were needed more than ever.⁶⁷ Lambe proposed replacing the RNAS

⁶⁰ Charles Rumney Samson, *Fights and Flights* (Nashville: The Battery Press, 1930), p. 356.

⁶¹ Newbolt, *Naval Operations*, vol. 5, Appendix B, p. 403.

⁶² Marder, *FDSF*, vol. 5, p. 114.

⁶³ Air Department. Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts. 30 March 1918, TNA AIR 1/279/15/226/133, p. 5.

⁶⁴ Abbatiello, *Anti-Submarine Warfare*, p. 67.

⁶⁵ *Ibid*, p. 68.

⁶⁶ *Ibid*.

⁶⁷ Extracts from Letter H.Q. No. 562 from Wing Captain C. L. Lambe, Commanding R.N. Air Station Dunkirk, to the Vice-Admiral Dover Patrol, dated 10 June 1917, and

seaplanes under his command with bombing airplanes, while maintaining steady patrols and raids against Ostende and Zeebrugge.

Vice-Admiral Bacon, in truth, considered the RNAS bombing policy less than useful, unless pursued on a massive scale.⁶⁸ Furthermore, RNAS Dunkirk, which was situated near the front lines on the Western Front, was the subject of constant air raids, and the squadrons stationed there were also required to support BEF operations during The Third Battle of Ypres, further restricting maritime operations. It was even necessary to bomb the aerodromes from which Germany's Gotha bombers were raiding England during the summer and fall of 1917, further limiting the possibilities of U-boat base bombing. The experience of RNAS Dunkirk during 1917 was in many ways representative of the diversity of RNAS missions during the unrestricted submarine warfare phase, where priorities clashed and personality conflicts could derail missions. From March, through to the end of the year, the Dunkirk forces dropped 344 tons of bombs, suggesting, despite all the constraints of weather, enemy action, and antithetical leadership, bombing was carried out on a significant scale.⁶⁹ However, bombs dropped specifically on the U-boat bases represented only a minority of the total bombing carried out by Lambe's forces. 80 tons of bombs were dropped on the Bruges docks, 30 tons on Zeebrugge and only 10 tons on Ostend, producing little strategic impact on the submarine war itself.⁷⁰

Early in 1918 Vice-Admiral Bacon was replaced by the aggressive Vice-Admiral Roger Keyes, formerly Commodore (S) and a veteran staff officer from the Dardanelles, who was expected to follow a more offensive policy than his predecessor.⁷¹ Keyes requested that Lambe review their bombing efforts to date, and it was clear that Lambe would favour a dedicated bombing policy.⁷² The RNAS, however, had almost run the

covering Letter by Vice-Admiral R. H. Bacon to the Admiralty, TNA AIR 1/641, #170 in Roskill, *Documents*, pp. 484-5.

⁶⁸ 'Extracts from Letter H.Q. No.562 from Wing Captain C. L. Lambe, Commanding R.N. Air Station Dunkirk, to the Vice-Admiral Dover Patrol, dated 10 June 1917,' and 'Covering Letter by Vice-Admiral R. H. Bacon to the Admiralty', TNA AIR 1/641, #170 and 171, in Roskill, *Documents*, pp. 484-7.

⁶⁹ Appreciation of British Naval Effort during the War. - Role of the R. N. A. S., 16 January 1919, TNA ADM 1/8549/13, p. 15.

⁷⁰ Jones, *WIA*, vol. 4, pp. 106-7.

⁷¹ Abbatiello, *British Naval Aviation*, p. 117.

⁷² Plans Division: war records, Volume 5., Lambe to Keyes Report, 'The general effects of Offensive Operations carried out by Bomb-dropping in aircraft,' 3 February 1918, TNA ADM 137/2710.

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course of its brief lifespan, and after 1 April 1918 became only a small component of the RAF.

Lambe, now a Brigadier-General RAF, played a minor role in support of Keyes' Zeebrugge raid on 22 April,⁷³ and on 16 May 1918 the forces under his command were re-designated the No. 5 Group.⁷⁴ Lambe's operating orders for 27 May called for the group's bombers to attack the Bruges docks twice daily, by day and night.⁷⁵ Likewise, in June 1918 Lambe ordered RAF No. 217 (Naval) Squadron, the only dedicated ASW squadron under his command, equipped with DH9 aircraft, to attack the Zeebrugge lock gates on a daily basis.⁷⁶ Finally, in September 1918, the RAF transitioned to assisting the general Allied offensive, while the Americans, who had steadily been expanding their naval aviation presence since July 1918 to form the Northern Bombing Group, began to assume greater responsibility for Dunkirk operations.⁷⁷ Also transferred to the USN were the Ireland bases, and on 20 July, Killingholme was handed over, with another four bases transferred in September.⁷⁸ The case of RNAS Dunkirk demonstrated that the Navy's approach to ASW was multifaceted, including not only routine patrols and convoy escort, but also direct bombing against the U-boat bases themselves. However, as Abbatiello concluded, the limited ordnance dropped on the submarine bases produced only superficial results against the U-boats themselves: this was not the result of any lack of effort, but rather due to the RNAS forces at Dunkirk, and their RAF successors, effectively carrying out, '...three bombing campaigns simultaneously- one against naval bases, one against aerodromes, and one against Army-support objectives'.⁷⁹ If anything, the Dunkirk forces were trying to achieve too much.

Codifying operational learning, the Air Division of the Naval Staff in 1918

In December 1917, shortly before his replacement by Admiral Sir Rosslyn Wemyss, First Sea Lord Jellicoe authorized the formation of an Air Division of the Naval Staff, a

⁷³ Abbatiello, *Anti-Submarine Warfare*, p. 74.

⁷⁴ Ibid, p. 75.

⁷⁵ Abbatiello, *British Naval Aviation*, p. 120.

⁷⁶ Lambe to CO 61 Wing, 15 June 1917, TNA AIR 1/58/15/9/62.

⁷⁷ Abbatiello, *Anti-Submarine Warfare*, pp. 77-8. See also, Geoffrey Rossano and Thomas Wildenberg, *Striking the Hornets' Nest* (Annapolis: Naval Institute Press, 2015), pp. 172-3.

⁷⁸ Abbatiello, *British Naval Aviation*, p. 186. Rossano, *Stalking the U-Boat, U.S. Naval Aviation in Europe during World War I* (Gainesville: University Press of Florida, 2010), p. 125.

⁷⁹ Abbatiello, *Anti-Submarine Warfare*, p. 80.

necessary measure pending the creation of the new Air Ministry, officially formed at the beginning of January 1918.⁸⁰ The Air Division offices were placed in the Admiralty's Old Building, rooms 16 (HQ), 45 (Material), 41 (Airships) and 42 (Operations).⁸¹ When the RAF was formed on 1 April 1918 the Air Department (located at the Hotel Cecil, the site of the new Air Ministry offices) ceased to exist, which meant that maintenance of relations with the Air Ministry, and the future progress of what was now essentially the RAF's naval aviation service, fell to the Director of the Air Division (DAD), Wing Captain F. R. Scarlett, the former head of the Central Air Office, Sheerness.⁸²

Scarlett's objective was focused on improving aerial ASW, and in March 1918, with the formation of the RAF less than a month away, the DAD announced that the RNAS station commanders and squadron pilots still lacked, 'knowledge of various matters in relation to enemy submarines which must govern the policy they pursue'.⁸³ The solution was the publication of a series of manuals covering the methods and theory of aerial ASW and convoy escort. The first of these was Scarlett's manual outlining submarine capabilities for the new RAF pilots, for whom he wanted 750 copies of his pamphlet printed.⁸⁴ A special anti-submarine observer school was formed at Aldeburgh,⁸⁵ and by the end of May 1918, Scarlett's office had produced a training scheme which stressed the general training of pilots and observers, who were required to master a number of specialized skills.⁸⁶

Another important document was the manual, 'Notes on the Co-operation of Aircraft with Surface Craft for Escorting Convoys of Merchant Ships', which was published

⁸⁰ Office Memorandum, 14 January 1918, TNA AIR 1/279/15/226/127, p. 3. Proposed Establishment of Air Division of Naval Staff, 16 December 1917, TNA ADM 1/8508/285. Marder, *FDSF*, vol. 4, p. 341.

⁸¹ Black, *British Naval Staff*, pp. 304-5.

⁸² Memorandum as to the functions of the Fifth Sea Lord and Director of Air Services, June 1917, TNA AIR 1/279/15/226/127, p. 3.

⁸³ Director Air Division, Supply to those actively engaged in anti-submarine operations with intelligence relating to types, performance and probably tactics of enemy submarines, 8 March 1918, AD35, TNA AIR 1/273.

⁸⁴ 'Memorandum by Captain F. R. Scarlett, Director Air Division, Naval Staff, dated 7 March 1918' TNA AIR 1/273, #231 in Roskill, *Documents*, pp. 635-7.

⁸⁵ Jones, *WIA*, vol. 6, p. 335fn.

⁸⁶ Training of Personnel for Anti-Submarine Work, Memorandum by Captain F. R. Scarlett addressed to Assistant Chief of Naval Staff (Vice-Admiral Sir A. Duff) and 2nd Sea Lord (Vice-Admiral Sir H. L. Heath), dated 31 May 1918, TNA AIR 1/274, #256 in Roskill, *Documents*, p. 676.

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after the armistice in December 1918, but is reflective of wartime learning.⁸⁷ This manual described best practices for seaplane convoy escort, instructing pilots to keep close to the convoy while also maintaining a good watch for enemy submarine periscopes.⁸⁸ Seaplanes, due to their limited crew comforts, were not to stay aloft for more than about three hours, whereas flying boats, with larger crews, could be kept up for from four to six hours.⁸⁹ Convoy escort cover was to be flown in a series of rotating patrols, each seaplane staggered to arrive over the convoy as the previous escort was completing its patrol. All aircraft involved were to be fitted with both W/T and *Aldis* lamps for signaling purposes.

After the formation of the RAF there was significant continuity between the former RNAS efforts and the ongoing ASW roles. The Air Division of the Naval Staff resembled the former Admiralty Air Department, while the new RAF groups retained their RNAS regional group structures.⁹⁰ The creation of the RAF in general had a negative impact on the procurement of aircraft for ASW, however. Handley Page bombers, for example, which had been briefly used for ASW, 'with conspicuous success' were quickly transferred to work with the 41st Wing, RFC, and then Major-General Hugh Trenchard's Independent Force for bombing operations.⁹¹ The Air Ministry preferred to supply the RNAS with DH6 trainers, the so-called 'scarecrow' tactics,⁹² over the more useful DH4 bombers.⁹³ Similar procurement issues were experienced with regard to flying boats, and between November 1917 and February 1918 the Air Board, the Air Ministry's predecessor, had promised to deliver 63 'Large Americas' but only 20 were actually delivered.⁹⁴ The truth is that the RAF, which was

⁸⁷ Abbatiello, *British Naval Aviation*, p. 168. Admiralty book: co-operation of aircraft with surface craft, December 1918, TNA AIR 1/2321/223/41/885. Abbatiello, *Anti-Submarine Warfare*, pp. 111-12. Lewis E. Pulsipher, *Aircraft and the Royal Navy, 1908-1918* (PhD Thesis, Duke University, 1981), p. 306. Also in TNA AIR 10/860

⁸⁸ Notes on the Co-operation of Aircraft with surface craft for Escorting Convoys of Merchant Ships, Air Division, Naval Staff, December 1918, TNA AIR 10/860, p. 1.

⁸⁹ *Ibid*, p. 5.

⁹⁰ Jones, *WIA*, vol. 6, p. 334.

⁹¹ Pulsipher, *Aircraft and the Royal Navy*, p. 299. Air Department. Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918, TNA AIR 1/279/15/226/133, p. 4.

⁹² Layman, *Naval Aviation*, p. 81.

⁹³ Pulsipher, *Aircraft and the Royal Navy*, p. 300.

⁹⁴ Air Department, Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918, TNA AIR 1/279/15/226/133, p. 3.

dominated by former RFC officers, preferred to focus on local air control,⁹⁵ and most importantly, operational and tactical bombing,⁹⁶ rather than naval missions such as ASW and convoy escort.

Conclusion

The RNAS anti-submarine patrol, convoy escort, and bombing at source missions evolved as part of the Royal Navy's comprehensive response to the U-boat threat. Although airplanes alone could not defeat Germany's U-boats, the combination of airplanes, airships, kite-balloons, surface elements, mines and the Royal Navy's own submarines, did seriously restrict the U-boat's freedom of operations. RNAS flying boats scored historic victories, in particular during May and September 1917, and by June 1918 it was not unusual for an airplane to attack an enemy submarine with bombs, then report by W/T for destroyer support, with the result that any submarine which survived an aerial bombing attack had to assume that it would be further attacked by destroyers and other escorts unless it vacated the area.⁹⁷ First Sea Lord Jellicoe's reformed naval staff, in particular the Air Division created in January 1918, enhanced cooperation between the RNAS station commanders and their Royal Navy counterparts, the district SNOs. The RNAS group commanders dedicated themselves to developing systematic aerial patrol and U-boat hunting methods. Others such as Wing Captain Lambe at RNAS Dunkirk focused on bombing the U-boat bases at source. The best results were achieved when there was unity of purpose between the Royal Navy SNOs and their RNAS group counterparts.

During 1917 and 1918 seven UC-type boats,⁹⁸ and ten UB-type boats,⁹⁹ were claimed as destroyed, by RNAS or RAF aircraft and airships, either operating independently or with the assistance of escorts and destroyers.¹⁰⁰ At least two of these, UB32¹⁰¹ and

⁹⁵ James Pugh, *The Royal Flying Corps, the Western Front and the Control of the Air, 1914-1918*, e-book (New York: Routledge, 2017).

⁹⁶ Neville Jones, *The Origins of Strategic Bombing* (London: William Kimber & Co. Limited, 1973).

⁹⁷ Extracts of Information received from Air Stations of Operations by Royal Air Force Contingents from 13th June to 16th June 1918. Operations from Killingholme, TNA AIR I/296, p. 3.

⁹⁸ UC1, UC6, UC36, UC66, UC69, UC70, UC72.

⁹⁹ UB12, UB20, UB31, UB32, UB36, UB39, UB59, UB83, UB103, UB115.

¹⁰⁰ Layman, *Naval Aviation*, appendix 2, p. 211.

¹⁰¹ Grant, *U-Boats Destroyed*, p. 160. Price, *Aircraft versus Submarines*, pp. 29-30. Gibson and Prendergast, *German Submarine War*, pp. 199, 372. Eric Grove, 'Air Force, Fleet Air Arm - or Armoured Corps? The Royal Naval Air Service at War', in *British Naval* www.bjmh.org.uk

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UC36,¹⁰² were destroyed by aircraft bombs alone, and there is debate that *UC66* may have met the same fate.¹⁰³ *UB59* was damaged by RAF aircraft on 16 May 1918 while undergoing repair at Bruges- one of the few concrete results of Wing Captain's Lambe bombing policy- and was ultimately written off after Germany withdrew from Bruges in October 1918.¹⁰⁴ *UB31*, *UB83*, *UB103*, *UB115* and *UC70* were all sunk by British aircraft or airships working in combination with destroyers.¹⁰⁵ These figures contrast significantly with the claim by Marder, for example, that '*not a single U-boat sunk during 1917, or indeed during the war, was definitely accounted for by aircraft*'.¹⁰⁶ No doubt further archaeological investigations will revise these findings, but significant is that aircraft and airships were indeed constantly patrolling for and attacking Germany's U-boats, in some cases with decisive effect.

The most effective anti-submarine aircraft of the war was the Blackburn Kangaroo, designed with input from Commander Hugh Williamson, of which 17 were built by the armistice. Kangaroos sighted 12 submarines over 600 hours of flying between April and November 1918, or one sighting every 50 hours. These were favourable figures compared to one sighting per 196 hours for Large America flying boats, and one per 2,416 hours for coastal airships.¹⁰⁷ Figure provided by Sturtivant and Page show that Kangaroos dropped a single 520-lb bomb and 16 230-lb bombs on submarines during 1918, but the only recognized victory was achieved against *UC70*, again with destroyer assistance.¹⁰⁸

Aviation: The First 100 Years, ed. Tim Benbow (Farnham: Ashgate Publishing Limited, 2011), p. 49. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 170.

¹⁰² Anthony Cumming, *The Battle for Britain: Interservice Rivalry between the Royal Air Force and Royal Navy, 1909-40*, Kindle e-book (Annapolis: Naval Institute Press, 2015), chapter 3, loc. 917. Jones, *WIA*, vol. 4, p. 54. King, *Royal Naval Air Service*, p. 105. Messimer, *Verschollen*, p. 271.

¹⁰³ The established narrative is that *UC66* was depth-charged by the trawler *Sea King* off the Lizard on 12 June 1917. The work of Dr. Innes McCartney in this regard is invaluable, see: McCartney, *Maritime Archaeology of a Modern Conflict*, pp. 139, 160, 171. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 140. Gibson and Prendergast, *German Submarine War*, p. 372. Termote, *Krieg Unter Wasser*, UC-Boote, loc. 6912.

¹⁰⁴ Messimer, *Verschollen*, p. 184.

¹⁰⁵ Layman, *Naval Aviation*, Appendix 2, p. 211.

¹⁰⁶ Italics in original, Marder, *FDSF*, vol. 4, p. 82.

¹⁰⁷ Jones, *WIA*, vol. 6, p. 334. Cited in Pulsipher, *Aircraft and the Royal Navy*, p. 298fn.

¹⁰⁸ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 356.

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The contribution of the RNAS to ASW and convoy escort can only be appreciated once the broader naval response to the submarine crisis is considered. As the case of Wing Captain Charles Lambe and the disconnect with Vice-Admiral Reginald Bacon over the bombing at source policy indicates, the best results were obtained when there was unity of policy between the RNAS and Royal Navy commanders. Amidst the rapidly changing administrative situation at the Admiralty and Air Department, the importance of RNAS officers, such as Commander Hugh Williamson and Wing Commander John Porte, cannot be overstated. These former Royal Navy submariners, amongst others who transferred to the RNAS, brought invaluable technical knowledge and service experience, while also maintaining focus on the ASW and convoy escort missions, which ultimately led to the defeat of the U-boat threat.

The total air contribution to the anti-submarine campaign must be viewed in context: of the 145 U-boat reported destroyed by British forces, only 30 were sunk by depth-charging during the entire war, less than the 38 submarines which were lost to accidents or other causes.¹⁰⁹ 12 U-boats were destroyed by Q-ships during the war.¹¹⁰ From this perspective, the RNAS and RAF contribution to ASW can be seen to have formed an important component of a broad anti-submarine system. It is also important to note, however, that only the coastal (UB) and mine-laying (UC) types were successfully destroyed by aircraft. The cruiser-type submarines operating away from the coasts were unlikely to be caught in the open and could operate out of range of flying boat or airship patrols.

Following the creation of the Air Ministry and the RAF, the Admiralty retained some oversight of naval aviation developments through the Air Division of the Naval Staff, where Wing Captain F. R. Scarlett and then Brigadier General R. M. Groves were able to codify the experiential learning to date, ensuring that the experience gained over the preceding four years of war was not lost under the new, Army aviation dominated, RAF regime.

¹⁰⁹ Marder, *FDSF*, vol. 2, p. 356. Gibson and Prendergast, *German Submarine War*, Appendix III, L, pp. 370-7. See also, Price, *Aircraft versus Submarines*, p. 29. Hackmann, *Seek & Strike*, p. 71. Llewellyn-Jones, *The Royal Navy and Anti-Submarine Warfare*, p. 10.

¹¹⁰ Massie, *Castles of Steel*, p. 722.