The Myths and Realities of Air Anti-Submarine Warfare during the Great War

By Col John Abbatiello

Although the historical record often got it wrong, the efforts of Royal Naval Air Service and Royal Air Force anti-submarine aviators met with varying degrees of success during the Great War. Anti-submarine missions fell into three categories: bombing German U-boat bases in Flanders, patrolling the sea lanes around Britain, and escorting convoys. Though bombing and patrolling certainly contributed to the failure of the unrestricted U-boat campaign, convoys served as the ultimate antidote and were made even more effective by the contribution of aircraft. First World War naval aviators did not enjoy guidance from existing doctrine; they invented it in the field. This essay highlights inaccuracies in the historical record and explains the challenges, successes, and failures of early air anti-submarine warfare (ASW). The author concludes that command and organizational constraints were the root cause of inconsistent employment techniques.

On 22 September 1917, a Royal Naval Air Service flying boat destroyed a small German U-boat in the English Channel. The Dunkirk-based flying boat despatched *UB32* with two 230lb bombs, striking the submarine behind the conning tower as the U-boat tried to dive for safety. Flying boat crewmembers and escorting Sopwith pilots confirmed that a mass of oil and wreckage resulted from the explosions.[1]

This engagement was the only confirmed case during World War One of a U-boat being destroyed by a British aircraft on its own, that is without the aid of surface vessels. There were at least five, and perhaps six, additional instances where British aircraft working with destroyers or patrol boats sank U-boats. However, if one considers that the Germans lost 178 submarines to all causes during the Great War, it is obvious that aircraft played a minimal role in thwarting their operations.[2] At least, that is what much of the literature of World War One has led us to believe.

In reality, aircraft served an important function in trade defence during World War One. Airplanes, seaplanes, and flying boats, as well as non-rigid airships and kite balloons, performed three anti-submarine roles during the Great War. First, RNAS and (from 1 April 1918) RAF bombers raided German U-boat bases in Belgium, damaging only a few U-boats, but forcing the Germans to invest heavily in defending their facilities and naval units from air attack. Secondly, aircraft patrolled the waters surrounding the British Isles, contributing to anti-submarine warfare by hunting and attacking U-boats and then using wireless, or other signalling techniques, to call in supporting naval forces. The third and final anti-submarine role for aircraft was convoy escort work. From the earliest days of convoy until the end of the First World War, U-boats were able to sink only five convoyed vessels when the convoy enjoyed both air and surface escort. In fact, U-boats did not attack an air-escorted convoy until December 1917, and there were only eight occasions when U-boats even attempted such attacks in home waters during the entire war.[3]

Since the end of the Great War, historians generally recognised this important contribution of aircraft to the U-boat war, but the details of this issue have remained clouded for a number of reasons. One of the primary causes is the simple fact that naval aviation did not fall neatly into aviation history on the one hand, or naval history on the other, meriting only secondary coverage in these sorts of studies. With the exception of the British and Canadian official air histories, pertinent details of the campaign are widely scattered across a range of texts. Air and naval general histories of the Great War see the campaign as only a minor issue in a greater conflict and offer only a few paragraphs, or at best a chapter, to explain it.[4] Likewise, the numerous extant surveys of naval aviation tend to view the RNAS's air campaign against U-boats simply as a forerunner to operations in World War Two. These brief treatments do not adequately explain this campaign and over-generalise the key issues. This essay will examine some of the misunderstandings surrounding

these innovative roles – again, consisting of bombing U-boat bases, conducting over-water air patrols, and escorting convoys – for British naval aviation and will present the myths and realities behind each. This discussion will deal only with British maritime air operations in and around home waters, which arguably was the decisive theatre of the naval war.

Bombing: Was it continuous?

Map of Dunkirk Area

The establishment of German U-boat bases in the Belgian ports of Zeebrugge, Ostend, and Bruges in early 1915 provided the RNAS with an opportunity to use aircraft offensively, which they took on with vigour. Actually, the RNAS was ordered to Dunkirk in September 1914 to aid Royal Marines hastily deployed to the Belgian coast. The projected force of 36 aircraft was meant to establish air superiority in Flanders 'with a view to attacking any German airships on their way to England, and preventing any temporary airship base being established' within a 100 mile radius from Dunkirk.[5] The initial bombing objectives were German Zeppelin sheds, but at the end of January 1915, RNAS pilots first spotted and attacked U-boats temporarily berthed at Zeebrugge. The combination of Germany's first unrestricted submarine campaign, beginning in February 1915, along with the obvious development of the Flanders ports into permanent U-boat bases soon after meant that RNAS squadrons operating in northern France and Belgium now had good reason to remain in the Dunkirk area. Attacks against enemy bases and sources of supply, or 'attacks at source,' reflected a long-standing tradition in the Royal Navy – going back to the wars with Spain, France, and America during the Age of Sail – and were especially useful when the enemy was difficult to locate once at sea.[6]

The RNAS establishment around Dunkirk fell under the overall operational command of the Vice-Admiral Dover Patrol, Sir Reginald Bacon. Bacon was deeply immersed in the new technology of the Fisher Era and was a proponent of submarines and airships. Wing Captain Charles L. Lambe, a torpedo specialist who had worked with Bacon previously in the Naval Ordnance Department, led the naval air forces themselves. Lambe was not a pilot, but had commanded the RN's first seaplane carrier, *HMS Hermes*, which was torpedoed and sunk by a German U-boat in the English Channel in October 1914.

Under Lambe and Bacon, naval air power grew steadily in the Dunkirk area. In 1918, after the RAF had

absorbed the RNAS, the bombing campaign continued, still under Lambe, now a Brigadier General, RAF, and reached its peak in June of that year. By September 1918, the bombers around Dunkirk switched completely to supporting the advance of the northern Allied armies, and in October the Germans abandoned their Flanders bases. However, attempts to bomb Zeebrugge, Ostend, and Bruges had met with only limited success during the war. Although they were forced to adopt some drastic defensive measures, such as building large concrete shelters, relocating ammunition stores away from the harbours, and investing in large numbers of anti-aircraft batteries, the Germans continued to operate their U-boats from Flanders at a furious pace. And, only about a third of Germany's U-boats operated there anyway; the rest were in bases in Germany, beyond the range of British bombers.[7]

There are a number of misperceptions associated with this campaign. The first was largely sparked by Sir John Jellicoe in his book *The Crisis of the Naval War* where he said that:

'During the year 1917 aerial bombing attacks were persistently carried out on the German naval bases in Belgium by the Royal Naval Air Force at Dunkirk, which came within the sphere of the Dover Command. These attacks had as their main object the destruction of enemy vessels lying in these bases, and of the means for their maintenance and repair. The attacks...were as incessant as our resources and the weather admitted, and our gallant and splendidly efficient airmen of the R.N.A.S. were veritable thorns in the sides of the Germans.'[8]

Likewise, Admiralty and Air Ministry staff studies, stating that attacks against the bases were 'frequent' and 'unremitting,' helped to mislead other historians of the period.[9] Such descriptions steer the reader into thinking that these bombing raids were persistent.[10] This was not the case. In fact, the bombing campaign against the Flanders bases waxed and waned with the strategic situation.

The establishment of multiple RNAS bomber squadrons during spring 1916, and their subsequent assault on the Flanders U-boat bases, was largely a response to the second German submarine campaign of March and April 1916. By late May 1916, Vice-Admiral Bacon was seeing some improvement in the anti-submarine war, which he thought to be the result of his new net and mine barrage installed off the Belgian Coast earlier in the month. Actually, the reduction in sinkings during this time was caused by the abandonment of the second submarine campaign after the Sussex Pledge and Scheer's plans to use some of his U-boats in conjunction with the High Seas Fleet.[11] Nevertheless, in late May, Bacon ordered that all bombing raids against the Flanders bases were to be suspended, after a raid sent to bomb a nearby aerodrome could not see its target and instead unloaded its bombs on Ostend Docks. Bacon saw this type of raid as counterproductive to his overall scheme of operations.[12]

Two weeks later, in a report on air operations in Belgium, Bacon stated that his aviators were just starting to understand that air operations were to be subordinated to land and sea campaigns. He also warned

that these 'indiscriminate bombing' missions were 'useless' and even 'harmful to well thought-out military operations' because they provoked enemy retaliation, caused a strengthening of German defences, and were ineffective unless massed.[13] Instead, Bacon offered the services of

DH4s – RNAS Dunkirk – 17th March 1918

his bomber squadrons to the British Expeditionary Force (BEF), which was preparing for the ill-fated Somme Offensive. The lack of a co-ordinating infrastructure and the relatively extended distances from Dunkirk to the Somme Front, meant that RNAS involvement with the offensive was limited to a few attacks against German aerodromes along the northern shoulder of the attack area. In late 1916 and early 1917, the Germans began to use the Flanders ports as staging bases for destroyer attacks against the Dover Patrol. Simultaneously, U-boat attacks against merchant shipping began to increase at a dramatic rate, which culminated in the new, final, unrestricted submarine campaign that began in February 1917. The combination of these factors offered Charles Lambe a superb opportunity to argue for a renewed bombing campaign against the German bases. Bacon agreed. In November 1916, the RNAS launched six raids against Ostend and five against Zeebrugge.[14] These November raids were the heaviest of the year and, according to the Canadian official air historian, succeeded in forcing the Germans to withdraw one of the raiding destroyer flotillas back to Germany.[15] Poor weather and extremely cold temperatures grounded the bombers through December and January thus limiting further attacks. Raids resumed in February 1917, but again weather prevented attacks in March. During this time the RNAS at Dunkirk took delivery of its first fast DH-4 and massive Handley Page bombers, both aircraft bringing greater payloads and speeds to the bomber force.

Handley Page o/100 - Dunkirk - 7 Squadron - 1917

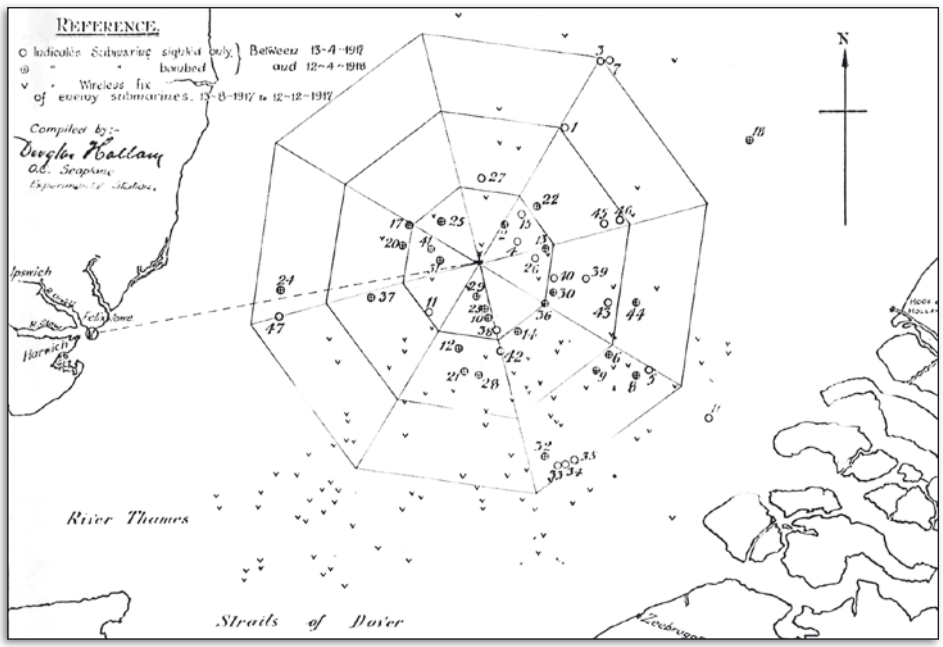
However, just as these newly-equipped squadrons became operational, Bacon offered them to the BEF to support the Ypres Offensive during the summer of 1917. Also, German Gotha raids against England necessitated RNAS attacks

against German aerodromes in Belgium. Gotha raids and the Ypres Offensive made aerodrome attacks a high priority, and RNAS bombers only occasionally flew against naval targets. The third quarter of 1917 serves to highlight the trend. Out of 137 bombing raids during the quarter, 79 were aimed at aerodromes, 15 at Bruges, 12 at Ostend, and 9 at Zeebrugge. The remaining two dozen attacks sought various military targets, including railway centres and ammunition dumps.[16] The end of the quarter serves to illustrate the new priorities clearly: during the last two weeks of September, Lambe sent only three raids to Zeebrugge with none against Bruges or Ostend. Twenty-one attacks were made against other targets.[17]

The lack of emphasis against the U-boat bases would continue until May 1918, when a new Vice-Admiral Dover Patrol, Sir Roger Keyes, pushed the Admiralty and the Air Ministry to support air attacks in the aftermath of his Zeebrugge and Ostend raids. Now under the RAF, Lambe's bomber forces would have the senior support required to carry out a proper bombing offensive against the U-boat bases. Attacks during the summer of 1918 increased dramatically in frequency and violence. In June alone, British aircraft bombed Bruges, Zeebrugge, or Ostend on 24 days of the month, some days seeing five or more attacks.[18] As mentioned above, September 1918 would see this campaign close as Lambe's bombers supported the Allied advance in the north. In the end, Lambe really conducted three separate bombing campaigns during his three and a half year tenure at Dunkirk: one against military targets, one against aerodromes, and one against the U-boat bases. Of the more than 1,000 tons of bombs expended against the enemy by Dunkirk-based naval bombers during the last 21 months of the war, only about half of them fell on naval targets – far from a persistent campaign mentioned in the literature.[19]

This first misperception leads to a second one: the official air historian later wrote in *The War in the Air* that the reason for such a disjointed bombing effort was that there was no independent air force to guide policy until very late in the war. In both Volumes IV and VI, H. A. Jones suggested that had there been a truly independent air force – that is, a force free from slavishly supporting either service and their constantly changing demands – it would have made these kinds of targeting decisions beforehand and been able to 'formulate a real policy.'[20] Such a focused assault on U-boat bases would have been highly unlikely under an independent air service had it been formed earlier. The Admiralty already had difficulty in acquiring the air support it needed in May 1918, a time when there was actually a lull in the fighting on the Western Front.[21] Had a more bombing-minded Vice-Admiral Dover Patrol been in place from the start, such as Sir Roger Keyes, then the naval bomber forces may have been able to conduct a more focused campaign earlier.

There were two underlying factors that caused the breakdown of the bombing effort against the Flanders bases. The first was the way in which the Admiralty controlled its air



Maps of Spider Web and SW patrol schemes

forces. Except for a very brief period in 1915, the system was generally straightforward: the Board of Admiralty and Air Department in London provided personnel and aircraft to regional C-in-Cs and formulated policy regarding personnel and equipment. Regional C-in-Cs, even in home waters, were typically provided an air group, and they were in complete control of how those air forces were employed against the enemy. This system remained in effect even after the RAF took over on 1 April 1918. Just as before, RAF Naval Air Groups would work directly for regional C-in-Cs; there was no Coastal Command HQ during the First World War. Thus the system allowed Sir Reginald Bacon, who as he said himself 'always gave the Army, during an advance, the prior call on our machines,' to employ his forces on three different air campaigns, where Sir Roger Keyes focused on the U-boat bases.

This command arrangement leads to the second factor. Naval aviation was brand new during the First World War; there was no historical experience to guide operational and organisational doctrine. Technique developed in the field. The Admiralty was willing to provide only general guidance, such as what missions the aircraft were expected to carry out.[22] Thus, each regional air group struggled to work out the best ways to use its aircraft **on its own.** This phenomenon will become even more pronounced as we move to a discussion of patrols and escorts.

Patrol: Was it useless?

The second Great War role for aircraft in anti-submarine warfare was patrol. In general terms, there were three types of patrol a given aircraft could fly. An aircraft might be sent out

to fly an assigned track or within a given block of airspace. Such area patrols normally remained within approximately 75 miles of the coast. The Spider Web and Southwest Air Group patrols, initiated in spring 1917, are typical of such patrol systems and were designed to catch U-boats either hunting in these coastal areas or cruising to their patrol stations.

An aircraft might also fly what was called an 'emergency patrol.' Here, aircraft would search a specific area where a U-boat had actually been spotted, had been identified through wireless direction-finding, or where a steamer had been torpedoed. Coastal air groups typically held aircraft on short-notice readiness for immediate launch. It is interesting to note that by 1918, and in some regions even earlier, a telephone system linked the Naval Intelligence Division at the Admiralty with regional C-in-Cs and their air groups in order to disseminate such intelligence.

Finally, aircraft were at times assigned to patrols in conjunction with naval vessels. The Southwest Air Group led the way in this technique. For a given mission, flying boats or seaplanes were typically assigned a specific rendezvous time and location with local patrol flotillas.

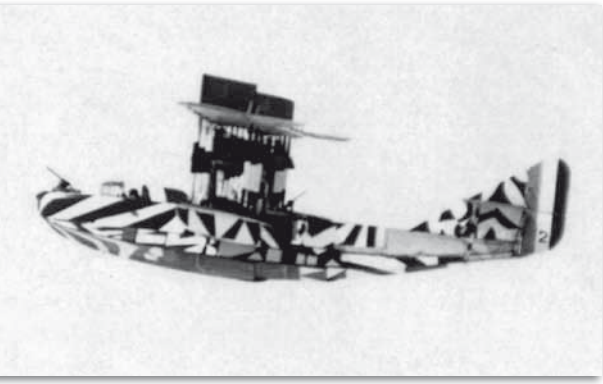
By summer 1917, the air patrol system around the coast of Britain had been firmly established. Patrol aircraft covered coastal waters from the Orkneys along the east coast of Scotland and England, to the Channel and around into the Irish Sea. The only gaps were the northwest coast of Scotland, where presumably traffic was too light and weather too rough to require the support of maritime aviation, and the coast of Ireland. Here, the C-in-C Queenstown, Vice-Admiral Sir Lewis Bayly, was initially sceptical about the use of seaplanes for patrol. On too many occasions in 1916 his destroyers wasted precious patrol time towing seaplanes home to port after many would have to ditch from engine failure. By late 1917, Bayly warmed to the idea of air patrols and by this time the US Navy had agreed to establish four seaplane bases and two kite balloon stations in Ireland.

During the first two years of the war, coastal patrols were rather haphazard; the few naval aircraft available occasionally flew multipurpose reconnaissance patrols searching for enemy Zeppelins, enemy surface forces, and finally enemy submarines. But, there was no real system. By late 1916, four key developments made a new patrol system necessary.

The first development defined the need: shipping losses to U-boats increased dramatically during the autumn of 1916 and the Admiralty recognised that something needed to be done. The start of the unrestricted submarine campaign in February 1917 added impetus to these efforts.

A second development soon followed in December 1916. Admiral Sir John Jellicoe, as the new First Sea Lord, established the Anti-Submarine Division under Rear-Admiral Sir Alexander Duff to coordinate all anti-submarine measures. One of the first memos that Duff wrote after arriving at the Admiralty was a call for a comprehensive air patrol system around the coast of Britain. This

memo planted the seed which grew into the system described earlier.



British Felixstowe F2 Flying Boat

Thirdly, in order to ensure adequate supplies of aircraft and trained personnel, the Admiralty needed a senior officer to oversee naval aviation. The Board appointed Commodore Sir Godfrey Paine as 5th Sea Lord in January 1917 to fill this post. Paine had been the commander of the joint Central Flying School and later commanded the Naval Air Service's training establishment at Cranwell. As 5th Sea Lord, Paine also sat on the Cowdray Air Board, which Lloyd George had given control over all army and navy aircraft production. Paine nevertheless became the focal point for the expansion of naval air forces in home waters in 1917.

Finally, none of this would have been possible without improved aircraft designs reaching full production in 1917. The Large America flying boat, able to carry four 100lb bombs for a six-hour patrol, became available during the spring. Non-rigid airships, the brain-child of Sir John Fisher, were now being improved and were able to fly missions of eight hours duration or more. Superior engine designs gave aircraft of all types better performance and hence more carrying capacity and endurance. Improved maintenance practices meant that more aircraft would be 'in-commission' on a given day.

This overview of the patrol system begs the question: how effective was it? Most historians have taken the view that schemes to use aircraft in the hunting patrol role were ineffective. Barley and Waters, in their famous Admiralty staff study *Defeat of the Enemy Attack on Shipping, 1939-1945*, argue that air patrols were ineffective in destroying U-boats and the proper use of aircraft was in the convoy escort role.[23] Likewise, Arthur Marder, strongly influenced by Waters in writing *From Dreadnought to Scapa Flow*, goes a step further and referring to 1917 air patrols offers that 'All this busy work was singularly unproductive' and for 1918 'As patrols they [aircraft] proved ineffective.'[24]

Convoy escort was certainly the most important and most effective role for naval aircraft in the Great War; on the other hand, the claim that patrols were a waste of time is not supported by the evidence. Obviously, without the development of patrol aircraft and infrastructure, especially regarding the sheer growth of naval air stations at home, convoy escort would never have been as effective as it was.

But there were other reasons as well. Air patrols were, in essence, a powerful contributor to an area denial strategy against the U-boats. The evidence strongly indicates that in certain areas, when weather conditions and adequate numbers of aircraft permitted, U-boats were literally forced to operate elsewhere

due to air patrols. In May 1917, six war cruises of Flanders U-boats accounted for only about 3,000 tons of shipping off the Dutch coast, a failure largely resulting from extensive air patrols originating from Dunkirk, Felixstowe (Spider Web), and Great Yarmouth.[25] Examples of aircraft patrols frustrating U-boat operations abound in the German sources from spring of 1917 onward, and wartime British commanders were aware of the contribution of aircraft from captured documents. One captured report confirmed that airship patrols off the Scottish coast 'were most unpleasantly active,' 'repeatedly compelling the boat [*UB35*] to submerge for long periods.' The commander of *UB34* confessed in his war diary that the combination of three airships, calm seas, and clear weather forced him out of his patrol area, while *UC77's* skipper explained that air-sea patrols north of the Firth of Forth 'hampers our operations in the same way as the centralisation of ocean-going shipping [convoy] had done.'[26] Spindler's German official history of the U-boat war and U-boat command war diaries support this argument; air patrols frustrated U-boat operations often, especially during the summer months of 1917 and 1918.[27]

There is one further point worthy of consideration regarding the positive impact of air patrols. The improved visibility afforded to aircraft by their height was not only an advantage in spotting submarines and their periscopes, but it also contributed to the ability to detect German mines. German mine-laying submarines, particularly the *UC* classes based in Flanders, had the potential to wreak havoc on busy shipping lanes by laying small fields unexpectedly along mercantile routes and at the entrances to harbours. The Admiralty recognised the usefulness of air patrols in spotting mines (albeit as a lower priority to enemy submarine and aircraft searches) as early as March 1916.[28] In 1917, mines accounted for 404,000 tons of British, Allied, and neutral shipping; the total losses to mines in 1918 was only about 60,000 tons, with only 12 ships being lost in areas under British minesweeping responsibility.[29] These figures demonstrate a clear defeat of the German mine-laying effort, but the question of how these mines were initially detected remains unexplained in the literature. The contribution of aircraft patrols may shed light on this issue.

According to the Admiralty's staff study on the minesweeping effort during the Great War, mines were located by three primary methods: through using the minesweepers themselves to sweep up unknown mines in suspected areas, such as the approaches to a port or in front of a convoy; by 'scouting by means of aircraft or shallow draft craft at or near low water'; or simply by a vessel striking a mine or otherwise sighting it. Although aircraft could not spot submerged mines in clouded waters, such as those found around most coastal areas in eastern Britain, they were certainly useful in spotting these weapon systems when they appeared on the surface after breaking free of their moorings or at low water. Aircraft had the advantage of speed and safety over surface vessels which hunted for mines; the British alone lost 214 minesweepers

and small patrol craft to mines during the war—all but nine of those in home waters.[30]

Between June 1917 and October 1918, airships detected 134 mines and destroyed 73 of them.[31] Although this seems like a miniscule contribution, given that German submarines laid about 11,000 mines in 1,360 small minefields during the course of the war, sightings led to detection of further mines and their neutralisation. For example, air reconnaissance led directly to the sweeping of 215 mines in the Dover area alone 'without accident' in 1918.[32] Seaplanes also made a significant contribution to mine detection, especially off the Thames Estuary and East Anglia coast.

Overall, air patrols made an important contribution to anti-submarine warfare from mid-1917 until the end of the war. A synergistic effect, leveraging the height and speed advantages of aircraft with the endurance and weaponry of surface vessels, developed dramatically during this period and denied the U-boats the ability to operate in certain areas. Between January 1917 and November 1918, aircraft sighted U-boats on 361 occasions, and followed with attacks on 237 of them, the vast majority resulting in the U-boat being forced to dive.[33] It is interesting to note that most of these air attacks occurred during area patrols and not while the aircraft were escorting convoys. This was hardly a wasted effort. A final comment from Admiral Sir William Jameson might help to conclude the patrol versus convoy debate:

'Convoy was by far the most important factor in robbing the U-boats of victory, but the fact that submarines were destroyed in large numbers was highly relevant, and most of them met their fate not whilst attacking convoys, but elsewhere. Without these casualties quality would not have fallen away, as it did from late 1917 onwards, and convoys would have been subjected to heavier and more skilful attacks. Convoys also relied for their protection on the A. S. weapons which had been developed; the depth charge, the hydrophone and, that very successful deterrent, the air.'[34]

This leads us to the final role for Great War aircraft in anti-submarine warfare: convoy escort.

Convoy: Were aircraft universally employed as escorts?

In general, the overall tactical benefit of the convoy system was that it forced the U-boats to attack a relatively well-defended area.[35] The shipping, which formerly stretched out across the trade routes, was now concentrated in small groups, providing larger *but fewer* targets for submarine commanders. If a U-boat sighted a convoy, it would normally have to proceed on the surface at high speed in order to position itself for an attack. Even if the U-boat was able to gain an adequate firing position, it usually only had one attempt to fire a torpedo, since the escorts' counterattack would normally be so powerful that a subsequent attack would be extremely difficult.[36]

Aircraft were a nearly perfect complement to the surface escorts of a convoy. Airships, seaplanes, and kite balloons brought increased visibility to the tactical picture. As one Admiralty technical history reported,

the track of a torpedo was easily seen from the air, even in a rough sea; the beginning of the track would deliver the position of the submerged U-boat to aircraft observers and pilots.[37] The inability of aircraft to deliver more than a couple of depth bombs, however, was offset by the availability of dozens of heavier depth charges onboard the surface escorts. Finally, aircraft orbiting further away from the convoy – as a distant escort a few miles ahead, behind, or on the flank – would most likely be able to observe a surfaced U-boat manoeuvring to gain a firing position. Thus, as Arthur Marder neatly concludes, 'air escorts deprived U-boats of their chief advantage – surprise attack after unobserved approach.'[38]

There is, however, a common misperception about air escort during World War One. The Barley and Waters staff study, which heavily influenced Arthur Marder's more well-known volumes, states that by the middle of 1918, anti-submarine air units 'shifted from area patrol to convoy close and distant escort.'[39] Marder failed to recognise that much of the evidence provided in the Barley and Waters study came from one area: the north-east coast of England, an area that led the way in air escort, but by no means typified a widespread, accepted policy.[40] Likewise, John Morrow's (air) and Paul Halpern's (naval) surveys generalise the role of aircraft in 1918 and imply that air units spent most of their time escorting as opposed to patrolling.[41]

In fact, using aircraft for convoy escort typically took second place to the patrol mission. Although the Admiralty generally supported the air escort of convoys, it refused to issue specific orders to district commanders regarding air policy in this role. A September 1917 Admiralty letter to all district commanders at home demonstrates this phenomenon clearly. The letter discussed methods for protecting convoys as they entered or departed a harbour, a vulnerable period for every convoy. Aircraft were considered valuable in this role, 'in order to immobilize all submarines as far as possible and sight any submarine that may be unwise enough to remain on the surface,' but no directives regarding their employment were issued.[42] In May 1918, the Admiralty strongly recommended the use of aircraft generally in the convoy escort role, which explains the overall statistical rise in air escorts during the summer of 1918. The Admiralty's Air Division certainly supported this policy.[43] The Air Division's role, however, was not to command, but was simply to advise the Admiralty on the use of aircraft and to liaise with the Air Ministry regarding naval air matters. The Director, Air Division, recommended doctrine, but could not enforce it across the commands. Except for cases of special projects, such as proposed air attacks on the High Seas Fleet, the Admiralty Board itself was hesitant to provide specific operational orders, instead allowing regional Senior Naval Officers (SNOs) to employ aircraft as they saw fit.

The following statistical analysis will serve to summarise the differences between the home commands regarding the use of aircraft in the escort role. The three tables below

are based on information provided in the Air Division's monthly Naval Air Operations Reports.[44] The 'Patrols' columns indicate the number of single-aircraft sorties flown from the air stations within the designated operational area. The 'Escorts' columns represent the number of occasions when a single aircraft escorted a convoy; a single patrol may have escorted more than one convoy and this could have been logged as two or three 'escorts' in one 'patrol.'[45] The ratio figure on the right of the table is a direct percentage of escorts relative to total patrol missions and must therefore be regarded as an approximate figure, valuable only for comparative purposes. Finally, the last five to six months of active anti-submarine flying will serve to highlight the fact that the use of aircraft for convoy escort was not the predominant role by the end of the war.[46]

For fixed-wing aircraft, including aeroplanes, floatplanes, and flying boats of all types, the following table demonstrates the sharp differences from area to area.

Table 1. Aeroplane and seaplane patrols and escorts, May – October 1918.

Area	Patrols	Escorts	Ratio
Orkneys/Shetlands (No. 28 Grp and Grand Fleet)	255	6	2%
Coast of Scotland (No. 22 Grp)	537	119	22%
East Coast of England (No. 18 Grp)	6509	3434	53%
East Anglia Coast (No. 4 Grp)	2542	55	2%
Dover/Dunkirk Area (No. 5 Grp)	1127	72	6%
Portsmouth (No. 10 Grp)	5107	846	17%
Plymouth (No. 9 Grp)	5356	109	2%
Irish Sea (Nos. 14 and 25 Grp)	1189	29	2%

Note that No. 18 Group outpaced the other areas in using fixed-wing aircraft as escorts. The Coast of Scotland and Portsmouth Commands, both strong in seaplane complements, made efforts to fly more escorts, but in no way can this work be considered a primary emphasis. Finally, the remaining five coastal areas clearly preferred fixed-wing aircraft for routine patrols, contact patrols, and 'emergency' hunts.

Airships appeared to produce a much more consistent rate of escorts across the commands. It is surprising, however, to observe that the number of escorts generally (except for No. 18 Group) gave way to area patrols. Thus, the convoy escort role was not 'the principal use of the airships' as John Terraine overstates in *Business in Great Waters*.[47]

Table 2. Airship patrols and escorts, May – October 1918.

Area	Patrols	Escorts	Ratio
Orkneys/Shetlands (No. 28 Grp and Grand Fleet)	nil	nil	—
Coast of Scotland (No. 22 Grp)	697	249	36%
East Coast of England (No. 18 Grp)	470	241	51%
East Anglia Coast (No. 4 Grp)	nil	nil	—
Dover/Dunkirk Area (No. 5 Grp)	657	301	46%
Portsmouth (No. 10 Grp)	1002	82	8%
Plymouth (No. 9 Grp)	859	341	40%
Irish Sea (Nos. 14 and 25 Grp)	1491	347	25%

It is interesting to note the small number of airship escorts in the Portsmouth Group. Also, the three major airship stations serving the Irish Sea varied in their emphasis; Pembroke's ratio was 18 per cent, Anglesey's 20 per cent, and Luce Bay's a much greater 39 per cent. Thus, even within an area, the focus of missions was not consistent.

Finally, the statistics regarding kite balloons appear to be the most surprising. This weapon system, perhaps perfectly suited for convoy

escort since it was physically attached to a convoy escort vessel, was employed in drastically different methods from area to area. The figures below demonstrate that Marder's assertion that kite balloons were employed 'frequently to provide air escort to convoys' did not paint a complete picture.[48]

Table 3. Kite balloon patrols and escorts, June – October 1918. [49]

Area	Patrols	Escorts	Ratio
Orkneys/Shetlands (No. 28 Grp and Grand Fleet)	21	nil	0%
Coast of Scotland (No. 22 Grp)	14	nil	0%
East Coast of England (No. 18 Grp)	15	15	100%
East Anglia Coast (No. 4 Grp)	7	nil	0%
Dover/Dunkirk Area (No. 5 Grp)	32	nil	0%
Portsmouth (No. 10 Grp)	44	9	20%
Plymouth (No. 9 Grp)	58	53	91%
Irish Sea (Nos. 14 and 25 Grp)	19	19	100%

Three commands stand out as clear supporters of the kite balloon escort philosophy: East Coast of England, Plymouth and the Irish Sea. The Plymouth and Irish Sea kite balloon units supported inbound and outbound ocean convoys, a suitable role when protection at a greater distance from shore was required. The remaining commands obviously chose to employ their kite balloons in the hunting role with patrol flotillas. Finally, between June and October 1918, kite balloons escorted convoys on only 96 occasions. Given a finite number of kite balloons available and with differing methods of employment from command to command, there were hundreds of daily convoys, as part of the ocean-going and coastal systems that did not benefit from the protection of kite balloons. During the entire year of 1918, kite balloons made only 131 escorts.[50] Thus, a relatively small proportion of convoys enjoyed this protection.[51]

The convoy system was the key innovation in the anti-submarine war and aircraft generally contributed to its success. Air escort of convoys was an effective means of employing aircraft, but the percentages of aircraft allocated to this mission differed from region to region – differences ignored in the works mentioned earlier. At least 37 squadrons of naval cooperation aircraft – amounting to 285 flying boats and floatplanes, 272 landplanes, and 100 airships – participated in trade protection in Britain by the end of the war.[52] But since tactical philosophies and operational requirements for the use of these resources differed from region to region, we find that the majority of these aircraft were used for air patrols and not for convoy escort. Only in northeast England did airship, seaplane, and aeroplane escort missions outnumber other forms of patrol work and here only barely. The absence of a centralised organisation to command all naval air contingents operating in home waters, such as RAF Coastal Command of later years, led to a situation where the benefits of air escort would not be equally enjoyed in all regions.

Conclusion

When Barley and Waters wrote *The Defeat of the Enemy Attack on Shipping* in the mid-1950s, their purpose was to provide a convincing argument in favour of convoy as the antidote to enemy submarine attacks against British commerce. This assertion was

intended to highlight the Admiralty's alleged poor preparedness for World War Two, after clear lessons from World War One, a trend that some saw as being repeated during the early Cold War.[53] Unfortunately, Barley and Waters' discussion of the Great War experience of air anti-submarine warfare (ASW) was over-generalised and did not provide a clear picture of the real situation; later historians, such as Arthur Marder and John Terraine, quoted from the work directly since it apparently provided evidence to support their own contentions about the Admiralty in World War One.

The real historical record of RNAS and RAF accomplishments in their campaign against German U-boats provided key lessons in other ways. The three air ASW missions of the Great War – bombing U-boat bases, patrolling the sea lanes, and providing air convoy escort – met with varying degrees of success. Bombing the Flanders U-boat bases forced the Germans to invest heavily in their defence, but failed to destroy or damage U-boats at a rate commensurate with the effort. That effort suffered from a lack of focus; loaning RNAS bombers to the army in support of ground offensives and the need to attack Gotha bases pulled missions away from naval targets. A persistent campaign against U-boat bases at Zeebrugge, Ostend, and Bruges may have forced the Germans to abandon these forward bases in favour of more secure dockyards in Germany.

RNAS and RAF air patrols along Britain's littoral waters became increasingly effective against U-boats as aircraft inventories grew and improved designs took to the air. German U-boat war diaries and flotilla records, recovered after World War Two, indicate anxiety over increased British air patrols above the sea lanes. Flooding the air with patrols – in order to deny U-boats their ability to move at speed on the surface – hindered German hunting operations. Air patrols may also have thwarted Germany's mine-laying tactics by the last year of the war.

Finally, the most effective use of aircraft in the ASW role was convoy escort. Aircraft of all types provided increased visibility and almost immediate detection of surfaced U-boats or torpedo wakes. The ability of aircraft to 'force multiply' surface escorts was a lesson employed with deadly effectiveness during the Second World War, but in the First it was not a widespread technique. Why not? We really do not know for certain. We do know that the use of aircraft in convoy was a recommended tactic that was publicized in monthly reporting. The command structure of naval aviation during the Great War might offer one explanation.

As stated above, there was no single commander or headquarters responsible for naval air operations during World War One. Advised by his air group commander, each naval C-in-C was free to employ his air assets as he deemed necessary. The Admiralty's Air Department, or later Air Division, could formulate and recommend naval air doctrine, but these organizations had no authority to force regional units in the field to employ it. Perhaps the most important lesson of the Great War

was the need for a single command to oversee such operations. RAF Coastal Command thus owes much of its success in World War Two to the experience of the Great War.

Notes

[1] Crew of Seaplane 8695, Report of Bombing Submarine, RN Seaplane Station Dunkerque, 22 Sep 1917, TNA ADM 137/377, 311-12, Public Record Office, The National Archive [TNA], Kew; Report of Operations, Dunkerque Seaplane Station and Seaplane Defence Flight, 22 Sep 1917, TNA AIR 1/1880/204/221/8; C. E. S. Lusk Logbook, 22 Sep 1917 entry, Fleet Air Arm Museum, RNAS Yeovilton.

[2] Robert M. Grant, *U-Boats Destroyed* (London: Putnam, 1964), 159. There were an additional 14 U-boats scuttled, bringing the total lost to 192.

[3] *RNAS Anti-Submarine Report*, Dec 1917, TNA AIR 1/2105/207/41/7, 15-23; Technical History Section, *The Technical History and Index, Part 4: Aircraft vs. Submarine, Submarine Campaign, 1918*, March 1919, Naval Historical Branch, UK, 19 [Hereafter TH4].

[4] For example, Paul G. Halpern, *A Naval History of World War I* (Annapolis: Naval Institute Press, 1995), 424-27; Dwight R. Messimer, *Find and Destroy: Antisubmarine Warfare in World War I* (Annapolis: Naval Institute Press, 2001), Chapter 15; Lee Kennett, *The First Air War, 1914-1918* (New York: Free Press, 1991), 189-97; John H. Morrow, Jr., *The Great War in the Air: Military Aviation from 1909 to 1921* (Washington: Smithsonian Institution Press, 1993), 245, 324-25.

[5] Air Department, Orders for Dunkirk, 12 September 1914, TNA AIR 1/2301/212/2. The force also included 60 motorcars for reconnaissance purposes.

[6] Norman Friedman, *Seapower as Strategy* (Annapolis: Naval Institute Press, 2001), 83.

[7] Vice Admiral Sir Arthur Hezlet, *Aircraft and Sea Power* (London: Peter Davies, 1970), 98.

[8] Admiral of the Fleet Sir John R. Jellicoe, *Crisis of the Naval War* (London: Cassell, 1920), 203.

[9] Admiralty Historical Section, *The Defeat of the Enemy Attack on Shipping, 1939-1945*, edited by Eric Grove (Aldershot: Aldgate, 1997), 10; Air Ministry, *Synopsis of British Air Effort during the War*, 1 Jan 1919, TNA AIR 8/13, 8.

[10] Robert D. Layman, *Naval Aviation in the First World War* (Annapolis, Naval Institute Press, 1996), 84-85.

[11] V. E. Tarrant, *The U-Boat Offensive, 1914-1945* (London: Arms and Armour Press, 1989), 30-31.

[12] Bacon to Admiralty, Cover Letter: Report of Attack on Mariakerke Aerodrome and Zeebrugge carried out on the 21st May 1916, 24 May 1916, TNA AIR 1/633/17/122/83.

[13] Bacon to Admiralty, Report: Air Service Operations in Belgium, 6 June 1916, TNA AIR 1/633/17/122/90.

[14] Air Department, 'Bombing raids from Dunkirk Listed by Objective, 1916-17', TNA AIR 1/296/15/226/145.

[15] S. F. Wise, *Canadian Airmen and the First World War, The Official History of the RCAF, Vol I* (Toronto: University of Toronto Press, 1980), 162.

[16] Dunkirk Résumé of Operations, July to Sep 1917 Summary, TNA AIR 1/629/17/117/3.

[17] Dunkirk Résumé of Operations, 16-30 September 1917, TNA AIR 1/629/17/117/5.

[18] Walther Gladisch, *Der Krieg in der Nordsee, Vol VII* (Frankfurt: E. S. Mittler, 1965), 319.

[19] Report of the Aircraft Bombing Committee, March 1919, 68, TNA AIR 1/2115/207/56/1.

[20] H. A. Jones, *The War in the Air*, IV: 107-08; and VI: 392-93.

[21] Halpern, 415-16.

[22] JWAC Memo AIR 4: Policy of the

RNAS, 3 Mar 1916, TNA AIR 1/2319/226/26.

[23] Historical Section, *Defeat*, 6-10.

[24] Arthur J. Marder, *1917: The Year of Crisis*, vol. IV of *From Dreadnought to Scapa Flow: The Royal Navy in the Fisher Era, 1904-1919* (London: Oxford University Press, 1969), 82; Marder, *Victory and Aftermath (January 1918 - June 1919)*, vol. V of *FDSF* (London: Oxford University Press, 1970), 91. In his preface to Vol. IV, Marder thanks Waters as well as RNAS veterans for their advice (vii). The anti-patrol arguments are repeated in Tarrant, *U-Boat Offensive*, 42-43, and elsewhere.

[25] Training and Staff Duties Division, *Naval Staff Monograph No. 35 (Historical), Vol. XIX: Home Waters, Part IX, 1 May 1917 to 31 July 1917*, Aug 1939, NHB, 84-5. The Flanders-based boats were *UC62, UC63, UC64, UB20*, and two cruises of *UC71*.

[26] Naval Intelligence Division, 'Extracts from German Secret Instructions for War Against Commerce, November 1916 - June 1917', Nov 1917, TNA ADM 137/3886, 33-40.

[27] Messimer, *Find and Destroy*, 131. Also see John J. Abbatiello, *Anti-Submarine Warfare in World War I: British Naval Aviation and the Defeat of the U-Boats* (London: Routledge, 2006), Chapter 7.

[28] JWAC Memo AIR 4: Policy of the RNAS, 3 Mar 1916, TNA AIR 1/2319/226/26.

[29] Marder, *FDSF*, V: 79.

[30] Training and Staff Duties Division, *History of British Minesweeping in the War*, Dec 1920, NHB, 123-28.

[31] Development of the Airship Service, Nov 1918, TNA AIR 1/2314/221/1, 22.

[32] *Minesweeping*, 76.

[33] *TH4*, 14.

[34] William Jameson, *The Most Formidable Thing* (London: Rupert Hart-Davis), 263.

[35] Historical Section, *Defeat*, 4; William S. Sims, *The Victory at Sea* (Annapolis: Naval Institute Press, 1984), 164.

[36] Messimer, *Find and Destroy*, 155.

[37] *TH4*, 12.

[38] Marder, *FDSF*, V: 93.

[39] Historical Section, *Defeat*, 8; Marder, *FDSF*, IV: vii.

[40] Marder, *FDSF*, V: 92; Historical Section, *Defeat*, 5-10.

[41] Morrow, *GWA*, 324-25; Halpern, *Naval History*, 426-27.

[42] Admiralty Memo M.011622/17, 12 Sep 1917, TNA ADM 137/1323, 428-36.

[43] DAD, Statistics and Notes on Escorts by Aircraft, 25 Jun 1918, TNA Air 1/284/15/226/136 Part I, AD2831.

[44] TNA AIR 1/626/17/59/1-7.

[45] Statistics and Notes on Escorts by Aircraft, TNA Air 1/284/15/226/136 Part I, AD2831.

[46] As inferred by Marder and Barley/Waters. Marder, *FDSF*, V: 91; Historical Section, *Defeat*, 7, 355.

[47] Terraine, *Business*, 126.

[48] Marder, *FDSF, Volume V*, 92. This statement counters an assertion in the previous volume (IV:271) that kite balloons 'were used mostly with destroyers for independent submarine hunting.' This inconsistency probably led a recent study to conclude incorrectly that the Admiralty abandoned kite balloon use with convoys. Messimer, *Find and Destroy*, 134.

[49] The kite balloon figures for the Irish Sea include the bases at Lough Swilly (Rathmullen) as well as Milford Haven. Additionally, this chart is based on returns beginning in June 1918, since numbers of patrols were not reported by base prior to this month.

[50] *TH4*, 19.

[51] Layman, *Naval Aviation*, 124.

[52] Peyton-Ward, *RAF in Maritime War*, TNA AIR 41/45, I: 44; Halpern, *Naval History*, 425.

[53] Historical Section, *Defeat*, Ed.'s introduction.