

Trenchard and Slessor:

On the Supremacy of Air Power over Sea Power

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Trenchard and Slessor:

On the Supremacy of Air Power over Sea Power

Gjert Lage Dyndal

 tapir akademisk forlag

© Tapir Academic Press, Trondheim 2007

ISBN 978-82-519-2270-8

ISSN 1502-007X

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Layout: Tapir Academic Press

Printed by: Tapir Uttrykk

Binding: Grafisk Produksjonsservice AS

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Introduction

Maritime air power is an important but often neglected concept of air warfare, operationally as well as doctrinally. It has suffered because it principally involves both sea and air power, and therefore has often fallen between the Service's sphere of interests, and simultaneously been haunted by inter-service rivalry.

There are universally recognised theorists of sea power and universally recognised theorists of air power, but their ideas and perceptions exist in different theoretical, historical and bureaucratic spheres. Navies think in terms of sea power, air forces think in terms of air power. Naval academies teach sea power, air force academies teach air power. An important question arising from this is which service 'owns' the aircraft that operate at sea. In addition, these theories or paradigms of sea power and air power argue for the primacy of their subject: air power on its own is the war winner, or sea power on its own is the war winner. Maritime air power is caught between these two extremes.

Maritime air power is fundamentally about sea power – but it is also air power applied. It is a two-service and joint affair. As maritime air power comprises both sea and air power, much literature has been obscured by the many naval and air force advocates. This book includes a reproduction of eight formerly classified essays by Marshal of the Royal Air Force Trenchard and Marshal of the Royal Air Force Slessor. The essays are reproduced for three main reasons: Trenchard and Slessor are two of the most influential and important figures of Royal Air Force (RAF) and air power history. All of the essays fall into the category 'air force extremes' in terms of the classical air force–navy controversies over air power. These essays should therefore be made available to students and other readers interested in air and sea power. The essays provide fascinating and interesting reading, as well as a good starting point for debates on and studies of maritime air power. The classic air force–navy controversies are by no means old history. The conflicts are arising now and then within all maritime nations. As these essays are extremes in the air force's understanding of maritime air power, two explanatory chapters on Trenchard's and Slessor's obsessions at the time of their writings have been written and presented as preambles to their respective essays.

The four essays by Marshal of the Royal Air Force Hugh Montague Trenchard, 1st Viscount Trenchard, are quite rare. Even though Trenchard was one of the greatest pioneers of air power, he wrote very little. He himself stated in an interview in 1934: 'I am not good at writing ... I cannot set out my ideas

in nice order. But I believe the air is one.¹ As he was not a writer himself, he often used staff writers, ‘English merchants’, for formulating his thoughts on air power.² Still, the texts which are in his name, as well as the Air Staff doctrines of the inter-war years, may well largely be understood as his thoughts. His position and influence over all aspects of British air power thinking in his time was substantial, and far beyond that of any of his successors.

Trenchard’s first essay in this book, ‘The change over from Sea Power to Air Power’, is directly devoted to the air power–sea power controversy. The essay was written as an official secret document in December 1942. The essay is held by the National Archives in London, in file AIR 23/1360. The three following essays by Trenchard are broader treatments of air power, but also much focused on maritime air power and the conflict with the Royal Navy. These three essays are all held in the National Archives file AIR 20/5567. The essay ‘The Effect of the Rise of Air Power on War’ was first published as an official secret pamphlet in October 1943. ‘The Principles of Air Power in War’ was first published as an official secret pamphlet in May 1945, while the ‘Air Power and National Security’ essay was produced as a secret pamphlet in August 1946. With the publication of this last essay, the two former essays were also attached. All three essays were later also reproduced as ‘Air Ministry Pamphlet 229’ in 1963, then classified as Restricted. The essay ‘Air Power and National Security’ was declassified and reproduced in Eugene Emme’s *The Impact of Air Power: National Security and World Politics* in 1959, following a seminar on national security. Trenchard was the most influential Commander of the Royal Air Force. Even though he is not reckoned as an air power theorist, nor in fact a good aviator, he definitively should be regarded as one of the greatest air power thinkers. These essays, written by Trenchard, are thus important both as theoretical essays on air power as well as for understanding the classical air force–navy controversies over the administrative and operational command relationships.

The other four essays on maritime air power reproduced here are written by Marshal of the Royal Air Force Sir John Cotesworth Slessor. In contrast to Trenchard, Slessor wrote extensively throughout his career. Slessor stands out as one of the greatest writers on British air power, as well as on maritime air power in general. His books *Air Power and Armies* of 1936 and *The Central Blue* of 1956 are monumental works. His books on nuclear strategy and NATO are also well recommended: *Strategy for the West*, *The Great Deterrent*, *What*

1 AIR 8/167, Independent bombing force: report of an interview with Lord Trenchard (1934).

2 P. Meilinger, *The Paths of Heaven, The Evolution of Airpower Theory* (Alabama: Air University Press, 1997), p. 53.

Price Coexistence? A Policy for the Western Alliance and *These Remain*. The essays reproduced in the present book are, however, of a different style. They are very much political, and very direct in their approach. Slessor, as many other air and sea power writers, was much occupied with military political life in the 1960s. These were times of economic decline for the defence sector, and following a great inter-service rivalry over the scarce resources available emerged. Slessor, even though a generally diplomatic, balanced and reflective thinker on maritime air power, became caught up in the British Air Ministry and Admiralty battle over the new carrier programmes of the 1960s. The four essays are very alike, and repeatedly using the same arguments. The 'Capital Ship Complex' essay is the most interesting for air and sea power study, and it covers most of the other essay's arguments. I have still reproduced also the three later essays, as some differences and new arguments emerged. Slessor's critiques of carrier aviation stands out as classical 'air force extremes'. As such 'air force extreme' arguments still exist, and probably will so in the future, they provide good reading for both air force and naval students, officers and other readers. For instance, may the processes of the late 1990s towards a more integrated maritime air organisation well be examined in light of the history of the Services.

Together, the eight articles by these two monumental personalities within the air power community represent some extreme understandings of maritime air power. In this respect, Trenchard and Slessor acted as 'air power advocates'. They argued strongly for the supremacy of air power over sea power; meaning aircraft supremacy over traditional naval surface ships, land-based aviation's supremacy over naval carrier aviation, and the need for a coherent and independent air force organisation. The purpose of this book is to reproduce and make available these extreme perceptions on maritime air power. There are two explanatory chapters setting the scene for the essays, but the texts are not analysed per se.

I do not support the views put forward by either Trenchard or Slessor on maritime air power in these essays, but they speak for many – also contemporaries – and thus make important contributions to the debate. There is a time and place for naval carrier aviation, as there is a time for land based air power.

Acknowledgements

Thanks are due to the British Ministry of Defence for permitting the reproduction of the essays, and the Air Historical Branch (RAF) for providing the pictures used. The essays' public accessibility makes an important contribution to the understanding of and debate on maritime air power. Thanks are also due to fellow staff at the Royal Norwegian Air Force Academy, especially Senior Lecturer Ole Jørgen Maaø and Miss Kristin Hjelmeland for their support.

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Introduction to the essays by Trenchard

Marshal of the Royal Air Force Hugh Montague Trenchard: a biographical note

Hugh Trenchard's name is the most prominent in the history of the Royal Air Force. He is not known to be a theorist, but he must clearly be reckoned as one of the great thinkers and organisers of the early days of military aviation history. He has been labelled the 'Father', the 'Creator' and the 'Architect' of the Royal Air Force. In fact, he did not approve of any of these terms – but they are all descriptive of his position. His position was undisputed and very influential, but he was also controversial. Sir John Slessor described Trenchard as both a hero and prima donna:

The Prima Donna – passionately involved, unpredictable, temperamental, often difficult to deal with, sometimes inclined to be egocentric, but supremely good at his job; the hero – a man whose physical and moral courage were unsurpassed; and in both, one of the few really great men of our time.⁴

Hugh Trenchard was born in Taunton on 3 February 1873. He joined the Royal Scots Fusiliers at a young age, and took part in operations around the world. As a 39 year old Major, he became interested in the new trend of aviation and joined the newly formed Royal Flying Corps. He was older than most of the other aviators, but this also meant he was more experienced. He soon became Deputy to the first Commandant, Captain Godfrey Paine. As the Great War broke out, Trenchard held the command position of the Military Wing at Farnborough. He was then sent off to France to lead the No.1 Wing. By 1915 he had succeeded General Henderson as the General Officer Commanding the Royal Flying Corps, responsible for the Western Front air operations.⁵ When the Royal Air Force was created as the world's first independent air force in 1918, he became the first Chief of the Air Staff (CAS). He was therefore central in the merging of the Royal Flying Corps of the Army and the Royal Naval Air Service into the

⁴ J. Slessor, *These Remain* (London: Michael Joseph, 1969), p. 8.

⁵ H. Probert, *High Commanders of the Royal Air Force* (London: HMSO, 1991), pp. 1–4.

world's first unified air force. He did not hold this position for long, as he came into conflict with the Secretary of State for Air, Lord Rothermere. The question at stake was the political fate of Sir Douglas Haig⁶ and Sir William Robertson, both of whom were greatly respected by Trenchard. In addition, Trenchard saw Lord Rothermere's political play as a source of great friction to the cause of a unified air service.⁷ Trenchard broke with Lord Rothermere and returned to France to command the air forces until the end of the war. After the war, Hugh Trenchard returned as Chief of the Air Staff. He was appointed the first Marshal of the Royal Air Force in 1927, and remained the official head of the Royal Air Force until his retirement in 1929. Upon retirement he entered the House of Lords as Baron Trenchard, and became Viscount Trenchard in 1936. Both during and after World War II, he was a public figure, speaking about air power and Royal Air Force issues.

Hugh Trenchard, GCB, OM, GCVO, DSO, died on 10 February 1956. Today's memory of this great pioneer is that of a builder of the first air force in the world, and an air power advocate of organisational independence. As for his perceptions on the use of air power, he is still most famous for his strong belief in 'strategic bombing' and 'air control', also called 'imperial policing'. His thoughts on the issue of maritime air power are less known. The following four original articles by Hugh Trenchard will hopefully contribute to a better and broader understanding.

-
- 6 The Cabinet and the High Command had been engaged in a running battle with Sir Douglas Haig over the course of events on the Western Front. Sir Douglas and Trenchard, who was his air advisor, resisted every request for the transfer of aircraft from the Western Front to the home front. Trenchard viewed defence as a misuse of aircraft, offence being their only proper role. (S. Robertson, 'The Development of Royal Air Force Strategic Bombing Doctrine between the Wars. A Revolution in Military Affairs?' in *Aerospace Power Journal* (Spring 1998)).
- 7 A. Boyle, *Trenchard: Man of Vision* (London: Collins, 1962), pp. 250–251.

Recommended reading on Trenchard

Allen, Hubert Raymond, *The Legacy of Lord Trenchard* (London: Cassell, 1972).

Boyle, Andrew, *Trenchard: Man of Vision* (London: Collins, 1962).

Fallon, William J., 'Over the next hill: a sailor's perspective of maritime air power and the legacy of Lord Trenchard', in *RUSI Journal* (Vol. 147, No. 2, 2002).

Grant, Rebecca, 'Trenchard at the creation', in *Air Force Magazine* (Vol. 78, No. 2, 2004).

Kudrycz, Walter, 'A practical prophet: Arthur Harris, the legacy of Lord Trenchard, and the question of "Panacea" targeting', in *Air Power Review* (Vol. 5, No. 1, 2002).

Meilinger, Phillip S., 'Trenchard and "Morale bombing": the evolution of Royal Air Force doctrine before World War II', in *Journal of Military History* (1996).

Meilinger, Phillip S., 'Trenchard, Slessor, and Royal Air Force doctrine before World War II', in Meilinger, Phillips S. et al., *The Paths of Heaven: The Evolution of Airpower Theory* (Alabama: Air University Press, 1997).

Mets, David R., *The Air Campaign: John Warden and the Classical Airpower Theorists* (Alabama: Air University Press, 1999).

Probert, Henry, *High Commanders of the Royal Air Force* (London: HMSO, 1991).

The command of British maritime air forces

A background chapter on the process towards a unified air service in Britain, and the subsequent inter-service rivalry is necessary in order to understand Trenchard's radical 'air' perspectives as presented in this book. From the early 1920s he became fanatical about the unified air force. The air was one – and all aircraft should be under a unified leadership.

Royal Air Force – the unified air service

The history of military aviation in Britain started with the *Balloon Section of the Royal Engineers*, which later expanded to the *Air Battalion of the Royal Engineers*. Following the introduction of the fixed-wing 'heavier than air' aircraft, the *Royal Flying Corps* (RFC) was constituted by Royal Warrant on 13 April 1912. This new organisation was intended to encompass all military aviation. Still, the thoughts of a specialised naval aviation group within the new establishment were all bedded from the beginning, with an offer of two aircraft and free flying lessons from a flying school at Eastchurch in Kent to the Royal Navy.⁸ The first four pilots were trained, and by late 1912 a separate *Naval Wing* of the *Royal Flying Corps* was established. However, the Admiralty was not satisfied with being under the control of the Army. On 1 July 1914, the Naval Wing was separated and formed the basis of the new *Royal Naval Air Service* (RNAS). All airships came under this new Command, and in September of same year the first naval air squadrons were formed. The Royal Naval Air Service soon grew to be larger in numbers than the Royal Flying Corps. The roles of the Royal Naval Air Service were focused on fleet reconnaissance and patrol of the coastlines in the hunt for submarines and ships, offensive operations in attacking enemy coastlines, and not at least the defense of the island from enemy air attacks. The RNAS even developed ways of operating aircraft from ships from this very first era of naval aviation.

Many conflicts arose between the two more or less independent services during the First World War, and in 1916 it was decided to create an *Air Board* to deal with the limited logistical supplies. The visions for a new centralised and independent service also spread. The principles of 'unity of war at sea' and the 'unity of war in the air' became slogans. The 'Smuts Committee Report' of 1917 (named after Lt General Jan Smuts, who led the enquiry group) and the Air Force Constitution Act of 1917 formed the basis of the world's first unified

8 M. Tagg, 'Wings over Water' in *Maritime Patrol Aviation*, September 1994.

air force.⁹ However, the Act did not come into effect until the end of the war. The *Air Ministry* was formed on 2 January 1918, with Lord Rothermere as the first Secretary of State for Air. Major-General Hugh Trenchard became the first Chief of the Air Staff. The two existing air corps – the Royal Flying Corps and the Royal Naval Air Service were merged, and the *Royal Air Force* came into operation on 1 April 1918.

The Royal Air Force officially held command of all military aviation in the period 1918–1937. During the early years of this period, the community of naval officers regarded the transfer to this new unified command as a relief, as they often had felt unappreciated by the Royal Navy. However, from the early 1920s, the Admiralty focused more on the potential of aviation and started fighting for their own control of the maritime air forces. The Royal Navy gradually gained more influence within the Royal Air Force led groups. Thus, it became readily apparent that integration of naval officers and crew was crucially important for effective operation of naval aviation.

The Admiralty made numerous attempts at securing command over the maritime air forces. The discussions on command relationships became a constant review issue and were treated by many political committees, the most important being the Belfour Sub-Committee of 1923 and the Trenchard-Keyes Agreement of 1924, which made important contribution to this integration.¹⁰ Also many other attempts were made by both services.¹¹ During these years of controversy, the groups of naval aviation became collectively labeled the ‘Fleet Air Arm’, though they still remained officially under Royal Air Force command. For practical reasons, operational control was still conducted by the ship commanders, and hence by the Royal Navy.¹²

During the next decade, only minor adjustments were made. In 1925, the Admiralty approached the Colwyn Committee and made a new attempt at securing command rights over the maritime air forces. The Admiralty’s proposal did not receive political support. The same story was repeated in 1928, when Lord Salisbury, who was acting as an arbitrator between the two Service Departments, effectively set aside the Admiralty’s demand for command rights. Later, some organisational adjustments resulted from Admiralty and Air Min-

9 AIR 2/2639, FLEET AIR ARM (Code B, 36): Fleet Air Arm: memorandum for Sir Thomas Inskip on organisation (1936). Memorandum from the first Sea Lord to Inskip, 20 April 1936.

10 AIR 2/2639, various correspondence and notes.

11 See P. Meilinger, *Airwar* (London: Frank Cass, 2003), p. 77.

12 See for instance D. Hobbs, ‘Naval Aviation, 1930-2000’, in Harding, Richard ed., *The Royal Navy 1930-2000* (London: Frank Cass, 2005).

istry agreements in 1932–1933. The Royal Navy gained an official line of own naval pilots and crew, as well as Squadron Leaders in the Royal Air Force led Fleet Air Arm organisation.

Coastal Command and Fleet Air Arm

The first great reorganisation of the Royal Air Force and consequent changes in maritime air power came in 1936 with the formation of the famous commands of *Coastal Command*, *Fighter Command* and *Bomber Command*. Subsequently, new debates arose questioning the unity of all military aviation. The result of these debates was a modification of the 1917–1918 agreements over unity at sea and in the air for warfare. Shortly after the establishment of Coastal Command, the Royal Navy regained command of its own air force. The Naval Air Branch of the Royal Navy was formed following a Government announcement on 30 July 1937. Shortly thereafter officially renamed the *Fleet Air Arm (FAA)*, which previously had been its ‘unofficial’ name. As for the land-based maritime air forces of the Coastal Command, these were to be kept under command of the Royal Air Force. The main rationale behind this decision was that large aircraft were inherently flexible and capable of performing several roles, and thus most effectively commanded by a unified air force. This agreement, which created the still effective two-split British maritime air force structure, became known as the ‘Inskip Award’ of 1937. It was named after Thomas W.H. Inskip, the Minister for Coordination of Defence. Inskip’s separation of the Fleet Air Arm from its ‘parent unit’ was a hard blow to the Air Ministry and to Trenchard personally. As the soon-to-be Chief of the Air Staff, Newill,¹³ wrote to Trenchard just after the decision: ‘May I say at once that I know what you must feel after all you have done for the Air’.¹⁴ Trenchard’s famous perception was that the ‘air was one’ – and that it was ‘indivisible’.¹⁵

When World War II broke out, the question of transfer of Coastal Command to the Royal Navy was raised once again. The Air Ministry was still against this, though the issue did not materialise into inter-service rivalry. Despite First Sea Lord Dudley Pound wanting unified maritime air force – under naval com-

13 Cyril L.N. Newill, Deputy Chief of the Air Staff between 1926 and 1931. Air Officer Commanding Middle East 1931–1935. Appointed Chief of the Air Staff (CAS) in 1937.

14 AIR 8/223, Fleet Air Arm: Sir Thomas Inskip’s reports and papers (1937). Newill to Trenchard, 13 August 1937.

15 M. Smith, *British Air Strategy between the Wars* (Oxford: Clarendon Press, 1984) p. 185.

mand – he did not find a war to be the right time for such changes.¹⁶ Following a Churchill inquiry and the Defence Committee (Operations) agreement of 4 December 1940 on the question of command and control of the maritime air forces, the two Service Departments were simultaneously directed to find an agreement. A joint ‘Committee on Coastal Command’ was created, with Vice-Admiral Phillips (VCNS) and Air Vice-Marshal Harris (DCAS) as central figures. This joint committee delivered a report on the challenging command issue on 19 March 1941.¹⁷ It was agreed that the Royal Navy should gain formal ‘operational control’ of the Coastal Command. This was supported by the Air Officer Commander-in-Chief Coastal Command, John Slessor. It was agreed that the Coastal Command would still be an integral part of the Royal Air Force.¹⁸ The institutional debating points were laid aside, and the operational co-operation was well handled by the new Admiralty/Coastal Command Committee for the remainder of the war.

Trenchard, who had no command posts during World War II, was still influential – and he would not leave the classical debate fully. The issue of the command relationship had been, and still was, a central question for him. This is a readily apparent underlying issue in Trenchard’s writing on maritime air power presented later in this book.

The tension of inter-service rivalry did not disappear with World War II, even though effective operational command and control structures came into force. With the end of the war in sight, the debate quickly came to the surface again. Letters and notes were passed around in the autumn of 1944 over the question of ‘Maritime Air Operations after the war’.¹⁹ By the summer of 1945, both the Royal Air Force and the Royal Navy had produced their own studies relating to organisation and command arrangements over the maritime air forces. The Admiralty was again eager to gain full command rights over the maritime air forces, which the Air Ministry opposed. The Air Ministry’s initial preference was for a continued two-split organisation of the maritime air forces – with effective joint and flexible solutions of operational control of the forces determined by the specific demands that any future conflict would require. The

16 J. Buckley, *Maritime Air Power and the Second World War*, in S. Cox and P. Gray eds., *Air Power History* (London: Frank Cass, 2002).

17 AIR 20/933, *Coastal Command: operational control (1945–1947)*, including a copy of the 1941 report from the ‘Committee on Coastal Command’ 19 March 1941.

18 AIR 20/933, Air Ministry note by Merkhams, 4 October 1945.

19 E.g. AIR 2/9655, *ROYAL AIR FORCE: Coastal Command (Code B, 67/10): Maritime Air Forces: organisation (1945–1946)*; AIR 20/933, *Coastal Command: operational control (1945–1947)*.

Air Ministry was satisfied with the solution of 1941 but recommended an altered Admiralty–Air Ministry Committee to replace the effective Admiralty–Coastal Command Committee of 1941. The basic argument was still the inherent flexibility of air forces, and that any air power effort and allocation of forces always had to come from a consideration of the ‘air situation as a whole’.²⁰

From the autumn of 1945 to early 1946 the debate continued in a diplomatically correct and polite manner. The question was first raised officially at a separate meeting between Vice Admiral McGrigor (VCNS) and Air Marshal Durston (DCAS), Rear Admiral Lambe (ACNS (Air) and Air Vice Marshal Dickson on 25 January 1946.²¹ Following this meeting, Air Marshal Durston wrote to Vice Admiral McGrigor communicating the Air Ministry’s understanding of the meeting, namely that the basic organisation of 1941 and the allocation of forces to meet commitments in the various theatres would be carried out by the Chiefs of Staff.²² This was not the understanding held by the Admiralty, and the debate soon escalated. Vice Admiral McGrigor revised the document, and made it clear that there could only be ‘one authority [the Admiralty] responsible to HM Government for the control of sea communication’.²³ With this, the debate had turned into a new inter-service rivalry over the command of the maritime air forces. As one Air Ministry official wrote: ‘The nigger is now right out of the wood-pile’.²⁴

A ridiculous, but perhaps necessary inter-service rivalry continued throughout 1946 until an agreement was reached by the end of the year. It was decided that command of the maritime air forces would be upheld in accordance with the conclusions reached by the Defence Committee (Operations) of the War Cabinet in December 1940. This new agreement of 1946 is known as the ‘Dickson-Lambe Agreement’. To a large extent, it was the Air Ministry who won their case. They had argued for the solution of 1940–1941 throughout the 1945–1946 controversy. The agreement of 1946 over the command relationships concerning the maritime forces recognised that naval command would normally be the predominant actor in terms of operations, but Coastal Command would continue to remain an integral part of the Royal Air Force.

20 See AIR 20/933, C.A.S. to V.C.A.S. 9 October 1945; and notes by A.C.A.S. (Ops) 12 October 1945.

21 AIR 20/933, Note of meeting, 25 January 1946.

22 AIR 20/933, Air Marshal Durston (D.C.A.S.) to Vice Admiral McGrigor (V.C.N.S.), 4 March 1946.

23 AIR 20/933, Vice Admiral McGrigor (V.C.N.S.) to Air Marshal Durston (D.C.A.S.), 23 March 1946.

24 AIR 20/933, J.C.S./A.M.P. to D.C.N.S., 26 March 1946.

When reading Trenchard's essays in the following chapter, the long political battle between the Royal Air Force and the Royal Navy over organisational structures, which lasted from the early 1920s until the end of World War II, should be kept in mind. If one looks beyond the most radical statements of this inter-service rivalry and Trenchard's obsession with the 'unified air force', the essays makes a valuable contribution to any air power reading list.



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Four essays by Trenchard on the supremacy of air power

‘The change over from Sea Power to Air Power’

Great Britain and the British Empire as they exist to-day have been built up on trade carried in ships. This fact has been recognised from the earliest time and the first attempt to maintain our trade in the face of opposition was the armed merchant ship.

In the course of time it was found that it was uneconomical and inefficient to attempt to combine the qualities of a merchant ship with those of a ship of war, and from this realisation the professional Navy emerged.

This Navy, whose sole function was to maintain the security of this country by assuring a measure of control of the sea communications, was and is dependent on other forms of strength for its continued existence. The manufacturing power of the country and its manpower provide the equipment and personnel and the Army has, in the past, assured the security of its bases.

It is true to say, therefore, that the British Empire has been built up in the last two hundred years on Sea Power, and been maintained by Sea Power.

By ‘Sea Power’ I mean the keeping open of the seas and oceans for our merchant ships by surface warships of all sizes, from battleships down to the smallest craft, and denying the use of the seas to the enemy.

But the Wright brothers changed all that when they left the ground at Kittyhawk. Air Power was then conceived. The deep significance of that flight lies in the fact that warfare is no longer in two dimensions but in three.

Since then our progress has been remarkable. From small beginnings and technical limitations that are fast disappearing, we reached the Great War when, among countless other duties, aircraft played an important part. Then followed the post war period, when long-distance flights over the oceans and continents of the world showed that aircraft could circum-navigate the globe with but a few stops.

Fighting aircraft, bombers, fighters and torpedo-bombers, developed rapidly with their own weapons, until the aeroplanes which Wilbur Wright flew became a formidable vehicle for war.

Organisation and yet further development rapidly built up what is now widely recognised as the most potent influence in the world to-day – Air Power.

Before and after Munich we saw what the mere threat of Air action could achieve in land-locked countries. We have since seen, notably off Singapore, at Midway, and off the Solomons, what Air Power can do to those who go down to the sea in ships.

The prophecies of those who years ago pointed to the decisive influence which the Air would be able to exert over land and sea have been proved to the hilt.

The present rate of progress is so rapid as to leave no room whatever for doubt but that Air Power is going to have an over-all influence over land and sea alike. In the “thousand-bomber” raids we know something of the shape of things to come as far as the land is concerned. And we have seen an Air/Land Power challenge an Air/Sea Power, in a manner which is pressing us closely.

The Air is handicapped at present because many of us lived in the past when there was no Air. We are strongly influenced by our surroundings and by the thought of the period in our early life, such as between the ages of fifteen and thirty. Those are the thoughts we remember. In the stress of difficult times we revert to type, to what we believed and thought in those days when there was no Air. There is no doubt about it. We are inclined to be dangerously prone to this influence of our ideas and conception of warfare in our early years. Those who have been born since the Wright brothers first flew are naturally imbued with the spirit of the Air. Most of the principles and methods used by those who lived in the days when we had not mastered the Air are out-of-date. Instead they will be replaced by the ideas of the new generation which is arising, the generation that is fighting this war for the New World.

At the end of this war the Air will be, and that without question, the predominating influence in the whole world, although it is likely that the Army may be of more importance to the British Empire than in the past. Our Army will need to be larger and better equipped, because the enemy will dig underground and put his bases and supplies there (on the lines of the great caves outside Heliopolis or the underground works in this country). The Army will be required to dig the opposing enemies out of these underground places and move them out of prepared positions. In mobile warfare the Army will secure our air bases from land assault.

Let us now examine Sea Power for a moment.

To-day no fleet, however powerful, can operate effectively within reach of an undefeated and strong air force. It requires an air umbrella before it can work effectively in open water. Coastal waters are almost closed to it, even when supported by a large carrier-borne air force. All ships, from battleships to cruisers, destroyers to submarines, are seriously hampered by the effective use of Air Power, unless their own air forces control the waters in which they operate.

Air forces, supported by light craft, daily pass our trade safely from point to point along the North Sea and Channel, in the face of a strong air threat. Only when trade adventures away from the protection of the Air do the enemy air forces, and the enemy surface and subsurface vessels take their toll. In other words, Air Power as a controlling force has already supplemented Sea Power in the exercise of Sea Power, and for obvious reasons.

It seems that the time has come for us seriously to reconsider the whole situation as it affects our sea-borne trade.

The Navy would have us continue to build fleets for the same purpose for which they were effective thirty years ago and for which to-day I believe them to be ineffective.

As I have already said, big warships operating in narrow seas or near coasts must have air cover protecting them, which is a mis-use of the home aircraft which could be used much more effectively to destroy the enemy's warships (if they have any) or anyhow to protect our own merchant shipping and attack the enemy's merchant shipping.

The fewer warships the Air have to protect the better. The prestige of losing a warship is much greater than losing a merchant ship. Therefore, convoys that are escorted by warships have to have added protection to cover the warships as well as the merchant ships, which the Air could cover effectively alone.

The next point I turn to is aircraft carriers, at present of some use. It may be that aircraft carriers will be necessary until the end of the war, where air bases have not been established and no facilities are available for shore-based

aircraft. But no naval battle in the last two hundred and fifty years had been fought more than a hundred miles from shore, and only one that distance – Tushima. To say that aircraft carriers are necessary for the oceans in which sea battles are fought is not supported by reality.

There is a naval saying which explains the reason for this historical fact. It is as follows:

“Enemy forces can be intercepted and brought to battle at the point of departure or in transit or at the point of arrival. Of these three methods, that of interception in transit is by far the most difficult.”

It is obvious that if one knows the base from which the enemy fleet is operating, the area for search for his ships is restricted. Similarly if the objective of his attack is known, he can easily be found. But anywhere in the open spaces of the oceans the enemy fleet may take its course with the object of evading interception, when the area of search is immeasurably greater.

Next, the submarine problem. Before the war we were generally told that the submarine was no longer a menace, but after three years of this war I think all recognise that it is still as a great a menace – if not greater than – it was in the last war.

It has been tackled as a naval problem and the Air made subordinate, and I feel the whole problem is an Air problem, and that the ships should aid the Air in helping to suppress this menace.

Is it not true to say in the last war and in this submarine arena²⁵ regard aircraft and also that hidden and mysterious weapon, the mine, as a most serious menace?

Announcements have been made in the Press recently of battles between U-boats and aircraft over the ‘body’ of a merchant convoy. Until the arrival of aircraft the enemy U-boat had taken heavy toll of the shipping in spite of the most gallant and determined efforts on the part of surface escorts. But with the intervention of Air Power, the enemy attack has been broken up and the convoy saved.

25 The word is of very poor print-quality in the original copy. It has been estimated to read [arena].

It is not difficult to see why the submarines fear aircraft more greatly than they fear surface craft. In the case of the surface ship, it is usually the submarines which brings off surprise, and owing to its ability to dive and its high speed on the surface, the submarine has a very good chance of evading the counter-attack. When faced with aircraft, however, the speed and manoeuvrability which enabled the submarine to avoid the surface vessel is entirely inadequate. The aircraft can frequently achieve surprise by the use of cloud cover, and by flying down the rays of the sun. Its rate of approach to its target enables it to deliver its attack frequently before the submarine has time to dive. This makes the bombing attack very much more accurate than is the surface vessel's depth charge where nothing can be seen of the submerged submarine and only a rough estimate made of its position below the surface.

Our own submarine Commanders have paid testimony to the efficacy of air attack. Certain areas of the oceans in which they have wished to operate have, in spite of the greatest courage and determination on their part, been almost denied to them by the activities of the enemy Air.

Mines are laid by air (or the majority of them are) and aircraft cover vast areas of water where surface ships cover few. And most important of all, Air can destroy and damage the sources of submarine production in Germany. It seems to me, therefore, it is primarily an Air problem.

To conclude, if England and America use Air Power as it should be used, it will win the war more quickly, it will dominate the world in future, and it will keep the peace.

The most offensive weapon yet invented in the world must not be used for the purpose of enabling the old and out-of-date methods of warfare to work. Nor must the swiftest and most powerful vehicle lack support when peace comes.

If we are old-fashioned and are left behind in the race we shall break faith with the young people who are fighting our battles so valiantly for us; young people to whom we have promised a New World with new ideas.

The whole future of our country hangs on the way we use the Air, now and post war.

1st December, 1942

‘The Effect of the Rise of Air Power on War’

FOREWORD

This note, which I am circulating to a few people, may be found somewhat controversial. As we move ever more rapidly towards final victory, when our Officers and men of all three Services have done and are doing so magnificently, and many of them are giving their all, some people may say “why not let well alone?” Yet I suggest that is a highly dangerous policy. We read how the great battles are being waged, we see headlines of the great casualties we may expect to suffer in some future operations.

Releasing that the war is not yet won I feel it is highly desirable, in the exuberance of our recent success, to reflect calmly before we launch other operations that might bring about terrible losses, when the same victories can be more swiftly won at a lower cost by using the right weapons at the right time.

Correct thinking about air power is vital to the world and in particular to the British Empire both for this war and the future.

Britain formed a separate Air Force from her practical experience in the Great War on a policy which has been proved correct in this one. Air has already shown more power than any theorist of twenty or thirty years ago thought possible.

Many books have been written during this war, chiefly by American authors, on the rise of Air Power – the most notable being Seversky’s “Victory Through Air Power,” Huie’s “Fight for Air Power,” and Ziff’s “Coming Battle of Germany.” Because a great number of other books and articles continue to be published and many speeches made by those who still mis-read the lessons of this war, I feel the time has perhaps come when a short note may usefully be written by an English man.

For this reason I have ventured to express in the following pages a few of my views derived from first-hand experience and 31 years study of the Air (including the lessons of this war and the last war, and the many minor wars in the intervening period) for the purpose of helping forward discussion on this most important subject.

I have tried to put down in simple language what is the belief of practically everyone in the Royal Air Force and what a great part of the Army believe and some of the Navy.

I am confident that the majority of the population of England will broadly agree with a great deal of what I have tried to imply, although Whitehall and Washington may not yet do so; for, as I have often said, probably 80 per cent. of the people of Britain and America believe in the claims of air power made by airmen, while 80 per cent. of Whitehall and Washington do not.

The purpose of writing this pamphlet is to set out the lessons and facts that we should learn from this war to date so that they may be taken into account in bringing to a successful conclusion the Hitler war and in our plans for the war against Japan.

In this short paper I have not attempted to cover the whole ground as that would be impossible without making it unduly long.

TRENCHARD.

MARSHAL FOCH said *That no War is like the previous War.*

Many thinkers support this view. On the other hand a large number of military and naval theorists are continually stating that the principles of war never change while they proceed to lay down methods as though they were principles.

Methods Though Change.

There is no such thing as academic war. Every war is different, although certain characteristics are common to most.

Since the world started wars have been fought on land and sea. The Army moves forward or backward, right or left, until stopped by seas, rivers or mountains. With every yard it advances or retreats the army's problems alter. Methods of solving those changing problems must be varied to suit the geographical features of the ground.

The Sea and the Air encounter fewer obstacles than the Army. The Navy moves forward and backward, right or left, until stopped by land or rocks.

The Air has no barrier save weather, and even that is being swiftly overcome. It can move forward, backward, left, right, up or down, in an immense three-dimensional space which appears so vast that few people understand it. And weather affects all three Services in more or less equal proportions; the Army by floods, mud and cold; the Navy through gales, fogs, and heavy seas; and the Air by fog and icing-up.

Fighting in three dimensions is unique. It had never happened before the Great War and then only few realised the development it foreshadowed, and such a startling innovation can never happen again.

We must realise certain facts about fighting in three-dimensional space before we can discuss the future of war. Here are the two most important:

1. **THE AIR IS INDIVISIBLE. IT ADMITS NO BARRIERS.** Unlike the oceans, seas, waterways, or the land, **THE AIR IS ONE.**
2. The law of gravity affects aircraft more seriously than ships or land vehicles. The great weight of fuel carried by aircraft relative to their total weight affects their performance.

“THIS IS TOTAL WAR” – *So runs a phrase of the day.*

But when stripped of its propaganda value this phrase simply means that this war has again proved, what all wars had previously shown, the necessity of co-operation and the necessity of harnessing all the resources of the Nation when the very existence of the Nation is at stake.

I fully agree with the importance of co-operation, especially between the Services, and this has always been ungrudgingly given in the battle zone. Nevertheless, it is too often erroneously thought that co-operation implies the combined use of all types of weapons, and methods, in war, whereas the truth is that with all the will in the world and the best possible co-operation, some types of equipment can prove a definite handicap. For instance, when the bomb works and factories in Paris the co-operation of Destroyers up the river Seine would be a definite liability because of the air cover they would require.

There are many operations in war in which one Service or one Arm cannot co-operate with another Service or another Arm. In fact this can sometimes prove a handicap as it often was on the Frontier of India. Whenever an operation took place there it was considered necessary to do two things; first to bomb the rebellious tribes after warning them they were going to be bombed, and then to advance with a brigade or a Division of Infantry of the Army. But because the enemy there loved a fight, directly the Army advanced he was overjoyed; for that gave him an opportunity to capture rifles and ammunition and carry on: even when some of the tribesmen were killed, they felt it was worth while, for they killed some of us and captured a good deal of loot. The tribesmen did not think the fight worth while if loot was not to be got, and if their villages were destroyed, thus forcing them to live in caves and interrupting the whole life of the tribe. After living in the caves for some time, fleas drove them out and they were ready to make peace. In one typical case when the recalcitrant tribesmen were on the point of giving in after two months of bombing, the Army decided to advance. Thereupon the enemy started to fight again and the whole affray started once more. This was proved after the subsequent collapse of resistance, which is precisely what I mean when I say that sometimes the Air can be hindered by the co-operation of another Arm.

Co-operation is thus not always desirable when it means using the wrong weapon. Although it may be useful and have to be carried out in certain circumstances, we should be quite certain that the weapons used are the most effective and economical, particularly in lives.

In these days neither the Army nor the Navy can fight without appalling casualties unless the Air has first won its battle for the Mastery of the Air.

In the land battles of yesterday losses were very severe. Take those of the Great War; on the Somme we lost over 480,000 men and it lasted for two or three months; Passchendaele cost us some 500,000 men and Neuve Chapelle over 200,000. Then what explains our sequence of victories from El Alamein and Tunisia at a cost of only 20,000 to 40,000 men? There was every reason to expect even greater casualties than in the last war. All the destroying weapons man's ingenuity has devised were available in huge numbers on either side – mines, mortars, quick-firing guns, artillery and tanks – yet the casualties were small. What new factor had helped to win these victories so quickly and economically? AIR POWER.

Again, on the sea, after our Navy won its victories at Taranto and Matapan which should have ensured our mastery of the Mediterranean, why was the Crete disaster, and the closing of the Mediterranean the sequel? Because our Air Power was then negligible compared to the enemies' and based out of reach.

A convoy to Malta was for eighteen months a most expensive necessity and in the closing stages of the siege a near impossibility. The few ships which got in during the summer of 1942 to keep the starving island going were a proportion of those which set out. What a price to pay when this island might never had been in danger had the importance of Air Power been recognised early enough.

Why simultaneously with the Army's advance in Africa from East and West did we regain the lost mastery of the Mediterranean? Was it not because our local command of the Air enabled the Army to capture more air bases which put our Air Force within reach of our convoys on passage again? And was it not because of the disintegration caused by our Air attack that all control of the German army was lost and our Army was able to push them out of Africa with relatively small losses?

In this connection I would refer to a recent visit I made to North Africa immediately after the collapse of the German Army in May, 1943. I met a large number of people, both American and British, who were in command of the Army and Air Force in North Africa, from the highest to the most junior. But I met only a comparatively few Naval officers.

I visited battlefields on the ground, and flew over them at low and medium height. I also saw the material effect from the ground and the Air of ours, and the German aerial bombardment, and examined many photographs and talked to many people.

Lessons which impressed themselves on my mind.

What was the reason for the sudden quick collapse of the German Army in North Africa? It was a dramatic collapse, and yet by all accounts the morale of the front line troops was not really broken, nor was the Army in a state of physical exhaustion. In fact, they were not half as hard hit physically for want of food as we were in Malta.

Going over the battlefields and talking to some of the officers who took part in some of the battles, brought back to my mind very much what land fighting is, and impressed upon me how much more deadly it has become with the improved fire-power of the modern weapons of a land army combined with nature's barriers.

All land warfare down through the ages has been a most difficult and complicated affair owing to nature's vagaries; the snow capped mountains, swamps, ridges, little furrows, holes in the ground, little and big wadis, undulations that can conceal companies, battalions, brigades, or even divisions; woods, hedges, ditches and dykes.

Land fighting has always been the most confused, even to the men fighting in the front line. Muddles develop. Sometimes a series of little muddles, sometimes greater muddles, caused by the noise, heat, dust, darkness, mines, gun-fire, the interruption of messengers being killed, the appalling deafening effect of all the types of fire on the brain over which voices cannot even be heard. This means you must have a wonderfully trained Army in the front-line, and even then the battle becomes a series of muddles, company muddles, battalion muddles, brigade muddles and sometimes even as big as Divisional muddles. It is the task of the Commander to keep control of these muddles and avoid them developing into chaos. The great Commanders behind the Brigades, the Divisions, Corps and Armies keep control from the information coming in by withdrawing here, reinforcing there, re-organising somewhere else, giving artillery support in another place to give the time for re-organisation and so on. The great Commander is he who stops all these muddles turning into chaos, or affecting his chief plan.

That to me is war on the land, and it is a thousand times worse to-day owing to the increased power of modern army weapons, mines, and Air Power.

When one side has gained Air supremacy, it can then hit at the opposing army with all its weight. When this happens Air Forces destroy all control and the great Army machine disintegrates. There is no control left. Nobody knows where they are, what they are doing, where the enemy is or where anything is. Nobody knows where to bring up ammunition or supplies, or whether any wireless stations are working, or where they should set up any wireless centres, if there are any left to set up. All control ceases and with it the complete disintegration (I can think of no better word) of the enemies' army. This does not mean though that our Army will not have to fight to drive the enemy out of their positions and complete the victory.

In this short paper I will not attempt to define the task of those directing the Air Power on to the vulnerable points of the opposing army except to say that this confusion and demoralisation can be brought about with almost negligible material damage being done.

That is what it seemed to me happened in Poland, Holland, Belgium, France, and to our enemies in North Africa. The casualties were small, material effect was small, but control was lost.

This war has shown that the power of the air over navies is much greater than the power of the air over armies.

Look at the sinking of the "Repulse" and "Prince of Wales," and many others. Some were knocked out by high-level bombing and some by torpedo attack. Look at the Mediterranean and the knocking out of the "Illustrious" and the sinking of the "Ark Royal" and other ships. Look at the sinking of the "Roma" by bombing, even after the Germans had lost supremacy in the Air in Southern Europe. Look at the lessons we have learned at Pearl Harbour. Look at the ships that were knocked out and the months and even years that it has taken to repair them.

When a ship is knocked out it is really serious because it either sinks to the bottom of the sea or sinks in the mud in the harbours and has to be raised. It takes a long time to repair it. The loss of life is great. The loss of material takes a long time to replace. It is generally much more of a complete loss than any damage than can be inflicted on Armies, such as the knocking out of a battery.

There is no doubt that aircraft carriers have sometimes been found almost a liability although in many places they have been of considerable value, such as in the middle of the Atlantic, and in protecting convoys to Malta. Where carriers have been successfully used is where there has been no equal Air Power against them.

On the other hand in my opinion one lesson of this war is that aircraft-carriers cannot operate within range of shore-based enemy aircraft, without undue loss, where we have not first obtained complete mastery over the enemy's air power with our shore-based aircraft. They are such highly vulnerable vessels that it is not too much to say that all the aircraft carried (about 50 to 60) are nominally fully occupied protecting the carrier and its escort, and there are few to spare to attack the enemy elsewhere – unless our shore-based aircraft have obtained a high degree of local air mastery anyway.

There are two further points which must be borne in mind in connection with Air Power:

First, THIS WAR HAS PROVED THAT IT TAKES MORE AIRCRAFT TO PROTECT A SHIP AT SEA OR IN HARBOUR IF IT IS WITHIN MODERATE RANGE OF THE ENEMY'S SHORE-BASED AIRCRAFT THAN IT DOES TO ATTACK A SHIP.

It probably takes five or six times as many aircraft to protect a ship than to attack one due to the fact that with such a fast-moving weapon as Air (aircraft travel at over 300 miles per hour and a ship does not do more than 30 knots) the initiative goes to the attacker, and the defender always has to have either aircraft up in the air to protect the ship or crews standing by to take off at a second's notice for twenty-four hours a day.

Second, THE AIR CAN CARRY MUCH MORE DESTRUCTION TO THE ENEMY PER MAN WITH A MINIMUM LOSS OF LIFE, THAN ANY OTHER FORM OF WARFARE.

As Admiral of the Fleet Lord Fisher said in 1919:

“As the locusts swarmed over Egypt, so will the aircraft swarm in the heavens, carrying (some of them) inconceivable cargoes of men and bombs, some fast, some slow. Some will act like battle cruisers, others as destroyers. All cheap and (this is the gist of it) only requiring a few men as the crew.”

And that is true. I should not be surprised to learn that more explosive power has been used by the Air on one night's bombing of Cologne or Hamburg than has been used in this war by all the Allied ships of all the Allied navies, except for anti-aircraft fire.

How much weight of explosive do the big battleships of 35,000 tons carry for their 14 or 16 inch guns? We know that in the last war a 250 lb. bomb contained more explosive than a 16 inch shell, because the weight of the casing of the explosive in order to withstand the shock of the discharge of the gun is so much greater than the weight of the casing enclosing a bomb.

Would not less than a dozen of our big bombers drop more weight of explosive in one minute at a 500 miles range than can be fired from all the big guns on a battleship using up all their ammunition? Generally our big bombers carry a crew of only seven to ten men. What is the crew of a big battleship? Some 1,500 or more. It must also be remembered that the explosive used in firing a gun is not what harms the foe. It certainly makes a noise and therefore frightens the enemy and heartens our own troops, but seldom causes real damage to the enemy.

There is another point to be remembered, the life of a gun is short. It cannot fire as much explosive on the enemy in its normal life, without being re-lined, as may be dropped by one of our bombers in its normal life without being rebuilt.

It has been said that at Salerno battleships have been of assistance to our troops ashore.

No doubt this is true because of the moral effect of the great ships going close in shore and firing their guns at close range. Was it the damage they did though which helped our troops, or was it the demoralizing effect the guns had on the enemy?

I am the last to decry the use of any weapon which can demoralise the enemy, but was the actual damage as great as could have been caused by bombers, and was the moral effect as great?

Incidentally, the battleships at Salerno could only be used there because the Air had first obtained complete superiority.

Many times it is asked “CAN WE WIN THE WAR BY BOMBING ALONE?” I do not know. I have never claimed that we can. Equally I have never suggested that we cannot. The answer to this question brings us to the great divergence between the old types of warfare and the new. Nevertheless, this war has admittedly shown the tremendous power of the bomber, it has surely shown what it can do in Germany.

It has destroyed many vitally important production factories, and damaged many others; it has destroyed great industrial towns, and is slowly but surely destroying the normal life of their people. This could not have been done by any other weapons. If Bomber Command were double its size what would it not have achieved?

Surely the writing is plain for all to read, after Hamburg, Hanover, Munich, Rostock, and many other places.

And what about the high-level precision bombing of the American Air Force? In the early days many doubted whether daylight bombing could ever be kept up, or whether it could be carried any distance into Germany. Fortunately, the American Air Force Commands never doubted it, nor did a certain number of people in this country.

What have been the positive results?

They have destroyed hundreds of vital factories. They have penetrated far into Germany. They have fought great battles, day after day, all the way to their targets, over their targets, and back from their targets, destroying many more enemy aircraft than they have lost themselves. No one who has seen the air photographs can doubt that this day-light bombing is having a most devastating effect on vital workshops. Were this Force double what would it not do?

It must be remembered the day-light bombing is supplementary to the night bombing, but the two together much exceed the sum of the two.

Again, what about the Pacific? It is plain for all to see what the Japanese did to the Americans and ourselves at Pearl Harbour and Singapore, and now what the American and Australian Air Forces are doing to them – to their shipping, to their navies and their aircraft.

The world recognises the indomitable courage, determination and endurance of the American and Royal Air Force bomber crews, who fight these great bombing battles daily and nightly miles up in the Air under incredible conditions, giving their all to achieve their and our object. Though the cost of life and limb of the bomber crews may on occasion be heavy, the world has never known such a small rate of loss in comparison to the population of the nation, taking into consideration the magnitude of these great bombing battles and the effect they are having in shortening the war.

Surely it is accepted by all that every effort must be made to win a war with as moderate casualties as possible. If we wipe out a whole generation even though we may have won the battle, untold harm has been done to the Nation by the loss of life.

Casualties in this war, where the Air have won Air Supremacy first, have been very light compared with previous wars.

The casualties of the armies in Holland, Belgium and France were very small both to the defenders and attackers. The complete disintegration of the Allied Army in these battles, and the complete disintegration of the German Forces at El Alamein, Tunisia, Sicily and Italy was due to Air.

Fire power and modern weapons on the ground and the enormous number of mines that are now used, are so powerful that if any Army attacks before the Air has gained supremacy, it wipes out a whole generation of young men; whereas if the Air battle is won first the Air can then turn all its weight on the enemy's Army, communications and control, and save thousands of lives in our Army, provided the Army is ready to hit and fight with the utmost vigour to take the enemies' battlefields or country immediately.

I fully recognise that although we have to face the war as it is and not as we should have wished it to be, Armies are already committed in various places, and it is the duty of all to see that their casualties are kept to a minimum in the successful prosecution of the war. But that does not necessarily mean that we should get committed to further great land campaigns and then be forced to use the Air in the manner of the Russians and Germans on the Eastern Front. This way of employing their Air Forces was forced on Russia by the attack of the whole German army in '41. The object of this paper is to prevent our undertaking too soon campaigns based on history of bygone days because of pressure both political and military.

THERE IS NOT THE SLIGHTEST DOUBT THAT IF WE LAUNCH AN OFFENSIVE IN FRANCE, AS OUR RUSSIAN ALLIES AND MANY OF OUR OWN PEOPLE WOULD WISH, BEFORE THE BOMBER FORCE HAS PARALYSED GERMAN PRODUCTION, ALTHOUGH VICTORY WOULD EVENTUALLY BE WON ITS PRICE IN HUMAN LIFE WOULD BE A HUNDRED TIMES AS GREAT BECAUSE WE WOULD NOT BE USING THE RIGHT AND THE MOST ECONOMICAL WEAPONS AT THE RIGHT TIME.

The significant sequence of events of this War.

1. It was the German Army and German Air Force that brought about the collapse of Poland, Holland, Belgium, France and Norway.
2. It was the Air that won the battle of Britain.
3. It was the Army and the Air that won the battle of El Alamein.
4. It was the Army and the Air that brought about the collapse of the Germans in Tunisia.
5. It was the Army and the Air that re-opened the Mediterranean for the Navy and Merchant Ships.
6. It was the Air that won Pantellaria.
7. It was the Air that enabled our troops to land in Sicily with practically no casualties and it was the Army and the Air, helped by the transport of the Navy, that brought about the collapse of Sicily.
8. It was the Air that brought about the surrender of Italy, with the threat of the Army ready to hit at once.
9. It was the Air, supported by the Navy, that reduced the submarine menace in the Atlantic. Would it not be true to say that probably more than 60 per cent. of the submarines now being sunk or damaged are being sunk or damaged by Air? And it is not too much to say that in a comparatively short period this percentage may be even greater.

This has been achieved by:

- a. Mining the waters where the Navy cannot reach.
 - b. Aircraft based on shore for reconnaissance purposes to help to locate them for the surface naval craft to destroy.
 - c. Direct action against the submarines by shore-based aircraft and out in the middle of the oceans by carrier-based aircraft.
10. It was the Air by itself that also reduced the submarine menace in the Atlantic and elsewhere by:
- a. Bombing the production centres and assembly yards of submarines in Germany and in German occupied countries.

b. Bombing the ports from which the submarines emerge into the sea. Although bombing the submarine pens is of little use, the bombing of the port installations definitely interferes with the submarines free access to the seas.

WE WON THE BATTLE OF THE AIR BEFORE EL
ALAMEIN AND TUNISIA.
WE WON THE BATTLE OF THE AIR BEFORE WE WENT
INTO SICILY.
WE WON IT BEFORE WE WENT INTO ITALY.
AND WE HAVE WON IT IN THE ATLANTIC AND
MEDITERRANEAN AND IN THE BAY OF BISCAY.

FINALLY, THE AIR IS SLOWLY BUT SURELY DESTROYING THE PRODUCTION CENTRES OF GERMANY WHICH WILL IN TIME RENDER THEM POWERLESS TO SUPPLY THEIR ARMIES AND AIR FORCES IN THE FIELD AND TO CARRY ON THE WAR.

In conclusion, the Air is saving and will save untold casualties in the other Services, provided the Army and Navy are in a position to support it when the time comes to advance and take immediate advantage of the enemy's impotence rather than seek to operate as the spear-head of war in the future.

When this war comes to an end I feel certain we should plan the future defence of this Empire on the following facts:

1. The Air will dictate strategy and therefore dominate all wars because of its over-all influence.
2. The Army will be more important to the British Empire than ever before because armies will be able to dig underground and make prepared positions which will always require an army to dig them out after, and I repeat after, the Air has gained supremacy. Directly the Air has gained supremacy the Army must be ready to go in and capture or destroy the enemy's bases otherwise there is a real danger of the enemy recovering in the Air and our Air having to fight for supremacy all over again. In long years of peace armies will be able to organise positions underground and in caves from which they will have to be turned out by opposing armies.
3. The Navy as we have known the British Royal Navy for 250 years or more which made and maintained Empire for all this time, will be completely changed owing to the power of the Air being so much greater over navies than over armies.

4. It has been shown in this war that Air will be the chief weapon, in some cases the only weapon, against surface ships. It will be the chief weapon against submarines, although small very fast surface vessels and submarines will still be required.

Submarines have proved that they are a most formidable weapon against shipping at sea, and our submarines have done magnificent work in this war and have sunk millions of tons of the enemy's shipping.

THEY WILL STILL BE A FORMIDABLE WEAPON OF THE FUTURE.

Though Air may be the best counter to them at present, even so they will remain a powerful weapon.

Our navy will require much larger submarine fleets and many more small fast surface craft than ever before.

The Navy as we have known it, sad though it may be, will be profoundly changed, and the earlier this is recognised the better for the British Empire and the world. Though the Navy have done magnificent and the personnel have shown as always, great fighting qualities, great powers of endurance, and great determination, can we say that their weapons (that is their ships) have really been the best type of weapons with which they could have fought, even in these days? And what revolutionary changes will they not have to make in their weapons for the future?

Extract from a report issued by the Prime Minister and General Smuts on the Prime Minister's Committee on Air Organisation and Home Defence, dated 17th August, 1917:-

“And the day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and populous centres on a vast scale may become the principal operations of war, to which the older forms of military and naval operations may become secondary and subordinate.”

I feel that those whose responsibility it is to arrange for the future prevention of wars, or the quick suppression of any that break out in the world and in the Empire, should consider the statements I have made in this note, particularly those in authority in the four great powers, the British Empire, America, Russia and China.

‘The Principles of Air Power in War’

From “LUNA HABITABILIS” – by Thomas gray – 1737

*The time will come, when thou shalt lift thine eyes
To watch a long-drawn battle in the skies,
While aged peasants, too amazed for words,
Stare at the flying fleets of wondrous birds.
England, so long the mistress of the sea,
Where winds and waves confess her sovereignty,
Her ancient triumphs yet on high shall bear,
And reign, the sovereign of the conquered air.*

FOREWORD

I have endeavoured to make plain in this pamphlet what part Air Power has played in victory over Germany, particularly in 1944-45, and to show how it has been based on the four great principles of Air Power.

These four principles were conceived on the day the Air was conquered. They have stood the stress of war, to enable Air Power to save countless casualties both in the field and at sea.

I have not dealt in these notes with the Air Force intervening in the battle, which is, of course, of primary importance. This demands a separate note, as it comes more under what I would call the Methods of using the Air Force in battle, and which has been dealt with fully in various excellent official documents which have been issued by the Army and Air Force.

TRENCHARD.

AIR POWER IN 1944-45

To understand the principles of Air Power it is necessary to refer to the Great War of 1914-18. In that, this nation suffered millions of casualties and there grew up the idea that there was no generalship, no leadership, no foresight, no imagination, whereas the truth was that it was the first great war that used weapons of a power never dreamt of in the past. The rate of fire of an enormous number of different types of weapons, the terrific effect of newly developed explosives, gas, barbed wire and all the new weapons and devices which the ingenuity of science had brought into existence, made destructive power on land and sea greater than had ever been foreseen in the past. This terrific fire power, combined with nature's obstacles, the hills and valleys, the swamps and deserts, the rocks and the streams and the rivers, made land warfare a costly shambles, and war had become a series of what in the phrase of the day was called "blood baths" in which victory was only one of exhaustion.

A good deal was said in those days to the effect that war had become a stalemate – that to win any major military operation meant wiping out the life of a whole generation at least. There were no flanks to turn; tactical surprises could still be utilised, but it was difficult to bring about strategical surprises.

In this war all that was changed. The stalemates and seemingly meaningless shambles of "the trenches" gave way to a war of movement and manoeuvre: above all the casualties suffered by our armies in reaching a decision were far lower. It was Air Power which made this fundamental change in the nature of warfare.

I will state here in a few words what are the four great principles of Air Power.

They are very similar to the principles of sea power, which shortly put are:- (1) To defeat the enemy's fleet; (2) To keep open the oceans for our warships and merchant ships; (3) To deny the use of the seas to the enemy.

The four principles of Air Power were and are:-

1. **To obtain Mastery of the Air**, and to keep it, which means continuously fighting for it.
2. **To Destroy the Enemy's Means of Production and his Communications in his Own Country**, that is by strategic bombing force.

3. **To Maintain the Battle without any Interference by the Enemy**, which means to enable the Commanders to build up the colossal supplies and reinforcements necessary for the battle, and to be able to maintain them without interruption by the enemy.
4. **To Prevent the Enemy being able to maintain the Battle**, that is, to prevent him being able to build up adequate supplies for his Armies or Navies or Air Force.

The above principles were implicit in air power as used even in the war of 1914-18, but the technical means for their application were not then sufficiently developed to give air power the influence which it has exercised in 1939-45. The war of 1914-18 was, it must be remembered, the first major war of *long duration* between great land powers which had taken place for 100 years, and one in which there were enormous developments in every type of warlike weapon, and vast increase in their destructive power.

Had there been no Air Power, in the opinion of the writer and many other thinking people, the present war would have wiped out not only a generation, but the whole life of the nations, and then it would probably have ended in a stalemate. There would certainly have been no El Alamein, no Tunisia, no landing in Italy, no landing in Normandy, no break-out of the Normandy peninsula, and no crossing of the Rhine, and NO DESTRUCTION OF GERMANY and crippling of German war economy.

It follows from the last two principles of Air Power that when armies meet and one side can maintain the battle, and the other side is prevented from doing so, there can be but one result. After the army has won such a battle, it will exploit the result of air power to the fullest possible extent, and nothing will then be able to stop a well led and efficient army, except running out of their own supplies. And even in this case, air supply can do much to solve the supply problems set by weather, by mud, by frost, by snow, and by rain.

At the beginning of the war in 1939 there was little air fighting and no offensive action against Germany. This was on account of political reasons, and also because of pressure from the French who feared the effects of counter-attack. In April, 1940, however, the battle for Air Power in France began and our air power there was overwhelmed. The Germans exploited their mastery of the air in France to the full; we were unable to maintain

our battle in France, while the Germans with their more powerful air force could do so, and they drove us to the beaches of Dunkirk. Here at Dunkirk began our real battle for the command of the air. Fortunately, the Royal Air Force, based on England had sufficient range to cover the beaches of Dunkirk and sufficient strength at the critical point to enable the evacuation of over 300,000 men with relatively little loss caused by the German Air Force. But it was only done by means of almost superhuman exertions on the part of the small Air Force in England; and immediately after Dunkirk the BATTLE OF BRITAIN began.

To enlarge on the Battle of Britain is outside the scope of this paper, although it should be recalled not only that we won the battle, but that it was the only battle the loss of which could have meant the loss of the war.

However, the mastery of the air, which we had obtained at home, had to be fought for continuously. The enemy was always apt to recover his offensive power in the air. At this stage in the war therefore we had to apply PRINCIPLE NUMBER TWO, namely hitting at the enemy's sources of war production and communications, with our bombers. For such offensive air activity was essential towards retaining our mastery in the air even over our own country. Our sustained attacks on Germany had had the effect of bringing the enemy's fighter force up into the air, and forcing him to concentrate his air power in the defence of his industries. In a word, the enemy's air power was pinned on to the defensive. At length in 1944, there came a time when our air supremacy got ever greater; the enemy was only willing to engage our attacking bomber forces from time to time. The continuous offensive of the bomber force is vital in order to maintain the Mastery in the Air; its power to interfere with the enemy's communications and war production as a whole is also a method by which it achieves the destruction of the enemy's air power.

The Mastery of the Air and the Attack on the enemy's production resources and communications are thus closely interlocked. Naturally, as soon as the mastery of the air, both at home and abroad, has been confirmed, the enemy's productive system as a whole falls a prey to our bombers. That is all a logical consequence of the mastery of the air. In short, the mastery of the air was far from being obtained finally for us in the Battle of Britain. Nevertheless, it was obtained temporarily over Britain, and that was the first and most important step to final victory, viz., a *secure base in England*.

The battle of the air was fought in the Western desert, over Malta, and in the Mediterranean generally, and that mastery was obtained in the end in each case. But all this was only part of the general fight for air mastery. The enemy could not send his best types of fighters and pilots to the Mediterranean in sufficient numbers as he *had* to have them at home to attempt to maintain his security there. It was all one air battle, but the effects of losing it were felt first by the enemy at his extremities. We thus obtained a definite air superiority which the enemy never afterwards could wrest from us though he challenged us at different times, until the final crossing of the Rhine when the Luftwaffe really had collapsed.

As we gradually obtained air superiority, helped enormously by the work of the bomber offensive, so automatically could bomber offensive increase its power in destroying the enemy's means of production and his communications in his own country.

It should be remembered that the bomber offensive must be by day and by night. This was obtained in 1943, 1944 and 1945 when their communications were almost completely destroyed and their production, especially of oil, greatly reduced. This in the end prevented them from maintaining the battle.

It is generally known that at the start of this war we were unprepared in the Navy, the Army and the Air Force, more particularly in the Army and the Air Force. The Navy luckily was immeasurably superior to the German Navy in September, 1939, before the Bismarck was ready for sea or the Tirpitz completed, with the exception that the Germans had more submarines and more small craft.

The Air Force was smaller than the German Luftwaffe, and we had very few bombers compared with the Germans.

The Army was the worst off of all the three Services and acknowledged to be the most poorly equipped army that had been sent overseas in my life time.

Notwithstanding, due to the Commanders and Staffs, and the brilliant work of all in the Royal Air Force, the Air Force won through and saved the world.

The spirit and training of our pilots were incomparably superior to the Germans. Second, our very few fighters were superior to the German fighters owing to our machines being equipped with 8 guns. This showed great foresight on the part of the Air staff who placed quality before quantity. Events have proved the wisdom of this policy beyond all doubt. The determination and the continuous battle of the Bomber Commands of the two Forces, the U.S. Army Air Force and the British Air Force, in spite of their heavy casualties carried on the terrific war without interruption for the last three years until Germany collapsed.

The Coastal Command carried out relentlessly their work in the Atlantic and finally they were largely responsible for winning the Battle of the Atlantic.

Last, but not least, the four principles of Air Power were recognised by the Air Staff who, in spite of criticism and opposition, firmly stuck to them.

PART 2

I have in the following pages added a few notes on what the Air Forces have done in support of one or other of the four principles of Air Power.

Recently a Joint Statement on strategic bombing by the United States Air Force and the Royal Air Force in Europe has been officially issued, in which it has been stated:

“The immense destruction done to all keypoints on the railways of north-west Europe is well known. The effect on the mobility of the German reserves was disastrous, and the Allied build-up proved to be far more rapid than that of the enemy. The journey of two Panzer divisions from the Eastern front is a clear indication of the difficulties which the enemy had to face. The two divisions had raced across Germany in 72 trains, each division using three lines with 12 trains on each. But when they got to Nancy, in Eastern France, it was found that they could only proceed from there to Paris at the rate of eight trains a day instead of seventy-two.”

Even these eight trains did not get through to Paris!

The devastating results of the raids on the fighter aircraft factories in Germany are now well known. They were almost obliterated and had to be dispersed all over Germany. It is also well known what the bomber force did in

knocking out Peenamunde, the experimental station of V1 and V2. In addition the bomber force destroyed all the launching sites of V1. New ones had to be made and this put back the German offensive of these weapons six months.

Again, there was the destruction of enemy oil production.

It is officially stated that:-

“Before the campaign began Germany had a normal monthly output of 1,344,000 tons of all oil products, and of 532,000 tons of motor and aviation fuel. By September of 1944, the output of all oil products was down to 310,000 tons, 23 per cent. of the original figure, and of motor and aviation fuel down to 105,000 tons, 20 per cent. of the original figure.”

“The great refineries at Ploesti, Rumania, were the first large oil targets for the Fifteenth, and a long series of attacks reduced Rumanian gasoline production from 155,700 tons per month in March, 1944, to 15,400 in August when captured by the Russian Army.”

The devastation of the munition factories and centres of production in Germany has to be seen to be believed. This devastation caused by a never ceasing attack forced a vast dispersal of the means of production and the placing of a great deal of the production underground which meant utilising man power. This is sufficient to show the value of the PRINCIPLES ONE AND TWO and their effect on PRINCIPLE FOUR, namely, to prevent the enemy being able to maintain the battle.

It is also interesting to see how the 2nd Tactical Air Force CARRIED OUT THE FOUR AIR PRINCIPLES.

I had the privilege of visiting the Normandy peninsula at the end of July, 1944, and I saw the harbour full of ships, and all the roads packed with transport going up to the battle front. Every field was full of tanks, guns and men, and all kinds of supplies; seldom could there have been so many men and such a colossal amount of supply in such a small area. Yet for the two days I was there I never once heard an anti-aircraft gun fire or anyone look up to see whether the machines overhead were our aircraft or theirs. They knew they were ours, which is, *maintaining the battle*.

I was also informed that a German Colonel who was captured while I was there reported that he had to march his Battalion for 19 nights running, 10 to 15 miles a night, because there were no means of transportation left either by railway or lorries for reaching the battle front.

The above shows how the Air Forces carried out the third and fourth principles of Air Power.

THE POWER OF THE AIR OVER THE SEAS

Coastal Command

I have often stated that there are no barriers in the air save weather, and the same Air Power that has such a tremendous effect over the land has even a greater effect over the sea.

It must not ever be forgotten that the Air Force has in these last 5 years become a primary factor in sea power. I do not speak only of the proofs that have been afforded in the closing months of the war of the validity of the airman's old claim to be able to sink the most modern capital ship. A far more dangerous threat to our existence as a maritime Empire than ever was formed by Tirpitz, Lutzow or Scheer was the U-boat. And in the critical year of the U-boat war – 1943 – it was the air more than anything else that killed the U-boat menace to our life-line, the Atlantic convoys. Once the famous “gap” was closed by the very long range shore based aircraft in the “North Atlantic”, that menace was killed – though we cannot be sure that it would not have arisen in a different form had the war gone on long enough. That a new and more dangerous type of U-boat did not appear in strength on our trade routes was largely due to the devastating bombardment of the building yards, and the component factories throughout the “Reich”.

This however was the defensive side – the share of air power in maintaining our own battle. Great though the contribution of Coastal Command was to our victory at sea, it would not be altogether surprising if history shows in time that Bomber Command's share was even more decisive. Apart from the indirect effect of the Bomber offensive, I believe it is difficult to overstate the effect on the enemy's war potential of the incessant mining of waters closed to all but air forces. That, and Coastal Command's strikes against his Norwegian and Dutch coast traffic, crippled the enemy's sea borne supply, and put an intolerable strain upon his land communications, themselves subject to constant air attack.

Finally, let us not forget the Mediterranean. No one underrates the great work of our submarines and light naval forces in that sea. But the factor which set the seal on Rommel's fate in Africa was our air attack on his supply lines from ITALY and GREECE to BENGHAZI and TOBRUK. If there was one thing more than any other which in Africa – as finally in Europe – spelt disaster for the Germans, it was shortage of oil. And it was the Air that sent Rommel's tankers to the bottom within sight of the AFRICAN shore.

In the Mediterranean, as in all seas, it is Air Power that finally enables us to maintain our battle and prevents the enemy from maintaining his.

It is interesting and of value to quote, in support of the above, what one or two senior German Generals out of many thought about the Allied Air Power, for instance:-

Field Marshal von Rundstedt after his capture gave his opinions to some war correspondents in which he said he believed the greatest factor in Germany's defeat was the strategic bombing by the Allied Air Forces, particularly the systematic destruction of German communications, railways and bridges. He also stated that his object in his Ardennes offensive was to take Liege and hold the line of the Meuse, and the chief reason it failed was because of the air attacks on his communications, which stopped the Germans bringing up all reinforcements and supplies.

Field-Marshal Kesselring, after his capture, stated the three reasons why Germany was defeated, were:-

1. Allied strategic bombing behind the German lines.
2. Attacks by low-flying Allied fighter aircraft, and
3. Terror raids against the German civilian population.

What is more important is what they said to their own troops while the battle was still on.

Field-Marshal von Rundstedt wrote in a captured order issued on the 20th June, 1944, a fortnight after the Invasion and nearly ten months before the collapse of Germany:-

1. "The enemy's complete mastery in the air."
2. "Enemy's Air Force – almost unlimited in radius, it controls in numbers not only the main battlefield but also the approach and supply roads to a depth of 150 or 200 km. Moreover, the enemy carries the battle right into the home battlefront with his tactical

bombers, in order to destroy the large railway systems especially railway junctions, marshalling yards, locomotive shops, bridges and important works connected with the War industry.”

He further wrote on D-Day that it was the bombing which destroyed the German communications, and that “Railroad transport which anyhow, because of the total traffic situation, has been reduced to a certain minimum, can scarcely be brought nearer than 200-250 kilometres from the front; and this, too, without any planned schedule. The sections of railway lines change hourly, according to the weather conditions; the trains may be in close succession (buffer to buffer) or they may travel only at night.”

Field-Marshal von Model, in an order that was captured, wrote on the 1st November, 1944, that the hostile Air Force was his enemy No. 1. He went on to say that it rendered movement in the rear areas impossible.

This order was issued to his own Army. He did not say the movement in the rear area was made difficult, he said impossible.

WHAT WAS THE ULTIMATE EFFECT?

Our foe suffered some millions of casualties, I suggest because he would not keep to the principles of air warfare. Where we employed a separate Air Force under an air plan which was part of the general military plan, his great military tradition overwhelmed him: he handed the Luftwaffe over to the Wehrmacht, to be used piece-meal.

What did the effort cost us in this war compared with the last war?

The terrific battle of Germany waged by the Bomber Command since the Battle of Britain cost:-

Killed ...	44,458	Missing ...	10,458
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Since the beginning of the war the total cost to Bomber Command alone has been:-

Killed ...	46,929	Missing ...	10,495
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In the missing I have not included those who are now known to have been liberated or have returned as repatriated Prisoners of War. Therefore, it is fair to assume that what I have got under the heading of Missing are now mainly fatal casualties, making a total of fatal casualties for Bomber Command in the Battle of Germany of some 57,000.

The Air Force as a whole since the Battle of Britain has lost:-

Killed ... 75,126 Missing ... 16,085

From the beginning of the war the Air Force as a whole has lost:-

Killed ... 80,378 Missing ... 16,233

The same considerations apply to the numbers missing as stated above.

To assess broadly the total cost of the war against Germany, casualties in all theatres have been included, excepting the Far Eastern theatre.

From the beginning of August, 1943, to the 30th April, 1945, the cost of the war in Europe to the Army and Navy in fatal casualties has been:-

Navy ... 14,036 Army ... 56,552

while the cost to the Air Force in killed and missing has been 45,940.

Again, the same considerations, as mentioned above, have been taken into account in computing the Air Force casualties.

Whereas during the 52 months of the Great War the total casualties suffered by the British Commonwealth and Empire Forces were 3,286,090, of which 996,230 were deaths, in the 66 months of the World War, that is to the end of February, 1945, the total casualties were 1,128,315, of which 307,201 were deaths.

This shows how the Air Force saved casualties in the Army and Navy.

What is the reason for these discrepancies, which have occurred in spite of a truly tremendous increase in fire power, afloat and ashore. I suggest the answer lies in our correct use of the four principles of Air Power to which the Wright Brothers gave silent birth when they first flew at Kittihawk in 1903.

It may be that I have put too much weight, though I don't think so, upon what the captured German Commanders say, but the whole German nation says the same.

In order to substantiate this, I would like to add what Field Marshal Montgomery said in his notes on the use of Air Power in support of land operations, under the heading of The Basic Fundamentals:-

- (a) "It is necessary to win the air battle before embarking on the land battle. If this is not done, then operations on land will be conducted at a great disadvantage."

- (b) “It is not possible to conduct successful offensive operations on land against an enemy with a superior Air Force, other things being equal. The enemy’s Air Force must be subdued before the land offensive is launched.”

I would like to quote Field Marshal Montgomery’s telegram of congratulation to the Chief of the Air Staff, Marshal of the Royal Air Force, Sir Charles Portal:-

“In 21st Army Group we have no Germans left to fight in western Europe.”

“At this historic moment I feel I would like to express to you, the head of the R.A.F. the deep sense of gratitude that we soldiers owe to you and your splendid force. The mighty weapon of air power has enabled us, firstly, to win a great victory with fewer casualties than would otherwise have been the case. We are all deeply conscious of these facts. The brave and brilliant work of your gallant pilots and crews, and the devotion to duty of the ground staffs, have aroused our profound admiration. I would be grateful if you would convey the gratitude of myself and of all those serving under me to all your commanders, both senior and junior, and to all ranks throughout the Royal Air Force. And perhaps you would include a special word of greeting and good wishes from myself personally to every officer and man in the Royal Air Force.”

This surely shows how the Commander-in-Chief recognises the power of Air, and his appreciation of its uses.

In conclusion I take an extract from “The War in the Air” (Volume II, Page 164) which is the official history of the last war in the air.

The Policy of the Strategic Air Offensive.

“But it was not alone the new aeroplanes which accounted for the British superiority; it was as much the policy which directed their use to ensure the maximum effect being obtained. This policy is fundamental and must be considered at some length. It is founded on nothing more than the principle of the offensive. That principle may seem to some so beautifully simple as to be almost axiomatic. But it was an axiom which the German command learned only after bitter and costly experience, and one which found highly-placed

disputants on the British side. The moral effect of aircraft attack is so great that those who are attacked from the air always call for protection. If a town is bombed there is at once a clamorous demand for aeroplanes to prevent the enemy doing such a thing again. If a bombing squadron blows up a munition dump, protection for all other munition dumps is demanded. One aeroplane flying over front line troops and attacking them with machine-gun fire may be feared by many thousands of men, and the question at once arises, why are not our own machines on the spot to attack it as soon as it appears? There is, indeed, in time of war a constant pressure exerted from many directions for a dissipation of air power, but that pressure, if yielded to, is fatal. Aeroplanes cannot be distributed like policemen across the face of the earth. The air service must carry the war into enemy territory and keep it there. The air war becomes a test of nervous endurance. The nation which keeps a stiff upper lip, and whose air service adheres to its determined offensive, of course will, in the end, secure the greatest measure of protection from the air for all its various activities.”

Others in years to come will write the full history, but I have to put together these short notes in order to try and show what I feel all in the Royal Air Force broadly think is the true meaning of Air Power. I feel sure that history will faithfully show what we owe to our great leaders, and all the Commanders and Officers and Men of the aircrews, and all men and women wherever they served in the Royal Air Force under the leadership of Marshal of the R.A.F. Sir Charles Portal.

May I pay my tribute to all those in the Royal Air Force who have laid down their lives in this War.

*They met with Death
And nonchalantly passed the time of day;
“Immortals these,” he said beneath his breath,
And put his scythe away.*

Quotation.

‘Air Power and National Security’

FOREWORD

In October, 1943, I wrote a rather controversial pamphlet called “THE EFFECT OF THE RISE OF AIR POWER ON WAR”, which I revised in 1944. In May 1945, when the war against Germany was won, I wrote “THE PRINCIPLES OF AIR POWER”.

This pamphlet deals with the future defence of this Empire as influenced by Air Power.

TRENCHARD.

It will take years to assess fully and correctly all the lessons of six years of world-wide war on sea and on land and in the air; and in the present unsettled condition, both political and international, it will also take time before the defence commitments of the British Empire can reach any stability. These facts make it difficult to frame any long-range defence policy for the maintenance and protection of the British Empire. Yet it is imperative that we shall be able to protect ourselves and to make our contribution to the ensurement of peace. For that purpose a policy is needed which will cover our essential needs for the next 15 or 20 years. If we start now to mould our defences in a shape that is broadly sound, readjustments can be made later as the lessons of the war become assimilated and applied to post-war developments.

The two pamphlets that I wrote during the war were written with the object of bringing out some of the most important principles on the use of Air Power, from the point of view of winning the war. The passage of time has proved them to be correct, and there is nothing in them that I find it necessary to change. The object of the present pamphlet, now that the war is over, is to apply these principles to our future needs, and in the light of them to formulate our ideas on the general shape of our defence forces and on the allocation of that part of the national income and resources that the Government devotes to our defence.

The biggest point of all those that we have to consider is the fact that in modern times it is essential to control the air before we can operate effectively on the land, on the sea, or in the air itself. Indeed the same governing factor

applies to the ability to carry on anything approaching normal life and essential industries in any country. This fact is now widely accepted and has been particularly stressed both by General Eisenhower and by Field-Marshal Viscount Montgomery.

The four principles on the use of Air Power that I set out were;-

1. **To Obtain Mastery of the Air**, and to keep it, which means continuously fighting for it.
2. **To Destroy the Enemy's Means of Production and his Communications in his Own Country**, that is by strategic bombing force.
3. **To Maintain the Battle without any interference by the Enemy**, which means to enable the Commanders to build up the colossal supplies and reinforcements necessary for the battle, and to be able to maintain them without interruption by the enemy.
4. **To Prevent the Enemy being able to Maintain the Battle**, that is, to prevent him being able to build up the adequate supplies for his Armies or Navies or Air Forces.

SOME BASIC FACTS.

Before we can consider the future we must assemble some of the essential facts against which we can consider the outstanding and guiding principles, taking into account our recent experience. It would be a grave mistake (but one which is easy to make) to allow the latter part of the last war to dominate our minds, and to take our lessons from that period when victory was assured. The real lessons of war must embrace the early days, that is when we were inferior to the enemy, or only equal in power to the enemy. We must give full weight to the early days and to such occurrences as our defeats in POLAND, in FRANCE, in NORTH AFRICA, in SOMALILAND, at PEARL HARBOUR, and in SINGAPORE, and we must remember the narrow margin by which we achieved victory in the BATTLE OF BRITAIN. THIS IS IMPORTANT. Surely this is plain, as in the latter part of this war we were overwhelmingly superior in manpower and materials to the enemy. We must not assume this is always going to be so, because then we are sowing seeds for setbacks as we did in the early days of the 1914-1918 and 1939-1945 wars.

It must be remembered that there is **not**, and **will not** be unlimited manpower for the requirements of the British Empire. Our resources are strictly and severely limited, as the 1939-1945 war proved beyond argument. **Raw material is also strictly limited.** Moreover, owing to technical and scientific development all three Services require a greater backing of manpower for a given size of force than was needed in 1914-1918. Therefore, we cannot afford to squander either manpower or materials on second-best weapons of war, **nor can we assume that time will be on our side.**

We must consider the amount of manpower, materials and time that will be available for military purposes in peace, and the use that we are to make of them, for on this will depend the value that we get from them when an emergency descends upon us. It would be a waste of money and time to build a weapon which, though it could be used and might even be useful, is not the best weapon for the work. It might, for example, take double the expense and many times longer, and much more manpower to build, than some other weapon which, although perhaps less conventional, can do the work more efficiently and cheaply.

America and England, though independent Powers in all their glory and in all their individualism, and although they are two separate nations for

all normal purposes, are, never the less, as one for the purposes of war. Their ideals are the same, their broad outlook on the world is the same and their military ideas very similar, and no one outside a lunatic asylum would take into account a possible conflict between these two nations.

VULNERABILITY.

The United Kingdom is in a particularly isolated and vulnerable position in relation to any enemy which is in control of the whole or of a major part of the mainland of Europe. This is all the more important because of the concentration of the greater part of the industrial capacity and the white inhabitants of the entire British Commonwealth and Empire in the small space of our home islands.

ATOMIC ENERGY AND OTHER MODERN DEVELOPMENTS.

Another fact that has got to be realised is the power of the atom bomb. Whatever may be the outcome of peace conferences and the international control of atomic energy, the fact is that this potent weapon is now in existence. It is a factor that we must consider in all our defence problems, and its effect is to increase the vulnerability of our population and industrial resources. The chief counter to the atom bomb is the Air Force and anti-aircraft guns, whether it is carried by rockets, by pilotless aeroplanes or ordinary aeroplanes.

The atom bomb in its present state of development will be launched from-

1. Piloted aircraft.
2. Pilotless aircraft.
3. Long-distance rockets.

With regard to-

1. It is my belief that piloted aircraft will be the normal method of launching the atom bomb for the immediate future, and the chief counter to this will be the defending aircraft and anti-aircraft guns.
2. Pilotless aircraft may be used for shorter or medium distances. This again can be countered by anti-aircraft guns, aircraft and improved balloons.
3. It is possible that the long-distance rockets can be made in the next 15 to 20 years moderately accurate. Then the atom bomb might render the Air Force as we know it to-day as obsolete as battleships and aircraft carriers are to-day. But that stage has not yet been reached and there is danger in looking too far ahead.

I am dealing in this paper only with the needs and problems of the next 20 years, and I believe that the balance of scientific opinion is that within this period the use of atom bombs from rockets is not likely to be a major factor. Apart from the atom bomb, we have to keep before us the fully demonstrated fact of the increases in power and accuracy of the ordinary types of bomb-carrying aircraft.

UNITED NATIONS ORGANISATION.

All this leads up to the conclusion that quite apart from ideals and our inherent preference for peace, from the purely material and practical point of view it is greatly to our interest that the U.N.O. should be a powerful and effective body which will control the world on the lines of the law courts and police force in our own country. But again, unregenerate human nature comes into the picture, and it will be many years before we can feel certain that we can risk our entire future on the effective operation of the U.N.O. in any circumstances in which our peace may be threatened. In the intervening period one of the most effective contributions we can make to the United Nations is to build our own defences into an effective organisation which, as all the world knows, will add to the strength of the United Nations and the cause of Peace.

TRANSPORTATION.

We depend for our very existence on our ability to import large quantities of food and raw materials. In war the increased vulnerability of our industrial and internal distribution system will lead to an increased need for importation and will add materially to our requirements for importing manufactured articles when, in spite of the efforts of our defence forces, we must assume that the attack will at least interfere with our production and with the ability of our ports and internal transportation to distribute food and other essentials.

During the last two wars the Navy has talked about the Merchant "Navy" and not the Merchant "Fleet". I feel there is some confusion of thought here and that a clearer definition is required. To my mind we mean **sea transportation**, which is as important to the other two Services and to the life of the country as it is to the Navy. As far ahead as we can foresee, sea

transportation will be vitally important to the Commonwealth, but I venture to ask the authorities to look well ahead. I used to say that what the air could carry in merchandise, or munitions, or machinery of war, was negligible compared with what could be carried by sea. I say now that I think I was wrong in using the word negligible. It will no longer be negligible, and I feel that our handling of air transport in this last war was wrong and that our outlook is still wrong.

To quote some figures. I understand that in one year of the war alone, 1,000,000 tons were carried by Allied Air Forces over the Hump from Burma to China, from improvised and inadequate aerodromes and with improvised and inadequate aircraft, when Burma and China were really almost side-shows and the war against Germany in Europe and the war against Japan in the Pacific was still proceeding. From past statistics I find that the following tonnages of merchandise were imported and exported from the great port of London:-

<i>Year ended 31st March</i>	<i>Tons</i>
1935	36,161,000
1936	37,799,000
1937	39,354,000
1938	40,910,000

and the following tonnages imported and exported from Nigeria:-

	<i>Tons</i>
1936	1,621,744
1937	1,950,494
1938	1,490,787
1939	1,453,322

I repeat what I have said before, that I believe sea transportation is, and will remain, essential to us. But I consider these figures show that the air is no longer negligible as a carrying factor in emergency, more particularly when we consider the vulnerability of other forms of transport and the difficulties of distribution by conventional transport in war.

Imagine what could have been carried with up-to-date aerodromes, up-to-date aircraft and modern radar equipment etc. We now have jet-propelled

aircraft and other developments that were used in the latter days of the war, and I consider that it is not too much to say that in another 10 or 15 years it would be possible to carry in and out of this country 10,000,000 to 15,000,000 tons by air, which is not a negligible figure. It may be claimed that this would be uneconomical, but is there any reason why these jet-propelled aircraft should not cost very considerably less than the petrol driven engines?

No form of transportation ever really dies out. Every new form is an addition to, and not a substitution for, an old form of transportation. Originally people walked and carried loads on their heads and backs; then they had dogs and donkeys carrying their loads, and then pre-historic carts. Then came railways and motor cars, and still all these forms of transportation were used. Camels and mules are still used in some parts of the world, and have to be. There is always room for transportation of all sorts.

Here in England, Airways House was built only a few years ago to accommodate 400 to 500 passengers a day leaving London, and now there are over 1,000 being carried from London alone. Is it too much to say that in another 5 to 10 years at least 15,000 to 20,000 more people will be carried out of London per day by air?

DOMINION COLLABORATION.

The British Commonwealth is a United Nations Organisation in miniature. In the case of a threat or an attack on any of the Dominions they would depend to a large extent on our support and help, and we, in our turn, depend upon them even more in modern times than we did in the past. A close understanding and collaboration in defence matters between the independent members of the British Commonwealth is therefore a commonsense precaution for all of us and in no sense any sort of a threat to the peace or the integrity of other people. In fact, a healthy and strong British Commonwealth is an essential factor in a settled peace.

These are what I call the main facts on which we should base our defence plans; there are many others, but I want to keep this pamphlet short.

Now I come to consider the problems that affect our organisation for war, and the role of our Fighting Services, based on the facts and the principles that I have enumerated above.

WHAT TYPE OF OPPOSITION SHOULD THE THREE FIGHTING FORCES BE PREPARED TO MEET?

1. AIR FORCES.

It is plain that the most dangerous weapons the Air Force will have to meet in the years to come will be missiles that arrive by air. In days of old our existence depended on our ability to use the sea and to prevent our enemies from using it freely. In modern days, the developments in the air mean that an enemy can achieve the same effect in an infinitely shorter space of time by direct attack upon our home islands, which would of course include our ports, our shipping, and our internal transportation and distribution systems. Whether these missiles are conveyed by rockets, by pilotless aircraft, or by comparatively conventional aeroplanes is immaterial to my argument. They arrive by air, and it is primarily Air Power, of one sort or another, that we must rely upon to counter them. We must remember the early days of the last war and our intense anxiety in the days when our still small Air Force held our future in its hands in exactly the same way as Drake's small fleet was our sole defence against the Armada. It is certain that in any future attack our survival will depend on our ability to **obtain and retain mastery of the air** over and about our own homeland as a first requirement. Wars cannot, however, be won by defence alone and we must, therefore, be prepared to hit as well as to defend, both to strike at the source of the attack upon us when we must, and to act as a deterrent to any potential aggressor.

Looking even further ahead and drawing now on the lessons of the war, we have abundant evidence that Armies and Navies are powerless unless we control the Air, thus enabling them to get on with their job without prohibitive casualties and interference, and to prevent the enemy being able to maintain the battle. I do not propose to labour this point. Suffice it to say that those great leaders General Eisenhower and Field-Marshal Viscount Montgomery have repeatedly and unreservedly accepted this view as proven and beyond doubt. To take just one naval example, all the traditional gallantry of our Navy failed to hold off the attack upon Crete, and the arrival of the German armies in North Africa. It was not enemy NAVAL power that prevented our sailors from performing these tasks. It was the fact that the enemy controlled the AIR, and the naval losses that we sustained during the campaign in Crete were inevitable under the conditions. **No Navy could have done more under the conditions, no other Navy would have done as much, but the cold fact remains that naval power was impotent to achieve the desired result.** To my mind there can be no other conclusion

than that the development of Air Power in its broadest sense, and including the development of all means of combating missiles that travel through the air, whether fired or dropped, is the first essential to our survival in war.

2. ARMIES

Armies will be required first of all to support the air-services with anti-aircraft guns in the defence of our homeland. They will also be required to enable Air Power to be used effectively in the later stages of the campaign. They will be required to meet the enemy's Armies that will be used in his own country (or in other countries that he has over-run) to defend the bases from which he will be launching his air attacks upon us. We must anticipate that the Air Force will have to assist our Army to occupy the sites from which these air weapons can be launched, and amphibious strategy will again come into its own, and we, in company with our Allies, will need to participate in land fighting and launch Armies, whether they land from ships or from the air, to keep the enemy from coming to close grips with us, or to occupy his country and to bring about his ultimate defeat. Modern development does mean, however, that Armies must be even more **HIGHLY TRAINED AND MORE EFFICIENTLY EQUIPPED AND MORE MOBILE** than they were even in the last war. Armies will still be required to do police work. In other words, Armies, even though they may be numerically smaller than in the past, **will be more important than ever.**

3. NAVIES

With regard to Navies; here I consider we must face a major change in our traditional outlook. We must get away from all preconceived ideas of prestige being enhanced or even dependent upon the number and size of battleships kept by the nation. The days of the big ship are past. They can no longer operate in the face of Air Power. Carriers were a passing phase and could only be used when one power ruled the air and was predominant over its enemy. It might be said that battleships will be of use to bombard enemy coastal defences. I do not deny the possibility, but I do not believe that big guns will be needed for this purpose. It is a most uneconomical way of doing the job, and even if guns were needed they should not be mounted on great battleships costing many million pounds each.

Surely it is now clear that in the next 15 or 20 years the only big Navies that there can be in the world, in effective operation, would be the Navies of the United States and the British Empire. All must agree that we can

straight away eliminate America as a possible enemy. What then remains for a British Navy to meet? There is no Navy in the world for them to meet in the conventional battle of the past. There still remains the need for small naval vessels and submarines, to protect our own trade against submarine attack and to attack the trade of the enemy. But the best and most potent weapons for this purpose will surely be shore-based aircraft supported by destroyers and all types of fast naval vessels and submarines and minelayers, etc.

CO-OPERATION.

I want to turn for a moment to co-operation. Everybody has praised, and rightly, the co-operation in the 1939-1945 war between the three Services. They praised the Chiefs of Staff Committee, and it has been described, and rightly, as one of the most wonderful pieces of machinery. It has certainly been magnificently developed since it was originally started, but the basis is the same. I would like to point out that Lord Hankey and the Air Service had more to do with starting this machinery than anybody else, and I remember too well at the time it was hotly opposed by the Navy and the Army. Many even did not like the Imperial Defence College, but that is all past history now. I am only mentioning this to point out that sometimes co-operation does not come without fighting for it.

Now another point while in the subject of co-operation. I fear co-operation must not be allowed to mean, which I feel it began to mean at the end of the last war, the using of a weapon which is not the most efficient for the job. **This is not what co-operation should mean, and it is certainly bad organisation.**

This point will undoubtedly be hotly debated, but I would ask everyone, IS IT NOT TRUE? Let me quote a sentence which I used in my 1943 pamphlet dealing with the question of the Navy and co-operation. "For instance, when we bomb works and factories in Paris the co-operation of Destroyers up the river Seine would be a definite liability because of the air cover they would require." In other words, here is a question of building and using a weapon that is really definitely a liability. The same could be said about battleships bombarding the coast, if Air superiority had not been established. The same could have been said about using land forces for keeping the peace in Iraq, in the hills of Rowandiz, or on the frontier of India.

True co-operation lies in a joint study of the problem – a quite dispassionate study – with the object of deciding on the best tools for the job and how to employ them. It is much easier to work in true combination in the heat of war, when one has to use every available resource, than it is to sit round the table in cold blood, in peacetime, and to recognise that cherished and time-honoured ideas and weapons have become a useless expense and a burden on the nation.

FLEXIBILITY OF THE AIR.

The very flexibility of Air Forces makes true co-operation all the more essential. Air Forces, at short notice, can be switched from one sort of target to another and, within limits, from one type of operation to a quite different type. There is, therefore, a constant temptation to use them piecemeal to meet an immediate requirement of the moment rather than to use them on a long-term joint plan and to utilise their flexibility in the method of achieving a consistent aim which is an integral part of our Government's policy, and of our strategy to implement that policy.

USE OF COASTAL AIR FORCES.

Perhaps the best example of this comes from the use to be made of our Coastal Air Forces. In the Mediterranean theatre there were times when the whole weight of our Air Forces had to be concentrated on sea operations, for example, in getting those rare but highly important convoys into Malta, or in preventing the enemy getting stores and reinforcements to North Africa. At another period a similar concentration of all air effort had to be made to help along at some critical period of a land battle. Thus a Squadron which is technically termed a part of our "Coastal" Air Forces would at one time be attacking enemy supply ships on the high sea and immediately afterwards be busting tanks or attacking enemy dumps and movements away behind his lines in the North Africa desert.

Similarly in home waters the primary task of our Coastal Command during a critical phase of the war was the attacking of enemy submarines at sea. Their strength for this task was augmented by the transfer of Bomber Squadrons, and even of a Bomber Operational Training Unit, to this work. It is known that these Bomber Units did splendid work in this role. Bomber

Units, an integral part of Bomber Command, played **a vitally important part** in the anti-U-boat war by their attacks on enemy shipyards and factories concerned with building prefabricated submarines. The anti-U-boat war was also materially helped by the operations of Bomber Command which were designed to reduce the enemy's supplies of oil and to interfere with his transportation system which, of course, was used to move prefabricated submarine parts. Bomber Command was responsible for implementing our very extensive – and highly successful – programme of the air mining of enemy waters and focal areas.

Aircraft of Fighter Command played their part, both in achieving and maintaining control of the air in home waters and in special patrols and operations to protect focal points on the routes of our larger anti-U-boat aircraft, and in the protection of convoys at sea against air attack and attack by E-boats and other small craft.

The point of all this is the fact that the Air is one element and provides a clear example of the necessity for centralising the control and command of Air Forces which, if they are to be adequately and economically handled, must be under a single control in order to take immediate and full advantage of their great flexibility and to ensure that it is directed towards a long-term policy and not frittered away on minor tasks by the orders of some authority who has not the full picture at his disposal.

In this connection I have never seen any public assessment of the real part played by the Air Force in our defeat of the U-boat. I have every reason to believe that that share was a very much larger one and its effects were far more far-reaching than the public (and indeed many of our Government and Service leaders) have ever realised. I believe that the information we now possess of the latest submarine developments indicates that the problem of dealing with submarine attack will be even more difficult and complicated in the future, and that many of the points which helped the Air Force in the last war may not be present to the same degree in the future. I refer particularly to the limited under-water speed of the older U-boat and its inability to stay submerged for long periods. Nevertheless it is a truism that with proper direction the defence will find a means of overcoming these difficulties. Whatever that means may be, surely the principle will hold good that the air is the most rapid and effective method of carrying detective devices and destructive weapons quickly to the scene of action.

TRAINING.

One of the most important aspects in the building up and maintaining of effective Air Forces is their training. The basic training required, and a great deal of the operational training required both for the men who fly in the aeroplanes and the men who maintain and service them, is the same whatever military function their squadrons ultimately perform. They all have the same element with which to compete. It is essential that they should all be imbued with the same doctrine, and that the doctrine should be up to date, up to the minute in fact, with every form of important development. That can only be achieved by concentrating that **training in one Service and under one control**. This is also the only economical method of training, and the cost will always be important, and particularly so during the years when we are endeavouring to get back to a state of economic solvency and stability.

We achieved this centralisation of training in 1919, and it was this solution which brought us immeasurably ahead of any other power in the quality of our training and the efficiency of our small Air Force, and which laid the foundations of our success during the war.

Right up to the beginning of the war we maintained this centralisation at least to a high degree. But there is a tendency, and has been in the latter days of the 1939-1945 war, for the training to be done separately and to be divided up again. I would ask that this be carefully watched by the authorities, or the duplication of overhead charges, the duplication at Headquarters and the **waste of manpower** will be colossal. In the many enquiries into this subject between the two world wars it was conclusively proved that it was more economical and efficient for the training to be done by one Service, always remembering, of course, that officers and men of the other Services should be attached to those schools and instructional places, both as staff and as pupils, so that knowledge is pooled and airmen of all kinds learn to think and talk in common terms and learn a real spirit of co-operation.

ALLOCATION OF RESOURCES.

Three white papers, Commands No. 6856, 6857 and 6858, on the cost of the three Services in the years 1941, 1942 and 1943 have recently been published. They are illuminating. I feel that if care is to be taken on this great subject of which weapon is the most economical and most efficient, we should

study the cost of the Navy, the Army and the Air Force. Roughly, the Army cost double the Air Force, and the Navy half as much again as the Air Force; in other words, the Air Force was about a quarter of the expense of the other two Services.

Yet can anyone doubt after the 1939-1945 war which weapons contributed most to victory.

From the past it looks as if at least double the amount of money spent on the Navy should be spent on the Air Force and an amount equal to that spent on the Army. I feel if we are not careful that in two years' time when the estimates take normal shape and the aftermath of war expenditure is finished with, you will find unless discussion and enquiries are instituted at once, the Air Force estimates will again be roughly half the cost of each of the other Services. The results of that might well be disastrous.

CONCLUSION.

In conclusion I would like to say that I consider it essential that we should continue to have three Services under their Chiefs of Staffs, the Air Service, the Army and the Navy. The three Services should all be under their Secretaries of State with the Minister of Defence in control. BUT THERE MUST NOT BE THREE AIR SERVICES, OR EVEN TWO.

In the interests of economy and efficiency let the three Services be each in its own element and let them have true co-operation between them under the Minister of Defence, and not try to make each Service entirely self-contained within itself rather than in its main element, with consequent wasteful competition and expenditure.

Finally, I would emphasise the necessity of a carefully considered allocation of the available money and material between the Services and based on a realistic outlook of our needs in war, but particularly in those vital opening stages of a war. In particular I would emphasise that our main dangers in the future lie in the Air and if we do not devote the major part of our resources to developing our own strength in the Air, we cannot hope to survive another world conflagration.

General H. H. Arnold, Commanding General of the U.S. Army Air Forces during the 1939-1945 war wrote in “The National Geographical Magazine” February 1946:-

AIR POWER FOR PEACE.

“...IT IS OUR OBLIGATION, NOW AND IN THE FUTURE, TO ORGANIZE OUR ARMED FORCES WITH THE MOST MODERN WEAPONS TO SECURE THE MOST POWERFUL STRIKING FORCE AT THE LEAST EXPENSE TO THE TAX PAYER.

WE MUST DO THIS, NOT TO PREPARE FOR ANOTHER WAR ... WE MUST DO THIS TO PREVENT ANOTHER WAR – TO PERPETUATE PEACE...”

Many who read this paper will think I have overstated the future of Air Power and the effect of it on war. Before they come to this conclusion let them read the poem on the back page which was written nearly 200 years ago. There was depicted a battle of the air, also the man who wrote those lines anticipated the spirit of the Air Force of to-day. The youth from Britain showed the indomitable spirit of the Air Force of to-day when, as he hurled towards the ground, he clutched his opponent by the heel and carried him with him to his doom.

EXTRACT FROM THE WORKS OF R. O. CAMBRIDGE, ESQ.,
WRITTEN IN THE EARLY 1700's AND PUBLISHED BY HIS SON.

*My swelling heart unable to restrain,
I rose, and thus addressed the list'ning train,
Behold yon matchless beast ordain'd to grace,
The rapid victor in th' aerial race.
None from ourself that prize should bear away:
But not for triumph is this mournful day.
Far other thoughts my sorrowing hours employ,
And sad contrition holds the place of joy.
Let brisker youths their active nerves prepare,
Fit their light silken wings, and skim the buxom air.
Mov'd by my words, two youths of equal fire
Spring from the crowd, and to the prize aspire.
The one a GERMAN of distinguish'd fame:
His rival from projecting BRITAIN came.
They spread their wings, and with a rising bound,
Swift at the word together quit the ground.
The BRITON'S rapid flight outstrips the wind:
The lab'ring GERMAN urges close behind.
As some light bark, pursu'd by ships of force,
Stretches each sail to swell her swifter course,
The nimble BRITON from his rival flies,
And soars on bolder pinions to the skies.
Sudden the string, which bound his plumage, broke;
His naked arms in yielding air he shook:
His naked arms no more support his weight,
But fail him sinking from his airy height.
Yet as he falls, so chance or fate decreed,
His rival near him urg'd his winged speed,
Not unobserv'd. (despair suggest a thought)
Fast by the foot the heedless youth he caught,
And drew the' insulting victor to the ground:
While rocks and woods with loud applause resound.*

Introduction to the essays by Slessor

Marshal of the Royal Air Force Sir John Cotesworth Slessor: a biographical note

John Slessor is perhaps the best known British air power theorist. He was also a great practitioner of air power, especially known for commanding the Coastal Command at the height of Battle of the Atlantic. He also held the most senior post in the Royal Air Force towards the end of his active duty, serving as Chief of the Air Staff from 1950 to 1952.

John Slessor was born on 3 June 1897. He joined the Royal Flying Corps during the Great War, and was awarded the Military Cross for his service. The last part of the war was spent in training squadrons. After the war, he tried making a living outside the service as well as undertaking various posts with the new air force. After a turbulent period, he decided on professional military service and graduated from the Royal Air Force Staff College in 1924. The following year he was given command of the Fourth (Army Co-operation) Squadron. He worked closely with the Army until the mid-1930s, including a four-year appointment to the Camberley Staff College as a lecturer. During this period he had time to think and write, and his thoughts on air/land operations are well captured in his famous book *Air Power and Armies* published in 1936. By the late 1930s and for the first stages of World War II, he served in the central organisations, first as Deputy and then as Director of Plans with the Air Ministry. He also served on the Joint Planning Committee as the Air Member. During the war, he served as Group Commander in Bomber Command for the first couple of years, before returning to the Air Ministry as Assistant Chief of Air Staff (Policy). His great abilities, both as a writer and in personal relations, made him the best man for diplomacy talks over strategy both with the Americans and Russians, as well as between the services. In 1943 he became Commander-in-Chief Coastal Command. It was his operational service which brought him most fame, as the tide turned under his command and the German submarine forces were pressed to their defensives by mid-1943. For the remainder of the war, he served as the Royal Air Force Commander-in-Chief in the Mediterranean and Middle East, as well as Deputy Allied Air Commander-in-Chief in the region. John Slessor emerged from World War II as a greatly respected practitioner of air power. He

held various positions in the post-war years and served as Marshall of the Air Force from January 1950 until the end of his career in late 1952.

Slessor's post-war years as an air power theorist started with his post as Commandant of the Imperial Defence College in 1948. There, he had time to use his splendid analytical and writing skills. His book *The Central Blue*, published in 1956, is a monumental work. The book is both a personal recollection and a great work on air power history, not at least for the field of maritime air power. However, as the Cold War developed, he became greatly occupied with issues of nuclear strategy. From this period of his writing, we have his book *Strategy for the West*. In addition, his many lecture notes on nuclear (air) strategies which he delivered regularly, especially at the NATO College, are well worth studying.²⁶ Even after he retired from the Royal Air Force in early 1953, he very much kept pace with the defence debates, both in public as well as internally within the closed circles of the defence establishments.

John Slessor, GCB, DSO, MC, died on 12 July 1979.

²⁶ His lecture notes, which were classified at the time, are available in his personal papers AIR 75/80, as well as from AIR 75/89, at the National Archives in London.

Recommended reading on/by Slessor

Meilinger, Phillip S., 'Trenchard, Slessor, and Royal Air Force doctrine before World War II', in Meilinger, Phillip S. et al., *The Paths of Heaven: The Evolution of Airpower Theory* (Alabama: Air University Press, 1997).

Meilinger, Phillip S. and John C., 'Slessor and the genesis of air interdiction', in *RUSI Journal* (1995).

Orange, Vincent, *Slessor* (London: Grub Street, 2006).

Probert, Henry, *High Commanders of the Royal Air Force* (London: HMSO, 1991).

Slessor, John, *Air Power and Armies* (London: Oxford University Press, 1936).

Slessor, John, *Strategy for the West* (London: Cassel & Company Ltd, 1954).

Slessor, John, *The Central Blue* (London: Cassel & Company Ltd, 1956).

Slessor, John, *The Great Deterrent* (London: Cassell & Company Ltd, 1957).

Slessor, John, *These Remain* (London: Michael Joseph, 1969).

Slessor, John, *What Price Coexistence? A Policy for the Western Alliance* (London: Cassell, 1962).

Slessor and the carriers

The question of command has always been (and probably will continue to be) a matter of controversy between the Royal Air Force and the Royal Navy, though Slessor was not so much occupied with this. He was very much a man of integration and co-operation. Still, the conflict over command once again haunted the two services around 1959 and influenced the tension between them. Therefore, a short sub-chapter has been included to describe the inter-service rivalry over the command relationships in 1959.

The rationale for Slessor's four controversial essays on maritime air power in this book is directly related to the controversial question of new strike carriers for the Royal Navy in the 1960s. Therefore, a longer sub-chapter discusses the carrier versus land-based air power debate which haunted the Royal Air Force and Royal Navy from 1960 to 1966 has been written. When writing these controversial and provocative essays, as well as other lectures and papers, Slessor was often criticised by Admiral Gretton and Admiral Caspar John, as well as the naval historian Stephen Roskill: The essays were, in fact, extremely political, and therefore had to be challenged.²⁷

A new round of debate on the command relationships

The controversial issue of command over all maritime aircraft again came to the surface in 1958–1959, much as a consequence of the Soviet submarine build-up and the need for revitalising British and NATO anti-submarine warfare (ASW) forces. In this case, the Admiralty was concerned over the Royal Air Force's true dedication to ASW. As the Admiralty made this case,²⁸ the Chiefs of Staff were asked to record their views. Simultaneously, the perennial conflict over the command relationships of Coastal Command and Fleet Air Arm reached the news. In June 1958 the *Daily Mail* reported how Ministry of Defence planners had recommended the handing over of Coastal Command to the Royal Navy, in an article with the headline 'Navy Ready to Take over Coastal Command'. The Chiefs of Staff as a joint institution found this a challenging case and did not reach any agreement on this controversial question. To a large degree, they

27 See V. Orange, *Slessor* (London: Grub Street, 2006), pp. 264–265. Also, copies of correspondence with these naval thinkers are included in Slessor's personal files, AIR 75/80.

28 PREM 11/2638, Discussions on possible transfer of RAF Coastal Command to RN. Minute from First Sea Lord of the Admiralty to Minister of Defence, 5 December 1958.

avoided entering into the inter-service rivalry between the Admiralty and the Air Ministry, as this could have crippled the fragile Chiefs of Staff organisation at the time.²⁹ Subsequently, the debate evolved around the individual services and influential individuals. The Admiralty and the First Sea Lord, Admiral Mountbatten, and the Permanent Secretary to the Minister of Defence, Sir Richard Powel, emerged as the main advocates for a full transfer of Coastal Command and all shore-based aircraft to the Royal Navy.

The main naval argument was that Coastal Command was much more closely akin to the anti-submarine functions of the Royal Navy than to the tasks of the Royal Air Force. The argument dating from 1937 about the 'inherent flexibility' of the aircraft had become less important. Aircraft such as the Shackleton were clearly not able to fill any 'bomber roles'. A further argument questioned the entire system of co-operation between two equal partners (in this case the Royal Navy and the Royal Air Force). This was argued as 'unsound': there should be a single structure. The double set of command structures and leadership was both ineffective and uneconomical. The naval conclusion was that the Coastal Command leadership and administration could and should be built down.

The Permanent Secretary to the Minister of Defence became the primary voice for the need for change. However, at the higher level, the political implication of such a dramatic organisational change was assessed to be too great. After being made aware of the debate on change, Prime Minister Macmillan wrote in a personal minute to the Minister of Defence, 'There are of course powerful arguments in favour of a change. Nevertheless I do not want this question raised this side of the Central Election. We shall gain nothing and stand to lose a great deal'.³⁰ An alternative solution of making the Commander-in-Chief Coastal Command (CINCAIREASTLANT) subordinate to the Naval Commander-in-Chief (CINCEASTLANT) was subsequently suggested.³¹ This would make the Royal Air Force subordinate to an Admiral, as with all maritime operations.

The Defence Board and the Minister of Defence³² decided by the autumn of 1959 that the organisational and administrative command regime was to

29 PREM 11/2638. Memorandum by the Chief of the Defence Staff, 8 January 1959.

30 PREM 11/2638. Harold Macmillan to the Minister of Defence. Unknown date, early in 1959 (M38/59).

31 DEFE 13/207. Directive by the Minister of Defence, 9 September 1959. Various correspondence.

32 Duncan Sandys was Minister of Defence January 1957 – October 1959; Harold Watkinson was Minister of Defence October 1959 – March 1962.

be upheld. The shore-based maritime air forces continued to form part of the Royal Air Force, and Coastal Command continued as a separate Royal Air Force Command. As for *operational command*,³³ more influence was transferred to the Royal Navy. In maritime operations or exercises, the senior naval commander in each area, both at home and overseas, was given the authority to decide which operational tasks and orders shore-based maritime aircraft were to fulfill.³⁴

It was decided that the policy on air/sea warfare matters would continue to be formulated by the 'Sea/Air Warfare Committee', but the new turn was that both the posts of Chairman and Secretary of the Committee as well as any sub-committees would be held by the Admiralty.³⁵ The Admiralty representative would also be the spokesman for all maritime operations at NATO conferences and meetings.

Both the Admiralty and Air Ministry agreed that the standing 'Dickson-Lambe Agreement' over command relationship was out of date and in need of revision. They accepted the changes, and since then the organisational and operational command regimes have remained broadly along these lines. The later internal Royal Air Force changes of 1969, where Coastal Command was absorbed as the No. 18 (Maritime) Group into the new and greater Strike Command,³⁶ did not exert much influence on the former agreements of 1946 and 1959 between the Royal Air Force and Royal Navy.

Carriers versus land-based air power

At the beginning of the 1960s, the relationship between the Royal Navy and Royal Air Force was not at its best. Great debates and inter-service rivalry reached a peak over the great procurements planned, namely the Polaris, TSR.2 strike aircraft, the V/STOL fighters and medium transport aircraft, and most of all the question of new fleet carriers.

By the late 1950s, the Royal Navy fleet of carriers consisted of seven ships, with HMS Centaur, HMS Victorious, HMS Ark Royal, HMS Eagle, and HMS

33 DEFE 13/207. Operational Command defined as: 'The authority granted to a commander to assign missions or tasks to sub-ordinate commanders, to deploy units, to assign or re-assign forces and to retain or assign operational and/or tactical control as may be deemed necessary. It does not include administration.'

34 DEFE 13/207. Directive by the Minister of Defence, 9 September 1959. Also stated in Hansard 05.11.1959, copy within PREM 11/2638.

35 DEFE 13/207. Directive by the Minister of Defence, 9 September 1959.

36 C. Ashworth, RAF Coastal Command: 1936-69 (Somerset: Patrick Stephens Limited, 1992).

Hermes as general purpose carriers.³⁷ In addition, HMS Bulwark and HMS Albion recently had been converted to Commando Carriers. The carriers were relatively newly updated to modern standards, but the general ageing of the current fleet and the limitations of the existing carriers for operating modern and bigger jet aircraft led to the Royal Navy opting for newly designed large carriers. The visions and demands for new large carriers were also fuelled by the increased interest in the East of Suez missions.

The question of new carriers entered the political arena in 1960. Ian Orr-Ewing, the Civil Lord of the Admiralty, argued for the case during a discussion in the House of Commons in November 1960:

*Four of our five operational carriers are comparatively new ships and the fifth, the 'Victorious', was completely rebuilt a few years ago. They should all, therefore, be capable of playing a full part with the fleet until the 1970s. Nevertheless, we are considering the requirements of the ships which will succeed them.*³⁸

The replacement was intended for the 1970s. The Admiralty planned from the beginning to build four new carriers of approximately the same size as HMS Eagle and HMS Ark Royal. The initial plan or proposal by the Admiralty was to lay down the first ship at the end of 1964 and complete the fourth by 1975. In its early phase this replacement programme was estimated to cost a total of GBP 620 million, including aircraft and all facilities.³⁹

The issue of new carriers, which all knew would be very expensive and which cast a heavy burden upon the already pressed defence budget, became part of the general re-examination of British military strategy. It was especially the Treasury that was occupied with this link. Both the Chiefs of Staff and the Minister of Defence still held a general preference that the HMS Victorious both needed to and would be replaced. In addition, it was agreed that one would opt for a new *joint* VTOL fighter/ground attack/strike/reconnaissance aircraft for any new carriers.⁴⁰ As the carrier programme clearly would be very

37 HMS Centaur (1953/22,000 tons), HMS Victorious (1941/1958, 30,000 tons), HMS Ark Royal (1955, 43,000 tons), HMS Eagle (1951/under modernisation for 1964, 44,000 tons) and HMS Hermes (1959, 23,000 tons).

38 DEFE 7/2353, Defence policy review: modernisation of aircraft carriers, 1959–1963. House of Commons extract from 16 November 1960.

39 DEFE 7/2354, Replacement of aircraft carriers, 1959–1963. For a detailed essay on the issue of costs and technical solutions, see for instance A. Gorst, 'CVA-01' in Richard Harding ed., *The Royal Navy 1930-2000* (London: Frank Cass, 2005).

40 DEFE 7/2354, From several Chiefs of Defence Staff meeting reports and correspondence from December 1961 to February 1962.

expensive, it would influence the economies of all of the services. Alternative solutions were sought, and the Royal Air Force put forward the 'Island Strategy' as an alternative to carrier task forces.

The background to this Island Strategy may be traced back to the question of safe and available air-transport routes to and from the Far East, especially after the Suez Crisis and the imposed 'Arab Air Barrier'.⁴¹ As the Arab countries denied the British over-flight rights for military aircraft, the routes had to be redirected around great parts of Africa. The original idea of an Island Strategy was thus a Transport Command issue. Air Marshall Hudleston was the man who came up with and fought for the concept during his post as the Vice Chief of the Air Staff (VCAS) from 1957 until 1962.⁴² The Island Strategy⁴³ was for the initial years mainly an Air Ministry internal idea and topic. It was first communicated from the Air Ministry in 1962, after Hudleston had left the staff. The ideas which developed during the autumn of 1962 were far beyond what originally was intended with the concept of staging islands for politically safe air-transport links. It had thus become *a direct alternative* to the carrier task force concept.

The general perception held by politicians and the Ministry of Defence in December 1961 – January 1962 was in favour of a carrier replacement for HMS Victorious. Yet on the sideline, the Air Ministry was awaiting an opportunity to halt the project. As one internal recommendation to the Chief of the Air Staff (CAS) before a Chiefs of Staff meeting stated:

*I would not recommend you to oppose this paper strongly, but much depends on the climate of opinion within your Committee. Your most effective intervention would probably be an indirect one in terms of 'island strategy' should the opportunity arise.*⁴⁴

From the summer of 1962, and well into 1963, the Island Strategy of land-based air power occupied much discussion within the Ministry of Defence

41 From an interview and correspondence with Peter Hudson, December 2006. During this period Peter Hudson worked as Assistant Secretary at S6 (Air), Air Ministry, 1956–57 and later as Head of Air Staff Secretariat, 1958–1961.

42 Air Chief Marshal Sir Edmund Hudleston. 1956: Chief of Staff (Air), C in C, 'Operation Musketeer'. 16 September 1957; Vice Chief of the Air Staff. 30 April 1962: AOC in C, Transport Command.

43 Sometimes called 'the Island Stance', or 'the Island Stance Strategy'.

44 AIR 8/2354, Island Strategy and the carrier force, 1962–1963. A.U.S.(A) (Quinlan) to C.A.S (Pike), 31 January 1962.

and related bodies. The Island Strategy concept, or vision, was based on the establishment of four bases in the Indian Ocean: Aldabra, Masirah, Gan, and Cocos. From these islands, British military forces would be able to project power where needed. Mobile army troops, as well as reinforcements for island protection with radars and SAM systems were to be flown into the four islands from the British Isles. Some of the islands were to be used as 'staging bases' and those closer to a conflict would act as 'mounting bases'. From the mounting bases the troops would be airlifted in by V/STOL tactical transport aircraft to establish airheads. The air support for these operations would come from strike (TSR.2) and air-air combat (V/STOL P.1154) aircraft stationed on some of the islands. An operation such as the Island Strategy could, according to the Air Ministry, be maintained independently by the Air Force for up to 28 days.⁴⁵

The Island Strategy concept was the Royal Air Force's proposition to deal with the challenges to the British policies and interests East of Suez: An alternative to the Royal Navy carrier replacement programme and their perspective of a carrier task force as the solution to British challenges East of Suez. However, even though the Royal Air Force proposal was less expensive, the Minister of Defence Peter Thorneycroft had grave doubts over the practicality of fighting limited wars from a distance. At the end of discussions, he supported the building of the carriers. The original demand for four carriers had been reduced to that of an agreed minimum of three fleet carriers.⁴⁶ With fewer than three carriers, the Royal Navy would be reduced to an anti-submarine navy. With the global role in mind, two carriers were intended for deployments East of Suez, while one would be in home waters for maintenance and training.⁴⁷ The Cabinet supported the Minister of Defence's stand, and the first new carrier was agreed upon on 30 July 1963.⁴⁸ However, even though the new carriers had been agreed upon by the Cabinet, the challenges would not ease for a long time. The Air Ministry and the Treasury, as well as public figures, such as Slessor, kept up their objections.

45 AIR 20/11423, Future aircraft carriers and the island strategy: Admiralty/Air Ministry study, January–February 1963. Interim report of the CSA's enquiry into Naval Task Forces, 7 February 1963.

46 DEFE 7/2354, Thorneycroft, Hansard Official Report No. 158 of 30 July 1963.

47 DEFE 7/2354, Note from meeting of the Chancellor of the Exchequer and the Minister of Defence on Aircraft Carriers and Defence Policy, 24 July 1963.

48 ADM 1/28639, Aircraft Carrier Programme: date for placing order for replacement for HMS Ark Royal, 1963.orce, 1962–1963. A.U.S.(A) (Quinlan) to C.A.S (Pike), 31 January 1962.

By 1965, the wheel had turned, and the carrier programme of CVA-01 was now on the defensive. The arguments of land-based air power, no longer so frequently under the name of ‘the Island Strategy’ but still with much the same content, gained increasing support. This was perhaps not so much because politicians or military strategy experts truly believed in it, but more because the option of land-based air power represented an economically feasible alternative to the costly new carriers.

A truly devastating blow to the Royal Navy and the Fleet Air Arm came after the proposed and highly needed carrier replacement, the CVA-01, was officially cancelled in February 1966.⁴⁹ According to this famous Defence White Paper, the ‘*Statement on the Defence Estimates 1966, Part I: The Defence Review*’, the Royal Navy was intended to gain a lot more of its air power support from land-based aircraft.

When reading the following essays and articles by Slessor, the British defence history of the 1960s should be borne in mind – in general, about the radical changes British defence policy and military forces saw during the 1960s as they were leaving the East of Suez, but more specifically the great inter-service rivalry that existed between the Royal Navy and Royal Air Force over strategic concepts and resources. The Royal Navy fought for the Carrier Task Force strategy and their carrier programmes, notably the CVA-01, as the solution to the British East of Suez challenges. The Royal Air Force, as well as Slessor, argued for the supremacy and cost-effectiveness of land-based air power. In addition, they constantly fought against the proposed new large carriers. Their rationale was both that of a genuine belief in the reduced cost-effectiveness of carrier aviation but also that such an expensive carrier programme would clearly have great negative implications for their budgets and position.

49 PP, *Statement on the Defence Estimates 1966, Part I: The Defence Review*, HMSO 1966 (2901).



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Four essays by Slessor on the supremacy of air power

‘The Capital Ship Complex’

Twice in this century Great Britain has been brought to the brink of defeat by the submarine. And in that a significant, indeed in the second World War the major contributory factor was the obsession of the Admiralty with the multi-thousand ton capital ship. It was fortunate for us that before 1939 a similar obsession in the German Admiralty led to diversion of resources to monsters like Tirpitz and Bismarck, at the expense of the U-boats which in larger numbers would very likely have strangled us at sea while we were still fighting alone – as they came within measurable distance of doing 3 ½ years after the outbreak of war, when the U.S. were ranged on our side.

We must all of us accept some share of the responsibility for our gross neglect at the time to provide the anti-submarine flotillas which we should have known from experience only 25 years before would be literally vital. It was the capital ship complex, backed by the massive propaganda and ‘dining-out power’ of the Admiralty that led even Churchill in 1937 to dismiss both the submarine (‘the undoubted obsolescence of the submarine’) and the aircraft as significant dangers to our supremacy at sea. But even after the fall of France the Joint Planning Committee, of which I was a member, expressed the view – on which Naval Staff opinion had inevitably a predominant influence – that U-boat activity was “likely to increase” (a vast understatement with the Biscay ports in German hands), but that if Italy were defeated we should be in an “overwhelming position” vis-à-vis Germany at sea; and that view was accepted by Churchill. In the section of that paper dealing with the requirements of the Services, more than three pages were devoted to capital ships (including aircraft carriers) and cruisers as compared with only eleven lines to destroyers and sloops – and much of that short paragraph was concerned with the sufferings of capital ships owing to lack of destroyers for their “proper function with the Fleet”. In nineteen paragraphs about the probable action of the enemy at sea, the word U-boat did not appear once – reference to A/s escorts was limited to 10 words “the need for escorting forces for trade protection is pressing”, but the main positive recommendation on Naval requirements was that the recently suspended programme of capital ship construction should be resumed.

Yet within a few months Churchill was pressing Roosevelt for 50 obsolete American destroyers for convoy escort, saying that a continuance of shipping losses at the rate of recent weeks might well be fatal; and two years

later, at the end of 1942 – in which year we had lost 8 million tons of shipping – he and Roosevelt at Casablanca endorsed the recommendation of the Combined Chiefs of Staff that the defeat of the U-boat should still remain a first charge on our combined resources. By that time also the development of what was then our only offensive strategy against Germany had been set back by the diversion of seventeen squadrons from the Bomber offensive of the Battle of the Atlantic.

To this near-mortal threat to our survival the relevance of the capital ship was little more than marginal.

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A quarter of a century later, circumstances have changed out of all recognition but the Naval preoccupation with the multi-thousand ton capital ship – or its modern equivalent with a different primary armament – remains. Our principal potential maritime enemy to-day has over 400 submarines – about the strength of the German U-boat fleet at its peak in 1943 – to which the Royal Navy could oppose about 60 destroyers and frigates, and a proportion of our 40 submarines in the hunter-killer role. But no-one now seriously contemplates a modernized version of 1939-45 – a prolonged war in which the safe and timely arrival of convoys in British ports would again be vital to our survival. That is just as well, because readiness for any such thing would be wholly beyond our resources – though of course another time we should have the great strength of the U.S. Navy (with their nine A/s carriers, some 220 destroyers and over 100 submarines) on our side from the beginning.

Nevertheless, the capital ship complex, if not quite so potentially lethal as in 1939, could still do far-reaching damage to our capacity to meet our strategic requirements in an age when it is more than ever vital that we should extract the absolute maximum of real military value out of every defence pound sterling. To-day our maritime strategy is concerned primarily with requirements East of Suez; and there our shipping would have to be protected over vast distances and in some dangerous narrow seas against an already not inconsiderable number of potentially hostile submarines (China 28, Indonesia 6, Egypt 8), which could and probably would be supplemented in war by ‘volunteers’ from the Soviet Navy. It is wholly unsafe to assume that in another real war in the Far East our warships, transports or supply

ships would be granted that complete immunity from submarine or air attack which – by a curious unwritten agreement with the enemy – they enjoyed in the Korean campaign 15 years ago. Yet once again – as before 1914 and 1939 – persuasive political pressure and relentless ‘public relations’ activity looks like resulting in the allocation of a high proportion of our all too slender defence resources to a small but enormously expensive modern capital ship force. This might have some relevance to a threat to our shipping from enemy cruisers and missile ships in certain not very likely circumstances – in which it is inconceivable that we should lack the support of the United States. But it bears virtually no relation to the much more dangerous submarine threat and, in fact, really has little to do with the control of sea communications at all but is just a seaborne extension of air power.

The question is – can we afford it, having regard to our other military commitments?

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It was much the same kind of Naval pressure which in the middle thirties led, not only to the diversion of resources to battleships at the near-fatal expense of anti-submarine forces, but also to a development more closely relevant to present conditions, namely the transfer of the Fleet Air Arm to Naval control in 1937. That was inevitable at the time, in view of the predominant Naval influence in Whitehall and the country as a whole, and the R.A.F. accepted it loyally though with scepticism. But it is instructive to summarise the result, to help us form a judgment about present claims for Naval Aviation.

By the end of the late war the Royal Navy had in commission 58 aircraft carriers, with their attendant escort and auxiliary vessels, and a first line strength in aircraft of about 1300, backed by large numbers of reserve and training aircraft and many shore stations of various kinds. As far as I am aware, this was unrelated to any considered estimate by the Chiefs of Staff of our real strategic requirements.

In comparison, Coastal Command of the R.A.F. comprised some 900 shore-based aircraft, of which about half were in the anti-submarine squadrons. And the Admiralty constantly pressed for this strength to be increased at the expense of other components of the R.A.F., notably Bomber Command.

As far as I know these two elements of air power in Hitler's war have never been accurately costed. But I have not the slightest doubt that the proportion of our G.N.P. absorbed by the Fleet Air Arm and its carriers was largely in excess of that represented by Coastal Command and its shore-bases. Churchill himself, who was closely involved behind the scenes in the Inskip award of 1937, admitted three years later when he was First Lord that he "had not conceived how enormous was the charge involved". It was indeed! Let us examine briefly the relative impact on the enemy of sea-borne aviation in that maritime battle on the issue of which depend our national survival and the capacity of our land and air forces to remain in operation; it was probably the most critical battle of the war, and the decisive enemy was the U-boat.

German submarines sunk during the whole war by British ship-borne aircraft numbered 19; those sunk by shore-based aircraft (mainly of Coastal Command) totalled 210; these figures exclude 18 U-boats sunk by air-laid mines, of which one fell to carrier-borne and the other 17 to shore-based aircraft; they also exclude 21 commissioned U-boats sunk in harbour by Bomber Command; and they take no account of more than 100 destroyed in course of production by Allied bombing in Germany.

It is true that the Fleet Air Arm also destroyed some enemy surface ships during World War II; but the R.A.F. destroyed vastly greater numbers.

All this, of course, is now ancient history; but it is a sombre commentary on the capital ship complex, and an enlightening background against which to judge the validity and probable cost of the idea, now being voiced in some quarters, that an increasing share in the exercise of British air power should be assumed by the Royal Navy.

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Let us now have a look at the present-day relative economics of shore-based and sea-borne strike capacities, using round and necessarily rather over-simplified figures which, nevertheless, I believe do not overstate the case.

The reason for the cancellation of TSR 2 was that the element of British air power represented by a relatively small force of these aircraft would have cost the tax-payer some £750 m. capital and perhaps £30 m. a year running costs – say a total of rather more than £100 m. a year over a period of ten

years. I wonder how many of our legislators or taxpayers realize that this other element of air power, the Fleet Air Arm (the cost of which has attracted virtually no public attention), looks like letting us in over the same period for something not far short of 50 % more than the sum. The Royal Navy includes two commando ships with their complement of Marines and helicopters and some thirty or forty other helicopters for the anti-submarine role carried in cruisers, destroyers and other miscellaneous craft, all of which are essential and, indeed, inadequate in numbers. But comparing like to like – strike to strike – and the implication is that the strike squadrons in the Fleet carriers should take the place to the TSR 2 replacement, the F 111A, it is a reasonably safe bet that the aggregate cost of the carrier programme over a 10 year period would be considerably more, probably something between 20% and 30% more, than the cancelled TSR 2 force.

But, keeping in the background of our minds this figure of relative cost, we must forget the TSR 2, and take as a shore-based yardstick the smaller and cheaper numbers of the equivalent F 111A, which will cost something of the order of £500 million – or substantially less than half the cost of the carrier programme. Taking into account relative performance, especially range and bomb-load, one F 111A is worth on a cost-effectiveness basis three of the Naval strike aircraft, the Buccaneer (Mr. Healy has used the figure of one to five for a sortie at 900 n.m. radius); and even this favours the Naval aircraft because the F 111A can carry a heavy load of bombs to longer ranges at which the Buccaneer can not operate at all. But disregarding that, a simple calculation will show that, even if only the same first-line numbers of strike aircraft could be provided under the F 111A project as those in the actual strike carrier programme, the impact of the latter on the enemy would still be about 1/3rd of the former and would cost more than twice as much; in actual fact the first-line numbers of F 111A that could be provided for about £500 million would be about twice as many.

These kind of equations contain so many variables that they can never be very precise; for instance, there may be occasions when in a given period it would be possible to make more strikes from a carrier than from shore-bases at greater range. But it would not be very wide of the mark to say that the cost per aircraft impact (the real point at issue) of the Naval air programme would work out at something between ten and fifteen times as much as the shore-based F 111A project over the ten year period.

All this seems at first sight so incredible as to demand explanation. What are the reasons for this enormous disparity in cost-effectiveness?

The first is the capital and running costs of these modern capital ships themselves – the floating airfields – excluding those of the other warships required to protect and support them (a point sometimes overlooked); unlike airfields ashore, carriers can be sunk by any enemy with a few submarines unless they are heavily escorted. The cost of the next replacement carrier has been quoted as £60 m; in the light of experience, another pretty safe bet is that it will actually cost nearer £100 m.

There are then the costs of maintenance and operation, including a large bill for oil fuel, periodical refits etc. And there is the cost of the sailors (including their training backing) and civilians required to operate the ships at sea and maintain them in harbour.

All this – be it noted – is for the carriers themselves, without taking any account of the purpose for which they exist, namely to carry and operate aircraft. It would not be very wide of the mark to say that the overall costs of the capital ships themselves – taking into account the modernized replacements which would soon be demanded, would amount to more than the whole cost of the force of F 111A at the strength now envisaged.

Next comes the only reason for the existence of these great grey ships, the lineal descendants of the battleships and battle-cruisers of our Imperial past, namely the aircraft they carry. These are provided by the Navy Department on a considerably more lavish scale in relation to first line strength than in the R.A.F. This is due partly to a higher wastage rate and a higher proportion in “non-established” use, reserves, etc; but partly also to a more extravagant tradition. The Navy finds it necessary to train about twice as many pilots as does the R.A.F. to fill a given first-line establishment. And the present increasing shortage of candidates for service as air crews at sea has led to the offer of financial inducements far higher than the R.A.F. finds necessary – a curious reflection in these days of economic stringency on the reluctance of the Navy to share this commitment with the R.A.F.

The essential core of the Fleet Carrier complements – the only thing which is really relevant to this argument – is the force of strike aircraft; this

is the only element of any real interest to an enemy. This represents on the average only about 40% of the aircraft carried in these monster vessels. The remaining 60% are on board primarily to protect the floating airfield itself – fighters, anti-submarine aircraft, early warning and rescue aircraft. It is true that some of these ancillary aircraft – the Phantom fighters – could in certain circumstances have some strike impact on an enemy; but this does not invalidate comparison because the same is true in a greater degree of several classes of shore-based aircraft other than the medium range bomber.

Moreover, all experience goes to prove that out of 3 carriers it is never safe to assume that more than 2 will be available for any one operation; indeed recent events have shown that even this is an optimistic estimate in some circumstances. That means that of the Naval Air first-line, only an average of some 25 to 30 Buccaneers could be counted on as available to strike an enemy; and that, even on the 3 to 1 basis assumed above which actually favours the sea-borne aircraft, is the equivalent of eight to ten F 111A – perhaps as many as 12 to 20, taking the ‘variables’ into account. This is another not unimportant factor in the cost – effectiveness analysis to which I have already referred.

Is it a very rewarding return for an expenditure of some £120 to £130 million a year, and the employment of a major proportion of the Navy’s 100,000 and 120,000 uniformed civilian personnel?

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There is an amiable theory – voiced, for instance, by F.M. Montgomery in the House of Lords – that the carrier is the “indispensable mobile air base for all three Services”. Is it? Let us examine that claim a little more carefully.

It implies, inter alia, that provided we have carriers we can dispense with shore bases, which it is now fashionable to assume we are bound to lose away. How carriers and their escorts are going to be able to dispense with harbours and dockyards is never explained. It is quite certain that we could never afford the enormous Fleet Train that the Americans find necessary.

But apart from that, is it really assumed that a couple of carriers could provide all the air support that our land forces could require in all reasonably probable circumstances? One need not conjure up the very unlikely

contingency of our having to mount an opposed landing on a remote hostile shore to doubt that. Can they be relied on to be on the scene sufficiently quickly or, with their short endurance, to be able to remain there long enough? Could they provide all the air cover required for their own bases or those of the Army? What about the transport aircraft to carry land forces to the scene of operations – where are they going to land and who is going to protect them? How are these necessarily relatively short range aircraft going to deal with longer range shore-based aircraft such as the Badger bomber – now being supplied by the Soviets to our ill-wishers in the Middle and Far East? If they could not, would it be regarded as a reasonable risk to commit any of our forces, land, sea or air, to operations against even a second class enemy?

And finally, are the carrier-borne squadrons going to do without any shore air bases anywhere near the area of operations – is that the experience of the Fleet Air Arm anywhere in the world? This is a wholly unrealistic idea; the Fleet Air Arm is almost as dependent on shore air bases in the vicinity of the area of operations as is the R.A.F. which, with the advent V/S.T.O.L., will become decreasingly dependent on great concrete runways. And any more attractive target for even a minor enemy than a carrier in dock it would be difficult to imagine.

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The inescapable conclusion surely must be that, if money is no object as in the U.S., it is possible to make a case for having 15 strike carriers in commission; it is easy to make a case for having none; it is quite impossible to make any convincing case for having 3 – on which the unhappy British taxpayer is expected to spend between £2 and £3 million a week over the next 10 years.

The answer surely lies in the application of what I regard as the only sound principle – that the man who fights on or under the sea should be a sailor; the man who fights on the ground a soldier and the man who fights in the air an airman, all under unified direction and control at the top. This is the best, indeed I think the only way to achieve real Defence economies. The Royal Navy to-day is as indispensable as ever; but instead of squandering resources on superfluous Polaris submarines and grossly uneconomic floating airfields, it should be really adequately manned and equipped for its proper

job, with surface and submarine anti-submarine craft, cruisers, destroyers, anti-aircraft ships, minelayers, more ships and helicopters to carry more Royal Marine Commandos or their Army equivalent – which at present it is not.

Inter-Service relations have improved out of all recognition since the Beatty/Trenchard era just after the Kaiser's war, when I was a young officer on the Air Staff, but they have suffered some deterioration recently. It is the duty of all officers of every Service to get on with our own jobs and bend our energies as a team, each in our own sphere, to do the job we are paid for – to defend the honour, safety and welfare of our Sovereign and her Dominions.

22 August 1965

‘The Defence Review: Air Strike – Seaborne or shore-based?’

The appalling cost of modern armaments has resulted, somewhat belatedly, in the principle of cost-effectiveness becoming the decisive factor in all Military estimates. The term simply means that every element of our military forces has to be subjected to critical analysis, to determine – in the context of the whole spectrum of our Military commitments and requirements – first whether the job for which it was designed is essential (not just desirable, but indispensable), and then whether that job could not be done at lower cost and with at least comparable efficacy by some other means.

The aim to which the Government is committed is to bring our total defence expenditure down to within a total of £2000 million a year at 1964 prices by 1970. It is thus a perfectly safe assumption that, in the course of the recent Defence Review, probably the major question with which the Staffs have been confronted was whether we can any longer afford the sea-borne air strike force of the present programme – three strike carriers in commission with their air components; whether, in effect, the Fleet Air Arm can be justified by the principle of cost-effectiveness.

It is generally agreed that some form of air strike force, capable of being deployed to meet our world-wide commitments, is indispensable. And the only alternative to the carrier strike force is, of course, a shore-based one.

My own assessment of this problem has led me to the conclusion that objective analysis of a major military problem can never have pointed to an answer as clear as that which should emerge from this one – namely that a shore-based force can meet the really essential requirements so much less expensively than a carrier-borne force that there should be no doubt about the decision. That decision, and the exact figures involved, have not yet been revealed; so in assessing the rather complex factor of relative costs, I have had to use some round and probably rather over-simplified figures which long experience of this problem convince me do not exaggerate the case for the shore-based force but which, I suspect, considerably understate it.

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The Royal Navy, of course, remains essential to our security. It is apparently committed, for political reasons, to the Polaris submarine programme. For the rest, it should be adequately equipped for its proper job at sea – especially with anti-submarine and anti-aircraft ships and commando carriers – instead of devoting the present very high proportion of its resources to a task which has little or nothing to do with the protection of sea communications is any conceivably realistic situation, but is merely a sea-borne extension of air power.

I am sure it is not commonly realised how enormously expensive Naval Aviation has always been in relation to its operational effect. And an example from recent history is, I think, a striking illustration of what is (or should be) the really decisive factor affecting any air programme – namely its cost per aircraft/impact on an enemy.

In Hitler's war our national survival and the ability of our land and air forces to remain in action depended on the outcome of the Battle of the Atlantic, in which the decisive enemy was the U-boat. The Royal Navy had 58 aircraft carriers in commission with about 1300 first-line aircraft; Coastal Command and the few Canadian maritime squadrons numbered about 750 aircraft – with, of course, their shore bases. There is no doubt that the proportion of Gross National Product absorbed by the former was considerably in excess of that devoted to the latter. But German U-boats destroyed at sea during the whole war in the Atlantic area by British carrier-borne aircraft numbered 19; those by our shore-based aircraft totalled 210 (196).*

The Fleet Air Arm also sank some enemy surface ships during World War II. The R.A.F. accounted for vastly greater numbers – most of them as a kind of diversion from other more every-day tasks; the Tirpitz, for instance, was sunk by the squadron of Bomber Command that had earlier breached the Mohne and Eder dams.

This bit of ancient history is an important background against which to judge the Government's decision on the future of the Fleet Air Arm.

*The "bag" in other areas being 1-25 respectively.

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The reason for the cancellation of TSR 2 was that a force of these aircraft would have cost the taxpayer some £750 million capital and perhaps £30 million a year running costs – call it a total of about £1000 million over a ten year period. The carrier strike force of the 1965 programme would cost very considerably more than that figure over the same period.

But TSR 2 is now a dead duck. And the present proposal is to provide a smaller shore-based force of its replacement, the American F 111A, at a cost of less than half that of the carrier strike force, and comprising a good many more first-line super-sonic reconnaissance-bombers than there would be sub-sonic strike aircraft in the latter.

It is thus not an unfair approximation to say that, on the oversimplified ‘nob for nob’ basis in terms purely of value for money, the strike-carrier force is about 3 times as expensive as the shore-based force. But that sum does not take into account the factor of cost per aircraft/impact. Comparing relative performance – especially range and bomb-load – it is no exaggeration to say that one F 111A is the equivalent of two of the very efficient Buccaneers (Mr. Healey in the Commons has used the ratio of one to five, in one specific ‘scenario’ involving a 900 mile radius). Thus the carrier force becomes about six times as expensive as the shore-based force.

But there is yet another factor. All experience proves that out of three carriers in commission it can never be assumed that more than two will be available at any one time – indeed, recent events have shown that even this is an optimistic estimate in some circumstances. For this reason one must subtract an average of at least a third from the number of carrier strike aircraft to be counted on as available for an operation – which brings their cost per aircraft/impact up to about eight to one compared with the shore-based F 111A.

These kind of equations contain so many variables that they can never be very precise. On the one hand, for instance, there might be circumstances in which more strikes could be made within a given period from a carrier than from shore bases at greater range; on the other, the period in which a carrier can remain in action without returning to base is strictly limited. Again, the cost quoted for the carrier force does not include that of the indispensable escort vessels; but it is sometimes argued (to my mind not very convincingly) that these vessels are necessary whether we have a carrier force or not. An air

base ashore is easier for an enemy to find than a mobile sea-borne air base; but when the latter is found, it is far more vulnerable – and so-on.

Suffice it to say that the foregoing rough and ready calculation of relative cost-effectiveness is certainly conservative.

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What are the reasons for this great disparity in cost-effectiveness?

The first is the capital cost of the carriers themselves – the floating airfields; that of the first replacement carrier has been quoted as £60 m; in the light of experience, it is a pretty safe bet that it would actually cost nearer £100 m. or more. There are then the running costs of maintenance and operation, including a large bill for oil fuel, periodical refits etc, the cost of the sailors (including their training backing) and civilians required to operate the ships at sea and maintain them in dock. It would not be very wide of the mark to say that the overall cost of the carriers themselves – taking into account the modernised replacements which would soon be required – would amount to more than those of the whole shore-based force at the strength now envisaged.

Next comes the only reason for the existence of these great ships, namely the aircraft they carry. These are provided by the Navy Department on a considerably more lavish scale in relation to first-line strength than in the R.A.F. This is due partly to a higher wastage rate and a higher proportion in “non-established” use, reserves, etc. The Navy also finds it necessary to train about twice as many pilots as does the R.A.F. to fill a given first-line establishment. And the present increasing shortage of candidates for service as air crews at sea has led to the offer of financial inducements far higher than the R.A.F. finds necessary; this may have been unavoidable, but it is a curious reflection in these days of economic stringency on the apparent reluctance of the Navy to share this commitment with the R.A.F.

The essential core of the Fleet Carrier complements – the only thing which is really relevant to this argument – is the force of strike aircraft; this is the element that has the direct impact on an enemy. It represents on the average only about 40% of the aircraft in the carriers. The remaining 60% are on board primarily to protect the floating airfield itself – fighters, anti-submarine aircraft, early warning and rescue aircraft. It is true that some

of these ancillary aircraft – the Phantom fighters for instance – could in certain circumstances have some strike impact on an enemy; but this does not invalidate comparison because the same is true in a greater degree of several corresponding classes of shore-based aircraft which must still be provided whether we have a Fleet Air Arm or not.

This, it will be evident, is an important element in the greater cost per aircraft/impact of the carrier force.

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There is a theory, voiced for instance by Field Marshal Montgomery in the House of Lords, that the carrier is an “indispensable mobile air base for all three Services”. Is it? Let us examine that claim a little more closely.

It implies that provided we have carriers we can dispense with shore bases, which it is now fashionable to assume we are bound to lose anyway. How carriers and their escorts are going to be able to do without protected harbours and dockyards is never explained (incidentally a more attractive target for even a minor enemy than a carrier in dock is difficult to imagine); we could certainly not afford anything like the enormous Fleet train that the Americans find necessary. Anyway, can the carrier-borne squadrons do without any shore air bases anywhere next the area of operations – is that the experience of ship-borne aircraft anywhere in the world? On the contrary, the Fleet Air Arm is nearly as dependent on shore airfields in the same part of the world as the scene of action as is the R.A.F. which, when we have the F 111A (and still more with the advent of V/S.T.O.L.) will no longer be dependent on great concrete runways.

But apart from that, is it really assumed that a couple of carriers could provide all the air cover and support that our land forces would require in all reasonably probable circumstances? One need not conjure up the very unlikely contingency of our having to mount an opposed landing on a remote hostile shore to doubt that. Can carriers be relied on to be on the scene sufficiently quickly? Can they remain at the scene of action for as long as they may be required? Could they provide all the air cover needed for their own bases and those of the Army? What about the transport aircraft to carry land forces to the scene of operations – where are they to land and who is going to protect them? How are the relatively short-range ship-borne aircraft going to deal with

longer-range enemy shore based aircraft such as the Badger bomber – now being supplied by the Soviets to our ill-wishers in the Middle and Far East? If they could not, would it be regarded as a reasonable risk to commit any of our forces – land, sea or air – to operations against even a second class enemy?

It is necessary to add that the R.A.F. has recently proved that it can deploy a strike force from England ready for action in the Far East within 48 hours of the word go – without any preliminary warning. And it is difficult to imagine circumstances in which a modern shore-based force, with its airborne maintenance echelons, would be unable to reach a scene of action – even if Aden were no longer available.

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What surely emerges from all this is that, if money is no object as in the United States, it is possible to make a case for having fifteen strike carriers in commission; it is easy to make a case for having none; what seems to me quite impossible is to make a case for having three – on which the unfortunate taxpayer would have to spend between £2 million and £3 million a week over the next 10 years.

The answer surely lies in the application of what I regard as the only sound principle – that the man who fights on or under the sea should be a sailor, the man who fights on the ground a soldier and the man who fights in the air an airman, all under unified direction and control at the top. That is the best, indeed I think the only way to achieve real Defence economics. Relations between the Services have improved out of all recognition since the Beatty/Trenchard era just after the Kaiser's war when I was a young officer on the Air Staff; but they have suffered some deterioration recently. It is no use blaming this on 'the politicians'. These inter-Service controversies have their roots in the fact – maybe distasteful in its implications but nevertheless inescapable – that to-day, if we are to meet our world-wide strategic responsibilities, we have no choice but to squeeze the ultimate farthing's worth of real military value out of every pound in the Defence estimates. That being me, it is the duty of all officers of every Service to get on with their own jobs and bend their energies as a team, each in his own sphere, to do the job they are paid for – to defend the safety, honour and welfare of our Sovereign and her Dominions.

14 October '65

‘Air Power – Seaborne or Shore-based?’

In these days it is more than ever essential that every element of our Military strength should be subjected to critical analysis, to determine – in the context of the whole spectrum of our commitments and requirements – first, whether the job for which it was designed is essential (not just desirable, but indispensable), and then whether that job could not be done at lower cost and with at least comparable efficacy by some other means. It was therefore inevitable that a major question for consideration in the course of the Defence Review should have been whether the sea-borne air strike force of the 1965 programme – three strike carriers in commission, with their air complements – is commensurate with the high cost involved.

The Royal Navy clearly remains vitally important, and must be adequately equipped for its proper job at sea – which at present it is not. But the conditions for which we have now to provide are not those of previous wars; and anyway the role of the strike carriers has little or nothing to do with the protection of sea communications, but is almost entirely a sea-borne extension of air power.

There is no disagreement about the need for shore-based strike capacity, available for our Nato commitments as now, and capable of being deployed to meet our obligations East of Suez. The question is whether we must have sea-borne air power in addition; to which the answer must be sought in ruthless and unsentimental cost-analysis.

The recommendations on that subject in the Defence Review and the detailed costs involved, have not been officially revealed. In arriving at my own conclusion that shore-based squadrons can meet the really essential requirements much less expensively than a Carrier force, I have had to use some round figures which, I am satisfied, do not overstate the case.

I am sure it is not commonly realized how expensive Naval Air has always been in relation to its operational effect. In World War II, for example, our survival and the ability of our fighting Services to go on fighting depended on the outcome of the Battle of the Atlantic, in which the decisive enemy was the submarine. The Royal Navy had 58 carriers with 1290 first-line aircraft; the Maritime aircraft of the R.A.F. and Dominion Air Forces, world wide, numbered under 1000. Enemy submarines sunk at sea

throughout the war in the Atlantic area numbered 19 by the Fleet Air Arm and 196 by shore-based aircraft – the bag in other theatres being 1 and 25 respectively.

Carrier-borne aircraft also sank some enemy surface ships during the war. The R.A.F. sank vastly greater numbers, many as a diversion from other tasks; Tirpitz, for instance, was destroyed by a squadron of Bomber Command that had earlier breached the Mohne dam.

This bit of not so ancient history throws a revealing light on what will no doubt be an important factor in any decision on the future of the carrier force – its cost per aircraft/impact on an enemy.

COST-EFFECTIVENESS

The reason for the cancellation of TSR 2 was that a force of these aircraft would have cost the taxpayer some £750 million capital and perhaps £30 million a year running costs – a total of about £1000 million over a ten year period. The carrier strike force of the 1965 programme would cost very considerably more than that figure over the same period – not counting the cost of the indispensable escort vessels.

But TSR 2 is, alas, now a dead duck. And the present proposal is to provide in its place a smaller force of the American F 111 A, at a cost of less than half that of the carrier strike force over the same period, and comprising substantially more first-line super-sonic reconnaissance-bombers than there would be trans-sonic strike aircraft in the latter.

So it is a fair approximation to say that, in terms purely of ‘hardware’ value for money the strike-carrier force is about 3 times as expensive as the shore-based force.

But that does not take into account the factor of cost per aircraft/impact. Comparing relative performances – especially range and bomb-load – it is fair to say that one F.111A is the equivalent of more than two of the very effective Buccaneers (Mr. Healey in the Commons had used the ratio of one to five, in one specific ‘scenario’ involving a 900 mile radius). On this basis the carrier strike becomes about six times as expensive as the shore-based.

All experience proves, moreover, that out of three carriers in commission one can never count on more than two being available at any time – indeed, recent events have shown that even this is an optimistic estimate. For this reason we must subtract an average of at least a third from the number of strike aircraft available for an operation – which brings the cost per aircraft/impact up to something like eight to one compared with the shore-based F.111A.

These kind of equations contain so many variables that they can never be very precise. There might, for instance, be circumstances in which more strikes could be made within a given period from a carrier than from shore bases at greater range; on the other hand, the period in which a carrier can remain in action without returning to base is strictly limited. But I believe the foregoing rough and ready calculation of relative cost-effectiveness to be on the conservative side.

CARRIER COSTS

What are the reasons for this great disparity in cost-effectiveness?

The first is the capital cost of the carriers themselves – which have to be replaced by new ones from time to time; that of the first replacement carrier has been quoted as £60M, but in the light of experience it is a pretty safe bet that it would actually cost £100M or more. There are then the running costs of maintenance and operation, including large sums for oil fuel and periodical refits, and the cost of the sailors and civilians required to operate the ships at sea and maintain them in dock. It would not be very wide of the mark to say that the overall costs of the carriers themselves over the ten year period would amount to more than those of the whole shore-based force now envisaged.

Next comes the only reason for the existence of these great ships, namely the aircraft they carry. These are provided by the Navy Department on a higher scale in relation to first line strength than in the R.A.F. This is due partly to higher wastage rate, a bigger proportion in reserve and other reasons. The Navy also finds it necessary to train many more pilots than does the R.A.F. to fill a given first-line establishment; and the present increasing shortage of candidates for service as air crew at sea has led – perhaps unavoidably but regrettably – to the offer of financial inducements higher than the R.A.F. finds necessary.

The essential core of the strike Carrier complements – the only thing which is really relevant to this argument – is the establishment of strike aircraft; this is the element that has the direct impact on an enemy. But on the average less than 30% of the carrier's component of aircraft could be available for this task. All the fighters, some of the strike aircraft, the early warning aircraft and the anti-submarine helicopters would be required for the protection of the ships itself. It is true that some of these aircraft – the Phantom fighters for instance – could in certain circumstances have some strike impact on an enemy; but this does not invalidate comparison because the same is true of similar shore-based aircraft which must still provided whether we have a carrier force or not.

This, it will be evident, is an important element in the greater cost per aircraft/impact of the sea-borne strike.

OVERSEA BASES

Is there any factor that makes a carrier force indispensable, despite its costs?

There is a popular theory that provided we have carriers we can dispense with shore bases. How carriers and their escorts are going to be able to do without protected harbours and dockyards is not apparent (incidentally a more attractive target for even a minor enemy than a carrier in dock is difficult to imagine); we could certainly not afford anything like the enormous Fleet Train that the Americans find necessary.

Our plans are not concerned with opposed landings on remote hostile coasts, for which sea-borne Air could be valuable in the initial stages. Assuming the more realistic requirement, the ability to respond to a request for help from a Commonwealth partner or ally East of Suez, is it really supposed that a couple of carriers could provide all the air support that our land forces would require in all reasonably probable circumstances? Could they provide the necessary air cover for the army ashore as well as for themselves? Can carriers be relied on to arrive on the scene sufficiently quickly? Can they remain in action for as long as they may be required? What about the transport aircraft to carry land forces to the scene of operations – where are they to land and who is going to protect them? How would relatively short-range Naval strike aircraft counter the longer range shore-

based bombers such as the Badger, now being supplied by Russia to our ill-wishers in the Middle and Far East? If they could not, would it be an acceptable risk to commit any of our forces – land, sea or air – to operations against even a second-rate enemy?

In point of fact, the Fleet Air Arm is not much less dependant on airfields ashore in the same part of the world as the scene of action than the R.A.F. which, when we have the F.111 (and still less with the advent of V/STOL), will not be dependant on great concrete run-ways.

I should add that the R.A.F. has recently proved that it can deploy a strike force from England ready for action in the Far East within 48 hours of the word Go – without any preliminary warning. And it is difficult to imagine conditions in which a modern shore-based force, with its airborne maintenance echelons, would be unable to reach a scene of action – even if Aden were no longer available.

Of course, if there were no bases overseas that we could use, then we could not operate East of Suez at all.

CONCLUSION

The answer to all this lies in the application of the only sound principle – that operations on or under the surface of the sea should be the job of the Navy, those on land that of the Army and those in the air the responsibility of the R.A.F. That is the best, indeed I think the only way to achieve real economies in the Defence field. It is a concept that inevitably gives rise to controversies; but these have their roots in the fact – maybe unwelcome in its implications but inescapable – that today, if we are to fulfil our world-wide strategic responsibilities, we have no choice but to squeeze the ultimate farthing's worth of real military value out of every pound in the Defence Estimates.

November 1965

‘Naval Air Power – is it worth it?’

The current examination of our defence policy and requirements has brought into the open the more extreme elements among the protagonists of Naval Aviation, who have even gone so far as to describe as “the paramount question for the future of our armed forces – do we any longer require a separate Air Force?” I deplore these public, and necessarily incompletely informed, Inter-Service controversies – the whole trend of modern defence organisation is opposed to this kind of narrow sectionalism. But that sort of consideration has never had much effect on the extreme Naval school of thought, and open attacks on the R.A.F. cannot be allowed to stand unanswered. Moreover it is important that the public – who, after all, have to foot the bill – should be aware of what all this is about, and know some salient facts about sea-borne air power which may surprise them.

It was much the same kind of Naval pressure which led to the transfer of the Fleet Air Arm from R.A.F. to Naval control in 1937. That was inevitable at the time, in view of the predominant Naval influence in Whitehall and the country as a whole, and the R.A.F. accepted it loyally though with regret. But it is instructive to summarise the result, to help us form a judgement about present claims for Naval Aviation.

By the end of the late war the Royal Navy had in commission 58 aircraft carriers, with their attendant escort and auxiliary vessels, and a first line strength in aircraft of about 1300, backed by large numbers of reserve and training aircraft and many shore stations of various kinds. As far as I am aware, this was unrelated to any considered estimate by the Chiefs of Staff of our real strategic requirements.

In comparison, Coastal Command of the R.A.F. comprised some 900 shore-based aircraft, of which about half were in the anti-submarine squadrons. And the Admiralty constantly pressed for this strength to be increased at the expense of other components of the R.A.F., notably Bomber Command.

As far as I know these two elements of air power in Hitler’s war have never been accurately costed. But I have not the slightest doubt that the proportion of our G.N.P. absorbed by the Fleet Air Arm and its carriers was largely in excess of that represented by Coastal Command and its

shore-bases. Let us examine briefly their relative impact on the enemy in that maritime battles on the issue of which depended our national survival and the capacity of our land and air forces to remain in operation; it was probably the most critical battle of the war, and the decisive enemy was the U-boat.

German submarines sunk during the whole war by British ship-borne aircraft numbered 19; those sunk by shore-based aircraft (mainly of Coastal Command) totalled 210; these figures exclude 18 U-boats sunk by air-laid mines, of which one fell to carrier-borne and the other 17 to shore-based aircraft; they also exclude 21 commissioned U-boats sunk in harbour by Bomber Command; and they take no account of more than 100 destroyed in course of production by Allied bombing in Germany.

It is true that the Fleet Air Arm also destroyed some enemy surface ships during World War II; but the R.A.F. destroyed vastly greater numbers.

This, of course, is now ancient history, but it is an enlightening background against which to judge the validity and probably cost of the claim that the exercise of British air power should now be handed over to the Royal Navy – with, no doubt, more useful assistance on the side from an Army Air Arm.

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Let us now have a look at the present-day relative economics of shore-based and sea-borne strike capacities, using round and necessarily rather over-simplified figures which, nevertheless, I believe do not overstate the case.

The reason for the cancellation of TSR 2 was that the element of British air power represented by a relatively small force of these aircraft would have cost the taxpayer some £750 m. capital and perhaps £30 m. a year running costs – pay a total of £100 m. a year over a period of ten years. I wonder how many of our legislators or taxpayers realise that this other element of air power, the Fleet Air Arm (which has attracted virtually no public attention), looks like letting us in over the same period for something not far short of twice that amount. This includes the cost of two commando ships with their complement of Marines and helicopters and some thirty or forty other helicopters for the anti-submarine role carried in cruisers, destroyers and

other miscellaneous craft, the need for which no-one should challenge. But comparing like for like, and the implication is that the strike squadrons in the Fleet carriers should take the place of the TSR 2 replacement, the F 111A, it is a safe bet that their aggregate cost over a 19 year period would be considerably more – probably something of the order of 30 % more – than the cancelled TSR 2 force.

But, keeping in the background of our minds this figure of relative cost, we must forget the TSR 2, and take as a shore-based yardstick the smaller and cheaper number of the equivalent F 111A, which will cost something over £500 million – or substantially less than half the cost of the Fleet carrier programme. Taking into account relative performance, especially range and bomb-load, it is no overstatement to assert that on a cost-effectiveness basis one F 111A is worth 3 of the Naval strike aircraft, the Buccaneer (Mr. Healy has used the figure of one to five for a sortie at 900 n.m. radius), and even this favours the Naval aircraft, since the F 111A can carry a heavy load of bombs to longer ranges at which the Buccaneer can not operate at all. But disregarding that, a simple calculation will show that, even assuming that only the same first-line numbers of strike aircraft could be provided under the F 111A project as those in the actual strike carrier programme, the impact of the latter on the enemy would still be about 1/3rd of the former and would cost more than twice as much; in actual fact the first-line numbers of F 111A that could be provided for less than £600 million would be more than twice as many; so the cost per aircraft impact (the real point at issue) of the Naval air programme would work out at about 15 times as much as the shore-based F 111A project over the ten year period.

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All this seems at first sight so incredible as to demand explanation. What are the reasons for this enormous disparity in cost-effectiveness?

The first is the capital and running costs of the strike carriers themselves – the floating airfields – excluding those of the other warships required to protect and support these airfields (a little matter sometimes overlooked); unlike airfields ashore, carriers can be sunk by any enemy with a few submarines unless they are heavily escorted. The cost of the next replacement carrier has been quoted as £60 m. In the light of experience, another pretty safe bet is that it will actually cost nearer £100m.

There are then the costs of maintenance and operation, including a large bill for oil fuel, periodical refits etc. And there is the cost of the sailors (including their training backing) and civilians required to operate the ships at sea and maintain them in harbour.

All this – be it noted – is for the carriers themselves, without taking any account of the purpose for which they exist, namely to carry and operate aircraft. It would not be very wide of the mark to say that the overall costs of the strike-carrier squadrons, equipped with the new floating airfields which would soon be required, would amount to more than the whole cost of the force of F 111A at the strength now envisaged.

Next comes the real reason for the existence of these great grey ships, which look so glamorous on the television and conjure up nostalgic memories of our Imperial past; namely the aircraft they carry. These are provided by the Navy Department on a considerably more lavish scale in relation to first line strength than in the R.A.F. This is due partly to a higher wastage rate and a higher proportion in “non-established” use, reserves, etc; but partly also to a more extravagant tradition. The Navy finds it necessary to train about twice as many pilots as does the R.A.F. to fill a given first-line establishment. And the present increasing shortage of candidates for service as Naval air crews is giving rise to claims for financial inducements far higher than the R.A.F. finds necessary – a curious reflection on the suggestion that the R.N. should now assume the residual responsibilities of the R.A.F.

The essential core of the Fleet Carrier complements – the only thing which is really relevant to this argument – is the force of strike aircraft; this is the only element of any interest to an enemy. This represents on the average only about 40% of the aircraft carried in these monster vessels. The remaining 60% are on board to protect the floating airfield itself – fighters, anti-submarine aircraft, early warning and rescue aircraft.

Moreover, all experience goes to prove that out of 3 carriers it is never safe to assume that more than 2 will be available for any one operation; indeed recent events have shown that even this is an optimistic estimate in some circumstances. That means that of the Naval first-line, only an average of some 25 to 30 Buccaneers could be counted on as available to strike an enemy; and that, even on the 3 to 1 basis assumed above which actually favours the sea-borne aircraft, is the equivalent of eight to ten F 111A. This is another not

unimportant factor in the cost-effectiveness analysis to which I have already referred.

Is this a very rewarding return for an expenditure of some £120 to £130 million a year, and the employment of a major proportion of the Navy's 100,000 uniformed and 120,000 civilian personnel?

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There is an amiable theory – voiced, for instance, by F.M. Montgomery in the House of Lords – that the carrier is the “indispensable mobile air base for all three services”. Is it? Let us examine that claim a little more carefully.

It implies, *inter alia*, that provided we have carriers we can dispense with shore bases, which it is now fashionable to assume we shall lose anyway. How carriers and their escorts are going to be able to dispense with harbours and dockyards is never explained. Could we ever afford the enormous Fleet Train that the Americans find necessary?

But apart from that, is it really assumed that a couple of carriers could provide all the air support that our land forces could require in all reasonably probable circumstances? One need not conjure up the very unlikely contingency of our having to mount an opposed landing on a remote hostile shore to doubt that. Can they be relied on to be on the scene sufficiently quickly or, with their short endurance, to be able to remain there long enough? Could they provide all the air cover required for their own base or those of the Army? What about the transport aircraft to carry land forces to the scene of operations – where are they going to land and who is going to protect them? How are these necessarily relatively short range aircraft going to deal with longer range shore-based aircraft such as the Badger bomber – now being supplied by the Soviets to our ill-wishers in the Middle and Far East? If they could not, would it be regarded as a reasonable risk to commit any of our forces, land, sea or air, to operations against even a second class enemy?

And finally, are the carrier-borne squadrons going to do without any shore air bases anywhere near the area of operations – is that the experience of the Fleet Air Arm anywhere in the world? This is a fantastically unrealistic

idea; the Fleet Air Arm is almost as depend on shore air bases in the vicinity of the area of operations as is the R.A.F. And any more attractive target for even a minor enemy than a carrier in dock it would be difficult to imagine.

However, even the most extreme Naval protagonist would hardly claim that we need no shore-based squadrons. The basic idea obviously is that we should put the clock back half a century, split up the R.A.F. between the Navy and Army, and have a grant Naval Air Force centred on the carrier. Of that I can only say that nothing in my 50 years in the Air Service gives me any reason to imagine that anything of the kind would conduce either to economy or to military effectiveness. On the contrary, there is not the slightest doubt that exactly the reverse would be the result. It is, moreover, a proportion that public opinion would nor for a moment be willing to accept.

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The inescapable conclusion, I feel bound to say, is that Naval Aviation is and always has been the most extravagant and least generally effective form of fighting force ever yet devised. If money is no object, as in the U.S., it is just possible to make a case for having 15 strike carriers in commission; it is very easy to make a case for having none; it is quite impossible to make any sort of case for having 3 – on which the unhappy British taxpayer is expected to spend getting on for £3 million a week over the next 10 years.

I know of no R.A.F. officer who would subscribe to any such asinine suggestion as that we do not need a ‘separate’ Navy; this sort of talk is really insufferable clap-trap in this day and age.

What I want to see is the application of what I regard as the only sound principle – that the man who fights on or under the sea should be a sailor, the man who fights on the ground a soldier and the man who fights in the air an airman, all under unified direction and control at the top. This is the best, indeed I think the only way to achieve real Defence economics. But we must have a Navy that, instead of squandering resources on superfluous Polaris submarines and grossly uneconomic floating airfields, is really adequately manned and equipped for its proper job, with surface and submarine anti-submarine craft, cruisers, destroyers, anti-aircraft ships, minelayers, more ships and helicopters to carry more Royal Marine Commandoes or their Army equivalent – which at present the Royal Navy is not.

Ever since the Beatty/Trenchard era just after the Kaiser's war, when I was a young officer on the Air Staff, the Blue Water school has been trying to abolish the R.A.F. For pity's sake let us have an end to this dangerous nonsense and bend our energies as a team, each in our own sphere, to do the job we are paid for – to defend the honour, safety and welfare of our Sovereign and her Dominions.

Bibliography and recommended reading

Published books and articles

- Allen, Hubert Raymond, *The Legacy of Lord Trenchard* (London: Cassel & Company Ltd, 1972).
- Armitage, Michael, *The Royal Air Force* (London: Arms and Armour Press, 1993).
- Ashworth, Chris, *RAF Coastal Command: 1936-69* (Somerset: Patrick Stephens Limited, 1992).
- Barlow, Jeffrey G, *Revolt of the Admirals. The Fight for Naval Aviation, 1945-1950* (London: Brassey's, 1989).
- Biddle, Davis Tami, *Rhetoric and Reality in Air Warfare* (Oxford: Princeton University Press, 2002).
- Bowyer, Chaz, *Fighter Command 1936-1968* (London: Book Club Associates, 1980).
- Boyle, Andrew, *Trenchard: Man of Vision* (London: Collins, 1962).
- Bradford, Jeffrey, *Thirty Years on: Reflections on CVA-01 Versus TSR2*, <http://www.jeffreybradford.com/JB1%202003.pdf> (Downloaded 13 June 2006).
- Brodie, Bernard, *A Guide to Naval Strategy* (New Jersey: Princeton University Press, 1944; and New York: Praeger, 1965).
- Buckley, John, 'Maritime Air Power and the Second World War', in Cox, Sebastian and Gray, Peter, eds., *Air Power History* (London: Frank Cass, 2002).
- Cooper, Frank, 'The Direction of the Air Force policy in the 1950s and 1960s', in *The Proceedings of the Royal Air Force Historical Society* (St Leonards-on-Sea: Hastings Printing Company Limited, Issue No.11, 1993).
- Corum, James S, 'The Myth of Air Control. Reassessing the History', in *Aerospace Power Journal* (Winter 2000).
- Cox, Sebastian and Gray, Peter eds., *Air Power History* (London: Frank Cass, 2002).
- Emme, Eugene Morloc, *The Impact of Air Power: National Security and World Politics* (Princeton: Van Nostrand, 1959).

- Fallon, William J., 'Over the next hill: a sailor's perspective of maritime air power and the legacy of Lord Trenchard', in *RUSI Journal* (Vol. 147, No. 2, 2002).
- Goulter, Christina J.M., *A Forgotten Offensive. RAF Coastal Command's Anti-shiping Campaign, 1940-1945* (London: Frank Cass, 1995).
- Grant, Rebecca, 'Trenchard at the creation', in *Air Force Magazine* (Vol. 78, No. 2, 2004).
- Gray, Peter ed., *British Air Power* (London: The Stationary Office, 2003).
- Grove, Eric J., *Vanguard to Trident* (Maryland: Naval Institute Press, 1987).
- Gunsten, Bill and Donald, David, 'Fleet Air Arm 1960-69', in *Wings of Fame* (Vol. 1, 1995).
- Harding, Richard ed., *The Royal Navy 1930-2000* (London: Frank Cass, 2005).
- Hart, Liddell, *History of the Second World War* (London: Papermac, 1997).
- Healey, Dennis, *The Time of My Life* (London: Michael Joseph, 1989).
- Hezlet, Arthur, *Aircraft & Sea Power* (London: Peter Davies, 1970).
- Hill, Richard, *The Oxford Illustrated History of the Royal Navy* (Oxford: Oxford University Press 1995).
- Kudrycz, Walter, 'A Practical prophet: Arthur Harris, the legacy of Lord Trenchard, and the question of "Panacea" targeting', in *Air Power Review* (Vol. 5, No. 1, 2002).
- Kyle, Keith, *Suez, Britain's End of Empire in the Middle East* (London: I.B.Tauris Publishers, 2003).
- Laite, B.C., *Maritime Air Operations* (London: Brassey's, 1991).
- Lee, David, *Flight from the Middle East* (London: Crown Copyright, 1980).
- Longstaff, Reginald, *The Fleet Air Arm* (London: Robert Hale Limited, 1981).
- Meilinger, Phillip S., 'Trenchard and "Morale bombing": the evolution of Royal Air Force doctrine before World War II', in *Journal of Military History* (1996).
- Meilinger, Phillip S., *Airwar* (London: Frank Cass, 2003).
- Meilinger, Phillip S., 'The Historiography of Airpower: Theory and Doctrine' in *Journal of Military History*, (Vol. 64, 2000).
- Meilinger, Phillip S., 'Slessor and the genesis of air interdiction', in *RUSI Journal* (1995).
- Meilinger, Phillip S., et al., *The Paths of Heaven: The Evolution of Airpower Theory* (Alabama: Air University Press, 1997).
- Mets, David R., *The Air Campaign: John Warden and the Classical Airpower Theorists* (Alabama: Air University Press, 1999).
- Mowthorpe, Matthew, 'The UK's Aircraft Carriers and their Rationale', in *Journal of Social, Political and Economical Studies* (Vol. 28, Summer 2003).

- Murfett, Malcolm ed., *The First Sea Lords. From Fisher to Mountbatten* (London: Praeger, 1995).
- Nesbit, Roy Conyers, *An Illustrated History of the RAF* (London: Salamander Books, 2002).
- O'Brien, Phillips P. ed., *Technology and Naval Combat in the Twentieth Century and Beyond* (London: Frank Cass, 2001).
- Orange, Vincent, *Slessor* (London: Grub Street, 2006).
- Probert, Henry, *High Commanders of the Royal Air Force* (London: HMSO, 1991).
- Robertson, Scott, 'The Development of Royal Air Force Strategic Bombing Doctrine between the Wars. A Revolution in Military Affairs?' in *Aerospace Power Journal* (Spring 1998).
- Sims, Charles, *The Royal Air Force – The First Fifty Years* (London: Adam & Charles Black, 1968).
- Slessor, John, *Air Power and Armies* (London: Oxford University Press, 1936).
- Slessor, John, *Strategy for the West* (London: Cassel & Company Ltd, 1954).
- Slessor, John, *The Central Blue* (London: Cassel & Company Ltd, 1956).
- Slessor, John, *The Great Deterrent* (London: Cassell & Company Ltd, 1957).
- Slessor, John, *These Remain* (London: Michael Joseph, 1969).
- Slessor, John, *What Price Coexistence? A Policy for the Western Alliance* (London: Cassell, 1962).
- Smith, Malcom, *British Air Strategy between the Wars* (Oxford: Clarendon Press, 1984).
- Snyder, William P, *The Politics of British Defence Policy, 1945-1962* (Ohio: Ohio University Press, 1964).
- Speller, Ian and Tuck, Christopher, *Amphibious Warfare* (Kent: Amber Books Ltd, 2001).
- Speller, Ian, 'Amphibious Renaissance. The Royal Navy and the Royal Marines, 1956-1966', in *International Journal of Naval History* (Vol. 1, April 2002).
- Straw, Sean and Young, John W, 'The Wilson Government and the Demise of TSR-2, October 1964-April 1965', in *The Journal of Strategic Studies* (Vol. 20, No. 4, December 1997).
- Sturtivant, Ray, *British Naval Aviation. The Fleet Air Arm 1917-1990* (Annapolis: Naval Institute Press, 1990).
- Tagg, Michael C, 'Wings over Water' in *Maritime Patrol Aviation* (September 1994).
- Till, Geoffrey, 'Maritime Airpower in the Interwar Period: The Information Dimension' in *The Journal of Strategic Studies* (Vol. 27, No. 2, June 2004).

Till, Geoffrey, *Air Power and the Royal Navy 1914-1945: A Historical Survey* (London: Jane's Publishing Company, 1979).

Treuenen, James, *The Royal Air Force – The Past 30 Years* (London: Macdonald and Jane's, 1976).

Ziegler, Philip, *Mountbatten: The Official Biography* (London: Collins, 1985).

Zuckerman, Solly, *Monkeys, Men and Missiles. An Autobiography 1946-88* (London: Collins, 1988).

Unpublished sources

Documents from the National Archives, London: PP/Parliamentary Papers. ADM/Admiralty Files. AIR/Air Ministry Files. DEFE/ Ministry of Defence Files. PREM/Prime Minister Office Files.

- ADM 1/28639, Aircraft Carrier Programme: date for placing order for replacement for HMS Ark Royal, 1963.
- AIR 15/348, Admiralty/Coastal Command Committee: Anti-submarine Warfare (1943-46).
- AIR 2/2639, FLEET AIR ARM (Code B, 36): Fleet Air Arm: memorandum for Sir Thomas Inskip on organisation (1936).
- AIR 2/9655, ROYAL AIR FORCE: Coastal Command (Code B, 67/10): Maritime Air Forces: organisation (1945-46).
- AIR 20/11423, Future aircraft carriers and the island strategy: Admiralty/Air Ministry study, Jan-Feb 1963.
- AIR 20/5175, Control of Maritime Air Forces (1942-46).
- AIR 20/5567, Pamphlets by Marshal of R.A.F. Viscount Trenchard: 'The Principles of Air Power in War', 'Air Power and National Security' and 'The Effect of the Rise of Air Power on War' (1943-46).
- AIR 20/933, Coastal Command: operational control (1945-47).
- AIR 23/1360, War strategy: notes by Viscount Trenchard (1942).
- AIR 75/89, Times aviation supplement: draft articles on 'Nuclear strategy and the future of manned aircraft', 'TSR2' and 'The case against carriers', 1964.
- AIR 8/167, Independent bombing force: report of interview with Lord Trenchard (1934).
- AIR 8/223, Fleet Air Arm: Sir Thomas Inskip's reports and papers (1937).
- AIR 8/2354, Island Strategy and the carrier force, 1962-1963.
- DEFE 13/207, Directive by Minister of Defence, 9 September 1959.
- DEFE 7/2353, Defence policy review: modernisation of aircraft carriers, 1959-1963.
- DEFE 7/2354, Replacement of aircraft carriers, 1959-1963.
- PP, Statement on the Defence Estimates 1966, Part I: The Defence Review, HMSO 1966 (2901).
- PREM 11/2638, Discussions on possible transfer of RAF Coastal Command to RN (1958-59).
- Naval War Manual, *BR 1806* (1957/1961) (declassified RESTRICTED).
- RAF War Manual, *AP 1300* (1957/1963) (declassified RESTRICTED).

