

This electronic thesis or dissertation has been downloaded from the King's Research Portal at <https://kclpure.kcl.ac.uk/portal/>



Why, and how effectively, did the Royal Navy procure, and then use, escort carriers in the Second World War?

McMeekin, David

Awarding institution:
King's College London

The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without proper acknowledgement.

END USER LICENCE AGREEMENT



Unless another licence is stated on the immediately following page this work is licensed

under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

licence. <https://creativecommons.org/licenses/by-nc-nd/4.0/>

You are free to copy, distribute and transmit the work

Under the following conditions:

- Attribution: You must attribute the work in the manner specified by the author (but not in any way that suggests that they endorse you or your use of the work).
- Non Commercial: You may not use this work for commercial purposes.
- No Derivative Works - You may not alter, transform, or build upon this work.

Any of these conditions can be waived if you receive permission from the author. Your fair dealings and other rights are in no way affected by the above.

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Defence Studies Department
King's College London

Why, and how effectively, did the Royal Navy procure, and then use, escort carriers in the Second World War?

David McMeekin

Thesis submitted for the Degree of Doctor of Philosophy, Defence Studies

2024

Acknowledgements

I would like to record my great appreciation of Dr Tim Benbow for his exceptional support, advice and encouragement as my PhD supervisor. Dr Christina Goulter and my second supervisor, Dr Jon Robb-Webb, both of the Defence Studies Department, provided useful feedback at the time of my upgrade. Previously, Professor Sir Lawrence Freedman of King's College London sparked my nascent academic interest in military and naval history, introducing me to Dr Alan James who led the History of Warfare MA course, leading to stimulating lectures and discussions with, amongst others, Professors Andrew Lambert, Joe Maiolo, William Philpott, and my MA supervisor, Philip Sabin.

The National Archives at Kew was a major source of documents for this research and a special thanks is due to the staff there as well as to Dr Elizabeth Evans, who photographed documents on my behalf, in my absence from the archives during the pandemic. Individual documents were sourced from a variety of other archives, both electronically and in person, including the Churchill Archive Centre, Churchill College Cambridge, the Imperial War Museum, London, the Directorate of History and Heritage, Ottawa, the British Library, London, and the National Archives and Records Administration, Maryland, the staff of which all responded helpfully in often difficult times. A number of useful out of print books were found for me by the late Gerald Lee.

I would like to thank a wide range of individuals who have provided help, information, and advice. Conversations with the late Captain James Abraham and the late Admiral Sir John Treacher, both of whom served in the Fleet Air Arm, encouraged my interest in naval aviation matters, while Captain Nick Blackman (Retired), a fellow PhD student, provided helpful encouragement. Other instructive interlocutors included Commander David Hobbs (Retired), whose books were a valuable source for the thesis.

I would also like to express my appreciation of family and friends for their interest and support, including my daughter, grandson, nephew, nieces, members of my sporting syndicates, Graham Waterton and fellow MA student, Hugh Robertson. Special thanks are due to my brother-in-law, Michael Hill, who rescued my work on a number of occasions when my computer failed during the pandemic, and to both him and my sister-in-law Professor Faith Hill, who critiqued and encouraged in equal measure. Special thanks are also due to my sister-in-law Jo Powell for her strong encouragement from the outset and to a lifelong friend whose doctorate inspired me over fifty years ago, Dr Paul Collison. Finally, my thesis could not have been completed without the support of my wife, Christine.

This thesis is dedicated to my late father, Brian M^cMeekin (RNVR), who served in the Naval Stores Division of the British Admiralty before joining the British Admiralty Delegation, Washington, D.C., in 1943 at the age of 22, where he worked as a Lieutenant Commander, jointly responsible for the purchasing and supply of naval aviation equipment, including the run-down of Lend-Lease operations (1945-1946).

Abstract

This thesis assesses the Royal Navy's procurement and use of escort carriers in the Second World War. Using primary and secondary sources, the subject is explored in an integrated way, examining its roots in the prewar period and in the context of developing naval and national strategy and resources. This is in contrast to previous work, where procurement and use have largely been studied separately, either from an operational perspective in particular campaigns or as peripheral subjects, as a result of which the role of the escort carrier has often been marginalised.

The thesis identifies complex reasons for the delays in procuring escort carriers, including limited resources and new, evolving, and competing threats. It suggests the Royal Navy had a better understanding of the aircraft's potential against a range of threats than is sometimes argued, and that rebuilding and protecting the fleet, with its multiple roles, needed prioritising. Nevertheless, as the thesis shows, after their delayed procurement escort carriers were deployed successfully in many theatres and in many roles, from meeting the urgent need for trade protection to assisting amphibious landings by Allied armies and air strikes on enemy assets, both on land and at sea, thereby releasing fleet carriers for other important tasks. In the final stages of the war, even the British Pacific Fleet with its modern fleet carriers became dependent on the escort carrier for logistical support, thus enabling a major national strategic priority for the Royal Navy to work alongside the USN in the Pacific in a new type of naval warfare.

Abbreviations

A/A	Anti-Aircraft
AASSB	Allied Anti-Submarine Survey Board
ABR	Amphibious Bomber Reconnaissance aircraft
ACAS	Assistant Chief of the Air Staff (RAF)
ACM	Air Chief Marshal (RAF)
ACNS	Assistant Chief of Naval Staff (Admiralty)
ACS	Aircraft Carrier Squadron
ACV	Auxiliary Aircraft Carrier (US designation changed from AVG to ACV 20 August 1942)
ADM	Admiralty Papers, TNA
AHB	Air Historical Branch, Ministry of Defence
AIO	Action Information Organisation (British terminology; US terminology: Combat Information Center)
AIR	Air Ministry Papers, TNA
AL	Admiralty Letter
AM	Admiralty Message
AMC	Armed Merchant Cruiser (British)
America	United States of America
AMR	Armed Merchant Raider (Axis)
ASDIC	Allied Submarine Detection Investigation Committee (1917) (US terminology: Sonar)
ASV	Air-to-Surface Vessel radar
A/SW	Anti-Submarine Warfare
AU Committee	Anti-U-boat Warfare Committee
AVG	Aircraft Escort Vessel (US designation introduced 31 March 1941)
AVGAS	Aviation Gasoline (US terminology; British terminology: petrol)
AVIA	Ministry of Aviation, MAP, and related bodies, TNA
BAC	British Air Commission, Washington, D.C.

BAD	British Admiralty Delegation, Washington, D.C.
BAVG	British Aircraft Escort Vessel (British AVG). Constructed in US
<i>B-Dienst</i>	German Naval Intelligence radio monitoring service
<i>BdU</i>	<i>Befehlshaber der U-boote</i> . U-boat Command HQ or Commander
BL	British Library
BT	Board of Trade, TNA
BuS	Bureau of Ships, USN
CAB	Cabinet Papers, TNA
CAM	Catapult Aircraft Merchant ship
Carrier	Aircraft Carrier
CAP	Combat Air Patrol
CAS	Chief of the Air Staff (RAF)
CB	Confidential Book (Admiralty)
CCS	Combined Chiefs of Staff (British and American)
C-in-C	Commander-in-Chief
CID	Committee of Imperial Defence
CIGS	Chief of the Imperial General Staff
Cmd	Command Paper
CNAS	Chief of Naval Air Service (Royal Navy)
CNO	Chief of Naval Operations (USN)
CNR	Chief Naval Representative at MAP
CNS	Chief of Naval Staff (Admiralty)
CO	Commanding Officer
COS(s)	Chief of Staff (or Chiefs of Staff)
CV	Fleet Aircraft Carrier
CVE(A)	Amphibious Landing Support Carrier or Assault Aircraft Carrier
CVE	Escort Aircraft Carrier (US designation changed from ACV to CVE 15 July 1943, although the term 'escort carrier' was used extensively)
CVL	Intermediate (Light) Fleet Aircraft Carrier

CVS	Support Aircraft Carrier in A/SW
DAE	Director of Air Equipment (Admiralty)
DAM	Director of Air Matériel (Admiralty)
DAUD	Director of Anti-U-Boat Division (Admiralty)
DAWT	Director of Air Warfare and Flying Training (Admiralty)
DCAS	Deputy Chief of the Air Staff (RAF)
DCNO (Air)	Deputy Chief of Naval Operations for Air (USN)
DCNS	Deputy Chief of Naval Staff (Admiralty)
DF	Direction Finding
DLT	Deck Landing Training
DNAD	Director of Naval Air Division (Admiralty)
DNAO	Director of Naval Air Organisation (Admiralty)
DNC	Director of Naval Construction (Admiralty)
DOD	Director of Operations Division (Admiralty)
DOP	Director of Plans Division (Admiralty)
DTD	Director of Trade Division (Admiralty)
FAA	Fleet Air Arm
FAT	<i>Fedesapparattorpedo</i> . German zig-zagging torpedo
FCS	Fighter Catapult Ship
FDO	Fighter Direction Officer
Flak	A/A armament installed on U-boats
FO	Flag Officer
GB	Great Britain
GC and CS	Government Code and Cypher School. Forerunner of GCHQ
GRT	Gross Registered Tons
HF/DF	High Frequency/Direction Finding
HMS	His Majesty's Ship
IE	Initial Equipment
IFF	Identification Friend or Foe

IJN	Imperial Japanese Navy
IWM	Imperial War Museum, London
IR	Immediate Reserve
JHRO	Joint History and Research Office, Joint Chiefs of Staff, US
JIC	Joint Intelligence Committee, Britain
LHCMA	Liddell Hart Centre for Military Archives, King's College London
MAC	Merchant Aircraft Carrier
MAP	Ministry of Aircraft Production
MONAB	Mobile Operational Air Base
MSFU	Merchant Ship Fighter Unit (CAM)
MT	Ministry of War Transport
NARA	National Archives and Records Administration, US
NAS	Naval Air Squadron (Royal Navy)
Navy	Royal Navy
OBV	Ocean Boarding Vessel
OIC	Admiralty Operational Intelligence Centre
PREM	Prime Minister's Private Office correspondence, TNA
RAF	Royal Air Force
RAPWI	Repatriation of Allied Prisoners of War and Internees
RAS	Replenishment at Sea
RATOG	Rocket Assisted Take-Off Gear
RCAF	Royal Canadian Air Force
RCN	Royal Canadian Navy
RDF	Radio Direction Finding (radar)
RFC	Royal Flying Corps
RG	Records Group, US National Archives
RN	Royal Navy
RNAS	Royal Naval Air Service
R/P	Rocket/Projectiles

R/T	Radio Telephone
<i>Schnorkel</i>	An apparatus which allowed U-boats to run diesel engines whilst submerged
SDAC	Shipping Defence Advisory Committee (1937)
SO	Senior Officer
T5	<i>Zaunkönig</i> . German acoustic torpedo
TAC R	Tactical Reconnaissance
TAG	Telegraphist/Air-gunner
TarCAP	Target Combat Air Patrol
TBR	Torpedo-Bomber-Reconnaissance
TBS	Talk Between Ships
TNA	The National Archives, Britain
TPC	Trade Protection Carrier (also known as Trade Route Carrier): the British interwar name for what would become the auxiliary aircraft carrier and later the escort carrier (and subsequently CVE)
TSR	Torpedo-Spotter-Reconnaissance
UK	United Kingdom
US	United States of America
USAAF	US Army Air Force
USN	US Navy
USNA	US National Archives
USS	United States Ship
VCNS	Vice Chief of Naval Staff (Admiralty)
VHF	Very High Frequency
VLR	Very Long Range
WAC	Western Approaches Command
WPB	War Production Board, US
W/T	Wireless/Telegraphy

Table of Contents

Acknowledgements.....	2
Abstract.....	3
Abbreviations.....	4
Table of Contents.....	9
1. Chapter 1: Introduction, Research Questions, Methodology, and Literature Review	13
1.1 Introduction	13
1.2 Research Questions	15
1.3 Methodology.....	17
1.4 Literature Review	20
1.4.1 Introduction	20
1.4.2 Interwar and wartime defence policy and strategy.....	21
1.4.3 Navy in general	28
1.4.4 Procurement policy and resources	30
1.4.5 The anti-submarine war	32
1.4.6 Naval aviation.....	35
1.4.7 Aircraft carriers	37
1.4.8 Escort carriers	37
1.4.9 Conclusion to literature review.....	39
1.5 Conclusion and structure of the thesis	40
2. Chapter 2: Doctrine of Trade Protection, the First World War and the Interwar Years.....	42
2.1 Introduction	42
2.2 Early Doctrine of Trade Protection	42
2.3 The First World War.....	46
2.4 The Interwar Years 1918-1939.....	52
2.5 Conclusion.....	82
3. Chapter 3: Early Hostilities: September 1939-December 1941	85
3.1 Introduction	85
3.2 Strategic Overview	85
3.3 Procurement	88
3.3.1 Introduction	88

3.3.2	British stop-gap measures and other initiatives	91
3.3.3	British-built auxiliary carriers	103
3.3.4	US-built auxiliary carriers	106
3.3.5	Naval aircraft.....	108
3.4	Deployment.....	114
3.4.1	Introduction	114
3.4.2	Atlantic.....	118
3.4.3	Competing needs for auxiliary carriers	119
3.5	Conclusion.....	120
4.	Chapter 4: Endurance: December 1941–May 1943.....	122
4.1	Introduction	122
4.2	Strategic Overview	122
4.2.1	Impact of Pearl Harbor.....	122
4.2.2	Impact of Axis successes	123
4.2.3	The tide turns.....	126
4.3	Procurement.....	127
4.3.1	Introduction	127
4.3.2	British-built escort carriers and MAC ships.....	129
4.3.3	US-built escort carriers	142
4.3.4	Naval aircraft.....	147
4.4	Deployment.....	149
4.4.1	Introduction	149
4.4.2	Atlantic.....	151
4.4.3	Arctic convoys	158
4.4.4	North Africa invasion	160
4.5	Conclusion.....	161
5.	Chapter 5: On the Front Foot: 1 June 1943–31 May 1944	164
5.1	Introduction	164
5.2	Strategic Overview	164
5.3	Procurement	168
5.3.1	Introduction	168
5.3.2	British-built escort carriers	172
5.3.3	US-built escort carriers	174
5.3.4	Naval aircraft.....	178

5.4	Deployment.....	181
5.4.1	Introduction	181
5.4.2	Atlantic.....	186
5.4.3	Arctic and Norway.....	196
5.4.4	Mediterranean	199
5.4.5	Indian Ocean	200
5.5	Conclusion.....	202
6.	Chapter 6: Home Run: D-Day June 1944–September 1945.....	205
6.1	Introduction	205
6.2	Strategic Overview	205
6.3	Procurement	207
6.3.1	Introduction	207
6.3.2	British-built escort carriers	210
6.3.3	US-built escort carriers	210
6.3.4	Naval aircraft.....	212
6.4	Deployment.....	214
6.4.1	Introduction	214
6.4.2	Atlantic.....	214
6.4.3	Arctic and Norway.....	217
6.4.4	Mediterranean	221
6.4.5	Indian and Pacific Oceans	224
6.5	Conclusion.....	231
7.	Chapter 7: Conclusion	233
7.1	Introduction	233
7.2	Thesis Questions	234
7.3	Themes.....	242
7.3.1	Policy and strategy	242
7.3.2	Impact of resource constraints	243
7.3.3	Naval aircraft.....	244
7.3.4	Multiple-role escort carriers	245
7.4	Wider Observations	245
	Appendix: Maps	250
	Map 1. Battle of the Atlantic, May 1943.....	251
	Map 2. Arctic convoy routes, 1941-1942.....	252

Map 3. Southern Norway.....	253
Map 4. Operation Dragoon, August 1944.....	254
Map 5. The Aegean Sea, 1944-1945	255
Map 6. Indian Ocean.....	256
Map 7. South East Asia	257
Map 8. The Burma Coast, 1945.....	258
Map 9. Western Pacific and Approaches to Japan	259
Map 10. Admiralty Islands, showing Manus	260
Map 11. The Philippines, showing Leyte Gulf and Ulithi (Western Caroline Islands).....	261
Thesis Bibliography	262
Primary Sources	262
Secondary Sources	274

1. Chapter 1: Introduction, Research Questions, Methodology, and Literature Review

1.1 Introduction

This thesis assesses the Royal Navy's (RN or Navy) procurement and use of escort carriers, placing the Navy's choices in the context of strategy, policy, operations, and resources. It studies both the prewar period and the Second World War, as the policies in the latter period are rooted in the former. Most historians have looked at the escort carrier as a peripheral subject or focused on its operational aspects. This thesis offers a different approach, using primary and secondary sources to examine the Admiralty's choices in relation to this one vital weapon system and looking at procurement and use on an integrated basis.

The thesis argues that Britain entered the interwar period with the opportunity for leadership in naval aviation, having developed the basic island carrier design, launched and recovered aeroplanes and applied land-based aircraft successfully in an anti-submarine role in support of convoys. That it fell so far behind Japan and the US in terms of capability, and behind its own needs in terms of trade defence, is striking. Few historians appear to acknowledge fully the efforts made by the Admiralty to procure such vessels only to meet persistent resistance from other branches of government. Critics of the Admiralty may suggest that it could have acted sooner to avoid the procurement delays. However, it was not operating in isolation. Firstly, it faced evolving and competing strategic and tactical threats, which required it to rebuild the battlefleet and deal with the long lead-times in capital ship construction. Furthermore, crucially, throughout this period it was not master of its own destiny regarding financial and industrial resources or, for most of the period, the development and supply of aircraft. Indeed, when the government transferred the Royal Naval Air Service (RNAS) to the Air Ministry in 1918, it placed the development and procurement of naval aircraft under the control of a service competing for resources and whose priorities lay in its core belief in strategic bombing.

By the 1930s the Admiralty clearly recognised the case for what were to become escort carriers, as it responded to the evolving threats to the control of the sea lanes from

submarines, aircraft, and surface vessels, with the last – in the form of the surface raider – seen at the time as the greatest danger to convoys. The Admiralty recognised it needed a modern, balanced fleet, including aircraft platforms to enable it to exploit the full potential of the fleet in its many roles, including countering these threats, but scarce resources and a lack of control of the development and supply of naval aircraft left it with limited choices. This is in stark contrast to the United States Navy (USN), which controlled its own naval aviation and had a single, clearly identifiable potential enemy, and where Rear Admiral William A. Moffett was able to ensure its naval air arm had become the largest in the world by the time of his death in 1933. Furthermore, the development of the lightweight radial aircraft engine, coupled with funding assured by the powerful champions of naval aviation in Congress, allowed the USN to move much more quickly to develop new concepts of naval aviation.

The research assesses the Royal Navy's effectiveness in the context of this complex web of influences. The thesis presents an integrated examination of procurement and use, weighing up the wide-ranging influences on the choices made by the RN in the Second World War, as well as the key role of developments in the interwar years. For example, regarding trade protection, the traditional strategic objective was to ensure the *safe and timely* arrival of a convoy;¹ however, a more offensive policy was to hunt down and 'kill' submarines, which required resources the Navy lacked in the early years of the war.² This raises the question of how successfully the Navy used the additional resources it later acquired to adopt a more offensive policy and thereby eliminate a threat to existing and future convoys. Thus, for the purposes of this study, judgements on effectiveness must be made in the context of resources and the ultimate aims of deployment of British escort carriers at different stages and in different theatres of the war.

Using this broad approach, the research highlights that from 1919 to 1945 Britain experienced continual pressure on available resources, with competing demands for vessels

¹ Knight (2022), p.284 cites Commander C.D. Howard-Johnstone, Senior Naval Officer, B12 Escort Group, Summer 1941: 'Our business is to bring home the merchantmen. The sinking of the enemy is only a secondary consideration at this stage'

² The futility of an offensive policy without such resources was seen in the early period of the war, when the Navy lacked both resources and innovative weapons systems. An early casualty was the fleet carrier *Courageous*

and aircraft for many naval and military activities in various theatres, as well as procurement constraints. Against this backdrop, it did not adopt escort carriers (CVEs) until 1941. Nevertheless, once adopted, the Navy successfully deployed these vessels not only in their intended role in the protection of trade, but to meet many other pressing operational requirements including that for amphibious landing support (CVE(A)) and ferrying aircraft urgently needed in key theatres.

The thesis takes forward the work of those who have challenged portrayals of the Admiralty as too conservative in this period,³ brings into perspective the role of government and the Air Ministry in the development of naval aviation, and places these in the wider context of trade defence and its place in naval strategy. The analysis exposes the impact of the interaction of various factors, including strategy, priorities, and underfunding, on a service required to fulfil the vital role of trade protection alongside its other duties. The examination of these various factors in relation to this weapon system supports the view that the priority attached to the battlefleet was justified by the nature of the prevailing and expected strategic threats, that financial and industrial capacity constraints severely restricted the Admiralty's choices and that, despite issues arising from the lack of control of the development of naval aviation, it recognised the benefits of air power earlier than is often acknowledged.

1.2 Research Questions

The central research question of this thesis is:

Why and how effectively did the Royal Navy procure, and then use, escort carriers in the Second World War?

This question is intentionally broad-based, necessitating an examination of a wide range of factors. It requires the 'the integrated examination of technical, personnel, economic, administrative, and financial factors in order to reinterpret the course of policy-making and its consequences in operations'.⁴ This approach recognises the essential 'inter-connectivity

³ These are covered in the literature review below

⁴ Sumida and Rosenberg (1995), p.30

in naval affairs'.⁵ It differs from many former studies in naval history which have been described by Sumida and Rosenberg as separating key content into 'conceptual "black boxes"'.⁶ Adopting a more integrated approach has been shown to reveal that apparently separate processes 'were not only connected to each other at many points, but indeed, by the very nature of their interactions, affected the making of policy and operations to such a degree as to count as a kind of output as well'.⁷

The central question is addressed through secondary questions organised chronologically. These are as follows:

What foundations were set during the interwar period – in terms of doctrine, leadership, organisational structure, and priority for resources – for trade defence, in the context of the Navy as a whole, and the development of the escort carrier in the Second World War?

Why were stop-gap solutions required for trade protection in the opening phase of the Second World War? Which ones were adopted and why? Why was the escort carrier given the roles it was?

How did the Navy adapt its approach to escort carrier procurement and use as strategic threats multiplied from June 1940 to December 1941?

How did the Navy respond between December 1941 and May 1943 to the heavy naval and mercantile losses and the competing demands over escort carrier usage in many theatres?

Why did Britain continue to face capacity constraints in the period from June 1943 to June 1944, and what impact did this have on the deployment of escort carriers?

How effectively did the Navy respond to the need to pivot its limited resources to the Far East during the last phase of the war?

⁵ Hattendorf (1995), p.4, referring to Kennedy (1995), pp.143-149. Kennedy describes the world of 'naval reality' as including 'technology, design, firepower, personnel, tactics, strategic options, and so on' (p.149)

⁶ Sumida and Rosenberg (1995), p.31

⁷ Ibid., pp.30-31. See also Harding (2016), p.132, who refers to the need to explain navies in terms of multiple levels of understanding: 'naval history must become more comparative, international and linked to the interests of the public at large'; Black (2004), p.x (Preface), who states the need, '...to see military institutions and undertakings in different settings and times, and thus present them as distinct culture and expressions of culture in their own right'

These secondary questions are examined in the context of the competing requirements for scarce resources and choices between government spending and taxation; civil versus defence spending; the requirements of the different services; the different roles assigned to the Navy; and the different ways of fulfilling those roles. Underlying these issues are the organisational structure in which the Navy operated; the impact of government and Air Ministry decisions on the Admiralty; and the technological developments of new weapons systems, as well as what Goldrick has termed ‘the *uncertainty* of the development process’.⁸

The criteria used to assess the effectiveness of procurement and use include a comparison with the USN, and with policy options considered but rejected or, despite their attractiveness in hindsight, apparently not even contemplated, together with the opportunity costs associated with the different options and the limitations within which the Navy operated. Also underlying the secondary questions in relation to the effectiveness of the Navy’s use of escort carriers, the thesis looks at questions relating to the changing priorities which faced the Admiralty as it took delivery of these specialised vessels.

1.3 Methodology

This thesis adopts the definition of methodology offered by Gunn and Faire,⁹ who argue that the term refers to the larger principles that underpin and justify the ‘tools and techniques’ used in the research approach. ‘Research methods’ are taken in this thesis to refer more narrowly to those specific tools and techniques.

The methodology underpinning this research is that characterised by Tosh as ‘problem-orientated’.¹⁰ The ‘problems’ are those identified in the research questions in the previous section. The purpose of the research is to answer these questions as fully and accurately as possible, while still recognising the role of interpretation in historical research. This approach is consistent with much current historiography, but contrary to the aspect of Rankeanism which has been characterised as being ‘based on an impossible ideal of neutrality’.¹¹

⁸ Goldrick (1995), p.17. Italics in original

⁹ Gunn and Faire (2016), p.1

¹⁰ Tosh (2022), p.102

¹¹ Berger (2022), pp.28-33; Berger, Feldner & Passmore (2020), p.3, for quotation; Grafton (1994), pp.53-76; Tosh (2022), pp.101-124; Warren (2020), pp.26-41

The research methods used are qualitative, exploring issues in depth through an analysis of both secondary and primary data. The secondary data sources include a wide range of published material, including official histories, books and journal articles by naval scholars and other historians, and autobiographies. These secondary sources were partly identified through an iterative process, whereby references in one source would lead to identification of others. To ensure as full a coverage as possible, secondary sources were also identified through extensive electronic searches of appropriate databases.¹² Further details of the secondary sources are given in the literature review following this section.

The major primary sources informing this research are the Admiralty files (ADM) held at the National Archives (TNA) in Kew. Other contemporary TNA files of particular relevance to the examination of the choices facing the Admiralty are those of the Air Ministry (AIR), Prime Minister's Office (PREM), Cabinet Office (CAB), Ministry of Aircraft Production (MAP), Ministry of Production (BT), Ministry of Supply (SUPP), Ministry of War Transport (MT), and Treasury (T).

Additional primary British sources reviewed include Parliamentary Papers for contemporary analysis such as the Salisbury Report; the papers of key individuals and organisations held at Churchill College Cambridge, including the papers of Winston Churchill and John Creswell; documents at the Liddell Hart Centre for Military Archives (LHCMA) at King's College London; and the Cunningham Papers at the British Library.

While the research focuses explicitly on Britain, where necessary the thesis compares British and North American strategic and operational policies. In this context, key overseas archives have been accessed, including the US National Archives and Records Administration (NARA), which holds the records of the War Production Board (WPB); the Joint History and Research Office (JHRO) of the Joint Chiefs of Staff, Washington, D.C., which holds major conference documents; the Franklin D. Roosevelt Presidential Library and Museum; and the Directorate of History and Heritage in Ottawa, Canada.

The primary sources were identified through various means. Appropriate electronic searches were conducted using online archival search facilities, supplemented by direct

¹² For example, King's College London's Libraries and Collections, Google Scholar, and individual journal databases

approaches to archive officials where necessary. As with the secondary sources, an iterative approach was adopted whereby one document led to another. This would include references in one primary document leading to searches in related primary documents or to secondary documents such as autobiographies, and secondary sources pointing to archival material.

In order to be as evidence-based as possible, the materials included in the primary data sources covered the wide range of strategic, economic, political and other factors listed in the previous section. In addition, in order to capture differing perspectives on this wide range of factors, the research also examined an extensive range of differing forms of archival material, from scribbled notes to official reports. Nevertheless, as Tosh argues, it is still important to recognise that ‘the majority of sources are in some way inaccurate, incomplete or tainted by prejudice and self-interest’,¹³ and the research acknowledges the widely recognised limitation of archival research, clearly articulated by King and in Warren’s discussion of the Rankean tradition.¹⁴

Addressing these limitations, the research adopted the approach outlined by Tosh, aiming to ‘amass as many pieces of evidence as possible from a wide range of sources – preferably from *all* the sources that have a bearing on the problem in hand’.¹⁵ Nearly 50,000 pages of wide-ranging archival material was therefore examined in depth. This comprehensive approach was facilitated through a process of photographing, numbering, printing, and collating according to the original archive reference, the archival pages selected for review and comparison. The analysis of the data then adopted an integrated approach to methods whereby primary and secondary sources are reviewed in relation to each other. The thesis is further enhanced by extensive referencing to footnotes which provide underpinning evidence for the arguments presented.¹⁶

¹³ Tosh (2022), p.113

¹⁴ King (2016), pp.15-30; Warren (2020), pp.25-41

¹⁵ Tosh (2020), p.113. Italics in original

¹⁶ Grafton (1994), traces the history of the footnote and its role in the use and presentation of evidence. See also King (2016), p.18

In the thesis, each chapter presents both primary and secondary sources and shows how together they address the research question. In this way, research methods are used to 'make sense' of the findings which, as King argues, is 'the true metier of the historian'.¹⁷

1.4 Literature Review

1.4.1 Introduction

The relevant secondary literature is dispersed across a wide range of historical sources, which can be categorised as follows: interwar and wartime defence policy and strategy, including studies of government and inter-service issues; the Navy in general; procurement policy and resources, both financial and industrial; anti-submarine warfare (A/SW); naval aviation; aircraft carriers generally; and escort carriers. This review is structured according to these categories and examines where this literature can contribute to the current study and where the thesis contributes to future understanding.

Prior to examining each of these categories in turn, a number of general points should be noted. Firstly, the examination reveals very different assessments of the Admiralty in this period, with some of the negative assessments overturned by later research.¹⁸ Secondly, relevant studies have typically not adopted the integrated approach to procurement and use adopted in this thesis. Those that have adopted a more integrated approach, and comparative multinational studies, have typically focused on the interwar period, thus omitting any detailed reference to escort carriers.¹⁹ Thirdly, there is a tendency for analysis to focus on individual elements of procurement or use, or separate fields of technology, policy, and economics, generally studied on a national basis,²⁰ leaving what Thomas Heinrich refers to in his study of warship construction in America as 'the big picture', unclear.²¹ This is important in understanding the gaps in the literature. For example, as Heinrich shows, there are detailed plant histories of wartime shipbuilding, and studies of the industrial history of

¹⁷ King (2016), p.24

¹⁸ For example, see Franklin (2012)

¹⁹ For example, Sumida in O'Brien (ed.) (2001), pp.128-147; other useful comparative studies in this book include papers on strategy, procurement and construction of naval forces across the four major combatants, focusing on the pre-1939 period (pp.93-164). See also Murray and Millett (eds.) (2009): Beyerchen (pp.265-299); Herwig (pp.227-264); Till (pp.191-226)

²⁰ See Peden (2007), pp.113-117, 160-167; Ranft (ed.) (1977), pp.37-64, 108-122; Roskill (1976), pp.194-212, 284-321, 392-415

²¹ Heinrich (2012), p.156

the navy yards in the US, and these contribute to the understanding of 'management structures and strategies, labour relations and industrial culture',²² but they fail to show how a wide range of interrelated factors in the interwar years influenced construction in shipyards after 1940. Similarly, studies of British defence industries often dwell on a history of underinvestment in cramped naval and private yards, loss of skilled workmen to the new industries, and near collapse of the supply chain underpinning construction of warships in the 1930s,²³ but fail to address any broader issues.

Because most historians have looked at the escort carrier as a peripheral subject or focused on its operational aspects, the literature features both notable gaps and relevant material widely spread across a disparate group of sources. The following review focuses on individual works in this disparate group and, where applicable, discusses the main trends in the historiography.

1.4.2 Interwar and wartime defence policy and strategy

In the literature related to interwar and wartime defence policy and strategy, there are a number of naval studies relevant to this thesis, which also show the evolving nature of the coverage. Early works include those by naval historians as well as those with a broader military remit, illustrated by the official *History of the Second World War* series, which provides an exhaustive narrative of the war and incorporates the *United Kingdom Military Series (Military Histories)*.²⁴ This series includes *Grand Strategy*, Volumes I to VI, which contributes to the analysis of strategy in each of the chapters of the thesis.²⁵ Amongst these early works are a number of autobiographies and studies by other former serving officers, which are limited by their restricted access to Admiralty files but whose different perspective make a useful contribution to the analysis.

The earlier group includes works by Stephen Roskill and Arthur Marder, who emphasise Admiralty conservatism and are critical of the Navy and RAF for their approach to naval and

²² Ibid.

²³ For example, Burton (1994); Gordon (1988); Johnman and Murphy (2002a); Jones (1957); Kennedy (1976); Warren (1998), pp.243-277. However, this tale of woe is challenged by Boyd (2017); Edgerton (2006), pp.26-33; Edgerton (2011), pp.34-35, 213; Maiolo (2010)

²⁴ These are complemented by the Naval Staff History Series (ADM 234/375, 377-379) and Battle Summaries (ADM 234/359, 368-370)

²⁵ Gibbs (1976); Butler (1957); Gwyer (1964); Butler (1964); Howard (1972a); Ehrman (1956a, 1956b)

maritime air power. They are joined in their criticism by the later writer, Correlli Barnett. This is in contrast to the work of more recent naval scholarship which, as this section shows below, has re-examined many of the early criticisms and moved the debate forward in various ways. Nevertheless, elements of these early works remain relevant to this thesis.

Roskill, in his *Naval Policy Between the Wars, 1: The Period of Anglo-American Antagonism 1919-1929*,²⁶ and *2: The Period of Reluctant Rearmament 1930-1939*,²⁷ provides a detailed account of British naval policy between the wars, and of the issues related to naval aviation disputes between the Admiralty and Air Ministry.²⁸ As the official historian, Roskill had access to an extensive range of official documents, which enabled him to examine naval policy-making and to develop his arguments about 'big gun' mentality, the dysfunctional relationship between the RAF and Admiralty, and the comparative development of the US and Japan in relation to naval aviation. The first volume analyses the antagonism between Britain and the US, which was markedly strong in the early interwar years. This was exemplified by President Woodrow Wilson's 'Freedom of the Seas', which placed the US on a collision course with the Royal Navy and the latter's determination to retain Belligerent Rights.²⁹ Britain saw any attempt to remove her rights to stop and search neutral cargo ships, enabling the enforcement of a wartime blockade, as an infringement of her position as the dominant naval power.³⁰ To the US, keen to build a 'navy second to none', Britain should accept at least parity in naval strength and accept that she was now in a much weaker position, both in terms of financial and economic strength, as well as industrial and shipbuilding capacity.³¹ Clearly, there was resentment on both sides, which was to continue throughout the 1920s, as witnessed by the Washington Naval Treaty and the Geneva Peace Conference, with arguments over the number, tonnage, and armaments of cruisers. Britain needed a large cruiser force, augmented by Armed Merchant Cruisers (AMCs), to protect the trade routes on which she was dependent for imports of foodstuffs and raw materials. Indeed, as late as 1929, the US saw British naval aviation capacity, in terms of aircraft

²⁶ Roskill (1968)

²⁷ Roskill (1976)

²⁸ Roskill (1968), pp.234-268, 356-399, 467-497; Roskill (1976), pp.194-212, 392-415. See also Marder (1974) and Barnett (1972, 1986)

²⁹ Roskill (1968), pp.21-22, 81-82, 150, 549-551; Roskill (1976), pp.44-48, 69, 79, 87, 334

³⁰ Fry (1965)

³¹ Tracy (1991), pp.153-174. US business perceived the protected markets of the British Empire as a product of naval dominance

carriers and aircraft, as superior to the US in terms of mobility and flexibility. Michael Simpson provides a helpful addition to Roskill on this subject, noting how Moffett (USN), writing to the US Navy Secretary in 1929, pointed out the advantage enjoyed by Britain in 'the potential value of merchant vessels for conversion to carriers in time of war'.³² Indeed it was only with the rise of common potential enemies, such as Japan and Germany, that differences were forgotten and the two powers began to coordinate their response to the rise of hostile naval powers and develop the relationship shown in this thesis to be crucial to the RN's procurement of escort carriers.

In the second volume of Roskill's important study, *The Period of Reluctant Rearmament 1930-1939*,³³ Roskill is, this thesis suggests, too critical of the Admiralty with regard to trade defence, arguing as he does that it was viewed by the Admiralty, 'mainly as a cruiser function against surface raiders....almost up to the outbreak of war', and suggesting that the Admiralty had an obsession with 'the battle fleet concept', although accepting this obsession was shared with the US and Japan.³⁴ Roskill also refers to the 'comparative neglect of escort vessels in between the wars' which, in views challenged by later historians, he argues 'indicates the lessons of 1914-18 were ignored or misinterpreted', suggesting this was partly the result of misplaced confidence in Allied Submarine Detection Investigation Committee (ASDIC) equipment.³⁵

Roskill's multi-volume official history, *The War at Sea: 1939-1945*, describes trade defence in the various theatres well, with extensive mention of the inter-service rivalry and shortages of ships and Very Long Range (VLR) aircraft; the use of Catapult Aircraft Merchant (CAM) ships and escort carriers; as well as the varied threats which the Admiralty was forced to address in the form of surface raiders, U-boats, and aircraft.³⁶ These pressures are seen in the context of a global naval war, with multiple demands made on the Fleet to confront three naval powers, while assisting the British army in its expeditions abroad, and co-

³² Simpson (2010), pp.128-129

³³ Roskill (1976)

³⁴ Ibid., pp.226-228

³⁵ Ibid., p.228

³⁶ Roskill (1960b, 1961a, 1961b, 1962b)

ordinating with its principal ally and supplier to keep open the trade routes across the Atlantic to Britain and Russia.³⁷

Marder, in *From the Dardanelles to Oran: Studies of the Royal Navy in War and Peace 1915-1940*, similarly argues that the Navy failed to remember key lessons from the First World War regarding trade defence, particularly in relation to convoys, the diversion of anti-submarine escort vessels to patrolling shipping lanes, and the lack of air power on convoy routes. He argues that the Navy entered the Second World War overconfident because of its previous success against U-boats and belief in ASDIC, and suggests that one of the reasons for what he sees as the Navy's failure to appreciate the potential of air power on convoy routes was the delay in the publication of the official history of British airpower until 1937.³⁸

Barnett, in *Engage the Enemy More Closely: The Royal Navy in the Second World War*, reviews carrier strength and Britain's comparative position versus the US and Japan, pointing out that while Britain had a superiority in number of carriers many of these were outdated and in particular the quality of British aircraft was inferior. Barnett is highly critical of the Navy, which he characterises as a 'fashionable yacht club' in 1930, a powerful image of what he perceived to be a lack of professionalism. Barnett continues with this negative picture, arguing that the Navy had a misplaced faith in ASDIC, which led to a neglect of anti-submarine escort vessel construction, was guilty of 'misreading of true naval lessons of the Great War' and 'neglect of the potential threat to Britain's own survival posed by enemy submarines', and failed to recognise the problems arising from airpower.³⁹ Barnett's views on ASDIC and other issues have been challenged by more recent naval scholars, as discussed below.

Examples of studies by those with first-hand experience of the Second World War include *British Sea Power: Naval Policy in the Twentieth Century*, by Vice Admiral Brian Schofield, Director of Trade (Convoy Routing) Division at the Admiralty during the war. This provides a different perspective on the Navy's response to the need for trade protection in the context

³⁷ Ibid.

³⁸ Marder (1974), pp.36-45

³⁹ Barnett (1992), pp.24-49. Barnett argues: 'the entire development of carrier aviation in Britain...came to depend on collaboration between two mutually suspicious departments...each with its very own priorities.' See also Barnett (1986), for further analysis of policy

of insufficient resources, and the conflicting and competing demands in different theatres.⁴⁰ Schofield recognised the benefits of continuous air cover of a convoy and, unlike many, was in a position to effect some change in policy with the introduction of the Merchant Aircraft Carrier (MAC) ships. In his assessment of the air gap controversy, he attributes the blame for the delay in the provision of VLR aircraft to politicians.⁴¹ These criticisms of politicians are discussed in later chapters of the thesis but, as Roskill notes, both these and those in Admiral Chatfield's memoirs,⁴² were made before the official records for the relevant period were open and thus inevitably lack some authority.⁴³

More recent naval scholarship has re-examined some of the criticisms of the Navy discussed above. For example, Joseph Maiolo argues that the Admiralty's expectations were reasonable: Maiolo notes the 'key document' from a senior committee of German naval officers planning for war with Britain after September 1938, in which they 'advocated "cruiser warfare"as the method to deliver a lethal blow to Britain's oceanic lines of supply'. As Maiolo argues, 'the German Navy's top planners looked to the "pocket" battleship...and the light cruiser....not the U-boat' as the main commerce raiders.⁴⁴ Furthermore, as Maiolo shows, the Admiralty had a clear understanding of the limitations of ASDIC and, in the case of some pronouncements, was deliberately misleading potential enemies in order to 'persuade potential adversaries that echo-ranging technology had undermined the effectiveness of the submarine'.⁴⁵ Andrew Lambert also challenges the 'commonly held' view, argued by Roskill, that the Navy was 'ill-prepared for the resumption of unrestricted submarine warfare by Germany in 1939'.⁴⁶ As Lambert argues, in 'Seapower 1939-40: Churchill and the Strategic Origins of the Battle of the Atlantic', in most of the interwar years the most serious naval threats were perceived to be from Japan and Italy, with the former the Navy's necessary focus, at least until 1936: 'Consequently the big policy issues were the Singapore naval base, cruiser strength for trade protection and the ability of the main fleet to protect the Empire'.⁴⁷ This thesis argues that it is clear that by the 1930s

⁴⁰ Schofield (1967)

⁴¹ Ibid., pp.194-195

⁴² Chatfield (1947)

⁴³ Roskill (1967)

⁴⁴ Maiolo (1999b), p.71

⁴⁵ Ibid., p.65

⁴⁶ Lambert (1994), pp.86-108

⁴⁷ Ibid., p.91

the Navy recognised the case for what were to become escort carriers but was severely hampered by key strategic uncertainties, tight financial and industrial capacity constraints, and the RAF's control over the development of naval aviation. It also argues that even when the Navy had a clear vision, such as in its attempts to regain control of the Fleet Air Arm (FAA), throughout the crucial interwar period it was unable to prevail against the arguments of the RAF.

Christopher Bell, in *The Royal Navy, Seapower and Strategy between the Wars*, moves the debate forward and makes an important contribution to an understanding of naval policy in the opening years of the Second World War, placing a different emphasis on what Roskill termed the 'big gun' mentality of the Admiralty, noting the need for both modern battleships and carriers to provide balance in a two-ocean war, and examining the issues faced by the Admiralty in the interwar years.⁴⁸ This thesis argues, with Sumida, that Bell 'provided a useful corrective to the interpretation of British naval policy between the World Wars given by Stephen Roskill'.⁴⁹ Daniel Baugh contributes to the development of the debate, emphasising the impact on naval planning of the difficulty in identifying the most likely foes in the 1920s.⁵⁰

Andrew Boyd, in his *The Royal Navy in Eastern Waters: Linchpin of Victory 1935-1942*, provides relevant insight into naval policy regarding the British shipbuilding and armaments industries, which suffered serious cutbacks in capacity.⁵¹ The findings from this thesis support his challenges of portrayals of Admiralty conservatism and his noting of innovative responses to new methods of warfare, such as ship radar, FAA fighter control techniques, and Air-to-Surface Vessel (ASV) radar, the latter giving aircraft the ability to operate at night or in bad weather, essential for convoy escort work.

⁴⁸ Bell (2000)

⁴⁹ Sumida (2002), pp.1224-1225

⁵⁰ Baugh (1996), pp.101-119, analyses interwar policy, laying greater emphasis on the control of the FAA and the difficulties of inter-service rivalry together with a shortage of industrial and financial resources, itself caused by poor defence planning by government

⁵¹ Boyd (2017), p.8, pp. 38-39, 261-264. In support of his argument that financial stringency can spur innovation in tactical thinking, Boyd cites Sumida (1992). In reference to his argument that interwar fleet exercises addressed 'problems and opportunities...besides new ways of handling a battle-fleet' he cites, *inter alia*, Franklin (2015) and Weir (2006)

An example of a contribution to the debate underlying relevant issues is provided by Christine Goulter, who provides a new perspective on Belligerent Rights discussed in Roskill's earlier coverage.⁵² She argues that the potential development by Britain of the role of maritime air power 'alongside the warship in blockade planning' was possibly undermined by the fact that aircraft (apart from flying boats) could not ensure the safety of the target ship's crew, a key commitment by Britain underpinning the legality of Belligerent Rights. This reinforced the belief that surface warships were required to deal with surface merchant vessels. Indeed, had Britain not made this commitment as part of its determination to retain the right to stop and search, Goulter argues that maritime airpower could have developed differently.⁵³ On the same basis it might be argued that ship-borne aircraft could have evolved differently and a small aircraft carrier, similar to the escort carrier, could have been developed by the Navy to enforce the blockade of an enemy. However, given the arguments the thesis presents regarding the lack of resources, it is likely that the development of such a vessel would have been delayed.

There is a rich body of literature on policy issues related specifically to the transfer of the RNAS from the Admiralty to the Air Ministry. Whilst such literature does not focus on the escort carrier it nevertheless provides important context for the repeated delays in its adoption and is therefore relevant to this thesis. Strong critics of the transfer include Geoffrey Till, discussed further below, who points to how naval aviation was 'deprived of leadership at the top', and how this impacted on the development of carrier aircraft.⁵⁴

Tim Benbow takes this analysis forward in his 'Brothers in Arms: The Admiralty, the Air Ministry, and the Battle of the Atlantic, 1940-1943', in which he examines the disputes between the Navy and the RAF, showing how the latter's focus on its 'core ideology' of strategic bombing reflected 'fundamental – and enduring – intellectual differences', and

⁵² Goulter (1995), pp.64-66

⁵³ Ibid., pp.65-66

⁵⁴ Till (1979), pp.188-189. See also Hone, Friedman & Mandeles (1999), p.130, who examine the inferiority of the Navy's carrier aircraft in the Second World War, arguing that it 'can be traced to the organizational arrangements that generated a series of mistaken technical decisions, beginning with the assessment of carrier capability'. Simpson (2012), p.21, in his biography of Admiral Sir Andrew Cunningham, argues in relation to the FAA that dual control proved 'a hindrance to its efficiency, growth, tactical development and high-level influence'

how government support for that strategy repeatedly thwarted the Navy's attempts to secure additional aircraft.⁵⁵

Others have provided additional focus on the pressures and challenges faced by the RAF in its infancy and development, helping to put disputes with the Navy in context. Andrew Boyle's *Trenchard* and Richard Overy's *The Birth of the RAF, 1918*, cover the formative years, while Air Chief Marshal Sir Philip Joubert de la Ferté's *Birds and Fishes: The story of Coastal Command*, and *The Fated Sky*, provide his first-hand perspective on the Second World War and Coastal Command's considerable difficulties, in particular regarding the number of suitable aircraft.⁵⁶

1.4.3 Navy in general

Regarding the literature on the Navy in general, studies on the Second World War campaigns often give a generalised view of the war at sea, with particular reference to convoys but often with only minor or incomplete reference to escort carriers.⁵⁷ There are also numerous studies on naval campaigns in the Second World War, including Roskill's series, *The War at Sea*, and Samuel Morison's extensive series, *History of US Naval Operations in World War II*,⁵⁸ but neither these early works or other later ones have as their focus the effective deployment of escort carriers or their procurement.⁵⁹ However, a notable work by Benbow, 'The contribution of the Royal Navy aircraft carriers and the Fleet Air Arm to Operation "Overlord", 1944', shows the important contribution made by the Navy's fleet and escort carriers to this campaign, as well as to other operations, and argues that 'navies and naval aviation contribute to campaigns in a way that is different to land-based forces'. In comparison to war on land or in the air, to understand naval warfare, as he states, 'requires a bigger map and a longer timescale'.⁶⁰ Ben Jones includes references to escort carrier operations in his analysis of the FAA in various theatres, for example in his

⁵⁵ Benbow (2014). Quotation on p.44

⁵⁶ Boyle (1962); Overy (2018); Joubert de la Ferté (1960, 1977)

⁵⁷ For example, Dimbleby (2015); Hague (2000); Kemp (1987, 1993a, 1993b); Kennedy (2013); Rohwer (1972, 1974); Winton (1983); Woodman (2000, 2004). Notable exceptions include Milner (1986, 2003, 2017); Roskill (1960a, 1960b, 1961a, 1961b, 1962b)

⁵⁸ Roskill (1960b, 1961a, 1961b, 1962b); Morison (1960)

⁵⁹ For example, Admiralty (1954); Barnett (1992); Chalmers (1954); Schofield (1967); Showell (2013). However, Smith (1994a) covers the use of escort carriers with PQ.18; Smith (1994b), covers their use in the Pacific. A notable exception to the general 'national approach' is Howarth and Law (eds.) (1994), in which Hobbs (1994) covers ship-borne air A/SW

⁶⁰ Benbow (2017b), pp.265-268

'The Fleet Air Arm and the Struggle for the Mediterranean 1940–44', and in 'The Fleet Air Arm and Trade Defence, 1939-1944'.⁶¹ The Far East campaign, while covered well by Roskill and Morison, benefits from the analysis provided by Marder's *Old Friends, New Enemies: The Royal Navy and the Imperial Japanese Navy*, a two-volume work: *Strategic Illusions, 1936-1941* and *The Pacific War, 1942-1945*.⁶² Naval strategy and policy for the war against Japan is addressed by Hedley Willmott in *Grave of a Dozen Schemes: British Naval Planning and the War Against Japan, 1943-1945*, providing details of escort carriers committed to both the East Indies and Pacific fleets, contributing to an analysis of their deployment.⁶³

To gain a rounded view of the naval campaign it is also necessary to study the war from the enemy's viewpoint. *The Fuehrer Conferences on Naval Affairs, 1939-1945*, together with Vice-Admiral Friedrich Ruge's *Sea Warfare 1939-1945: A German Viewpoint*, and Cajus Bekker's *Hitler's Naval War*, provide an overview of the struggle at sea, as does *The German Navy in World War Two – A Reference Guide to the Kriegsmarine 1935-1945* by Jak P. Mallmann Showell, a prolific writer whose books include many on the U-boat campaign. *The Fuehrer Conferences*, a summary of situation reports provided to Hitler by the head of the *Kriegsmarine*, is particularly valuable for its record of policies and strategies under discussion, and insights into German intelligence.⁶⁴ Other relevant works include *The Critical Convoy Battles of March 1943* by Jürgen Rohwer, and Grand Admiral Karl Doenitz's *Memoirs: Ten Years and Twenty Days*, in which he states that he recognised the tactical threat to U-boats from escort carriers when *Audacity* appeared in 1941.⁶⁵ The Mediterranean campaign from the Italian perspective is well covered in Marc Bragadin's *The Italian Navy in World War II*, and *The Naval War in the Mediterranean 1940-1943* by Jack Greene and Alessandro Massignani.⁶⁶ The Pacific war is covered from the Japanese perspective in David Evans', *The Japanese Navy in World War II, in the Words of Former Japanese Naval Officers*; and Masanori Ito's, *The End of The Imperial Japanese Navy*; with further material in *The Imperial Japanese Navy* by Anthony Watts and Brian Gordon, which

⁶¹ Jones (2011, 2019). See also 2007, 2012, (ed.) 2018

⁶² Roskill (1960b, 1961b); Morison (1960); Marder (1981); Marder, Jacobsen and Horsfield (1990)

⁶³ Willmott (1996)

⁶⁴ Raeder and Dönitz (1990); Ruge (1957); Bekker (1974); Showell (1979)

⁶⁵ Rohwer (1977); Doenitz (1990)

⁶⁶ Bragadin (1957); Greene & Massignani (2011)

provides design and production details of escort carriers in the Imperial Japanese Navy (IJN).⁶⁷

1.4.4 Procurement policy and resources

Whilst this element of the thesis is largely based on official statistics drawn from the Admiralty files held in the TNA, augmented by statistics from US archives, it also uses the analysis contained in the early post-war official *History of the Second World War* series, which incorporates the *United Kingdom Civil Series (Civil Histories)*, covering a wide range of financial, economic, and industrial subjects relevant to procurement and use of escort carriers.⁶⁸ Typically, early studies of British procurement and production during the Second World War feature a national focus and narrow parameters. There are many examples which, whilst invaluable in limited ways, nevertheless often focus on just one issue or simply allude in a generalised manner to the broader issues which are central to the questions addressed in this thesis.⁶⁹ Further studies contribute important, albeit individual, elements to an understanding of politics and strategy underpinning procurement and deployment in the period, some looking at Britain and the US in a comparative light.⁷⁰

In comparing Britain to the US and their respective contribution to the supply of escort carriers to the RN, work on the US WPB's papers, in the form of the first two of three planned volumes, yields a particularly important perspective. These early post-war volumes are narrowly focused on 'the administrative problems and techniques involved in the mobilization of American industry during World War II'.⁷¹ These volumes are often overlooked but are, nevertheless, an invaluable guide to the procurement bureaucracy established by President Franklin D. Roosevelt to prepare the US for war, recording the President's difficulties in balancing the need to advance industrial and military mobilization with the prevailing desire of the US public to avoid entanglement in another European

⁶⁷ Evans (2017); Ito (1962); Watts and Gordon (1971)

⁶⁸ Hall (1955); Hancock and Gowing (1949); Hornby (1958); Inman (1957); Postan (1952); Postan, Hay and Scott (1970); Sayers (1956); Scott and Hughes (1955)

⁶⁹ For example, Behrens (1955) and later writers including Brown (1995, 2000) and Lenaghan (1983)

⁷⁰ For example, Brodhurst (2000); King (1946); King and Whitehill (1953); Leighton and Coakley (1955); Leutze (1977); Reynolds (1982); Smith (1996). Other important works covering the input of politicians include Alanbrooke (2001); Churchill (2015a-f); Roberts (2008, 2018); Roskill (1977); Wilson (1995)

⁷¹ War Production Board (1969): the first volume (*Program and Administration*) was originally published in 1947. The second volume (*Materials and Products*) was not published and remains in its original typewritten form at NARA and is referenced here as WPB, RG 179. The proposed third volume was never prepared

conflict.⁷² The WPB's papers also underline Roosevelt's foresight in anticipating the urgent need for escort carriers and the resistance from some senior US naval officers and officials in the early years of the Second World War.⁷³ They were written contemporaneously as an *aide memoire* for successor generations of American combat commanders, industrialists and politicians preparing for any future war and, whilst they lack the international perspective and an analysis of key political, economic and technical issues, they provide insights into various individual procurement programmes initiated by Roosevelt and delivered by industrialists such as Henry Kaiser.⁷⁴ Despite shortcomings, they assist in addressing the secondary questions relating to the period 1940-1944 by showing why production was so much faster in West Coast yards than in Britain or US East Coast yards, why difficulties were experienced by the Royal Navy in handling some of the earlier ships, and why there were prolonged delays in reaching Royal Navy standards in all classes of US-built ships.⁷⁵ The one published volume also touches on the issue of Lend-Lease,⁷⁶ and the remarkable degree of co-operation between Britain and the US, prompted by self-interest, and resulting in significant allocations of escort carriers to Britain in the period 1943-1944 although, controversially, excluding later upgrades.⁷⁷ A number of other studies similarly enhance an understanding of the US role in Britain's procurement and use of escort carriers, including those by the United States Maritime Commission, but are limited in their contribution to this study by their narrow focus.⁷⁸

An example of much later but also narrow coverage, is George Moore's *Building for Victory: The Warship Building Programmes of the Royal Navy 1939-1945* which contributes to the subject of this thesis by providing an analysis of British naval policy-making in the period,

⁷² This subject is discussed further by Klein (2013) and Koistinen (2004)

⁷³ Terzibaschitsch (1981), p.24. See also Friedman (1983), pp.161-165. For the relationship between the President, the naval establishment and the Bureaux of Ships, Aeronautics, and Yards & Docks, see Furer (1959)

⁷⁴ See also Foster (1989), pp.68-89; Heiner (1991), pp.117-154

⁷⁵ See also Friedman (1983), p.168; Friedman (1988), pp.183-184. The responsibility for the difficulties and delays was often unfairly attributed to the RN, leading to some ill feeling on the part of Admiral King, C-in-C and CNO of the US Navy. This impacted relationships and possibly influenced the type of escort carriers later procured by Britain. This is discussed further in chapter 5 of the thesis

⁷⁶ See also Dobson (1986). The Act was passed 11 March 1941

⁷⁷ WPB, RG 179, regarding further reasons for production delays

⁷⁸ Elphick (2001); Lane (1951); United States Maritime Commission (1946)

showing the impact on building programmes of limited industrial resources, changes in designs and requirements as the war developed, and competition from the other services.⁷⁹

A number of later studies feature broader coverage but are limited in their relevance in other ways. These include Gordon's *British Seapower and Procurement Between the Wars: A Reappraisal of Rearmament*,⁸⁰ in which he challenges the traditional silo approach to naval history and, based on the findings of this thesis, is rightly applauded for his integrated approach,⁸¹ but his analysis relates to the period prior to the start of the Second World War, and therefore does not examine escort carriers, although it offers an insight into British procurement procedures. More recently, Maiolo's *Cry Havoc – The Arms Race and the Second World War, 1931-1942* is also a notable exception to the traditional silo approach, with a good comparative examination of the major combatants, but the timeframe of his study limits his contribution to the issues under examination in this thesis.⁸² Similarly, Simpson, in his *Anglo-American Naval Relations, 1919-1939*,⁸³ has re-examined the issue of naval co-operation between America and Britain, looking at the different priorities of each nation, the level of Anglophobia in the US Navy, and the attitude of the American public towards defence, providing background to the issues arising about co-operation during the Second World War, but without covering the war itself. Heinrich's important study of American naval shipbuilding between 1928 and 1945, "'We Can Build Anything at Navy Yards:' Warship Construction in Government Yards and the Political Economy of American Naval Shipbuilding, 1928-1945', takes a broad approach, but is largely confined to the American experience.⁸⁴

1.4.5 The anti-submarine war

The anti-submarine war is the subject of many early works, including the Naval Staff History, *The Defeat of the Enemy Attack on Shipping, 1939-1945*, based on an Admiralty study of 1952, edited by Grove,⁸⁵ which looks at the use of aircraft in the defence of shipping, comparing the success of the RNAS in the First World War with the faltering steps of the

⁷⁹ Moore (2003)

⁸⁰ Gordon (1988)

⁸¹ Sumida and Rosenberg (1995), p.30

⁸² Maiolo (2010)

⁸³ Simpson (2010)

⁸⁴ Heinrich (2012)

⁸⁵ Grove (ed.) (1997)

Navy and Coastal Command as they developed an effective counter to the enemies' attacks on British convoys. Grove also examines the development of convoy escorts and the introduction of escort carriers. Whilst including relevant facts, as Grove notes, the book was 'part of an important debate on the correct dispositions in a future Battle of the Atlantic' and it became 'a vital source in doctrinal debate'.⁸⁶ In a similar vein regarding its contribution to relevant facts, the three-volume *U-Boat War in the Atlantic 1939-1945*, by Gunter Hessler, commissioned by the Admiralty after the war and classified for some years, is also a helpful source of details on U-boat activity, with much of the statistical data assembled by Rohwer.⁸⁷

More recent coverage includes George Franklin's *Britain's Anti-Submarine Capability 1919-1939*, which re-examines the criticism of Britain's interwar preparations for A/SW and shows that at the start of the Second World War the Navy understood the role of convoys and the limitations of ASDIC, but that its decisions on resource allocation in the interwar years reflected the need to assess and respond to a variety of different potential threats.⁸⁸

Besides Franklin's work, most relevant to this thesis are *Business in Great Waters – The U-Boat Wars, 1916-1945*, by John Terraine; *Battle of the Atlantic* by Marc Milner; *Decision in the Atlantic*, edited by Faulkner and Bell; *The Royal Navy and Anti-Submarine Warfare, 1917-49*, by Malcolm Llewellyn-Jones; and *Battle of the Atlantic 1939-1945: the 50th Anniversary International Naval Conference*, edited by Stephen Howarth and Derek Law, which draws on contributors from both sides of the conflict.⁸⁹ Terraine provides a valuable analysis of changing technology in A/SW, covering the role of Fighter Catapult Ships (FCS) and escort carriers (CVEs), and the development of U-boats. However, the findings from this research suggest he is, perhaps, too strong in his criticism of the Navy and in his suggestion that the Navy should have devoted more resources earlier to meet the submarine threat in the Second World War. Milner's work offers a different perspective, drawing on his earlier examination of the role of the Royal Canadian Navy (RCN). This thesis argues that he was right in his contention that the RN was forced to prioritise scarce resources and that, in this

⁸⁶ Ibid., pp.xxii-xxvi

⁸⁷ Hessler (1992)

⁸⁸ Franklin (2015)

⁸⁹ Ibid.; Terraine (1989); Milner (2003; see also 1986, 2017); Faulkner and Bell (eds.) (2019); Llewellyn-Jones (2006); Howarth and Law (eds.) (1994)

context, and given the small scale of the U-boat programme in the early years and the long lead time for battleships versus escort vessels, the focus on battleship building was justified. Milner also covers A/SW operations of MAC ships and both British and US CVEs. Llewellyn-Jones, although devoting much of his coverage to the period after 1945, examines the development of different A/SW methods and different U-boats chronologically: the period from 1939-1943, when the U-boat was fundamentally the same design as its First World War predecessor; the period from 1944-1945, when the snorkel was introduced; and 1944-1946, looking at later U-boat developments. This thesis supports Llewellyn-Jones' defence of the Navy's record in A/SW; he also looks at the debate over the Navy's approach to defensive and offensive A/SW. He quotes post-1945 analysis by the Admiralty's Historical Section showing that in both World Wars, '...of all the measures we adopted, the convoy system alone provided the means for waging unremitting and highly remunerative *offensive* action', and maintains that 'the "defensive" and "offensive" operations were consistently visualized (in both peace and war) as interdependent and symbiotic parts of anti-submarine strategy'.⁹⁰ These latter works provide background to the demands for continuous air cover for convoys, the deployment of escort carriers and the capabilities of such vessels in an anti-submarine role.

At the heart of A/SW and trade protection during the Second World War was the convoy, which is addressed directly on a number of levels. *Convoy Protection: The Defence of Seaborne Trade* by Paul Kemp, provides a background to the conflict, and contrasts the campaigns of the *Kriegsmarine* and USN in submarine operations against enemy mercantile shipping,⁹¹ while *Merchant Shipping and the Demands of War* by C.B.A. Behrens provides the political and strategic background to the use of convoys by the Allies.⁹² *Convoy: The Defence of Sea Trade 1890-1990* by John Winton analyses the use of convoys as a means of achieving trade defence and illustrates its importance with a narrative covering many of the famous convoy battles of the Second World War.⁹³ Winton stresses that the Battle of the Atlantic was a team effort involving many participants including escort vessels, long-range aircraft, fleet and escort carriers and the introduction of radar for both ship and aircraft.

⁹⁰ Llewellyn-Jones (2006), pp.2-3, 8-92. Emphasis in original

⁹¹ Kemp (1993b)

⁹² Behrens (1955)

⁹³ Winton (1983)

Winton shows how, assisted by ULTRA intelligence, the balance of power swung decisively towards the convoy, and against the U-boat, which was transformed from hunter to hunted. Naval intelligence is a key component in Allied trade defence and is covered well by Boyd in *British Naval Intelligence Through the Twentieth Century*,⁹⁴ and in the earlier extensive series by Francis Hinsley, *British Intelligence in the Second World War*.⁹⁵ The important relationship between Britain and America regarding convoys is addressed by Kevin Smith in *Conflicts over Convoys: Anglo-American Logistics Diplomacy in the Second World War*,⁹⁶ while convoy organisation, defence and operation is addressed by Arnold Hague in *The Allied Convoy System 1939-1945*.⁹⁷

1.4.6 Naval aviation

With reference to naval aviation, the early post-war archival material was the key source for this thesis,⁹⁸ and whilst there are a number of important secondary works on the use of naval and maritime air power they rarely study in detail or, often, in any integrated way, effective deployment of escort carriers.⁹⁹ For example, Till, in *Air Power and the Royal Navy 1914-1945: a historical survey*, mentioned above, provides a detailed analysis of the background to the FAA, covering its development in the First World War with the expansion of the RNAS and its transfer to the Air Ministry in 1918, as well as its development in the interwar period and operations in the Second World War. However, he provides little detail on the escort carrier. He covers trade defence from the viewpoint of air power, and gives a clear account of the many political battles fought over the provision of aircraft for the growing number of aircraft carriers, both fleet and escort. These battles were fought, not only in Whitehall, with the Air Ministry, MAP, and Treasury, but in Washington with allies who had their own inter-service rivalries. Till concludes, in a very balanced statement, that

⁹⁴ Boyd (2020)

⁹⁵ Hinsley (1979, 1984, 1988, 1991, 1993)

⁹⁶ Smith (1996)

⁹⁷ Hague (2000)

⁹⁸ *The Naval Staff History, Second World War, The Development of British Naval Aviation, 1919-1945*, in two volumes, is a critical source regarding naval aviation and its impact on the effectiveness of escort carrier use. They are referenced in this thesis with their TNA file numbers: ADM 234/383-384

⁹⁹ Notable works include Ashworth (1992); Bell (2015); Benbow ((ed.) 2011, and 2014, 2017b); Buckley (1995a), pp.175-197; Buckley (1995b), pp.115-214; Gates and Jones (2016); Grove (ed.) (1997); Hezlet (1970), pp.85-322; Jones (2019); Larkins (1988); Price (1980), pp.32-238; Ritchie (1997); Slessor (1957), pp.144-590; Terraine (1985), pp.223-250, 401-458; Terraine (1989); Thetford (1971); Till (1979, 1980, 2009, 2011); Till and Bratton (eds) (2013); Trimble (1990); Turnbull and Lord (1949) pp.284-323; Vleet, Pearson, and Wyen (1970), pp.91-141

'Britain needed air power, sea power and land power to survive and win, but lacked the resources for all three...in Britain's case the gap between resources and commitments was particularly severe'.¹⁰⁰ John Buckley examines the issues of trade defence, more from the perspective of the RAF, focusing on the lack of resources that Coastal Command received in the interwar period and early part of the Second World War, but the escort carrier is beyond his remit in this book.¹⁰¹ However, in his 'Atlantic Airpower Co-operation 1941-1943', Buckley provides a study of the rivalries between allies and services on both sides of the Atlantic, including the important role of Admiral King, which is particularly relevant to the discussion of RN escort-carrier procurement in this thesis.¹⁰²

Gates and Jones address air power in the maritime environment broadly throughout the relevant period, and study the development of the catapult and MAC ships, but they offer little coverage of escort carriers in this work.¹⁰³ Sir John Slessor's autobiography, *The Central Blue*, provides some relevant comparative statistics as to the 'killers' of U-boats, but is somewhat dismissive of escort carriers and positively scornful of MAC ships. Regarding land-based air support, he is quite blunt in his assessment:

...the whole story of VLR aircraft for convoy cover is one of misunderstanding, argument, procrastination and delay, bedevilled throughout by the inter-Service controversies in Washington and King's determination...to give priority to the Pacific.¹⁰⁴

A more balanced approach was taken in later analysis by Terraine in *The Right of the Line: The Royal Air Force in the European War 1939-1945* and Richard Overy's *The Bombing War: Europe 1939-1945*, in which Overy covers the European air war in the Second World War, demonstrating the failure of strategic bombing, an opportunity cost of which was the delay in the transfer of B-24 Liberators to Coastal Command.¹⁰⁵ The impact of the Admiralty's and RAF's 'basic and fundamental differences over the nature of warfare and the conduct of strategy' is looked at by Benbow in his analysis of the relationship between these parties in

¹⁰⁰ Till (1979), p.201

¹⁰¹ Buckley (1995b)

¹⁰² Buckley (1995a)

¹⁰³ Gates and Jones (2016), pp.209-236

¹⁰⁴ Slessor (1957), p.499. Another early example which helps to provide balance is *The Rise and Fall of the German Air Force 1933-1945*: Air Ministry (1948)

¹⁰⁵ Terraine (1985); Overy (2013)

'Brothers in Arms: The Admiralty, the Air Ministry, and the Battle of the Atlantic, 1940-1943', in which he notes their 'many serious clashes' during the Second World War: 'Perhaps the most enduring as well as the most significant concerned the allocation of aircraft between the competing claims of the strategic air offensive and the campaign against the U-boats'.¹⁰⁶ Goulter also provides valuable insights into land-based maritime aviation for the period relevant to this thesis, but the escort carrier is outside the focus of her work.¹⁰⁷ The second volume of *The Fleet Air Arm in The Second World War*, edited by Jones, provides guidance to TNA documents regarding escort carriers in the period covered.¹⁰⁸ Jones also covers particular theatres or themes addressing the role of the FAA.¹⁰⁹

1.4.7 Aircraft carriers

The development of aircraft carriers generally is well covered in a wide range of material, usually within two broad categories. The first is a comprehensive review of the vessel and its development as a total weapon system, including short pieces on escort carriers. Secondly, as a directory of classes of ships together with a short summary of each vessel and its service history. The first group includes the following notable studies: Friedman's *Carrier Airpower*; and Chester Hearn's *Carriers in Combat: The Air War at Sea*.¹¹⁰ The second group includes two works by David Hobbs, *Aircraft Carriers of the Royal and Commonwealth Navies: The Complete Illustrated Encyclopedia from World War I to the Present*, and *British Aircraft Carriers: Design, Development and Service Histories*.¹¹¹ These works detail the development of the vessel, giving background to the trade-offs between construction timescales and costs, and aircraft carrying capacity, all of which impacted on policy decisions regarding carrier-borne aircraft for trade protection and the support of amphibious assaults.

1.4.8 Escort carriers

Works which focus in more detail on the escort carrier itself include the important studies on carrier aviation by Friedman, dealing with the development of fleet and escort carriers in

¹⁰⁶ Benbow (2014), pp.42, 88

¹⁰⁷ Goulter (1995)

¹⁰⁸ Jones (ed.) (2012, 2018). The two volumes cover 1939-1941 and 1942-1943

¹⁰⁹ Jones (2007, 2011, (ed.) 2012, (ed.) 2018, 2019)

¹¹⁰ Friedman (1981a); Hearn (2005). See also Chesneau (1988) and Polmar (1969)

¹¹¹ Hobbs (1996, 2013)

Britain (*British Carrier Aviation: The Evolution of the Ships and their Aircraft*) and the US (*U.S. Aircraft Carriers: An Illustrated Design History*) separately,¹¹² although their focus, as Claire Scammell notes, is not on 'issues of strategy and operations'.¹¹³ However, Friedman is crucial to understanding the evolution of escort carriers, covers design and construction well, and gives policy background to a number of developments during the period under review. Furthermore, his work with Hone and Mandeles in *American & British Aircraft Carrier Development, 1919-1941* offers a comparative approach to many aspects of carrier development in Britain and the US, although only prior to the introduction of escort carriers in 1941.¹¹⁴ The same three authors, in their *Innovation in Carrier Aviation*, cover a broader period, provide a valuable analysis of technical developments in naval aviation during the Second World War, but only touch on the escort carrier.¹¹⁵

The examination of the effectiveness of the use of escort carriers has received similar narrow treatment, being particularly prone to national focus. For example, Hobbs, in *Royal Navy Escort Carriers*,¹¹⁶ with its focus on Britain, and Stefan Terzibaschitsch, in *Escort Carriers and Aviation Support Ships of the US Navy*,¹¹⁷ with its focus on the US, contribute to the analysis of escort carriers by describing their operational history in their respective fleets. Other important works which make a contribution to the study of escort carriers' deployment are often focused on specific theatres, such as *The Tenth Fleet*, by Ladislav Farago, which covers USN use of CVEs in anti-submarine operations in the Atlantic; 'Shipborne Air Anti-Submarine Warfare', the study of CVEs in the Atlantic campaign by Hobbs, and his other work, *The British Pacific Fleet: The Royal Navy's Most Powerful Strike Force*; and *Carrier Operations in World War II, Volume I: The Royal Navy*, by David Brown.¹¹⁸

When the study of the use of escort carriers is central to the work, it is sometimes prone to flights of jingoism, focusing on tactical and operational matters, particularly combat, reflecting its target audience. A good example are the works by Kenneth Poolman, who produced, over nearly 20 years, seven books on naval defence of trade by various types of

¹¹² Friedman (1988), pp.119-131, 155-244; Friedman (1983), pp.159-199

¹¹³ Scammell (2001), p.14

¹¹⁴ Hone, Friedman, & Mandeles (1999); see also MacDonald (1964), pp.49-53

¹¹⁵ Hone, Friedman, and Mandeles (2011)

¹¹⁶ Hobbs (2003)

¹¹⁷ Terzibaschitsch (1981)

¹¹⁸ Farago (1962); Hobbs (1994), pp.388-407; Hobbs (2012); Brown (1974)

British vessels and aircraft. These cover the CAM and MAC ships in their combat with the *Focke-Wulf 200 Condor (FW Condor)*; and escort carriers in operations in the Atlantic, Arctic, Indian and Pacific oceans.¹¹⁹ Other examples in this category include, James Noles' *Twenty-Three Minutes to Eternity: The Final Voyage of the Escort Carrier USS Liscome Bay*; Don Woodman's *HMS Tracker and the Attacker Class Escort Carriers*; David Wragg's *The Escort Carrier in the Second World War: Combustible, Vulnerable and Expendable!*; and William Y'Blood's *Hunter-Killer: US Escort Carriers in the Battle of the Atlantic* and *The Little Giants: US Escort Carriers Against Japan*.¹²⁰ These works describe the vessels and their aircraft in their wartime roles, covering such matters as the type of operations, successes, and casualties sustained; however, their focus is not on the issue of strategy or an analysis of procurement.

1.4.9 Conclusion to literature review

As can be seen from the literature reviewed above, many authors cover individual aspects of the procurement and use of escort carriers and in so doing contribute to this research in helping inform and shape the arguments in the following chapters.

The key relevant debates identified in the literature are, broadly, between those who charge the Admiralty in this period with being overly conservative, dominated by an inappropriate battle line philosophy, late to recognise the significance of air power, and late to respond appropriately to the U-boat threat to trade; and the more recent trend of scholarship on the Royal Navy which suggests to varying degrees that the Admiralty was less conservative than scholars once thought. This thesis argues that there was indeed a focus on the battleship in the interwar years, which might be characterised as conservative but which was necessary, and that whilst there was a lack of sufficient resources to exploit nascent airmindedness in trade protection in the early period of the war this was largely overcome as the war progressed, predominately by innovation in auxiliary carriers and the help of US CVEs and modern naval aircraft. Furthermore, the thesis shows how the Admiralty developed its use of air power with modified CVEs to meet new operational needs for these vessels exposed by the absence of light fleet carriers (CVLs). As Lambert suggests, the 'Admiralty's handling

¹¹⁹ Poolman (1970, 1972, 1976, 1978, 1982, 1983, 1988)

¹²⁰ Noles (2004); Woodman (1987); Wragg (2005); Y'Blood (1983, 1987)

of its rearmament reflected great credit on all concerned',¹²¹ reflecting the need to rebuild and modernise the battlefleet in order to counter the fleets of likely enemies Japan, Italy and, later Germany - itself essential in order to provide the support needed for trade protection.

While these debates and other material covered in the existing literature provide insights into the history of the escort carrier, they do not address the core question of why, and how effectively, the RN procured and used this vessel. With particular regard to procurement, a significant gap in the literature relates to the timeframe of major studies, which have focused on either the interwar or early Second World War periods; in contrast, this thesis brings together an analysis of both these earlier periods in order to reveal the impact on development of later policy. The most important subject inadequately covered in the existing literature in relation to procurement is why there were persistent delays when needs were obvious and outlined cogently in various Admiralty reports from 1918 to 1938.¹²² The principal gaps relating to the use of escort carriers concern why and how they were allocated as they were commissioned between 1941 and 1944, and the impact of that allocation on naval air operations.¹²³ This thesis fills these gaps in the literature by focusing specifically on the Admiralty's actions in relation to one key weapon system, the escort carrier.

1.5 Conclusion and structure of the thesis

This chapter has introduced the research questions, described the methodology adopted, and offered an examination of the existing literature. The following chapters 2 to 6 are structured according to the supplementary research questions. Chapter 2 covers the doctrine of trade protection, the First World War and the interwar period. Chapters 3 to 6 are each structured with a strategic overview, followed by sections on procurement and deployment, exploring the relevant primary and secondary data and offering an integrated assessment of why and how effectively the Royal Navy procured, and used, escort carriers in the relevant time period.

¹²¹ Lambert (1994), p.91

¹²² The relevant Admiralty files are discussed further in chapters 2 and 3

¹²³ This is looked at further in chapters 3 to 6

The conclusion of the thesis is presented in chapter 7, which brings together the analysis in the preceding chapters, explaining the balance struck by the Admiralty, which had to weigh up the requirements of allies; British national strategy; national arms policy and procurement; service doctrine, priorities and policy; as well as operational choices and the need to operate most effectively. It also addresses the question of why the escort carrier's role is often marginalised by naval historians.

2. Chapter 2: Doctrine of Trade Protection, the First World War and the Interwar Years

2.1 Introduction

This chapter examines both the historical and conceptual background to the Navy's procurement and use of escort carriers. It examines why repeated efforts to develop and build Trade Protection Carriers (TPCs) in the interwar period came to nought, and whether some hard-learned lessons of the First World War were forgotten in the Admiralty and Air Ministry. It thereby sets the background for the choices leading to the absence of TPCs during the first two years of the Second World War, when experience might have suggested the need for carrier-borne aircover over the trade routes. Throughout this period surface raiders were, for good reason, considered the major threat to trade, and the greatest naval threats in the interwar period, at least until 1936, were from Japan and Italy.¹

2.2 Early Doctrine of Trade Protection

England had used convoys to protect trade and military interests since the twelfth century, with a series of Navigation Acts promoting British ships, masters and crew from 1650.² The British merchant marine grew from 3,000 ships in 1700, to 16,000 by 1793,³ with the government establishing an extensive bureaucracy to organise and control wartime convoys. Yet by the end of the nineteenth century government had turned its back on the merchant marine, leaving it to prosper under free trade but failing to maintain the bureaucracy needed in time of war.⁴

This shift in policy accompanied a focus on the battle line concept and its tactical emphasis on the role of the battleship. While there was still a vital role for cruisers in defending trade routes and, where necessary, attacking enemy convoys, trade defence would ultimately be settled by the use of battleships to achieve command of the sea in decisive engagements or, more often, by containing the enemy's forces. The American naval historian and influential exponent of this doctrine, Alfred Thayer Mahan, was clear: '...defence is insured only by

¹ Maiolo (1999b), p.71; Lambert (1994), pp.86-108

² Kemp (1993b); Winton (1983). Cromwell introduced the first Navigation Act in 1650

³ Winton (1983), p.15

⁴ Ibid., p.27

offense, and that the one decisive objective of the offensive is the enemy's organized battle-fleet'.⁵ Mahan argued that elimination of an enemy's battlefleet was the first step to trade protection, although insufficient on its own: with sea control achieved, the victorious navy could implement blockades and destroy the enemy's merchant fleet. He recognised the value of convoys, albeit in defensive terms, stating that it would have 'more success as a defensive measure than hunting for individual marauders, – a process which...resembles looking for a needle in a haystack'.⁶

Sir Philip Colomb in *Naval Warfare: Its Ruling Principles and Practice Historically Treated*, focused on convoys as part of a strategy to control the seas, to ensure safe passage of seaborne commerce, but argued that maritime empires needed large battlefleets to contain enemy forces, protecting sea lines of communication.⁷ The battle line philosophy is evident even in those focusing on trade protection. Commander Kenneth Dewar won the Gold Medal (Naval) Prize for RUSI in 1912 with a paper on the vulnerability inherent in Britain's dependence on overseas trade. Having demonstrated the vital importance of overseas trade and the doctrine of commerce warfare, Dewar argues the best defence is defeating enemy fleets in battle: '...in all cases the battlefleet...is the final arbiter in the attack and defence of trade'.⁸ The strategic aim was trade protection; the means was the battlefleet neutralising the opposing battlefleet, while cruisers protected shipping more directly. The relatively few references to convoys in his 1912 essay contrasts sharply with his acknowledgement of their critical importance in *War on Shipping (1914-1918)*, published in 1959.⁹

In 1911 Sir Julian Corbett's *Some Principles of Maritime Strategy* argued that 'the primary objective of the fleet is to secure communications', achieved by neutralising the enemy's fleet to protect communications.¹⁰ Corbett controversially emphasised the advantages of the defensive position, arguing that it was usually better to seek out the enemy's fleet by taking a position which controlled communications needed by the enemy, thus attracting the enemy to a chosen position. Like Mahan, Corbett emphasised the operations of the

⁵ Mahan (1902), p.168, quoted by Hattendorf in Mahan (1991), pp.xxiv-xxv

⁶ Mahan (1892), p.217

⁷ Colomb (1990a, 1990b). First published 1891

⁸ Dewar (1913), p.453

⁹ Dewar (1959), pp.3-13

¹⁰ Corbett (1988), pp.323-325

main fleet, but as Grove argues he differed from Mahan in his views of concentration and dispersal.¹¹ Corbett argued in favour of allocating cruisers by prioritising control of communications over their role in supporting battleships.¹² However, Corbett's view of communications in terms of 'sea lanes' defended by patrols was, as Grove notes, 'doomed to failure' against the impending submarine *guerre de course*.¹³ Furthermore, unlike Mahan, Corbett questioned the continuing value of convoys, arguing that abolition of privateering, reduced range of warships, and wireless telegraphy meant that '...the possibilities of operations on the great trade-routes are much less extensive than they were formerly, while to speak of cruisers 'infesting' these routes is sheer hyperbole'.¹⁴ However, as Grove argues, when Corbett was writing neither submarines nor aeroplanes were significant threats and British trade protection dealt adequately with German cruisers of 1914. It should also be noted that Corbett was aware of the 'unproved value' of submarines.¹⁵ Perhaps, therefore, Ranft is a little harsh in his judgement:

...by not following Mahan's example in emphasising the permanent tactical advantages of the convoy system he made himself party to the most costly miscalculation in British naval thinking ever made.¹⁶

In assessing Mahan and Corbett in the light of the period studied in this thesis, it is important to note that, while Mahan proved more correct regarding convoys, Corbett emphasised control of sea communications, which permitted combined operations and 'local command', allowing a nation to carry out operations in furtherance of a grand strategy. A key feature of Corbett's work was his approach to theory and his clear understanding of its limitations. As George Baer notes, paraphrasing Till, Corbett's purpose was 'to present guides to thought, not directives for action'.¹⁷ As Corbett argues, '...a system of operations which suits one form [of war] may not be that best suited to another'.¹⁸ He understood that the contribution of land, air and sea would depend on the particular war. His emphasis on the limitations of sea power, and that command of the sea was not an end

¹¹ Grove in Corbett (1988), p.xxx

¹² Corbett (1988), pp.113-114

¹³ Ibid., p.xxxiv

¹⁴ Ibid., p.269

¹⁵ Ibid., p.231

¹⁶ Ranft in Corbett (1988), p.xxxiv

¹⁷ Baer (1993), p.293

¹⁸ Corbett (1988), pp.8-9

in itself and was a relative concept, as well as his view of the navy as ‘an instrument of statecraft...his insistence on combined operations, his definition of the war as beyond the battle...’,¹⁹ were all relevant in the period studied here. Indeed, as Milner and others argue, having failed to defeat the U-boats in 1939 with hunting operations, at this stage:

...the objective of British strategy and operations in the Atlantic was entirely Corbettian: interfere with the enemy in order to allow trade to flow with acceptable losses. Success was measured in tonnage delivered and strategy for the wider war advanced, not in U-boat kills.²⁰

This British strategy reflected necessity, driven by available resources.

A new urgency overshadowed these different approaches in the First World War. The Battle of Jutland prompted a strategic debate between those who argued Admiral Jellicoe’s caution was justified because a navy’s fundamental purpose was to defend sea communications, and thus its existence must not be risked unless to achieve its aim by neutralising the enemy’s fleet and gaining command of the sea; and ‘the Victory School’, who believed that battlefleets were at the heart of sea power and victory required a decisive battle.²¹ Herbert Richmond contributed significantly to this debate by focusing attention on the function of a navy, which he later defined as ‘to prevent pressure from being brought to bear upon its nationals’, which could be achieved either by invasion or by ‘cutting off...external traffic’.²² Thus he argued that trade defence was a vital objective of sea power, and was highly critical of an Admiralty that he wrote, with characteristic hyperbole, ‘really appear[s] to attach no importance at all to trade’. He advocated transferring destroyers from the North Sea to combat the German submarine threat to British shipping. Richmond argued that, ‘we should lessen our chance of a decisive victory at sea, but we should increase our chance of winning the war’, although this strategy, as Churchill said about Jellicoe, risked losing the war ‘in an afternoon’ through a decisive defeat of the British battlefleet.²³

¹⁹ Baer (1993), p.293

²⁰ Milner (2017), p.47. Although, as Milner notes, when victory over the U-boat was possible, it was ‘sudden, stunning, and crushing in its effects....a modern Trafalgar’. See Milner (1990a, 1990b, 1997); Grove (ed.) (1997)

²¹ Baugh (1993), p.21

²² Ibid., p.25, citing *Pollen Papers*: ‘Richmond to Pollen’, 7 April 1931

²³ Ibid., p.30, citing *Richmond Papers*; Roskill (1977), p.59 for Churchill on Jellicoe

Baugh argues that Richmond may have been overly critical of Admiralty responses to shipping losses in 1917, but was correct that naval budgets had focused on building capital ships designed to win a decisive battle, and both procurement and deployment had reflected this approach to the detriment of the vitally important objective of trade defence.²⁴ However, at this stage the Admiralty was understandably focused on the size and capability of the German High Seas Fleet, which potentially might break out into the North Atlantic shipping lanes and prove a major threat to trade. In order to defend sea communications it was necessary to defeat both the enemy's main fleet and raiding forces, although inevitably there were different approaches to balancing these two interconnecting requirements.

2.3 The First World War

The First World War opened with an Admiralty dominated by the battle line concept and questioning the efficacy of convoys for merchant shipping. However, increases in merchant ship sinkings and associated mounting political pressure challenged the institutional position on convoys and prompted the Navy's successful introduction of air cover. Rising sinkings reflected Germany's increasing U-boat deployments and adoption of unrestricted submarine warfare, the latter unexpected at the outset of the war by the high command of either navy.²⁵ The Admiralty reorganised to address the issue and on 18 December 1916 the Anti-Submarine Division was created under Rear Admiral Alexander Duff; Kemp argues that British A/SW only became professional with Duff's appointment.²⁶ While Kemp is right in ascribing professionalism to Duff's handling of the convoy programme once established, it took months for Duff and the Admiralty to accept the necessity of its introduction for merchant convoys,²⁷ although convoys to protect troop transporters were instigated from the beginning of the war and had proved highly effective.²⁸

Following Duff's appointment, merchant shipping losses rose from 2.2m tons (1916) to 6.1m tons (1917).²⁹ John Abbatiello, Duncan Redford and Philip Grove, and Terraine, attribute this

²⁴ Ibid., p.24

²⁵ Kemp (1993b), pp.19-28; Marder (1969), pp.115-166; Tarrant (1989), pp.51-69; Terraine (1989), pp.40-84; Winton (1983), pp.46-86

²⁶ Kemp (1993b), p.30

²⁷ Marder (1969), pp.121-166; Winton (1983), pp.46-60

²⁸ Terraine (1989), p.51

²⁹ Tarrant (1989), pp.148-149

sharp rise to unrestricted submarine warfare; while agreeing, V.E. Tarrant also notes the sharp increase in operational U-boats,³⁰ leveraging the impact of the unrestricted policy. The Navy responded with various experiments, an approach which proved both characteristic and effective.

For example, the French coal trade,³¹ suffering serious losses, instituted 'controlled sailings' (essentially convoys) in February 1917 on three cross-channel routes, the ships escorted by armed trawlers operating in an anti-submarine capacity.³² Air escort by land-based aircraft was provided by day. From March to May 1917 only nine vessels were lost, all at night, from 4,000 convoyed.³³ A similar scheme had been established at the end of 1916 between Harwich and the Scheldt, and in April 1917 the escorts were augmented by flying boats which flew around and ahead of the convoy; no losses were experienced.

By April 1917 the Admiralty recognised that statistical errors in their calculations had misrepresented losses as a relatively low percentage of vessels.³⁴ Discovery of this error is attributed to Commander Reginald Henderson, the officer in charge of French coal trade.³⁵ In April the true loss rate of ocean-going vessels had reached 25%, which was clearly unsustainable.³⁶

An experimental ocean convoy sailed from Gibraltar to Britain on 10 May 1917. On reaching the Western Approaches its destroyer escort was supplemented by a flying boat from the Scillies; no losses were suffered. The Atlantic Trade Convoy Committee (established 15 May 1917), proposed a convoy system in its report of 6 June to the Assistant Chief of Naval Staff (ACNS).³⁷ Most escorts consisted of a cruiser or AMC to counter surface raiders, augmented

³⁰ Abbatiello (2011), p.107; Redford and Grove (2014b), p.64; Terraine (1989), pp.40-48; Tarrant (1989), pp.48, 163-164

³¹ The British shipped large quantities of coal to France to replace lost coal-mine output in occupied North East France

³² Kemp (1993b), p.45

³³ Grove (1997), pp.7-10. The Rear Admiral Falmouth reported on the success of the French coal trade convoys, with only 53 ships lost out of 39,352 sailings, which he attributed to 'aircraft escort'

³⁴ Black (2005), pp.170-177, points out that the Admiralty may have been misled by its own misinformation, designed to reassure the public and confuse the enemy, but that by late 1916 was fully aware of the true number of merchant ships crossing the Atlantic and hence rate of losses. He cites B.H. Smith, Table A, 4 January 1917, ADM 137/1322. See also Marder (1969), pp.150-151

³⁵ Henderson rose to become Captain of *Furious*, Rear Admiral Aircraft Carriers, before promotion to Third Sea Lord and Controller (1934-1939)

³⁶ Kemp (1993b), p.42; Marder (1969), pp.150-151

³⁷ Kemp (1993b), p.49

by armed trawlers or Q Ships in an anti-submarine capacity. However, when convoys entered the submarine danger zone another vessel was needed: the destroyer in an anti-submarine role.

In June, the first five convoys across the Atlantic arrived safely in Britain.³⁸ Duff then successfully pressed for outbound ships to be convoyed, which reduced losses, despite operational U-boats reaching their 1917 peak (174) in October.³⁹ Allied and neutral merchant losses to U-boats, and mines they laid, fell from 860,334 tons in April 1917 to 411,766 tons in December.⁴⁰ Clearly, the reduction in shipping losses was not primarily due to the sinking of U-boats but to the introduction of convoys.⁴¹

However, many naval officers still failed to acknowledge the basis of the success: they considered convoys to be 'a defensive measure', and the reduction in losses was attributed to the 'offensive strategy' of Navy destroyers counter-attacking by patrolling the sea lanes. The Admiralty equated the success of convoys with killing U-boats.⁴² Indeed, a comparative study by Commander Waters demonstrated that the 'kill rate' (exchange rate of U-boats sunk to number of merchant ships sunk) was 7.5 times greater with convoys than independently sailed ships – a useful by-product of convoy strategy.⁴³

Although air power was not solely responsible for the number of U-boat kills at this stage (airborne weapons were too small and unreliable to do most U-boats any material damage), it did deter attack, also frustrated particular attacks, and could summon surface warships.⁴⁴ U-boat commanders would usually dive on sight of Allied air cover where, with low underwater speeds and limited battery life, they lost their tactical advantage. U-boats had to be in a correct firing position to identify and attack individual targets. Attempting an 'end-around' on a convoy whereby the U-boat surfaced and chased ahead of the convoy, out of sight of escorts, had become hazardous: airborne support could spot the U-boat,

³⁸ Marder (1969), p.258

³⁹ Tarrant (1989), p.164. See also Salter (1921), pp.126, 348-349 for statistics: at the end of April 1917, the proportion of vessels sunk was 7% outward bound and 18% homeward bound

⁴⁰ Tarrant (1989), pp.148-149

⁴¹ Ibid. See p.164 for statistics on 1917 U-boat losses

⁴² Marder (1969), pp.290-291

⁴³ Marder (1970), p.103. For extract from study: Grove (1997), Appendix B, p.XL

⁴⁴ See Howlett (2021), for A/SW and naval aviation in the First World War

attack with bombs and alert the nearest warship, which could counter-attack with depth charges.⁴⁵

While 1918 saw a sharp increase in flying hours by air escorts (4.8m hours compared to 1.7m in 1917), there was only a 24% increase in attacks on U-boats.⁴⁶ All types of aircraft were employed, subject to weather, to sweep ahead of the convoy and offer close escort anywhere from 50 to 100 miles from land.⁴⁷ Whilst the modest increase in attacks on U-boats compared with the very large increase in flying hours might seem unproductive, the outcome was recognised subsequently as an indication of successful air protection of trade. The strategic aim of a convoy was to allow merchant ships to reach their destination in a safe and timely manner; the Navy's use of convoys with air cover achieved this to a remarkable degree.

Between November 1917 and October 1918, losses of independently-sailed ships in the Atlantic and Home Waters were recorded at 3.1% (1,497 ships), while between January and October 1918 convoyed ships in all areas, including the Mediterranean, suffered losses of only 0.4% (393 ships).⁴⁸ Losses fell even further if an air escort was provided. During 1918 U-boats made only six attacks against convoys with an air escort. Only two attacks were successful with three ships sunk. During the whole of the First World War, only five ships were sunk from all convoys with an air escort.⁴⁹ The Naval Staff concluded: 'Employment of aircraft as air escorts to convoys had been "found to be very satisfactory as an A/S measure" whereas patrolling of areas by aircraft "did not give successful results"'.⁵⁰ The Naval Staff in 1918 recommended close aircraft escort to follow torpedo tracks to the U-boat's location,⁵¹ and distant escort around convoys to force any U-boat to submerge.⁵²

The last year of the First World War saw a change in U-boat strategy and tactics. The presence of aircraft inshore caused U-boats to move far out to sea, thus avoiding Allied

⁴⁵ Kemp (1993b), p.60

⁴⁶ Winton (1983), p.107; Grove (1997), p.9

⁴⁷ Terraine (1985), p.226, cites AHB II/117/3(A), p.44. By November 1918 anti-U-boat duties involved 103 airships, 272 land-based aeroplanes, and 285 flying boats and seaplanes; some 26% of total RNAS aircraft

⁴⁸ Winton (1983), pp.114-115

⁴⁹ *Ibid.*, p.107. Grove (1997) states only four vessels (pp.7-8)

⁵⁰ Grove (1997), p.9. The Anti-Submarine Division report of 1918, the 'Protection of Merchant Shipping by Patrol', demonstrated the effectiveness of close air support

⁵¹ Marder (1970), pp.92-93

⁵² Grove (1997), p.10

aircraft as only balloons and kites were available to escorting warships. U-boats increasingly moved on the surface at night, which permitted higher speeds and assisted in identifying and firing at targets at night. By 1918 some half of U-boat attacks were at night on the surface; during the closing months of the war this rose to nearly two-thirds.⁵³

To counter the western move of U-boats, the Admiralty recognised the need for long-range aircraft for anti-submarine maritime patrol and convoy escort; this demand was still unsatisfied at the end of the war, and would effectively remain so for a further 25 years.⁵⁴ In the First World War early machines lacked reliable engines and coped poorly with unfavourable weather, while aircrew often found navigation over water a challenge,⁵⁵ although later machines had longer endurance and were successfully employed in anti-submarine work.⁵⁶ The latter included the Felixstowe/Large America flying boat, whilst the Blackburn Kangaroo aeroplane was successfully employed for coastal patrol.⁵⁷

Turning to the development of aircraft carriers and their aircraft during the First World War, in 1914 the RNAS had nearly 100 flying machines,⁵⁸ with just over half operational. Seaplanes, with the early fleet seaplane carriers, were unable to operate in the frequently rough weather of the North Atlantic and North Sea.⁵⁹ In November 1915 a wheeled aircraft flew from the deck of *Vindex*⁶⁰ and it became apparent this was potentially a more versatile type of aircraft, able to bomb or torpedo enemy vessels and return to the deck of its mother ship.⁶¹

Attempts to develop a landing-on deck saw, in the autumn of 1917, *Furious* converted from a battlecruiser, with a short flight deck (284 x 70 feet); she rejoined the Fleet in March 1918

⁵³ Marder (1970), p.94

⁵⁴ Grove (1997), p.9

⁵⁵ Abbatiello (2011), pp.21-36

⁵⁶ Grove (1997), p.9

⁵⁷ Howlett (2021), pp.77-127. Howlett (2019), pp.42-47, 149 notes the Handley Page bombers, initially used for A/SW 'with conspicuous success', were transferred to strategic bombing in France and discusses the implications for A/SW development

⁵⁸ Turnbull and Lord (1949), p.40, cite US Office of Naval Intelligence estimates in 1914 that total aircraft numbers (presumably military and naval) were as follows: Germany, France, and Russia (500 each); Great Britain (250); Italy (150); US (19). Till (1979), p.85: in 1914 the RNAS had 93 machines, of which 51 were operational and even fewer capable of working with ships. Wyen (1969), p.6: in April 1917 the USN had 54 aircraft, of which none was fit for patrol work

⁵⁹ Another major difficulty was the necessity to stop to hoist the seaplane aboard

⁶⁰ Till (1979), p.85. The aircraft was a Bristol Scout

⁶¹ Marder (1969), pp.12-14, outlines the superior characteristics of aeroplanes over seaplanes

but air currents around the superstructure and funnels, when the vessel was steaming, proved dangerous for aircrew.⁶² It was only after the end of the war, with the conversion of the former liner *Conte Rosso* (becoming *Argus*),⁶³ with a complete flush deck (550 x 68 feet), that full launching and landing of aircraft could be efficiently and safely undertaken. A further development was a converted Chilean battleship which incorporated the first 'island' superstructure on one side of the flight deck; she was taken over in July 1917 and launched in June 1918 as *Eagle* (26,400 tons) but did not join the Fleet until 1922.⁶⁴ *Hermes* (12,900 tons) was the first island carrier to be built from the keel up; laid down in July 1917, she was not commissioned until 1924.⁶⁵ These developments illustrate that it was still early days in the progress of naval aviation; emphasis was on aircraft as an extension of the fleet's traditional tasks, primarily used for reconnaissance and gunnery spotting.

An organisational change in the control of the RNAS in 1918 heralded a new period of inter-service rivalry which undermined development of air cover in trade protection and other naval activities.⁶⁶ The Smuts' report 'Air Organisation and Home Defence against Air Raids' (July 1917) and the second report, 'Air Organisation' (August 1917) which called for a Unified Air Service, led to the formation of the RAF by the merging of the RNAS and Royal Flying Corps (RFC) on 1 April 1918.⁶⁷ The merger was designed to increase efficiency in air defence, whilst also leading to cost savings. The Air Department of the Admiralty was absorbed into the Air Ministry. While the Navy retained control of the construction of aircraft carriers,⁶⁸ development and procurement of naval aircraft passed to the Air Ministry. Some 55,000 naval officers and men were transferred from the RNAS to the RAF on 1 April 1918 with 2,500 aircraft.⁶⁹

⁶² Ibid., pp.13-14

⁶³ Hobbs (1996), p.40. 14,000 tons standard; 16,500 tons deep load

⁶⁴ Marder (1969), p.14

⁶⁵ Hobbs (2013), pp.49, 56

⁶⁶ Howlett (2021), pp.57-209, provides details on inter-service rivalry prior to 1918

⁶⁷ Overy (2018), pp.20-46

⁶⁸ Till (2009), p.194. See also Hobbs (2013), pp.13-34: the Navy had 12 fleet and seaplane carriers in 1918, many obsolete

⁶⁹ Roskill (1968), p.241

2.4 The Interwar Years 1918-1939

Transferring the RNAS to the RAF fractured the close co-operation between airmen and sailors developed during the First World War.⁷⁰ As Till argues, this new line of management undermined what he called 'sea sense', while many senior Admiralty officials remained antipathetic to convoys, seeing them as fundamentally defensive.⁷¹ The rapid expansion of the RNAS during the war fostered a sense of autonomy amongst aircrew, some seeing themselves as airmen first, with better promotion prospects in the RAF, which was determined to develop its own unified ethos of air power and viewed providing aircraft for trade protection as a distraction from its central role of strategic bombing.⁷² Indeed, as Benbow argues, the RAF's development of a particular 'institutional identity' and a 'core ideology' is central to understanding the interaction of the different parties.⁷³ Ultimately, the 'core ideology of the Royal Air Force [which] led it to focus on strategic bombing to the exclusion of properly resourcing other, equally valid, roles for air power', so that by mid-1940 to early 1943 it was 'blind to the requirements of Britain's most vital campaign', namely, the Battle of the Atlantic.⁷⁴

During the interwar years, significant lessons regarding naval aviation and convoy protection were forgotten. This partly reflected the different ethos of the RNAS and the RFC, as well as the severe shortage of resources covered in more detail below. By far the most important lesson was the need for good co-ordination between aircraft and warships hunting submarines, which was a feature of the First World War, and which was largely absent in the early years of the Second World War. Another example is the work on marine markers to aid navigation over water, particularly at night, in 1917, which became operational by the beginning of 1918; it was only reinvented in 1941 when Coastal Command issued an operational requirement.⁷⁵

The loss of 'naval mindedness', and with it the emphasis on operational research, a key feature of the ethos of the RNAS, contributed to the need to relearn many lessons learnt in

⁷⁰ Ibid. See also Howlett (2021) for the development of British naval aviation in the period

⁷¹ Till (1979), p.30; Terraine (1985), p.226

⁷² Till (1979), pp.29-31

⁷³ See Benbow (2014) for a discussion of the RAF's views on air power

⁷⁴ Ibid., pp.44. For further details on the loss of maritime air power knowledge within the Air Ministry, see Goulter (1995), pp.34-131

⁷⁵ Goulter (1995), pp.10-12, 22-23, 135-136, for examples of forgotten lessons

the First World War and the failure to develop some promising research. This loss reflected the dominance of the RFC component of the RAF⁷⁶ and is illustrated by the RAF's and Navy's different opinions regarding the effectiveness of naval anti-aircraft fire against high-altitude precision bombing. The Naval Staff was of 'the opinion that most of the anti-aircraft and bombing trials were still unscientific',⁷⁷ and was keen to see more realistic operational conditions used for trials. In contrast, the RAF assigned bomber squadrons to the task of attacking naval targets but failed to have them carry out such exercises.

The Air Ministry viewed convoys and their protection as a defensive issue with little need for anti-submarine air patrols. The RAF's Coastal Area Command oversaw the FAA and its own maritime reconnaissance aircraft based in harbours (flying boats) and on aerodromes near the coast (aeroplanes). Flying boats became the weapons of choice for the Air Staff, who saw their use increasingly in maritime roles as a 'substitution' for naval forces policing the Empire and its sea routes. The Air Staff pushed Coastal Area down the water route with parent ship/dock for maintaining flying boats and their hulls. This offered the RAF lower base-building costs around the Empire, avoiding heavy investment in numerous aerodromes and support facilities,⁷⁸ outweighing the fact that land-based aircraft themselves were cheaper to build and maintain than the flying boat or seaplane. As Goulter and Buckley argue, Imperial policy led the RAF down a 'doctrinal cul-de-sac', losing most of its skills in trade protection.⁷⁹ The flying boat came to symbolise the RAF's contribution to trade defence.

Transfer of the RNAS to the RAF, and with it responsibility for aerial convoy escort near the shore was, following the successful efforts of the air lobby, coupled with an effective prohibition on the RN developing long-range maritime aircraft.⁸⁰ This, combined with severe

⁷⁶ Overy (2018), p.48: most senior RNAS officers and men transferred to the RAF, which numbered 25,000 officers and 140,000 men post-merger on 1 April 1918. By 11 November 1918 the ex-RNAS contingent represented 19% of the total RAF establishment of 290,170 (AIR 41/45, p.47)

⁷⁷ Goulter (1995), pp.80-84, quotation p.81. Other weapon systems, such as the torpedo bomber and dive bomber, found by the Navy in trials to be more effective methods of sinking ships, were ignored by the Air Staff who seemed reluctant to see developments which might lead to the Navy 'making claims over shore-based maritime squadrons' as it did 'during and after the Second World War' (p.80)

⁷⁸ Buckley (1995b), pp.24-30. However, these early flying boats were not designed to carry offensive weapons, such as bombs or torpedoes, and possessed poor aerodynamics, rendering them unable to engage enemy land-based aircraft in combat. See Abbatiello (2011), pp.13-18 for the relative performance of aeroplanes, flying boats and seaplanes during the First World War; flying boats outperformed seaplanes

⁷⁹ Goulter (1995), pp.37-44; Buckley (1995b), pp.18-24, quotation p.30

⁸⁰ Buckley (1995b), pp.22-24; Goulter (1995), pp.19-20; Roskill (1968), pp.234-268, 356-399

defence cutbacks and the RAF's strategic bombing focus, meant that by 1925 its maritime reconnaissance units possessed only 11 operational aircraft dedicated to trade defence,⁸¹ in contrast to 660 aircraft/airships dedicated to anti-submarine duties in November 1918.⁸²

During this interwar period, the Admiralty focused on aircraft and their carriers in association with the battlefleet, covering reconnaissance, gunnery spotting, air cover and torpedo attacks; Roskill argues that during the 1920s air power was considered peripheral to trade defence.⁸³ However, in the 1930s the Admiralty pushed for 'maintenance of fighter formation over the convoy',⁸⁴ while it saw surface raiders – both heavy capital ships and specialist German pocket battleships (referred to in naval records as the *Deutschland* class) - as the principal threat to trade, and focused on essential capital ship construction, which could also be used as a counter to commerce raiders.

Thus the two parties, for different reasons, drifted apart, undermining the potential for close air-naval co-operation in trade defence. They often overlooked the relevance of land-based maritime aeroplanes and made serious tactical errors in weapon development, such as failing to create an effective aerial anti-submarine bomb,⁸⁵ and spent twenty years in a 'turf war' over the FAA and the training of its pilots.⁸⁶ Buckley suggests returning the FAA to the Navy earlier than 1937/39 would not have guaranteed earlier development of an effective trade defence policy.⁸⁷ However, whilst funding and industrial constraints may have delayed such a development, the chances of this would have greatly increased with a continuation of the good working relationship of 1914-1918 between airmen and sailors. Left to themselves, on the basis that more senior Admiralty officers would have had air experience, they would most likely have pushed for continued development of existing air cover for convoys by both land- and carrier-based aircraft. Indeed, they had laid out such ideas in replies to an Air Ministry request in August 1918 for naval C-in-Cs and senior RAF officers to outline their aircraft requirements by type and number assuming war continued

⁸¹ Buckley (2018), p.180. Supported by 18 training aircraft

⁸² Terraine (1985), p.226

⁸³ Roskill (1968), pp.257-258, 373-374, 536; Roskill (1976), pp.227-229

⁸⁴ Roskill (1976), pp.336-337. The CID reviewed the Protection of Seaborne Trade in 1937, covering all forms of enemy threat

⁸⁵ Buckley (1995b), p.167

⁸⁶ Roskill (1968), pp.234-268, 356-399, 467-497; Roskill (1976), pp.194-212, 392-415

⁸⁷ Buckley (1995b), pp.35-36

into 1920, and by a conference to discuss the responses in December 1918.⁸⁸ The responses and the conference are important because they demonstrate that, at this time, there was clear vision in both the RAF and Navy regarding the potential of naval aviation in trade protection.

Responses included comments on provision of convoy air cover, long-range maritime aircraft, MAC ships and carriers for convoy work.⁸⁹ On convoys, the highest priority was given to trade protection by aircraft. Admiral Charles Dare, Admiral Milford Haven, covered the issue perceptively. He proposed converting merchant ships into aircraft carriers, to ‘...have a convoy equipped with its own air escort and capable of maintaining a continuous patrol by reliefs, throughout the voyage - except at night’.⁹⁰ This clearly called for something resembling what was later called an escort carrier. An alternative was to have an ‘aeroplane carrier’ (i.e., a fleet carrier) attached to a convoy but this was considered ‘hardly feasible’ owing to the building costs of large numbers of such carriers. This would have proven even less feasible given the many other calls there would be on these valuable ships, such as indeed occurred during the Second World War.

A/SW was addressed in a response by a senior RAF officer,⁹¹ who outlined the potential growth of a more sophisticated aerial campaign against submarines under three headings: Coastal Patrol; Convoy Protection; and Offensive/Search patrols with ‘Hunting’ Operations. The first two were of the highest priority and of clear strategic importance.

Offensive/Search patrols would be partly determined by the ‘methods adopted by the enemy, and the naval policy in these waters’. No doubt this reflected the poor returns associated with offensive patrols of the sea lanes by destroyers during the recent war. Indeed, it would take the advent of new technologies, like radar, ship-borne High Frequency/Direction Finding (HF/DF), and the use of ULTRA intercepts, together with the deployment of escort carriers, to make these hunting operations effective. The proposed Hunting aircraft required 14 hours endurance at 90 knots, with crew relief, and a payload of

⁸⁸ Roskill (1969), pp.715-733, 9 September 1918; ‘Naval Post-War Aerial Requirements’ (‘Hope Conference’), 4 December 1918, ADM 116/1836

⁸⁹ Roskill (1969), pp.715-733

⁹⁰ Letter from Admiral, Milford Haven, to Admiralty, 21 September 1918, ADM 1/8540/258

⁹¹ Roskill (1969), p.718. Brigadier-General H.D. Briggs, Commanding No. 9 (Operations) Group RAF, Plymouth. See ADM 1/8540/258, pp.4-7

three bombs capable of damaging U-boats, reliable wireless/telegraphy (W/T) and D/F receiving equipment, with the ability to communicate over 400 miles.⁹² For convoy protection, similar aircraft were proposed, accommodated on merchant ships in convoy or escorting warships.

These proposals were reviewed and a strategy outlined in the subsequent conference, which the Deputy First Sea Lord (Vice Admiral George Hope) chaired to consider 'Naval Post-War Aerial Requirements'.⁹³ The first requirement was determining who the enemy might be: at this stage, listed as France, the USA, and possibly Japan. Discussions included provision for carrying aeroplanes on merchant ships. The agenda stated 'developments in this direction are very desirable and will be an important factor in any future war'; the minutes stated, somewhat optimistically, that 'it was agreed that commercial possibilities would bring about the development required'.⁹⁴ Unsurprisingly, this did not occur.

Navy Fighting Instructions were updated in 1924 and included convoy protection. However, Roskill claims this was only intended to cover fast valuable military convoys, screened by numerous warships. Roskill argues that neither he nor others e.g., Rear Admiral Crombie, remembered exercises involving a slow convoy screened by destroyers against submarine or air attack between 1919–1939. The exercises were always designed to protect merchantmen (not in convoy) from surface raiders. Roskill argues that behind these exercises lay the belief that ASDIC had neutralised the submarine threat, reinforcing senior officers' attitudes that convoy protection was purely defensive.⁹⁵ However, Franklin challenges Roskill's assertions,⁹⁶ and shows that between the wars the Admiralty's specialist anti-submarine teams worked hard to improve the technology behind ASDIC⁹⁷ and convoy tactics involved in tackling the U-boat threat.⁹⁸ Furthermore, Franklin specifically points to

⁹² For coastal work, a smaller aircraft (aeroplane or seaplane), was recommended with lower speed, endurance of about four hours in 'very rough weather', and capable of carrying two 230-pound bombs

⁹³ 'Hope Conference', 4 December 1918, ADM 116/1836

⁹⁴ Ibid.

⁹⁵ Roskill (1968), pp.535-536. No copy of the Fighting Instructions survived. Roskill also cites 'Letter from Crombie to Roskill', 19 August 1964

⁹⁶ Franklin (2015), pp.112-115, contradicts Roskill widely throughout, and notes nine Navy convoy defence exercises between 1927-1938, all but one being between seven and 11 knots

⁹⁷ Ibid., pp.190-195

⁹⁸ Ibid., p.140, describes an interwar Mediterranean Fleet exercise involving a slow (7 knots) convoy attacked by a large fleet incorporating carrier-borne aircraft and four submarines and defended by capital ships, a destroyer flotilla and RAF aircraft

the recognition of ASDIC's limitations when faced with U-boat surface night attacks, which were to be expected in any future war.⁹⁹

It is notable that USN exercises were larger and more realistic than their British counterparts in the 1920s, and used large numbers of aircraft to make attacks on slow moving convoys.¹⁰⁰ The US exercises of 1926 and 1928 appeared to confirm that submarine attacks on mercantile shipping could be severe but held off by screening formations of surface vessels and aircraft.¹⁰¹ The US exercises of 1927 and 1928 showed 'the vital importance of providing air cover for all convoys'.¹⁰²

It is evident that aerial trade protection became an increasingly key issue for the Admiralty in the 1930s, as it grappled with funding cutbacks, supply of suitable aircraft, and emerging changes to strategic threats. In November 1932 the Director of Naval Construction (DNC) was asked for proposals and outline arrangements were prepared for converting a variety of merchant vessels into aircraft carriers, from 14,000 to 20,000 Gross Registered Tons (GRT) with speeds of 15 to 20 knots. The estimated conversion time was nine to 12 months.¹⁰³ A Naval Staff review of these proposals (March 1934) concluded that converted merchant vessels should be constructed with flush decks, diesel-powered ships being the most convenient. Importantly, for an understanding of the development of their procurement and use, this was the origin of the true escort carrier. At this time the British mercantile marine introduced fast diesel-powered passenger liners, capable of 18 to 20 knots with size, length and speed very suitable for conversion to a flush-decked TPC. In November 1934 the Controller, Henderson, suggested the matter be raised in 1936¹⁰⁴ when, no doubt, he hoped budgetary constraints would have eased.

A period of intense Admiralty scrutiny of its options relating to the development of naval aviation began in 1935. This was marked by a series of reviews and recommendations, some

⁹⁹ Ibid., pp.129-135. See also Maiolo (1999b), pp.55-76, regarding the Admiralty's use of ASDIC's reputation to discourage U-boat building

¹⁰⁰ Levy (2012a), p.17. By 1934 the RN was performing fleet exercises involving multi-carrier operations, but could not achieve realistic massed air attacks due to the limited numbers of available aircraft

¹⁰¹ Nofi (2010), pp.85-87, 99-106, 'Fleet Problem': No VI – February 1926, No VIII – April 1928

¹⁰² Turnbull and Lord (1949), p.270. See also Nofi (2010), pp.91-106, 'Fleet Problem': No VII – March 1927, No VIII – April 1928. Felker (2007) analyses USN fleet exercises in this period

¹⁰³ Friedman (1988), p.178

¹⁰⁴ Ibid.

coming in quick succession as threats emerged from the ambitions of Japan, Italy, and Germany, and reflecting changes in treaty obligations and funding.

Prior to the mid-1930s, in the absence of TPCs, air support for trade protection was seen by the Admiralty as 'most economically' to be provided by shore-based flying boats or land-based aeroplanes operated by the RAF, until reconsideration followed Italy's invasion of Abyssinia (1 July 1935).¹⁰⁵ It then became clear that mobility was key to aerial support, as spelt out in the ACNS's 'Requirements of Aircraft', 28 October 1935.¹⁰⁶ This memorandum shows trade protection was high on the Admiralty's agenda, with TPCs as the preferred vessels to cover trade routes, particularly if enemy surface raiders were to use aircraft, especially carrier-borne, and so increase losses of British merchantmen. Anti-submarine naval air patrols would provide convoy protection in conjunction with vessels fitted with ASDIC, the aircraft flying ahead to force enemy submarines to submerge.¹⁰⁷ Significantly, this also marks the point at which the Treasury began to release funds in response to the strategic threats resulting from deteriorating relationships with Japan, Italy and, now, Germany.¹⁰⁸ Japan was seen as the greatest threat, with four pages of appendices concerning war with Japan, followed by two on Germany, and one on Italy.¹⁰⁹

The 'Requirements of Aircraft' memorandum laid out requirements for trade protection in war with any of these countries. It recommended an optimum number of four medium (carrying 30 amphibian aircraft) and 20 small (carrying 15 amphibian aircraft) TPCs, amphibians offering the greatest mobility in terms of tactical usage, being able to 'operate from the carrier, sea or land', unlike coastal reconnaissance aircraft or flying boats.¹¹⁰ The

¹⁰⁵ 'Requirements of Aircraft for Protection of Trade and Coastal Operations' ('Requirements of Aircraft'), 28 October 1935, ADM 116/3724, pp.18-19

¹⁰⁶ Ibid., pp.15-38. This memorandum was in response to one from the Chief of the Air Staff (CAS). Point 6, p.19, outlined the Admiralty's previous position on air support for trade protection

¹⁰⁷ Ibid., pp.20-27. The Admiralty was also alert to the possibility of a modern German fleet carrier able to accompany a capital ship into the North Atlantic to warn of any British hunting groups and provide reconnaissance of convoys; see also Maiolo (1998), pp.23-24. The German aircraft carriers *Graf Zeppelin* and *Peter Strasser* (laid down in 1936) reinforced this perception. Each ship was designed to hold 40 aircraft; see Jane's (1997), p.146. A third ship of the class was apparently assumed in the Admiralty's estimates dated 28 September 1938 (ADM 116/4038, p.149)

¹⁰⁸ Peden (1979), p.205. Naval Estimates increased by 15% in 1935 and 25% in 1936

¹⁰⁹ 'Requirements of Aircraft', 28 October 1935, ADM 116/3724, pp.31-37

¹¹⁰ Ibid., pp.27-29. Some 420 aircraft in total

memorandum also provided details of RAF coastal reconnaissance aircraft requirements.¹¹¹ The initial conclusions clearly show the Admiralty's awareness of its needs although, recognising that finance remained critical, requirements were reduced to one medium amphibian carrier and four small amphibian carriers, with land-based reconnaissance aircraft numbers to be doubled on the outbreak of war. These lower numbers were clearly laid down against the Admiralty's better judgement. Indeed, the memorandum states, regarding the original recommendations: 'it is unlikely to be practicable to do this for financial reasons in the near future, and it will probably be necessary to accept a proportion with provision for war expansion in emergency'.¹¹²

Importantly, in October 1935 the Admiralty, following consultation with the Air Ministry, approved a four-ship programme of armoured-deck TPCs, one to be included in the 1936 programme, ahead of the next fleet carrier after *Ark Royal*.¹¹³ This is particularly significant because it demonstrates the Admiralty's awareness of the need for both types of carrier, even putting a TPC ahead of a much-needed fleet carrier (CV), and would form part of a new aircraft carrier strategy. Original plans for five CVs operating with the main battlefleet(s) were replaced by three large CVs and four TPCs, supporting cruisers on trade route patrol and, if 'properly designed' to incorporate armour, also operating with the main Fleet, providing flexibility in the uses to which TPCs might be put.¹¹⁴ Interestingly, this foreshadowed issues appearing during the Second World War when trade protection was competing with other priorities for naval air power in the face of insufficient supply to meet strong demand.

The Air Ministry's response, 'Aircraft and Trade Protection in War' ('Aircraft and Trade'),¹¹⁵ pointed to 'naïve' false assumptions that warships could defend merchant ships from aircraft attack. The RAF's solution was to operate against enemy air bases, submarine pens and shipyards, illustrating their strong ideological preference for the 'offensive'. There was

¹¹¹ Ibid., pp.30-37. 198 coastal reconnaissance aircraft, and 46 amphibians. Japan required a long 'wish list', totally unrealistic in light of the resource allocation during the 1930s (and was therefore ignored); however, Singapore's protection was seen as critical with 36 aircraft

¹¹² Ibid., pp.29-36. War with Germany was deemed to require 81 coastal reconnaissance aircraft in peacetime, and 162 on war being declared

¹¹³ Friedman (1988), pp.131-132

¹¹⁴ Ibid. Earlier targets were formally replaced in October 1935. This new carrier strategy was itself abandoned by July 1936

¹¹⁵ 'Aircraft and Trade', 4 January 1936, ADM 116/3724, pp.39-41

‘no question of effective local or organised aircraft defence of merchant shipping at sea’ as, at this time, there was no effective warning system of enemy bombers approaching convoys and not enough fighters could be deployed in time.¹¹⁶ The Admiralty countered that the Air Ministry failed to address ship-borne air attacks on trade and challenged their assertion that the Navy could not protect trade at sea from air attacks.¹¹⁷ At this stage the Admiralty was clearly requesting a specific carrier-based aircraft or land-based aircraft designed for long-range maritime air cover, and reiterating the need to build some form of carrier for trade protection.¹¹⁸ The key point is that the Admiralty discussed aerial trade protection at length in the 1930s, but requests for air support foundered in the face of scarce resources and the RAF’s focus on strategic bombing; this would continue until the outbreak of war and beyond.

Nevertheless, in early 1936 the Admiralty established a ‘New Standard of Naval Strength’ calling for eight fleet carriers augmented by five TPCs and a training carrier, making 14 carriers in total.¹¹⁹ This required a new design of TPC. The designers had no experience of small carriers, giving the Controller (Henderson) the opportunity to look at radically different design ideas. He delegated to the responsible constructor, Forbes (designer of *Ark Royal*), initially only requiring that TPCs’ flight decks be armoured against 500-pound bombs, delivered by carrier-borne or maritime aircraft, and their sides armoured against cruiser shellfire; however, he shortly requested additional unarmoured and armoured variants, illustrating awareness of different threats requiring different emphasis on speed, protection, cost, and number of aircraft carried.

Whilst the possibility of building new TPCs was being reviewed, the issue of converting merchant passenger liners to TPCs was raised again (November 1935). The first conversion plans were prepared by the DNC in February 1936. These were for *Winchester Castle* (20,000 GRT with a flight deck of 631 feet) and the smaller *Waipawa* (12,500 GRT and a flight deck of 516 feet). Subsequently (December 1936), the DNC developed outline designs

¹¹⁶ Ibid., pp.39-51

¹¹⁷ ‘Detailed comments by the Naval Staff on Air Staff Memorandum Aircraft and Trade’, 11 February 1936, ADM 116/3724, pp.52-73

¹¹⁸ Ibid., pp.70-73: for design and purpose of reconnaissance aircraft and the need of a TPC to shadow ‘enemy raiders from one area to another’

¹¹⁹ Friedman (1988), p.132

for conversion of six ships. This was a significant proposal, potentially taking the Admiralty down the route of converting unarmoured vessels with relatively low aircraft capacity, placing constraints on wartime operational decisions, while financial pressure and industrial capacity constraints would delay other programmes and force choices between priorities. However, earlier cutbacks in designers and sharply rising demand associated with British rearmament prevented conversions being sanctioned. A Staff conference (July 1937) was followed by Henderson's decision (April 1938) to take the matter forward albeit, as Friedman noted, with a 'low priority'.¹²⁰

Forbes' plans for purpose-built small TPCs were submitted on 25 February 1936. The Scheme F ship (14,600 tons standard displacement with an armoured flight deck) would cost £2.8m including 15 torpedo bombers.¹²¹ Scheme G was an unarmoured variant of F, saving weight (only 13,500 tons) and money (costing £2.7m); Scheme J, proposed a month later, with an armoured flight deck, offered 24 Torpedo-Spotter-Reconnaissance (TSR) aircraft¹²² but displaced 17,600 tons and cost £3m.¹²³ This last variant would become the benchmark for Naval Staff discussions on TPCs, armoured and carrying 24 TSRs. However, the budget for a TPC was only £1.5m and Henderson therefore rejected all variants of TPCs as uneconomic in relation to numbers of aircraft carried.¹²⁴

Further discussions on naval air policy took place in 1936. The Naval Staff produced a 'Memorandum on Naval Air Policy' ('Naval Air Policy'), which was the first of two planned volumes. The first volume was subtitled 'Fleet operations, and equipment of existing Carriers and Catapult ships'.¹²⁵ The second volume (Volume II (in preparation)) was meant

¹²⁰ Ibid., pp.178-179

¹²¹ Ibid., pp.130, 133-134. F and G's costs included stores, ammunition, and aircraft (25 February 1936, ADM 1/9399, p.32)

¹²² Multiple-role aircraft able to carry out torpedo attacks on the enemy's capital ships, spot for the fleet's guns, and reconnoitre the enemy's fleet. See ADM 1/9399, p.8 (unnumbered following Minute Sheet 1)

¹²³ Friedman (1988), p.130. See ADM 1/9399, p.65: originally 17,000 tons, but increased in later iterations to 17,600 tons

¹²⁴ Henderson, 3 March 1936, ADM 1/9399, p.33. See also Friedman (1988), pp.130-134, for TPC costs and budget. The Washington Treaty lapsed on 31 December 1936 and the London Naval Conference of 1935-1936 saw the failure to restrict the size of battleships. Consequently, the cost of new battleships rose and to fit within naval estimates a trade-off had to be made to reduce expenditure on aircraft carriers. The cost of a CV at this time was estimated between £3.5m-£4.05m; *Ark Royal* cost £3.85m

¹²⁵ 'Naval Air Policy', 13 March 1936, ADM 116/4030, p.5

to cover 'Trade Security and building programme and equipment of future Carriers', but was never 'prepared'.¹²⁶ Admiralty files in 1938 state:

...owing to pressure of work and lack of staff, it has not been found possible (even if it were desirable) to revise the Draft Memorandum or to prepare the projected Volume II; but all the essential appendices...are now included in the revised 'War Game Rules' ...¹²⁷

'Naval Air Policy' involved contributions from all Naval Staff departments, attempting to settle naval air policy and agree a carrier-building programme. It noted the need to address 'the lack of a clearly defined statement of the problem as a whole', resulting from 'the absence of a settled policy' in the past, which the document then analyses providing Admiralty reasons for the absence. Reference is made to lack of clear strategy, lack of experience (unstated here but resulting from the obsolescence of carriers and aircraft), and use of aircraft 'not specifically designed for fleet work', noting that 'operational experience and technical progress must continue to modify many of the factors involved' and, importantly, calling for 'continual re-examination of the deductions drawn from them'.¹²⁸ Admiralty papers reveal a strong sense that the Naval Staff saw catapult aircraft as poor value (they were 'one shot aircraft' which could not easily be recovered by their parent vessel) and believed they should be phased out in favour of aeroplanes as sufficient carriers were built.¹²⁹

Illustrating the Admiralty's awareness of the importance of aircraft support for both Fleet and trade protection, the subject was reviewed again the following month. The Staff meeting, 'Aircraft Carriers – Fleet Requirements and Board Specifications' ('Aircraft Carriers'), chaired by the ACNS on 28 April 1936 discussed the distinction between the two types of carrier (CV and TPC), concluding that separation should cease and TPCs should be able to operate with the Fleet.¹³⁰ The two types were designated 'large' and 'small', the former able to carry 48 TSRs and the smaller 24 TSRs.¹³¹ The large, or CV, carrier was to

¹²⁶ Comments on 'Naval Air Policy', 26 April 1939, ADM 116/4030, pp.14-15. 'Trade security' was trade protection by another name

¹²⁷ Comments on 'FAA Tactics', ADM 116/4030, p.14 and unnumbered following page

¹²⁸ 'Naval Air Policy', 13 March 1936, ADM 116/4030, p.5

¹²⁹ Ibid., unnumbered page following p.5

¹³⁰ Comments following 'Aircraft Carriers', 11 May 1936, ADM 1/11971

¹³¹ 'Aircraft Carriers', 28 April 1936, ADM 1/11971. Minute Sheet 1 and following page. The CV would not carry more than 36 aircraft under normal conditions. The small carrier cost £3m (armoured with 24 aircraft); it was

focus on fleet work, providing reconnaissance, gunnery assistance, air protection, and strike capability against enemy surface vessels. For trade protection, the Admiralty favoured the smaller carrier but, on the grounds that it was not sensible to build 'a special ship for a special purpose', required it be armoured, noting that an armoured TPC could become a useful addition to the main fleet, offering deployment flexibility during the course of a conflict.¹³² Admiralty files refer to the small carrier's greater flexibility in operational use, with specific potential including fleet operations, trade protection, security of fleet bases, strategic reconnaissance, and anti-submarine operations.¹³³ This accurately anticipated many of the roles the escort carrier would perform in the Second World War.

In June 1936 it was decided not to proceed with the small carrier because 'the provision of adequate carrier strength to the main fleets must come first', with which Henderson and others concurred. The decision was to build carriers to the largest size permissible by treaty, and only when sufficient of these had been commissioned would attention turn to constructing smaller TPCs. Smaller carriers were less economical than CVs in cost per aircraft carried.¹³⁴ Clearly, the CV, although costing £3.5m-£4m, offered flexibility across the full range of operational requirements, including trade protection, and was therefore prioritised over the armoured TPC (at a cost of £3m).

Chatfield, CNS (1933-1938) and Minister for the Co-ordination of Defence (1939-1940), was aware of the importance of air power but was also clear regarding the choices faced:

If we rebuild the battlefleet and spend many millions in doing so, and then war comes and the airmen are right, and all our battleships are rapidly destroyed by air attack, our money will have been largely thrown away. But if we do not rebuild it and war comes, and the airman is wrong and *our* airmen cannot destroy the enemy's capital ships, and they are left to range with impunity on the world oceans and destroy our convoys, then we shall lose the British Empire.¹³⁵

found 'that it cannot be built cheaply'. See also Thetford (1971, p.133): the TSR was a multiple-role aircraft, able to perform both reconnaissance and strike tasks, illustrated by the Swordfish aircraft (introduced in February 1936)

¹³² Comments following 'Aircraft Carriers', dated 15 June 1936, ADM 1/11971

¹³³ 'Aircraft Carriers', 28 April 1936, ADM 1/11971. Undated attachment headed Aircraft Carriers, pp.20-21

¹³⁴ Comments following 'Aircraft Carriers', 15 and 16 June 1936, ADM 1/11971, p.17 (unnumbered following p.16) and Minute Sheet 7 (p.18)

¹³⁵ Chatfield (1947), p.99. Report of a conversation with Lord Halifax, believed to be in 1936. Original emphasis

Friedman suggests Henderson had possibly, all along, accepted the TPC was a 'non-starter' financially, and was using the concept to gain support for further platforms for naval aircraft from the Air Ministry.¹³⁶ This may be, but has not been the subject of focus by other historians. Certainly, Henderson disliked the idea of a small carrier, believing the small air group of 24 TSRs too small to hunt down commerce raiders.¹³⁷ This underlines the perceived primary threat to convoys at the time: surface raiders rather than alternative threats from submarines or aircraft.

The Admiralty's internal debates over the utility of carrier aviation continued for the best part of the interwar years. They reflected the need to respond to uncertain and changing strategic threats, the pace at which this new weapon system was proven, and the ongoing competition for scarce resources, which included the need to update the battlefleet. These factors were exacerbated by poor performance of naval aircraft in British naval exercises in the 1920s, due to their outdated design and the use of small numbers attacking the fleet or convoy, itself a reflection of scarce resources and, regarding small numbers, an example of a lesson forgotten from the First World War.¹³⁸ This poor performance reinforced divisions in the Navy over carrier aviation and lent weight to those wary of diverting resources from the proven weapon system of the battleship, an essential part of a balanced fleet. The debate over naval aviation was further complicated by the choice between catapult aircraft flown off capital ships, versus carrier-borne aircraft, which were seen by some as too easily diverted with their carrier from fleet duties. As discussed above, underlying these issues was the loss in 1918 of senior naval aviators with 'sea sense' to the newly formed RAF. However, many senior naval officers recognised that aircraft could both support the battlefleet with reconnaissance and spotting functions, and take the fight to the enemy with dive bombers and torpedo bombers. Furthermore, in time the lack of senior aviators was overcome as new leaders emerged, including Admirals Henderson, Ramsay, Cunningham and Somerville. Nevertheless, with the ongoing battle for resources, the debate continued, despite the

¹³⁶ Friedman (1988), p.134

¹³⁷ Ibid., pp.134-135; 'Aircraft Carriers', 28 April 1936, ADM 1/11971. Confirmed by Henderson memorandum, 18 May 1936

¹³⁸ Goulter (1995), pp.10-11. Regarding maritime aircraft, Goulter notes that the benefit of 'delivering an attack in force' had been learned in the early stages of the First World War by the RNAS, but had to be relearned and was considered 'revolutionary' by Coastal Command in 1942

laying down of the carrier *Ark Royal* in September 1935 and the decision to lay down six *Illustrious*-class armoured carriers, starting with two in 1936.

The Admiralty's explanations of the underlying 'large fluctuations' in carrier building proposals are instructive and illustrate the difficulties it faced in determining naval aviation policy. They included the fact that insisting on an armoured deck eliminated the use of a very small carrier which had been envisaged, and that comprehensively reviewing carrier building was now possible following government spending proposals which at last recognised the need for significant rearmament. Their explanations led to the final decision, of which type of armoured carrier should be prioritised: CV or TPC.¹³⁹ These seem perfectly logical steps in decision-making and explain the rationale to focus on deciding between these two sizes of carrier.

However, this explanation of the complexities facing the design department of the Admiralty and Director of Plans Division (DOP), still leaves open the important question of why the Admiralty failed to pursue until much later a low cost unarmoured TPC from an unconventional but practical source, the mercantile shipbuilders. The latter had capacity and could convert a merchantman for a fraction of the cost of a CV (£3.5m and rising).¹⁴⁰ *Activity*, a small converted auxiliary carrier completed in 1942, cost £850,000, less than a quarter of a CV and, as important, completed in a quarter of the time¹⁴¹ (10 months).¹⁴² This was not a radical idea, indeed it had been around since the First World War.¹⁴³ By insisting on armoured TPCs, the Admiralty's proposal was expensive and could never be produced quickly and cheaply,¹⁴⁴ characteristics necessary if large numbers of TPCs were to be built in the latter half of the 1930s, or in wartime. However, at this stage the priority was to focus limited resources on CVs, which offered the greatest amount of operational flexibility, rather than TPCs (armoured or unarmoured) which, because of the type and number of

¹³⁹ ADM 1/11971, Minute Sheet 5, 15 June 1936

¹⁴⁰ Friedman (1988), p.131; Jones (1957), pp.139-140: excluding capacity placed on a 'care and maintenance' basis by National Shipbuilders Security Limited (NSS), 45% of British merchant shipbuilding berths were still idle in 1937

¹⁴¹ Chesneau (1988), pp.100-103. For example, *Ark Royal* took 38 months; *Indomitable* 47 months

¹⁴² Brown (1995), pp.82-85. *Activity* was laid down as a cargo-liner in 1940, taken over for conversion in January 1942 as an escort carrier, launched on 30 May 1942, and completed on 14 October 1942. For *Activity*'s cost see Brown (1983a), p.22

¹⁴³ Friedman (1988), p.47

¹⁴⁴ ADM 1/9399, Minute pages 1-5 (February/March 1936) and extract from Board Minutes (14 May 1936), p.40, discusses the cost of various TPCs against a budget of £1.5m

aircraft they could carry, suffered restrictions in their operational role, particularly against large surface raiders perceived as the primary threat to trade. This debate and its conclusions are important in that they show the Navy focusing on naval aviation, accurately predicting a shortage of platforms, and responding to this shortage by focusing on maximum operational flexibility. These deliberations, and its own analysis of issues which had undermined 'a settled policy',¹⁴⁵ reveal a Navy very different from the one characterised by its critics as complacent at this time, or slow to appreciate the value of aircraft. The Admiralty was not alone in debating the size of proposed carriers, with similar discussions taking place in the US.¹⁴⁶

Meanwhile, 'Naval Air Policy' was duly recorded as a Draft Memorandum to reflect its status as a consultation paper and finally issued in January 1937 as 'FAA Tactics and Equipment' ('FAA Tactics').¹⁴⁷ Senior fleet officers discussed it on 7 December 1937 and on 28 January 1938. No decisions emerged. This was a key issue: decisions were postponed in the face of conflicting views and shortages of funding, leading to a policy hiatus.

During the discussions, Chatfield, as CNS, apparently disliking carriers as they could be detached from the Fleet, so removing air cover,¹⁴⁸ canvassed opinion amongst the C-in-Cs regarding catapult versus carrier-borne aircraft.¹⁴⁹ Roger Backhouse (Home Fleet) favoured carriers, and stated that it was not possible to:

...create a large and efficient Fleet Air Arm by the policy of crowding aircraft into all our ships. If we want a larger Fleet Air Arm we must have carriers from which to operate the aircraft. It is not practical politics either to train aircraft or to operate them....on the one-shot principle.¹⁵⁰

Dudley Pound (Mediterranean Fleet) preferred capital ships to be 'self contained' with a spotting aircraft and a fighter to deal with enemy spotters.¹⁵¹ This, however, was not rejecting carrier-based aircraft, which would be released for other key operational roles.

¹⁴⁵ 'Naval Air Policy', 13 March 1936, ADM 116/4030, p.5

¹⁴⁶ Wilson (1966)

¹⁴⁷ 'FAA Tactics', 15 December 1936, issued January 1937, ADM 116/4030, pp.14, 125-133

¹⁴⁸ Roskill (1976), p.398, citing Conclusions, 23 June 1937, ADM 1/9088

¹⁴⁹ A Staff Meeting, 26 May 1936, raised the issue of 'Aircraft in Battleships and Cruisers – Policy', ADM 1/9088, p.4; the debate overlapped with 'FAA Tactics'

¹⁵⁰ 'Backhouse memorandum', 31 December 1936, ADM 1/9088, p.36

¹⁵¹ Roskill (1976), pp.397-398 and cites ADM 1/9088. See Henderson's memorandum, 7 July 1936, in line with Pound's view, ADM 1/9088, Minute Sheets 3-4

Chatfield supported Pound, determining that capital ships should have two TSR aircraft, while supporting development of the autogyro¹⁵² as nearest to meeting trade protection needs. Admiralty files show repeated demands for development of the autogyro, with the comment that development was ‘hampered by lack of money and by inability to secure production’, blamed on the lack of spare ‘productive capacity’.¹⁵³

In a response to the Admiralty’s ‘FAA Tactics’ memorandum, Pound issued a memorandum dated 27 January 1938.¹⁵⁴ Having covered fleet operations, he commented on aircraft and carriers in trade defence. He noted aircraft patrols could help suppress enemy raiders (both surface and submarine) by co-operating with escort vessels. If there were no carrier present, catapult aircraft or land-based maritime aircraft would be required.

As, however, it is unlikely that any aircraft carriers will normally be engaged in the protection of trade, it will be necessary for cruisers to carry as many aircraft as they can efficiently operate, i.e. usually three.¹⁵⁵

He argued that carrier-borne aircraft mobility would enable the Navy to confront surface raiders anywhere in the world. On the high seas a composite carrier and cruiser force would be required in areas outside the range of shore-based aircraft. The advantage of carriers was that more aircraft were available at short notice. He noted the carrier was a ‘valuable and extremely vulnerable ship’ requiring protection. It needed one large cruiser (ideally three) and a division of destroyers; destroyers being the limiting factor regarding fuelling requirements. If weather restricted flying, convoys would need escort ships for trade protection.¹⁵⁶

During this period, convoy exercises reflected and influenced opinion. For example, Atlantic convoy exercises in the late 1930s reflected the Admiralty’s heightened anxiety over German capital ships operating on North Atlantic convoy routes.¹⁵⁷ A fleet exercise in March

¹⁵² Roskill (1976), p.397. The progenitor of the helicopter; the prototype could not lift two men with any armament

¹⁵³ ADM 1/9088, 13 July 1936, p.8 and unnumbered following page; 15 October 1936, p.9 and unnumbered following page; 21 June 1937, p.10 and unnumbered following page

¹⁵⁴ ‘Response to FAA Tactics’, 27 January 1938, ADM 116/4030, pp.125-140

¹⁵⁵ *Ibid.*, p.130

¹⁵⁶ *Ibid.*, pp.129-133

¹⁵⁷ Maiolo (1998), pp.80, 210, citing 14 September and 18 November 1938, ADM 1/10076. See also ADM 116/4038, pp.109-110. These contradict Roskill’s claims on the lack of convoy exercises, noted above

1938 was tasked with defending a large convoy from enemy forces deploying surface and submarine vessels as well as aircraft, thus demonstrating the Admiralty's awareness of the multiple threats to convoys. Indeed, other exercises even included bringing a commerce raider to battle.¹⁵⁸

Another important review was completed in 1938, which sheds further light on Admiralty thinking. Following the formal decision in 1937 to return the FAA to the Admiralty's control,¹⁵⁹ and approval of expansion of naval aviation forces, the Admiralty reviewed aircraft and carrier needs for the perceived threat from Japan and Germany/Italy. The target date for aircraft delivery was March 1942. The rapid expansion of aircraft numbers would obviously be partly determined by the needs of TPCs and a general review of TPC requirements was included in 'Air Requirements in War' of 1938, known as the 'Holland Report' ('Holland').¹⁶⁰

This report is largely overlooked in the literature¹⁶¹ but is important because it highlights the Navy's analytical approach to air power and trade protection. Its calculations illustrate the complexity of changing strategic threats and is evidence of the Admiralty's appreciation of the likely threats, countering arguments that it underestimated the risks presented by aircraft and submarines. Unsurprisingly, it also illustrates different views of priorities in the face of scarce resources.

'Holland' emphasised the need for TPCs (operating 24 TSRs) and argued that previous estimates of four to six TPCs should increase to 12 if Britain faced war with Germany and Japan simultaneously.¹⁶² The report strongly favoured carrier-borne aeroplanes rather than catapult aircraft on capital ships for practical reasons;¹⁶³ with 100 carrier-borne aircraft for trade defence recommended from total FAA aircraft forecast of 401 for March 1939 and 638 for March 1942. While these aircraft requirements indicate recognition of the importance of

¹⁵⁸ Maiolo (1998), p.80, citing Exercises and Operations 1938, February 1939, ADM 186/159

¹⁵⁹ Completed in 1939

¹⁶⁰ 'Holland', 20 September 1938, ADM 116/3726, pp.266-332. Rear Admiral Lancelot Holland chaired the Committee

¹⁶¹ Only minor references to 'Holland' appear in Roskill (1976), p.409; Till (1979), p.129

¹⁶² 'Holland', 20 September 1938, ADM 116/4038, pp.109-110. Later plans called for 14 fleet carriers

¹⁶³ Ibid., pp.114-117. The drawbacks of catapult aircraft on capital ships included aircraft recovery and movement from its point of recovery to the catapult position, the repair and maintenance/spares facilities, and crew necessary to maintain and fly the aircraft

trade defence, they required carriers, but the severe operational strain placed on the relatively few fleet carriers available prevented any sign at this stage of fleet carriers being committed permanently for such work or any TPC being built or converted. However, importantly, there were plans to address this, with forecasts for available aircraft for trade protection in 1942 of 162, of which 54 should be carrier-borne on *Hermes*, *Eagle* and *Furious*, which would be reassigned to trade protection as new fleet carriers were commissioned.¹⁶⁴

Concerning types of aircraft used on carriers operating on trade routes, 'Holland' argued for maximum search and strike capacity, and therefore recommended all embarked aircraft should be Torpedo-Bomber-Reconnaissance aircraft (TBRs).¹⁶⁵ However, 'Holland' recognised the need to counter enemy aircraft shadowing a convoy, either from shore or enemy carrier, and suggested the need for fighters be addressed by cruiser-based catapult fighter-spotter aircraft, available if such cruisers accompanied the convoy.¹⁶⁶ This, once again, reveals the need to compromise when facing scarce resources. Indeed, 'Holland' then tackled 'financial stringency'. Taking the threat of a two-ocean war as a strong possibility, it recommended maintaining numbers of carriers at the proposed 14; allowing a reduction of three carriers only in the absence of such a risk. The easiest and 'safest path to economy' was determined to be a major reduction of catapult aircraft, although cruisers on trade protection might carry two aircraft when space allowed.¹⁶⁷

'Holland' argued that a composite force of three cruisers and one TPC, with their attendant anti-submarine destroyer screen, would be able to search, find and destroy any likely raider. It calculated that such a force, advancing at 20 knots, could search an area of 510 by 480 miles in 12 hours, which would require 25 surface vessels on their own – a major productivity gain in locating and attacking enemy raiders. It further noted an added advantage of TPCs was that their strike aircraft could, it was assumed, attack raiders with

¹⁶⁴ Ibid., pp.152-153. The three carriers would join *Albatross*, cruisers and AMCs on the trade routes. *Glorious* and *Argus* would be assigned to training duties

¹⁶⁵ Ibid., p.132. This reflected the view at the time that the most likely threat to trade was a surface raider. The advent of the Fairey Swordfish in 1936 allowed the combination of the T/B and S/R function in one airframe

¹⁶⁶ Ibid., pp.124, 127

¹⁶⁷ Ibid., pp.134, 154-155

torpedoes and slow them down, allowing capital ships and cruisers to complete the raiders' destruction.¹⁶⁸

Decisions were taken on the recommendations of 'Holland' at a meeting (5 October 1938), chaired by Holland as ACNS.¹⁶⁹ However, the decisions were subject to 'further review should this prove to be necessary' because of Naval Estimates and FAA funding constraints and 'subsequently to approval by the Board'.¹⁷⁰ The impact of 'Holland's' recommendations, clearly laying out the needs for improved naval aviation for trade protection, was unfortunately muted. The recommendation for TPCs, together with other key measures for trade defence, were necessarily sacrificed on the altar of resource allocation. Basically, approval was only given when deferral was proposed.¹⁷¹ This explains the low level of interest shown by historians in a document which nevertheless shows the state of Navy thinking at this stage.

The funding constraints imposed by the Treasury and industrial capacity restrictions prevented any radical changes to aerial trade defence until war forced a change in policy. The responses to 'Holland' showed the Navy would have to rely on a combination of fleet carriers for 'essential air requirements of the Fleets' and only two unspecified carriers held 'in Reserve for Trade Defence', rather than the recommended four armoured TPCs with 100 aircraft.¹⁷² It was accepted the Navy would have fewer (493) naval aircraft in 1942 than Japan (503) and Germany (174),¹⁷³ 'the two most powerful probable enemies' and thought likely to be fought by Britain simultaneously,¹⁷⁴ and, given the lack of references to allies in these responses, presumably on her own, although the Chiefs of Staff (COS(s)) Committee minutes mention France as 'our only major ally'.¹⁷⁵ The reasoning behind these

¹⁶⁸ Ibid., pp.135-136. Productivity gains were subject to 'war experience'. The raider was assumed to be a surface vessel

¹⁶⁹ 'Decisions taken on 5 October 1938', ADM 116/3726, pp.333-336. In attendance were the First, Second, Third, and Fifth Sea Lords, plus DCNS, ACNS, DPS, and DOP. Till (1979), p.170 names Holland as ACNS on 6 October 1938

¹⁷⁰ Summary of conclusions following meeting on 'Holland' on 5 October 1938, ADM 116/3726, pp.348-350

¹⁷¹ Ibid.; 'Enclosure to First Sea Lord's Minute of 16 October 1938', ADM 116/3726, pp.351-353

¹⁷² 'Holland', 20 September 1938, ADM 116/3726, pp.314-316; Summary of conclusions following meeting on 'Holland' on 5 October 1938, ADM 116/3726, pp.348-350

¹⁷³ 'Decisions taken on 5 October 1938', ADM 116/3726, pp.333-336. The Navy's total aircraft was later amended to 489 (see ADM 116/3726, p.353, enclosure to minute of 16 October 1938)

¹⁷⁴ ADM 116/3724, pp.28-29; ADM 116/3726, pp.301-314; ADM 116/4038, pp.109-110. See also Bell (2000), pp.185-189; Boyd (2017), p.42

¹⁷⁵ Till (1979), p.198, cites CAB 53/37, 19 March 1938

procurement decisions clearly shows they were seen as the lesser of two evils: the opportunity cost of providing the recommended number of TPCs and aircraft would have been further delays in the introduction of fleet carriers and their air groups. The decisions made in 1938 reaffirmed those made in 1936: the importance of aircraft for carriers for trade protection was clearly recognised, but procurement of fleet carriers must take priority over TPCs as they offered greater flexibility.¹⁷⁶ The highest priority remained the protection of the battlefleet, which in turn provided front line support for trade protection, particularly from surface raiders, the perceived most likely threat.

However, responses to 'Holland' also reveal a sense of frustration at the 'fluid' state of naval air policy, which itself reflected the ongoing need to respond to uncertain and changing threats in the context of constant pressure on resources and dependence on a sister service for development of a critical weapon – the naval aircraft.

Whilst responses recognised the importance of aircraft for convoy protection, as had previous reports,¹⁷⁷ they included the hope that land-based long-range aircraft might gain sufficient endurance to deliver trade protection over many parts of the trade routes,¹⁷⁸ thus reducing the need for so many TPCs. However, as discussed previously, the downside of relying on Coastal Command was placing the safety of trade in the hands of a service which might withdraw their aircraft to aid the RAF's core mission, strategic bombing.

Presciently, it was also suggested that the COS(s) might concentrate land-based aircraft for trade protection in one particular theatre, focused within that theatre on defeating the attacks on trade, i.e., 'some single objective which, if destroyed, might go far to winning the war'.¹⁷⁹

¹⁷⁶ 'Holland', 20 September 1938, ADM 116/3726, p.319, citing policy in TD 77/36 (see ADM 1/11971, Naval Staff meeting held by ACNS on 28 April 1936). The 1936 decision was reaffirmed in papers following 'Holland' in October 1938, ADM 116/3726, pp.333-353

¹⁷⁷ 'Requirements of Aircraft, 1935'; 'Naval Air Policy, 1936'; and 'Air Requirements in War, 1938'. See also Creswell (1938), p.77, the new *Naval War Manual*, which states: 'a convoy escorted by ships and aircraft capable of attacking submerged submarines will be to a significant extent immune from danger. When attack cannot be prevented a good chance of counter-attack will be offered, with the result that many submarines will be sunk and the remainder much discouraged'

¹⁷⁸ Response to 'Holland', 6 October 1938, ADM 116/3726, pp.337-343

¹⁷⁹ *Ibid.*, p.343

These remarks illustrate the complexities facing the Admiralty, which included the uncertain pace of technological advances, and places in context the delay in procuring TPCs, whether the high-end specification or inexpensive merchant-yard alternatives. Indeed, the responses go to the heart of the debate over escort carriers. While recognising the importance of aerial trade protection, and the advantages to be gained in using carriers, the Admiralty had to make choices in terms of resource allocation. Facing the overriding need to protect the battlefleet and emerging threats from U-boats and aircraft, it needed to place fleet carriers and other small convoy escort vessels (e.g., corvettes) ahead of armoured TPCs. The Admiralty's conclusion on available resources for convoy protection was made clear in 1939: 'we must rely primarily on evasive routing for the protection of trade', until 'large numbers of AMCs...are available'; this was not expected for six to eight months.¹⁸⁰

Meanwhile, the Air Ministry saw aircraft as the winner in the battle between the bomber and the battleship,¹⁸¹ consistent with its view that protection from air attack was achievable only offensively, by bombing. Having prioritised re-equipment of Fighter Command in the late 1930s, the Air Ministry was anxious to progress new aircraft for Bomber Command and a naval fighter was a distraction,¹⁸² as discussed further below. Strategic bombers would always come first in terms of aircraft development and would be the weapon system to attack Germany's industrial base and shipyards,¹⁸³ consistent with Lord Trenchard's doctrine of strategic bombing.¹⁸⁴ The Navy had to settle for a compromise with the Air Ministry, adjudicated by the COS(s), which determined the number of shore-based aircraft to be dedicated to trade protection, although these numbers far exceeded actual numbers of largely obsolete aircraft made available to Coastal Command,¹⁸⁵ which continued to be starved of enough suitable aircraft for much of the war.

¹⁸⁰ 'Conclusions of the Shipping Defence Advisory Committee (SDAC)', Roskill (1976), p.478, citing Admiralty Letter (AL) 4 August 1939, ADM 1/9676. The emphasis on AMCs reflected the Admiralty's belief that the primary threat was surface raiders, rather than submarines. See also Roskill (1976), p.335, citing AL, 5 February 1937, ADM 116/3635

¹⁸¹ Roskill (1976), pp.221-223, and CAB 16/178-179 for reference to 'Sub-Committee of Assessors on Bomb versus Battleship Experiments' ('ABE Committee'), 8 October 1936

¹⁸² Till (1979), pp.100-106; Barnett (1992), pp.38-39

¹⁸³ Roskill (1976), p.337; Benbow (2014), pp.44-48

¹⁸⁴ Barros (2009), pp.424-427

¹⁸⁵ Roskill (1976), p.338, cites COS 640, 26 November 1937, CAB 53/34; CID 1368 B, CAB 4/26. This outlines the 165 land-based aircraft for convoy escort in a war with Germany and 393 in a war with Japan. Unfortunately, as Ashworth (1992) and Buckley (1995b) show, at the outbreak of war, Coastal Command had nominally 330 aircraft, actually 298, of which 171 were operational and of these only two types were capable of lifting a

Concerning aircraft procurement, the Navy entered the interwar period with very few carrier-borne aircraft, 50 in 1919-20, rising to 105 in 1924, when the Admiralty called for four new 17,000-ton carriers requiring 350 aircraft in total.¹⁸⁶ Eventually, after much debate, 275 main fleet aircraft and 59 for subsidiary operations were proposed to Cabinet (March 1925). However, the Cabinet ruled that war with Japan (then the most credible threat) was unlikely in the next 10 years.¹⁸⁷ This 'Ten Year Rule', introduced in August 1919 but only becoming effective in 1925, was extended on a number of occasions before becoming self-perpetuating in 1928; it was effectively abandoned in 1932 with the most damage to naval construction being in 1930-1933.¹⁸⁸ The Cabinet's decision led to postponement of the carrier programme with a new target of 241 aircraft by 1935.¹⁸⁹ In November 1928 Pound (as ACNS) deferred the target to 1938, whilst only increasing the number of aircraft to 251.¹⁹⁰ A file note to Pound clearly shows the decision was forced on him by the Cabinet decision to extend the Ten Year Rule, and curtail defence expenditure.¹⁹¹ Delays in the catapult programme reduced targets again to 241 by 1938 (of which 65 would be on capital ships).¹⁹²

These cutbacks reflect a complex combination of factors, including an unavoidable lack of strategic clarity; the impact of dual control; the temptation to delay orders in the face of technological changes; and all of these exacerbated by the shortages of resources, both industrial and financial.¹⁹³

meaningful bomb load over a reasonable distance. These aircraft, 36 Lockheed Hudsons and 12 Short Sunderlands, represented some 28% of operational aircraft available to Coastal Command. Ashworth (1992), pp.18-19, 227, Order of Battle, Coastal Command, September 1939. Buckley (1995b), p.116, quoting Terraine (1989), p.246. See Hezlet (1970), pp.128-138 including comparative performance of combatants' aircraft
¹⁸⁶ Till (1979), pp.86-88 PD, 15 July 1924, ADM 116/3117. The British aircraft industry produced 503 aircraft in 1924, versus 30,000 in 1918 (Till (1979), p.197)

¹⁸⁷ Roskill (1968), p.215

¹⁸⁸ For a discussion of the impact of the Ten Year Rule: Bell (2010); Ferris (1989); Roskill (1968), p.215; Roskill (1972), p.70. Roskill (1972), citing the relevant Cabinet meeting minutes, states that although the Rule was effectively abandoned in 1932 it was not formally abolished until 15 November 1933

¹⁸⁹ Till (1979), p.89, cites Board Memorandum, 27 April 1926, ADM 167/74

¹⁹⁰ Memorandum by Pound, 27 September 1928, and Board Minute, 15 November 1928, ADM 116/2550, pp.192, 198. Pound ignored previous forecasts of his predecessor, Admiral Dreyer, which had resulted in official Admiralty policy of 346 aircraft by 1937, which would have necessitated a new carrier

¹⁹¹ ADM 116/2550, hand-written file note between pp.177-178

¹⁹² Till (1979), p.89, citing Pound, 2 June 1927, ADM 1/9276; Board Memorandum 17 May 1928, ADM 116/2550; Board Minute 2532, 15 November 1928, ADM 167/77; Letter from A.V. Alexander, First Lord of Admiralty (First Lord), 3 September 1929, ADM 116/3479

¹⁹³ Till (1979), pp.87-88, 121-131

Turning first to issues of strategic clarity, one of the problems with ordering aircraft stemmed from uncertainties regarding likely enemies and the location of any likely conflict, both of which would impact on demands placed on the Navy and on the tasks likely to be required of the aircraft. Another uncertainty regarded the basis of assessing required strengths. Should the needs be based on some theoretical 'absolute' tactical requirements or upon the forces of possible enemies?¹⁹⁴ Till dates the 'renaissance' to Spring 1931 when Naval Staff put 'the cart before the horse' and, sidestepping uncertainties, based aircraft estimates on the projected carrying capacity of the Fleet.¹⁹⁵

Secondly, with regard to the FAA, at the heart of poor design and production of British naval aircraft, both sea- and land-based, was the dual-control system. The Air Ministry was responsible for designing and procuring all material for the FAA, liaising with the Admiralty who set specifications, and manufacturers for delivery of airworthy aircraft.¹⁹⁶ The impact of this is debated. Roskill argues that the Air Ministry, sometimes colluding with the Treasury, was responsible for inadequate naval aircraft;¹⁹⁷ Hezlet argues that the poor performance of British naval aircraft cannot be laid exclusively at the door of the Air Ministry, given that the Admiralty laid down the specification of its aircraft.¹⁹⁸ Till holds both parties responsible, with the Air Ministry unreceptive to many requests for aircraft development and the Admiralty dilatory and inconsistent in determining its requirements. He seemingly reaches a balanced conclusion when he states that 'the system of aircraft procurement was probably more at fault than either of its main components', quoting Admiral Sir Caspar John, 'the Admiralty was not competent to say what it wanted and the Air Ministry was not competent to advise'.¹⁹⁹ Certainly, the Admiralty rightly remained convinced that the Air Staff would prioritise other RAF Commands over the carrier-borne FAA. Indeed, as discussed further in the next chapter, the tactical urgency of developing first line fighters for the FAA was not heeded by the Air Ministry, who tended to modify land-based aircraft for naval use. This differed from the US approach of designing aircraft specifically for launching from, and

¹⁹⁴ Ibid., p.96. The Admiralty lacked senior officers with air experience and only appointed Henderson as Rear Admiral Aircraft Carriers in 1931

¹⁹⁵ Ibid., pp.94, 96

¹⁹⁶ Barnett (1992), pp.38-41; Hezlet (1970), pp.126-135; Till (1979), pp.94-103

¹⁹⁷ Roskill (1976), pp.194-212, 392-413

¹⁹⁸ Hezlet (1970), pp.126-135. Following the return of the FAA to the Navy, the Admiralty, lacking appropriate staff, initially left the Air Ministry to oversee design and procurement of aircraft

¹⁹⁹ Till (1979), pp.100-104. Till cites letter from Admiral John to Till, 1 August 1978

landing on, aircraft carriers. Using modified land-based aircraft was problematic because stresses placed on the undercarriage and structure of carrier-borne aircraft during landing were far higher than on land-based aircraft; furthermore, naval aircraft required folding wings to allow efficient use of lifts and hangars on carriers.²⁰⁰ In addition, manufacturers, like Hawker and Rolls-Royce, focused on large orders from a revitalised RAF and ignored short production runs for the FAA.²⁰¹

Another problem facing the Admiralty was that while naval aviation technology often changed in incremental steps, financial constraints led to delays in building a new carrier, and a 'wait and see' policy evolved. The Treasury used this attitude to justify deferring new construction. The negative impact of this proved disastrous in the absence of the industrial capacity to recover lost ground.

Finally, underlying all these issues was lack of finance for carrier and aircraft construction. Despite the FAA receiving 18% of the Admiralty budget during 1925-1928,²⁰² this was only £30m and naval aviators complained of resource restrictions.²⁰³ This figure was totally inadequate for the Navy's developing aviation arm, but severe cuts in Naval Estimates left the Admiralty with little choice. Admiralty requests for more carrier-borne aircraft met with resistance from the Air Ministry and Treasury, the latter reflecting funding concerns related to the state of the economy and misplaced optimism based on the mirage of potentially lower defence requirements following Disarmament agreements.²⁰⁴ The result was that only 18 aircraft were added to the FAA between 1929 and 1934.²⁰⁵

With regard to industrial infrastructure, it is important to review the impact of key decisions upon the Admiralty's ability to procure escort carriers and secure aircraft both before and

²⁰⁰ Brown (1975), pp.8-9

²⁰¹ Till (1979), p.100. Barnett (1992), p.38, notes that the two principal aircraft manufacturers (Blackburns and Faireys) selected by the Air Ministry to produce FAA machines were 'inefficient even by the standards then generally prevailing in the industry'

²⁰² The aircraft, shore establishments, air and ground crew and the construction and maintenance of aircraft carriers

²⁰³ Cited by Roskill (1968), p.519. The total (£176m) included Navy pension costs of £8m. For details of the direct costs of the FAA see Memorandum, Appendix D, 27 September 1928, ADM 116/2550, p.197

²⁰⁴ Till (1979), p.94 cites DNAD Minute and discussions, March 1931, leading to AL 13 May 1931, ADM 116/2793. See also 'Staff Requirements of Aircraft Carriers', March 1931, p.4, ADM 1/9330, which outlines the requirements and notes '...it is evident that a new Carrier is a necessity'

²⁰⁵ Till (1979), p.95 cites Monsell, First Lord. Letter to Air Ministry 23 January 1934, Air 8/181

during the Second World War.²⁰⁶ From a prewar (1909-1913) annual average of 166,305 tons of warship construction in the UK, the average in the 1920s was only 30,919 tons, with the private yards hit particularly.²⁰⁷ The decline in British shipbuilding has been examined exhaustively,²⁰⁸ as has the acceleration in that decline following the Wall Street crash of 1929.²⁰⁹ The reasons for cutbacks in defence expenditure are addressed by Kennedy, Peden and Sayers, who argue that the Navy's interwar decline was primarily due to the state of the British economy and growing trade deficit, prompting savage budgetary cuts.²¹⁰ However, credit is due to the Admiralty for its foresighted attempts to foster overseas orders for naval vessels to support the British shipbuilding industry.²¹¹ The nadir of defence expenditure was reached in 1932, with the gradual recovery in naval expenditure well covered by Peden and Roskill.²¹²

As Britain began rearming and demand outstripped increased funding,²¹³ competing demand for other large ships used all appropriate capacity still available in traditional naval yards and their suppliers, so building TPCs and other trade protection measures were deferred.²¹⁴ Boyd argues that British shipbuilding and armaments industries, despite

²⁰⁶ Gordon (1988). Gordon's work on procurement between the wars draws attention to the innumerable policy/procurement/supply committees established by Whitehall to regain control of expenditure by the Services and settle inter-service disputes

²⁰⁷ See Jones (1957), p.125

²⁰⁸ See Lorenz (1991), p.1, who notes in 1913 Britain accounted for 60% of world output of ships, and controlled some 80% of world export markets, citing Parkinson (1956), p.242; Jones (1957), pp.62-63, 79-80, for a comparison of US production methods, p.158 for a review of trade union representation, and p.167, citing Ministry of Labour and National Insurance statistics; Warren (1998), p.185, for US output; Ormston (1948), pp.263-272, for a review of the categories of unskilled and skilled trades in shipyards

²⁰⁹ Gordon (1988), pp.76-82, 131. Typically, peacetime warship building took place in naval yards on the Admiralty's list, besides the Royal Dockyards which focused on 'refit and repair'; Jones (1957), pp.128, 133-136, estimates that during 1923-1929 demand only required one-third of available shipbuilding capacity, resulting in rationalisation by the government-inspired NSS; Hornby (1958), p.37-40, and figures given to Gordon (1988), p.77, show that NSS cut some third of merchant shipbuilding capacity and saw a decline in naval slipways of some 20%

²¹⁰ Kennedy (1976), pp.268-298; Sayers (1956), pp.1-22; Peden (1979), p.3

²¹¹ Bell (2000), pp.138-161

²¹² Peden (1979), pp.3-7, 205. The other two services were also treated harshly. The RAF had re-equipment of aircraft deferred from 1928 to 1935. The Army shrank to a level below that of 1914. See also Roskill (1976), pp.213-214; ADM 116/3436, pp.184-185

²¹³ Peden (1979), p.205. Admiralty expenditure increased, although its share of the annual defence budget fell (49% in 1932 (£50m); 43% in 1936 (£81m); 21% in 1939 (£149m)), compared with a rise in the RAF's share (£17m in 1932; £249m in 1939), and the Army approximately maintaining its share (£36m in 1932; £244m in 1939)

²¹⁴ Gordon (1988), pp.175-176 (citing documents, 15 April 1937, 5 May 1937), 185-191, 209-212. Gordon mentions the arming of ships with modern anti-aircraft guns; the size of the order required it to be broken into two classes, fleet vessels and trade protection vessels, the latter being deferred because of shortages

reduced capacity, were still the world's largest in 1935, but notes a 'block obsolescence' of British naval ships in the mid-1930s.²¹⁵ Furthermore, naval and merchant yards suffered from obsolete equipment and even more importantly had lost the skilled tradesmen upon which the mass of semi-skilled and unskilled workers depended. Indeed, this was exacerbated by capacity constraints in the engineering and armaments' supply chain reported on numerous occasions.²¹⁶ These factors played a major role in delays to completing the *Illustrious* class and continual deferral of TPC construction during the 1930s, which the Admiralty noted was important.²¹⁷ Roskill places the blame for the decision on the Admiralty's 'big gun' mentality, seeing trade protection as a secondary strategic objective.²¹⁸ However, as noted above, other historians place a different emphasis on the big gun issue. As Bell recognises, the Admiralty needed modern battleships as deterrents in the Far East, with fleet carriers providing balance in what the Admiralty expected to be a two-ocean war; battleships were also needed for trade protection in answer to the enemies' capital ships in the Atlantic, Mediterranean, and Pacific. Bell argues that, at this stage, capital ship building restrictions in place until 1936 had to be corrected, and the Admiralty planned well for the war which broke out in 1939 as far as its resources would allow.²¹⁹ Till argues naval aviation was 'deprived of its leadership at the top' following the transfer of the RNAS, resulting in a lack, for many years, of 'the bureaucratic muscle needed to push for the kind of progress and expansion that would have made the sceptical think again'.²²⁰ Certainly, the ability to exploit naval aviation was delayed by the poor performance of carrier aircraft in fleet exercises in the early years, where inadequate aircraft, a result of dual control and the Ten Year Rule, failed to match the carriers themselves – summed up in the expression 'good carriers but bad aircraft'. Till argues failure to show the potential of naval aircraft created a vicious circle of poor performance, undermining its case, and leading to underinvestment. He also argues that bias towards proven technology, the battleship, reflected these uncertainties regarding naval aviation, leading some to adopt a 'wait and

²¹⁵ Boyd (2017), pp.7-9

²¹⁶ Jones (1957), pp.27-140; Johnman and Murphy (2002a), pp.33-59; Gordon (1988), pp.76-95, 212-267

²¹⁷ Two *Illustrious*-class fleet carriers' completion was deferred to 1944 (Hobbs (2013), pp.83-113); 'Requirements of Aircraft', dated 28 October 1935, ADM 116/3724; 'Holland', 20 September 1938, ADM 116/3726

²¹⁸ Roskill (1976), p.224

²¹⁹ Bell (2000), pp.1-47. Bell (p.44), citing Gordon (1988), argues that the constraints on the battleship building programme of the late 1930s was related more to shipbuilding capacity than money

²²⁰ Till (1979), pp.188-190

see' policy;²²¹ however, as Lambert argues, focusing on capital ships reflected prevailing strategic threats from Japan, Italy, and Germany, clear by 1938-1939, which meant that 'Britain had to rebuild her battlefleet to provide strategic cover for trade protection'.²²²

Baugh also denies big gun mentality was the issue: he argues Britain's planning of a coherent naval defence policy was severely hampered by difficulty with identifying the most likely foes during the 1920s, resulting in lack of political will to sustain the naval and industrial infrastructure associated with defence industries. He argues that 1919 to 1934 saw a degree of policy confusion regarding naval aviation and, until its return in 1937/39, the 'insidious effects of the RAF's retention of the Fleet Air Arm'; he also notes an 'inferiority of machines but also of tactics and of war-fighting imagination'.²²³ However, whilst still suffering from a lack of control of the FAA and inferior machines, it is evident that the Admiralty became increasingly clear on the role of the FAA in the 1930s; indeed, in August 1934 an AL stated strongly that 'the main function of the Fleet Air Arm is offence'.²²⁴ Additionally, as Boyd concludes, the Navy achieved a better balance of the Fleet than other combatants in the late 1930s. That air power's importance was recognised is demonstrated by decisions to continue building most of the *Illustrious* class while new *Lion* battleships were suspended to enable a large investment in smaller escort vessels; these decisions illustrate the Admiralty's priorities and form a further basis to challenge some of the accusations of conservatism levelled at the Admiralty. Boyd further challenges Roskill, Marder, Barnett and others for their portrayal of Admiralty conservatism, pointing to the innovative response of Cunningham and others to new methods of warfare – citing night fighting and changes to command and control practices such as 'initiative, flexibility and rapid response'.²²⁵ Despite the limitations of available aircraft, as Boyd states the Navy's

²²¹ Ibid. Till argues that, even if the Admiralty was 'obsessed with battleships', it is 'necessary to know why'; 'conservatism of this kind, if it exists, is at least as much of a symptom of malaise as a cause, because in such circumstances there is necessarily a vicious circle at work'. He shows that the FAA's lack of resources 'produced an indifferent performance which confirmed and reinforced original doubts'

²²² Lambert (1994), p.92

²²³ Baugh (1996), pp.101-119. Till (1979), pp.94-96, 188-189, makes similar observations regarding confusion as to the best way forward during the 1920s, but as noted argues that the 'renaissance' of naval aviation began in 1931

²²⁴ 'AL to C-in-Cs', 14 August 1934, ADM 1/9007, p.97. Original underlining

²²⁵ Boyd (2017), pp.3-54. Boyd gives a well-balanced review of interwar Navy modernisation and rearmament. For examples of the views he challenges, see Roskill (1968, 1976); Marder (1974); Barnett (1972, 1986)

record on air power, 'strategically, operationally and technically, was impressive', with the *Illustrious* programme of six fleet carriers 'ambitious and visionary'.²²⁶

Chatfield blamed politicians for pressure on spending, referring to 'the steady abuse of the defence system handed on from Government to Government', and a mistaken encouragement by politicians of an entrenched public opposition to rearmament.²²⁷

However, politicians too faced dilemmas: the public, sickened by the slaughter of the First World War, was in no mood to countenance another war, particularly without an obvious enemy or threat. Given the prevailing financial orthodoxy and popularity of welfare spending, the choice was between defence expenditure and lower taxes. It was hoped that cutbacks in defence expenditure would release funds for productive investment, leading to higher growth and wealth, and hence the ability to support higher naval expenditure when threats became apparent and spending justified. This, as Bell notes, was based on two faulty assumptions: that Britain would have time to rearm, and that it would still possess the necessary industrial infrastructure.²²⁸ By 1936 the capacity to build armoured carriers, large or small, was severely curtailed by a lack of specialist capacity and money. Time had run out.

The British experience contrasts with that of the USN, which had the advantage of controlling procurement and development of both naval aircraft and carriers, with a clearly-identifiable likely enemy in the Pacific requiring carriers (as forward bases) and aircraft with long flight endurance.²²⁹ The Morrow Board (1926) rejected centralization of naval, military and civilian aviation development, one of the central conclusions of the Smuts Committee (1917).²³⁰ This allowed the USN to develop naval aviation in line with the recommendations of Admiral Montgomery Taylor's Board which strongly recommended specialist aircraft, in contrast to British policy of building multi-application hybrid aircraft which often failed to perform any single task well. Morrow also decreed that US naval aircraft designs would remain standardised for three years, particularly beneficial to the US aviation industry in planning expansion in the run-up to, and during, the Second World War.²³¹ Congress backed

²²⁶ Boyd (2017), pp.40-45

²²⁷ Chatfield (1947), pp.112-113, 189-193

²²⁸ Bell (2000), p.186

²²⁹ Hanable (1998); Till (1979), pp.122-127

²³⁰ Turnbull and Lord (1949), pp.255-258; Roskill (1968), p.468

²³¹ Roskill (1968), pp.467-471

the USN plan, authorising expansion in 1926 with funds for new carriers and 1,000 naval aircraft, including land-based, by 1931.²³² In contrast, Britain increased her number of seagoing aircraft to 165 with the re-commissioning of *Courageous* (1928) and *Glorious* (1930)²³³ but lagged further and further behind the USN, which by 1930 had 419 carrier-borne aircraft.²³⁴

In the 1930s the USN extended its air supremacy lead, aided by two key factors: far-sighted men and ample money.²³⁵ The new President, Roosevelt (1933-1945), former Assistant Secretary of the Navy, had a clear vision of the benefits of naval aviation, building on the earlier successes of Rear Admiral Moffett at the Bureau of Aeronautics, who was succeeded after his death in April 1933 by then Rear Admiral King (later Chief of Naval Operations (CNO) and C-in-C Fleet during the Second World War). Roosevelt used the considerable resources established under 'New Deal' legislation to build ships and, particularly, infrastructure for the USN and naval aviation, augmenting funds established by Congress for the Navy Department.²³⁶ The US began rearming in earnest a year behind Britain but had several advantages in addition to strategic clarity and the difference in the requirements between the main conflicts that the USN and RN envisaged, the latter more in northern waters, with worse weather, and closer to land. The first Vinson-Trammell Act of 1934 had authorised the USN to build up to their full treaty strength,²³⁷ and the US had the finances to implement the wishes of senior political and service leaders. Whilst still sharing the same dominance of the battle line concept²³⁸ as the Royal Navy, the USN had the resources and, crucially, the control over the direction of air power development, and hence the ability to expand its naval air arm to a far greater extent; their aircraft in particular were in another league by 1941, and backed by a strong industrial base capable of rapid expansion in the

²³² Till (1979), p.86. See also Turnbull and Lord (1949), pp.259-260

²³³ 17 May 1928, ADM 116/2550, pp.168-169

²³⁴ Roskill (1968), p.528

²³⁵ Till (1979), pp.86, 91. See Turnbull and Lord (1949) for further analysis of US naval aviation

²³⁶ Roskill (1976), p.472. New Deal monies included US\$238m (1934) and US\$40.7m (1935), augmenting Congress-authorized USN expenditure of US\$33.4m (1934) and US\$33.6m (1935)

²³⁷ Cook (2004). Carl Vinson was Chair of the House Naval Affairs Committee (1931-1947) and a champion of naval aviation and the USN

²³⁸ Hone, Friedman & Mandeles (1999), pp.71-73

event of war.²³⁹ It was the capacity to realise their vision that most differentiated the USN from the RN, both of whom had men of vision.

Similarly, the Japanese made greater advances in naval aviation than the British. The early 1920s saw the British Aviation Mission to the IJN, the Sempill Mission, greatly assist Japanese efforts to catch up with British and US naval aviation capacity and quality. Western opinion was that the Japanese could only copy best practice, while in fact they rapidly began to innovate, illustrated by the launching of the *Akagi* (34,000 tons displacement completed in 1927 with 63 aircraft), and the *Kaga* (33,200 tons completed in 1928 with 72 aircraft). By the London Treaty of 1936, Japan had overhauled Britain in developing naval aviation and caught up with the US; not that this was recognised in the West at the time.²⁴⁰ The IJN had developed an integrated naval air arm incorporating carrier-borne aircraft with modern land-based maritime aircraft in considerable numbers, developing the art of attacking naval vessels.²⁴¹ The efficiency of these forces would be seen in December 1941 with the attacks on Pearl Harbor and Force Z.²⁴²

Meanwhile, in Britain the issue of FAA pilots remained unresolved until the Inskip Inquiry's Second Report (21 July 1937) which recommended that the Admiralty took responsibility for recruiting, training and organising the FAA, but rejected the Admiralty's claim for Coastal Command.²⁴³ In July 1938 Admiral Alexander Ramsay became Fifth Sea Lord with responsibility for the FAA, and with this appointment reorganisation accelerated.²⁴⁴

Finally, with reference to shore-based maritime aircraft, Coastal Area was formed as part of the RAF in 1919, with both the Air Ministry and Admiralty formally committed to this form of air power. In March 1927 they concluded that convoy escort work in the event of a European war would require some 350 shore-based aircraft, a figure very similar to that

²³⁹ Turnbull and Lord (1949), pp.308-323

²⁴⁰ Roskill (1968), pp.530-531. Roskill cites Okumiya and Horikoshi (1957); this bibliography edition 1991, p.146

²⁴¹ Hezlet (1970), pp.131-132. The Japanese Navy 96 (Nell) was a shore-based bomber capable of lifting 1,100 pounds of bombs for 2,125 miles over the ocean at 270 mph

²⁴² Edwards (2010), pp.82-90, 206-213

²⁴³ Roskill (1976), p.403, cites 21 July 1937, CAB 24/270. Copy in AIR 19/23. The classic British compromise; the pressure of war dictated that the Admiralty would obtain operational control of Coastal Command in April 1941 (Till (1979), p.195)

²⁴⁴ Barnett (1992), p.40. Ramsay was formerly Rear Admiral, Aircraft Carriers

deemed necessary in 1937 when 339 were called for to confront Japan and Germany.²⁴⁵ The difficulty arose in the subordinate position in which maritime aviation found itself within the RAF.²⁴⁶ Whilst the RAF had its own problems of strategic uncertainty, shortage of funding, and unfulfilled demand, it cannot escape the charge that the focus on strategic bombing overrode all other considerations, with serious consequences. Coastal Command, as it became in 1936, was always overshadowed by both Fighter and Bomber Command, and by September 1939 Coastal Command still had only half the number of maritime aircraft, 171 out of 339, requested by the Admiralty; of these, only 48 were operationally effective.²⁴⁷ It is unsurprising that this was well behind the US and Japanese maritime air forces in both quantity and quality.²⁴⁸

2.5 Conclusion

This chapter has shown that the Admiralty recognised both the importance of convoys and, with some dissenters, the need for TPCs, and periodically planned for the provision of the latter, if necessary by the more expedient method of conversion. In the interwar years, facing scarce resources, it was necessary to prioritise the battlefleet and its protection, not least because it formed the vital foundation for trade protection. The analysis of 'Holland' and the responses it received illustrates the complex pressures on the Admiralty, pressures which forced it to accept the delays in naval aerial trade protection.

Faced with the failure of government to provide funding throughout the 1920s and early 1930s to maintain shipbuilding and naval aircraft assembly capacity, the Admiralty had to prioritise. Modern battleships and CVs, the key foundation of trade protection, would be necessary to match modern Japanese, Italian and German capital ships and carriers, and what carrier building capacity and funding there was, was focused on the more flexible CVs. Accordingly, even when the Controller instructed designers to focus on an armoured TPC which could also be used with the Fleet it was, predictably, rejected as too expensive given resource constraints. Indeed, proceeding with an armoured TPC would have required the cancellation of CVs or capital ships, both of which were priorities.

²⁴⁵ Till (1979), p.98, citing 'Joint Staff Conference', 31 March 1927, AIR 5/411, and 'Joint Planning Sub-Committee report', 11 October 1937, CAB 53/33; Buckley (1995b), p.84

²⁴⁶ Buckley (1995b), p.116; Probert (1994), pp.371-372

²⁴⁷ Ashworth (1992), pp.18, 227. 'Order of Battle', 3 September 1939

²⁴⁸ Till (1979), pp.98-103

As this chapter has shown, the Admiralty could have used the capacity still available in merchant shipyards to build or convert unarmoured TPCs quickly and cheaply, able to carry the relatively small number of aircraft necessary for trade protection. However, this would have required the acceptance of some financial opportunity costs, a very vulnerable vessel being deployed in the shipping lanes, and a TPC which could not serve in a dual-purpose role with the Fleet. It was therefore not an acceptable solution until required by the exigencies of war.

Finally, the chapter has examined how the priorities of the fledgling RAF, and the associated issues with dual control of the FAA, impacted upon the development of TPCs and suitable aircraft. It has shown that at the end of the First World War there was a clear understanding of the need for air and naval co-operation and the function of air support of convoys. An analysis of the Hope Conference papers of December 1918, revealed strong support for air cover throughout the voyage of a convoy, as well as proposals to use converted merchantmen as carrier platforms, and to deliver air support through two types of aircraft: carrier-borne and long-range land-based. This vital ethos of co-operation was fractured by the transfer of the RNAS to the RAF. The result was a diminution of air-mindedness in the Admiralty and a loss of appreciation of maritime air support in the Air Ministry. The issue of aerial trade protection became clouded by inter-service suspicion and rivalry for scarce financial and industrial resources, with the Admiralty dependent on the Air Ministry's ability and willingness to provide effective maritime air co-operation, and the Air Staff doubting the effectiveness of the convoy and remaining focused on strategic bombing. The result was the severe under-resourcing of the development and procurement of naval and maritime aircraft and pilots. Nevertheless, it is clear from the Admiralty's repeated, intense scrutiny of its options in relation to naval aviation, evident in the analysis of 'Holland' and other key reviews of the 1930s, that it was significantly more open to the role of the aircraft against a range of threats than is often suggested.

The external threats at the end of the interwar period forced an end to this quarrelling and the COS(s) accepted that both air attacks and unrestricted submarine warfare were probable, with the Air Staff notionally committed to the provision of land-based air cover of convoys. However, while the Admiralty requested that Coastal Command receive over 300

land-based maritime aircraft for trade protection the RAF was only able to offer some 171, mostly obsolete, aircraft. This sums up their relative priorities.

The measures to protect convoys were inevitably vulnerable to the enemy adopting a different approach to the one assumed in plans for the Navy to focus on surface raiders. As the next chapter explores, the enemy did indeed adopt a different approach, and the Admiralty responded by re-examining its approach to trade protection and auxiliary carriers.

3. Chapter 3: Early Hostilities: September 1939-December 1941

3.1 Introduction

This chapter examines the choices facing the Admiralty and its responses during the first two years of the Second World War, when Britain lacked the TPCs needed to counter three of the major threats to trade: surface raiders, submarines and aircraft.¹ It examines why stop-gap solutions to trade protection were adopted in the opening phases of the war, assesses their operational effectiveness and places them in the context of procurement constraints and competing demands for air cover for other military activities in many theatres. The chapter also considers how the Navy adapted its approach to escort carrier procurement and use as strategic threats multiplied from June 1940 to December 1941. Note that throughout the period of this chapter 'escort carriers' were still known as 'auxiliary carriers'.

3.2 Strategic Overview

The key objective of British naval strategy in this period was to control sea communications, enabling the blockade of German mercantile trade and protection of trade to and from Britain, as well as transportation of military forces.² This control was to be exercised by the Navy and Coastal Command focusing on the Atlantic and, with France, on the Mediterranean. The Navy also needed to assess and respond to the changing strategic situation following the fall of France in June 1940 and increasing threats from Japan to Britain's Far East interests. The resulting pressure on resources led to unsatisfactory but necessary compromises,³ which lie at the heart of the Navy's approach to the procurement and use of auxiliary carriers in this period.

Whilst the period was preceded by an Air Ministry expressing doubts that, 'close air escort provides the best protection that aircraft can afford a convoy',⁴ the Navy's continued recognition of needing TPCs is illustrated in various debates in the first three months of 1940 and in December 1940, and in memoranda showing its assessment of the impact of

¹ TPCs could not counter the fourth, the mine

² Roskill (1961a), p.44. In the first six weeks of war some 338,000 tons of contraband was confiscated

³ 'Proposed New Standard of Naval Strength', 26 April 1937, ADM 1/9081, pp.1-17, Appendix; Butler (1957), pp.13-27

⁴ Memorandum, Air Commodore S.A.S.O. to C-in-C, 13 April 1939, AIR 15/34, paragraph 8

the changing strategic situation. For example, a response to a January memorandum⁵ discussed the role of aircraft carriers in trade protection and needing a full aircraft complement on TPCs to ensure destruction of enemy surface raiders.⁶ The uncertain strategic situation is illustrated by the ensuing debate in which the Director of Operations Division (DOD)(F) was relatively optimistic about avoiding war in the Far East, but others focused on inherent risks of assuming no war with Japan and the postponement of two aircraft carriers previously agreed to be laid down in 1940.⁷ The debates' conclusion, summarised by Pound (now First Sea Lord), was that the aircraft carrier issue be reconsidered in the autumn of 1940.

German strategy in the early years of the war was to use a 'balanced fleet' to disrupt trade routes, relying on surface raiders on oceanic routes, U-boats focusing on coastal waters using unrestricted warfare, and the *Luftwaffe* attacking ports and bases.⁸ The success of this early strategy was undermined by limited resources. The *Kriegsmarine's* planning rested on Hitler's assurances ruling out naval war with Britain before 1946; the earlier outbreak of war disrupted the naval construction programme, Plan-Z,⁹ and while Germany had more modern capital ships she possessed far fewer vessels overall than Britain. However, in June 1940 the fall of France and entry of Italy into the war altered the strategic picture dramatically. Germany secured naval ports and air and U-boat bases in France and Norway, and gained a new ally, whilst Britain lost a valuable ally and that ally's forces and bases. The distance for U-boats to reach the Atlantic was reduced by 450 miles, enabling even small 250-ton class

⁵ Memorandum from DOP, 4 January 1940, ADM 116/4299, p.43. This noted the need for 14 CVs, plus the old *Argus*, as had been recommended in prewar papers (see 'Building Policy', 1936, ADM 1/11971, p.37) which, reflecting shortages of carriers, had cut TPCs from five to three in 1936, and to one when war broke out ('State of FAA', 4 September 1939, ADM 116/3722, pp.1-3. The designated TPC was the CV *Courageous*, lost in September 1939)

⁶ Addendum by DOD(F) (to Memorandum by DOP), 8 February 1940, ADM 1/11971, p.46

⁷ Addenda, 4 and 9 March 1940, ADM 1/11971, pp.48-50

⁸ Behrens (1955), pp.80-84; Padfield (1993), pp.157-189; Roskill (1961a), pp.52-57; Terraine (1989), pp.191-207. Bekker (1974), pp.34, 94-95, argues that a 'balanced fleet' was the wrong strategy given the time and resource constraints and the urgent need for adequate numbers of U-boats; this argument is supported by Padfield and Terraine

⁹ Hitler gave many assurances to the *Kriegsmarine*, the last on 29 January 1939: Bekker (1974), p.34 quotes Hitler, 'For my political aims I shall not need the Fleet before 1946'; Doenitz (1990), p.38. For details of Plan-Z: Bekker (1974), p.372; Showell (1979), pp.23-24. See Doenitz (1990), pp.25-36, for the debate over the correct composition of vessels to defeat the RN

U-boats to be used there,¹⁰ and larger U-boats to roam beyond Longitude 25 degrees West, well past the air cover capability of most Coastal Command aircraft in the early days.¹¹

Italy's entry into the war exposed British interests in the Middle East, leading to campaigns there and in East and North Africa, placing further pressure on RN resources, including increasing demands for escorts in the Mediterranean for ships transporting British army and RAF personnel, equipment and supplies.¹² A key feature of the Mediterranean campaign was the close proximity of land from which shore-based Italian, and later German, aircraft could attack warships and convoys,¹³ resulting in heavy losses of British ships, notably on the Malta convoys and during the Crete campaign. To reinforce Malta with fighter aircraft, CVs were used as fighter transports,¹⁴ illustrating a further potential use for an auxiliary aircraft carrier and another example of competing demands for such an asset.

The end of 1940 saw DOP review the needs for carriers again, but noting that 75% of naval armour-producing capacity was currently allocated to military (i.e., army) needs and accordingly any increase in carriers would have to await approval of the draft 1941 Construction Programme. He stressed the strategic uncertainty of the conflict's duration and possible Japanese involvement, pressing for two carriers in each of the 1941 and 1942 programmes.¹⁵ He was supported by the Director of Naval Air Division (DNAD) who warned of the obsolescence of older carriers and naval aircraft, and that the war had, during 1940, become more strategically challenging, impacting on both the trade routes and Fleet with 'shortages of carriers [is] becoming more seriously felt', stating:

¹⁰ Roskill (1961a), pp.346-349. Germany opened the Lorient U-boat base in July 1940, then Brest and La Pallice

¹¹ Showell (1989), pp.37-38. Only the three squadrons of the Sunderland flying boat (with six aircraft each) could make any impression with their 850 nautical mile radius of action (Ashworth (1992), pp.18, 227)

¹² Bragadin (1957), pp.3-37, 354-367; Greene and Massignani (2011), pp.10-191; Roskill (1961a), pp.294-308. The initial advantage of superior Allied surface ships and inadequate Italian air cover, was offset almost immediately by the loss of the French fleet's involvement (June 1940), which tipped the balance in favour of Italy. However, Swordfish flown from *Illustrious* attacked the Italian fleet's Taranto naval base (11 November 1940). See also Hobbs (2020), pp.1-88; Jones (2011) pp.83-84. Many Italian capital ships were damaged, the remainder being moved to northern ports, and the initiative passed to the RN for a period

¹³ Cunningham (1999), pp.55-560; Woodman (2000), pp.1-276

¹⁴ Roskill (1961a), p.433; Woodman (2000), pp.246-248. The CV *Ark Royal* was sunk in November 1941, following the flying-off of replacement Hurricanes to Malta

¹⁵ December 1940, ADM 1/11971, p.51

...there is no early prospect of shore-based aircraft substituting for carrier-borne aircraft effectively...therefore, it is carrier-borne aircraft or nothing, on which we must primarily rely for ocean work and battle.¹⁶

On 22 June 1941 Germany invaded Russia and RN resources became further stretched by the introduction of Arctic convoys providing US and British war goods to Russia, a situation exacerbated by the absence of effective Russian trade protection and by the likely build-up of German forces (surface, U-boats and air) in northern Norway.¹⁷ Furthermore, whilst the invasion saw the bulk of *Luftwaffe* bomber forces transferred to the east, the benefit of this in the Atlantic was offset by the impact of increased numbers of U-boats.¹⁸

The final major strategic event in this period was the Japanese attack on Pearl Harbor, the impact of which is discussed in the following chapter.

3.3 Procurement

3.3.1 Introduction

This section examines procurement issues in the context of the compromises needed in the face of pressure on resources and evolving threats which, with regard to trade protection, resulted in the adoption of stop-gap measures to compensate for a lack of TPC's on oceanic trade routes for most of the period.

The extent and impact of procurement constraints are revealed in official documents in which the Admiralty examined its potential resources, the results pointing to the stark choices it faced as it grappled with changing strategic and operational threats. In September 1939,¹⁹ six CVs were under construction – the *Illustrious* class.²⁰ *Illustrious* was completed in

¹⁶ Memorandum by DNAD, 9 December 1940, ADM 1/11971, p.52

¹⁷ Roskill (1961a) p.485; Woodman (1994), pp.1-82. This threat materialised in early 1942

¹⁸ Roskill (1961a), pp.615-618. *Luftwaffe* sinkings of ships in the Atlantic peaked in 1941 at 1m tons (23% of Allied tonnage sunk in 1941)

¹⁹ 'State of FAA', Memorandum by Ramsay, 4 September 1939, ADM 116/3722, pp.1-3: lists the six operational CVs (*Hermes*, *Eagle*, *Furious*, *Courageous*, *Glorious* and *Ark Royal*, with *Albatross* housing the amphibious seaplanes), of which only *Courageous* (lost in September 1939), was dedicated to trade routes. The six CVs had 159 FAA aircraft embarked; 47 amphibians and 18 TSRs were distributed between *Albatross*, a seaplane carrier, and catapult-carrying warships within the Fleet

²⁰ Hobbs (2013), pp.83-113. *Illustrious* (completed May 1940), *Formidable* (November 1940), *Victorious* (May 1941), and the modified *Indomitable* (October 1941), *Implacable* (May 1944), and *Indefatigable* (May 1944)

May 1940; the difficulty was in finding enough pilots (a shortage of 100 was mentioned) and stores/equipment.²¹ No TPCs were available or under construction.

January 1940 saw a review of naval construction by the Sea Lords, who discussed the comparative strength of Britain and her potential adversaries in the period 1940-1942. These included Germany, Russia, Japan, and Italy. This review is important in illustrating ongoing strategic uncertainty, issues with British naval shipbuilding capacity, and debates over the number of carriers and whether more emphasis should be placed on their use on trade routes.²²

The DOP fully supported the need for more carriers, noting:

Although our new aircraft carriers [the *Illustrious* class] will begin shortly to come into commission, we shall still be far short of the total of 15 carriers which we require. Moreover, our present carriers are for the most part old and approaching the end of their life.²³

The Sea Lords' review clearly shows recognition that more carriers were needed on trade routes but, in light of the constraints discussed, decisions were made retaining the policy of a total target of 15 fleet aircraft carriers; estimates were that by 1942 Britain would have 11 carriers to Germany's two and Japan's eight or nine.²⁴ The review also showed pressure on resources for close escort vessels needed to provide AA and A/S capability for trade protection, and early difficulties with the Ministry of Shipping. Of the 336 vessels required to ensure a minimum of four ASDIC-equipped vessels per convoy, only 258 vessels were in commission, being built, or approved. The other 78 vessels could only be acquired by conversion of merchant ships, which was 'strongly opposed by the Ministry of Shipping', who resisted requisition of oceanic merchant ships required to maintain the flow of trade and whose numbers were already threatened by war losses and the use of cargo-liners as

²¹ 'State of FAA', 4 September 1939, ADM 116/3722, p.3

²² 'Sea Lords' Meeting', Draft of minutes, 3 January 1940, ADM 205/5, pp.1-6

²³ Memorandum, DOP to ACNS, 4 January 1940, ADM 116/4299, p.43. The files imply that this 15 related only to CVs, not to seaplane carriers

²⁴ 'War Construction Programme, 1940-1942', Memorandum by DOP, 9 January 1940, First Sea Lord's Records, 1939-1945, ADM 205/5, Section B, pp.1-6

troop transports.²⁵ This opposition impacted on provision of any hulls for auxiliary aircraft carriers.

The core issue of resource shortages is illustrated by an exchange of letters in January 1940 between Churchill, as First Lord, and Sir John Simon, Chancellor of the Exchequer. The Chancellor was highly critical of the Admiralty's financial forecasting, comparing it unfavourably with that of the Army and RAF whom, he suggested, had worked more collaboratively with Whitehall. He noted the funding requirements, competing demands for new merchant vessels, shortages of shipyard labour, manning levels of the enlarged Navy, together with other aspects of naval expenditure such as harbour expenses and the FAA. He was particularly upset over the cost of hiring and converting merchant ships, the costings of which had not been shared with the Treasury in advance as promised.²⁶ Subsequently, the Treasury insisted on naval shipbuilding cutbacks, causing cancellation of battleship and fleet carrier orders, with no new carriers laid down for the 1940-41 programme. The Admiralty, forced to prioritise immediate needs, focused new construction on escort vessels, such as destroyers and corvettes. However, it noted the lack of modern capital ships and fleet carriers would place Britain in a vulnerable position if Italy and Japan, whose intentions were still unclear, entered the war.²⁷

Responsibility for merchant shipbuilding passed to the Admiralty on 1 February 1940.²⁸ Whilst the war had opened with a theoretical British annual shipbuilding capacity of 2.5m tons of merchant and naval ships, the reality was a combined output of 1.6m tons²⁹ and, as discussed in chapter 2, the Admiralty faced a shortage of skilled shipyard workers, with production now disrupted by air raid warnings, lighting restrictions, and damage to yards.³⁰ Merchant shipbuilding particularly suffered from supply shortages, including steel in the first year of the war, frequently resulting from a lack of priority for merchant shipbuilding

²⁵ *Ibid.*, Section F, Note 9

²⁶ Letter from Sir John Simon to Churchill, 20 January 1940, ADM 205/5. The exchange included: Letter from the First Lord to the Cabinet, 1 February 1940, and other memoranda within the Admiralty, 2 and 3 February, ADM 205/5, pp.1-6

²⁷ 'Revised Schedule of New Construction Programme and Costs', and other papers, including Draft Memorandum, 'New Construction Programme, 1940-41', 31 January and 6 February 1940, First Sea Lord's Records, 1939-1945, ADM 205/5; Extract from Board Minutes, 22 and 26 February 1940, ADM 116/4601, pp.3-6

²⁸ Ayre (1945), p.4

²⁹ 'Merchant Shipbuilding and Repairs in the Second World War', Volume I, CAB 102/440, paragraphs 53-54

³⁰ *Ibid.*, paragraph 54; Moore (2003), p.33

with subcontractors.³¹ In April 1940 the Controller of Merchant Shipping reported that steel supplies were sufficient to see a projected annual rate of 1.5m tons of merchant shipping being achieved in a few months.³² However, the Admiralty faced numerous obstacles. Firstly, the projected availability of steel fell with the loss of supplies from Belgium and Luxembourg. Furthermore, this figure would necessitate cutbacks in naval construction and in conversion of merchant ships to auxiliary vessels, or an expansion of shipbuilding capacity, which labour shortages prevented, while the 'Priority of Production Direction' (14 June 1940) gave an 'over-riding preference to aircraft and tank production', adversely affecting shipbuilding.³³ Another key issue was repair work. In April 1940, nearly half of the labour force was engaged in repair and conversion (excluding the Royal Dockyards).³⁴ Additionally, there was a fall in construction of cargo-liners, the vessel most suitable for conversion to auxiliary aircraft carriers; their share of completions fell from 27% in 1940 to 'well below 20 per cent' in 1941.³⁵ These issues added to pressure on the Admiralty as it sought to develop some form of auxiliary aircraft platform by way of conversion.³⁶

3.3.2 British stop-gap measures and other initiatives

In this early phase, the Admiralty (and *Kriegsmarine*)³⁷ perceived surface raiders as the major threat to convoys. These included pocket battleships, designed specifically to attack maritime trade,³⁸ auxiliary Armed Merchant Raiders (AMR),³⁹ battlecruisers and cruisers,⁴⁰ and two battleships nearing operational readiness.⁴¹ The *Kriegsmarine* often operated surface warships in pairs (for example, *Scharnhorst* and *Gneisenau*, and *Bismarck* and *Prinz Eugen*), enabling them to overpower a convoy surface escort of limited size. However,

³¹ 'Merchant Shipbuilding and Repairs in the Second World War', Volume I, CAB 102/440, paragraphs 72-76. January 1940 saw a target of 1.5m tons of merchant shipping adopted which, with an allowance for repairs, required 1.1m tons of steel annually

³² *Ibid.*, paragraphs 320, 76-77. The returns were clear: one ton of steel gave nearly four tons of deadweight carrying capacity, which could carry to Britain over 12 tons of goods annually

³³ *Ibid.*, paragraph 324; Moore (2003), p.35

³⁴ 'Merchant Shipbuilding and Repairs in the Second World War', Volume I, CAB 102/440, paragraph 320

³⁵ *Ibid.*, paragraph 329

³⁶ *Ibid.*, paragraphs 317-319

³⁷ Maiolo (1999b), p.71. German perception of ASDIC as an antidote to the U-boat had played a part in shaping German naval policy

³⁸ Showell (1979), pp.108-111

³⁹ *Ibid.*, pp.119-122, provides details and operational successes of these 11 ships

⁴⁰ *Ibid.*, p.105. Some were so large as to be classed as battleships by the *Kriegsmarine* (*Scharnhorst* and *Gneisenau*)

⁴¹ Roskill (1961a), p.57. *Bismarck* and *Tirpitz*. The Admiralty expected these battleships and the aircraft carrier, *Graf Zeppelin*, to be completed by December 1940

despite expectations on both sides, and the few U-boats initially operational, U-boats rapidly proved the greatest threat to trade, evident in steadily increasing sinkings of Allied merchantmen.⁴² The potential air threat also evolved in this period, with the *Luftwaffe's* designated squadrons for maritime work focused initially on the North Sea. In addition to six *Gruppen* (wing) of Heinkel 111 for a maritime blockade of Britain, there was an early agreement the *Kriegsmarine* should have 41 *Staffeln* of 12 aircraft of which 12 *Staffeln* would complement the three planned aircraft carriers.⁴³

The secondary literature provides good background to the Navy's response to surface raiders,⁴⁴ which included forming eight hunting groups (capital ships, often supported by cruisers and fleet carriers)⁴⁵ by October 1939. Other cruisers patrolled major trade routes, cornering *Admiral Graf Spee* (December 1939), and providing close escort to key military convoys, e.g., troop convoys. Importantly, Admiralty plans to locate and counter German attacks on trade by the *Bismarck* and *Graf Zeppelin* showed recognition that *Graf Zeppelin* represented the bigger threat with its aircraft covering many square miles a day looking for convoys and, furthermore, that these aircraft could protect *Bismarck* from Allied hunting groups.⁴⁶ This illustrates the Admiralty's recognition of the need for close convoy protection by aircraft carriers (fleet or TPC), although it was unable to provide it at this stage due to shortages of carriers and their aircraft, and competing requirements. It thus sought alternative measures.

⁴² Ibid., pp.58-60. Only 46 U-boats were fully operational with 39 on station at the outbreak of war. Costello & Hughes (1977), p.304, note 105 ships sunk by a daily average of five U-boats engaged in the Atlantic between September and December 1939; this grew to 150 ships sunk between July and September 1940, by a daily average of eight U-boats. War had come too early for Doenitz, appointed Rear Admiral and C-in-C of U-boats in 1939, who initiated in September 1939 a U-boat building programme of 20-25 vessels a month (Doenitz (1946), p.3). Showell (1979), p.23: Plan-Z called for 241 U-boats by 1948

⁴³ Roskill (1961a), p.60; Showell (1979), p.23; Janes's (1989), p.146. *Graf Zeppelin* and *Peter Strasser* (both laid down in 1936 as fleet carriers to carry 40 aircraft each), and *Seydlitz* (a heavy cruiser, launched in 1939, its hull converted to an aircraft carrier). Plan-Z proposed four fleet aircraft carriers by 1948, with eight the ultimate goal; however, none became operational

⁴⁴ Bekker (1974), pp.17-95; Costello & Hughes (1977), pp.9-67; Milner (2003), pp.19-33; Redford (2014a), pp.13-21; Roskill (1961a), pp.32-33, 113-121

⁴⁵ Churchill, First Lord, Memorandum to Sea Lords, 5 September 1939, ADM 205/5, p.5; Roskill (1961a), p.114

⁴⁶ 'Action to be taken against Bismarck', Memorandum, 28 January 1940, ADM 1/10617 and comments by DOP and others suggested that regarding a break out into the North Atlantic, the *Graf Zeppelin* was perceived as a greater threat than the battleship (1940: 29 January, 31 January (handwritten), 8 February). DOP (8 February 1940) noted that *Graf Zeppelin* was due to complete 'very shortly' and 'we must count on her being available for service after 1st April'

To supplement cruisers⁴⁷ on trade routes, the Admiralty's solution was the reintroduction of AMCs, designed to protect convoys from German AMRs.⁴⁸ This is an example of a stop-gap measure, based on the tried and tested technique for wartime expansion of using auxiliaries and adapting available resources when facing strategic uncertainty. Similarly, plans for arming AMCs with catapult aircraft were developed as a temporary solution to the expected need for convoy air cover, a need impossible to meet with the limited range of shore-based aircraft.⁴⁹ However, catapult manufacturing constraints only permitted four heavy catapults to be ordered for 1939 and 1940, and three for 1941.⁵⁰ Eventually, only nine AMCs received catapult aircraft; a tenth (*HMS Pretoria Castle*) was reconverted to an escort carrier in 1943.⁵¹ Subsequently, the catapult aircraft programme for AMCs was deferred. This decision reflected grave shortages of ships, aircraft, catapults, and trained personnel (pilots and aircraft fitters),⁵² and urgent, competing requirements.

The Navy's response to U-boats in this period, during which U-30 sank the *Athenia* (3 September 1939), focused on the formation of convoys, while the loss of *Courageous* on an A/S sweep in September reinforced the need for greater A/S capabilities. Roskill is highly critical of the Admiralty's response to the U-boat threat, arguing that lessons of the First World War had been forgotten.⁵³ However, as discussed, clearly the Admiralty was fundamentally constrained by limited resources. Whilst it may, as Terraine argues, be guilty of initially attempting to hunt U-boats rather than focusing on convoy protection,⁵⁴ it was

⁴⁷ Roskill (1961a), p.43: 70 cruisers was the minimum required by the Admiralty in 1939. Only 58 were available

⁴⁸ Hague (1983a), pp.8-24: of 74 AMCs requested, 56 vessels were requisitioned, mostly between August and October 1939, with conversion typically taking three to four months. AMCs were first seen in the First World War with some modified to operate aircraft (see Friedman (1988), pp.30, 42-43)

⁴⁹ 'Aircraft for Armed Merchant Cruisers', 28 April 1938, ADM 116/4299, pp.9-11. This reflected earlier plans by a policy committee under the ACNS that some AMCs on 'detached duties' (i.e., far from land) might use a Walrus (Amphibious Bomber Reconnaissance aircraft or ABR). However, rough weather in many oceans restricted their use

⁵⁰ Ibid.; 'Aircraft in Capital Ships and Cruisers', undated, ADM 1/9088, p.10, paragraph 20: the cost of a heavy catapult was given as £17,000 (with the statement that catapult aircraft were probably more expensive than carrier-borne aircraft). See also 'Air Council Sub-Committee on Supply', Meeting Friday, 13 May (apparently 1938), instructions for Director of Air Matériel (DAM), ADM 116/4299, p.14: the Air Ministry's dilatory response to requests for Walrus is underlined in a meeting in which it talked of the requirements of the Walrus Mark II, and noted it 'is not a matter of such urgency to reach a decision in the case of this aircraft'

⁵¹ Cocker (2008), pp.103-108

⁵² 'Aircraft for Armed Merchant Cruisers', Meetings, 28 April, 11 and 13 May, 8 July 1938, ADM 116/4299

⁵³ Roskill (1961a), pp.103, 134-135; Terraine (1989), p.222

⁵⁴ Terraine (1989), pp.244-248, is critical of this 'flawed' policy which had failed in the First World War. Roskill (1961a), p.134, suggests Churchill, as First Lord, was partly responsible for this policy

lack of resources which undermined the Admiralty's ability to achieve convoy air cover effectively. Indeed, convoys were introduced with very little surface protection, and in the early period of the war often only one AMC was available per convoy beyond Longitude 12.5 degrees West.⁵⁵

Important light is shed by official papers on the Admiralty's recognition of the need for some form of permanent air cover over convoys, as well as on the persistence with which it pursued attempts to produce some realistic stop-gap solutions. For example, one set of papers between September 1939 and March 1940, reveals lengthy discussions on converting merchantmen into auxiliary seaplane carriers.⁵⁶ Policy had evolved into an Admiralty decision to convert four merchant ships into seaplane carriers for 36 Walruses.⁵⁷ The requirements were laid out in two memoranda by the DOP, noting the need for:

...at least four sea-plane carriers – these are required to make up for our shortage of aircraft carriers, (now increased by the loss of the *Courageous*), in order (a) to provide reconnaissance for trade defence and control of shipping in areas where shore based aircraft cannot be made available [and] (b) to counter the submarine campaign.⁵⁸

However, the opportunity cost of the Walrus, previously allocated for use with cruisers, and the six months minimum to procure such aircraft and the seaplane carriers, meant physical manifestation of the policy failed to materialise.⁵⁹ The availability of suitable aircraft was questioned and there was an initial reduction of seaplane carriers to only two,⁶⁰ with subsequent questioning of the availability of hulls for conversion.⁶¹ In January 1940 the

⁵⁵ Roskill (1961a), map 9, opposite p.93, states 12.5 degrees West; Tarrant (1989), p.82, states 15; Showell (1989), p.37, suggests 17. Differences reflect the gradual westward movement of British air and surface protection

⁵⁶ 'Conversion of Merchantships to Seaplane Carriers', 3 September 1939, and 'FAA Aircraft for Auxiliary Seaplane Carriers', Memoranda, 21 September 1939, both ADM 116/4299, pp.17-28, including related pages. Expected conversion time was three to four months; specification given, 5 September 1939, pp.20-21. See below for other September-March papers

⁵⁷ 'Conversion of Merchantships to Seaplane Carriers', 3 September 1939, ADM 116/4299, pp.17-19

⁵⁸ 'Merchant Ship Conversion to Sea Plane Carrier', Memorandum, 5 September 1939, ADM 116/4299, pp.20-21; quotation from a second memorandum, 'Fleet Air Arm Aircraft for Auxiliary Seaplane Carriers', 21 September 1939, ADM 116/4299, pp.22-23. This quotation makes clear that the policy was not solely defensive but also offensive in assisting enforcement of Britain's maritime blockade of Germany and the occupied countries

⁵⁹ Memorandum, 5 October 1939, ADM 116/4299, pp.24 and following page

⁶⁰ 'Aircraft Equipment for Auxiliary Seaplane Carriers. Proposed increase in Authorised 1st Line Strength of the FAA by 36 ABRs', 13 October 1939, ADM 116/4299, pp.25-27

⁶¹ 'Proposed Conversion of Merchant Ships to Seaplane Carriers', Memorandum from Director of Sea Transport, Ministry of Shipping, 5 December 1939, ADM 116/4299, p.63

DNAD wrote to ACNS regarding trade protection in the Caribbean and the Mozambique Channel, outlining the 'urgent need for seaplane carriers to provide reconnaissance which cannot be found from any other source for some years, if at all'.⁶² The Admiralty, in response to these shortages of seaplane carriers and their ABRs, ordered 40 long-range seaplanes (PBY-Catalina) from the US for delivery towards the end of 1940. As this was the likely completion date of two auxiliary seaplane carriers, and delivery of ABRs was uncertain, the decision was taken to defer construction of the seaplane carriers for six months.⁶³

The fall of France in June 1940 was a pivotal moment resulting in British naval resources being stretched even further, covering greater areas of the oceans and combating a broader range of weapons systems used by Germany and Italy. Access to the Atlantic from the west coast of France increased the threat from surface raiders based on Brest,⁶⁴ U-boats transformed by the establishment of U-boat pens, and *FW Condors* based on maritime airfields, with U-boats becoming the dominant threat.⁶⁵

The activities of the surface raiders, culminating in the British sinking of *Bismarck*, underlined the importance of carrier-borne aircraft in tackling this threat.⁶⁶ This issue had been raised previously by DNAD stating a carrier force was needed to combat the German carrier *Graf Zeppelin* and, until the *King George V* battleship was completed, would provide the only means to force *Bismarck* to accept action should she break out into the Atlantic.⁶⁷ The Navy's response to increased threats from surface raiders demonstrates flexibility in its search for ways to provide close convoy support vessels, whilst maintaining other operational duties. The AMCs were augmented by Ocean Boarding Vessels (OBVs), 17 being commissioned in the second half of 1940 to patrol shipping lanes and intercept German

⁶² Memorandum, DNAD to ACNS, 2 January 1940, ADM 116/4299, p.42

⁶³ Memorandum, 15 March 1940, ADM 116/4299, p.36 and following page. For deferral, see Memorandum by the Head of Air Branch, 20 March 1940, ADM 116/4299, p.46

⁶⁴ Roskill (1961a), pp.82-83, 277-292, 364. The *Scharnhorst* and *Gneisenau* had performed a successful sortie in November 1939, covering the North Atlantic. 1940 saw German disguised AMRs crisscrossing the Atlantic and Indian Oceans, while the *Admiral Sheer* and *Admiral Hipper* focused on the Atlantic. *Hipper*, *Scharnhorst*, and *Gneisenau* were active in the early months of 1941, and *Bismarck* and *Prinz Eugen* broke out into the North Atlantic in May 1941

⁶⁵ For losses see: 'Merchant Shipping Casualties', Memorandum by Air Ministry, 28 August 1940, AIR 15/35, p.48A; Butler (1957), pp.571-573; Franklin (2015), pp.129-135; Roskill (1961a), pp.349-354, 463; Showell (1979), p.34; Showell (2002), pp.31-43

⁶⁶ Kennedy (1974); Roskill (1961a), pp.394-418

⁶⁷ Addendum by DNAD (to Memorandum by DOP), 5 February 1940, ADM 1/11971, pp.43-45

contraband runners. Hague called these vessels 'a cut price AMC', and OBVs were earmarked for expansion to release AMC's larger crews and greater potential for deployment as troopships or cargo-carrying vessels. However, these plans failed because commissioning further OBVs would have employed refrigeration vessels and placed even greater stress on British shipyards, full of damaged ships and high-priority vessels for conversion.⁶⁸ OBVs can be seen as part of the desperate scramble by Admiralty planners to substitute vessels for others badly needed elsewhere for alternative operational roles. It was a matter of priorities shifting with the fortunes of war.

Dramatic increases in Allied merchantmen sinkings in the summer of 1940⁶⁹ marked the point at which the Admiralty began garnering the political and inter-service support to pursue the procurement initiatives which would lead to aerial trade protection. The impact of increasing losses is illustrated by AOC-in-C, Coastal Command, Air Chief Marshal Bowhill's memorandum for a meeting of the Air Ministry and Admiralty, in which he outlined his fears: 'If our losses in shipping continue on the lines at present, then we lose the war. The Merchant shipping of this country is its life blood'.⁷⁰

There followed a series of meetings called to improve co-ordination and communications between Coastal Command and the Admiralty over convoy protection, with actions spelt out to enhance convoy defences.⁷¹ In an *aide memoire*, Bowhill suggested using catapults on merchant ships, with Hurricanes or Spitfires tackling *FW Condors*, with one catapult ship per convoy. This would be accompanied by the RAF attacking German naval bases, U-boat pens, and the *FW Condors'* airfields.⁷² Bowhill pursued this in a memorandum to Rear Admiral H.R. Moore, suggesting the Admiralty might wish to consider using Hurricanes or US Grumman

⁶⁸ 'Merchant Shipbuilding and Repairs in the Second World War', Volume I, CAB 102/440, paragraph 320; Hague (1983b), pp.25-29

⁶⁹ Roskill (1961a), pp.617-618. 1940 British, Allied and neutral merchant ship losses in the North Atlantic were (quarterly, tons): 121,944; 370,186; 586,075; 727,289. These losses in 1941 were (quarterly, tons): 896,449; 903,741; 366,020; 255,490. Global merchant ship losses in 1940 were 4m tons and in 1941 4.3m tons (both well ahead of British shipyard output)

⁷⁰ 'Some remarks on the 'U' boat problem to be used for discussion', 22 September 1940, AIR 15/35, 56A

⁷¹ AIR 15/35: topics included (1940): trade protection, 23 September, 64B; shortages of escort vessels which had been diverted to anti-invasion duties in the Channel, 1 October, 69A; the need for Air-to-Surface Vessel (ASV) radar in aircraft: benefits of ASV now 'definitely proven', 15 October, 78A; and tramlines policy: attacked by the Director of A/SW, who called it 'suicide' unless escorted by adequate numbers of destroyers, 29 October, 85A

⁷² 'Notes for next U-boat Conference', 11 November 1940, AIR 15/35, p.87A

Martlet aircraft catapulted off converted tankers.⁷³ Meetings in November 1940 show the Admiralty pushing again for solutions to the problems of convoy air defence. For instance, on 13 November the CAS and First Sea Lord, supported by their staffs, reviewed air threats to convoys and the initiatives proposed, including a Radio Direction Finding (RDF or radar) cruiser with catapult aircraft, and a revolutionary expendable wooden aircraft, catapulted off a special RDF ship.⁷⁴ Further meetings in November examined converting AA ships to some form of auxiliary FCS,⁷⁵ while the RAF debated using shore-based fighters,⁷⁶ but their range was too limited even if based in Northern Ireland or Iceland.⁷⁷

In early December 1940, Captain M.S. Slattery, DAM, produced a memorandum on the German air threat to merchant shipping, proposing a blended aircraft carrier and cargo vessel, to be known as an 'auxiliary fighter carrier'.⁷⁸ Two days later another DNAD memorandum reviewed the wooden aircraft idea first proposed on 13 November by Air Vice-Marshal Sholto Douglas, Deputy Chief of the Air Staff (DCAS).⁷⁹ Douglas had proposed equipping large numbers of merchant ships, possibly 400, with inexpensive and simple catapults, capable of launching newly designed expendable wooden aircraft: the Woolworth Scheme. The DNAD proposed the aircraft (the Miles M.20 Fighter)⁸⁰ could carry one 250-pound bomb, for use against surface raiders and submarines, or act as a fighter to tackle German reconnaissance or bomber aircraft such as the *FW Condor*.

⁷³ Memorandum, 18 November 1940, AIR 15/35, p.89A. Martlet was the British name for the Wildcat

⁷⁴ Minutes of Admiralty-Air Ministry Meeting of 13 November 1940 to discuss 'Measures to Improve the Air Defence of Shipping in Home Waters', 13 November 1940, ADM 1/11139, pp.103-110, discussed in a letter dated 14 November to Vice Admiral Tom Phillips (VCNS), pp.100-101

⁷⁵ 'Bank Class Auxiliary A.A. ship – Fitting of Catapult', 27 November 1940, ADM 1/11139, pp.166-167

⁷⁶ 'Fighter Defence of Atlantic Shipping, Protection of Shipping in North-Western Approaches', 27 November 1940, AIR 20/2078. For the RAF perspective on the initial phases of the Battle of the Atlantic, see responses invited by CAS (7 March 1941) on a directive by the Minister of Defence, AIR 20/2895; 'Interception of Focke-Wulf Aircraft in the Atlantic', including Vice Chief of the Air Staff note 1 March 1941, AIR 20/2896; for RAF views on the Battle of the Air, see AIR 41/73

⁷⁷ Conferences and briefing notes, 1940: 11 November, 12 November, 27 November, 1 December, AIR 20/2078

⁷⁸ Friedman (1988), p.182. No original copy of this 5 December 1940 memorandum (AM 8136/40) has survived

⁷⁹ 'Provision of Fighters for Merchant Ships', DNAD memorandum, 7 December 1940, ADM 1/11139, pp.132-133

⁸⁰ Minutes of Meeting held at the Admiralty on December 12, 1940, to discuss 'Provision of Ship-borne Fighters with Convoys ('Provision of Ship-borne Fighters'), ADM 1/11139, p.140: the Miles M.20 (6,700 pounds, eight guns, and 93 gallons of fuel), had 1.2 hours endurance at 295 mph. It had been under development at Reading for about six months as the private venture of Lord Beaverbrook (the Minister of Aircraft Production), but was still being evaluated

On 12 December 1940, the Admiralty hosted a major inter-service conference reviewing the provision of ship-borne fighters with convoys to tackle *FW Condor* and other German aircraft.⁸¹ This meeting is particularly significant because it led directly to three initiatives, all implemented, including what would become known as the escort carrier. It is also important in revealing some of the complexities facing the Admiralty in its search for solutions.

One example of complexities relates to the first two initiatives, which were based on catapult technology. Cruisers, with their catapult aircraft, were in short supply and unavailable for convoy duty. The only immediately available catapult-carrying vessel was *Pegasus*, an FCS used to train fleet catapult pilots. *Pegasus* was already sailing with convoys and it was decided to investigate converting the *Bank* class of AA ship to carry a catapult aircraft, although it was recorded that no catapults were immediately available. It was also decided to investigate using tankers as catapult aircraft platforms, but the low freeboard meant this required further evaluation.⁸² Given pressure on catapult manufacturing resources, it was concluded that nothing could be expected for at least 12 months. Other negative statements followed in quick succession. For example, the Ministry of Shipping representative thought that when ships were light, as most outbound ships were, they would be 'too lively' to use a catapult.⁸³ The DOP representative placed great importance on catapults not interfering with loading and discharging of cargo and stated that three months to install a catapult on a merchant ship was unacceptable.⁸⁴ Another problem was the type of aircraft: the only British ones agreed as immediately available for catapulting were the Fulmar and Skua and neither was fast enough to tackle current German aircraft.⁸⁵ Finally, the Admiralty conference determined that the Woolworth Scheme, as currently envisaged by DCAS, was unworkable for various reasons, including insufficient catapults for anything

⁸¹ *Ibid.*, pp.140-143. The Admiralty, Air Ministry, and Ministry of Shipping attended

⁸² *Ibid.*, pp.140-141. The meeting noted that there were two types of aircraft catapult in use: a heavy type for aircraft up to 12,000 pounds, and a lighter type for aircraft up to 5,500 pounds. Five firms could make catapults in Britain: two were fully employed, one was doubtful as a supplier, and two could 'probably do something slowly'. Development of new catapults would take at least 12 months, whether from Britain, or America where catapult technology differed. The DNC's representative had examined drawings of merchant ships and expressed difficulty in finding a suitable site for a catapult

⁸³ *Ibid.*, p.141. It would be necessary to fire the catapult 'on the right point of the role [*sic*]', which would be hard to gauge

⁸⁴ *Ibid.*

⁸⁵ *Ibid.* The decision was taken to investigate the suitability of the Martlet or Miles M.20, while the Air Ministry was examining the possible use of the Hawker Hurricane on a catapult

like 400 merchantmen. Some other means of providing ship-borne aircraft would have to be found.⁸⁶

At this conference, Slattery reported on his investigations into alternative systems for launching aircraft from ships. These included using rockets which, although requiring time to evaluate, would avoid the procurement bottleneck of traditional catapults.⁸⁷ Slattery also proposed building a flight deck along the length of a merchant ship with its superstructure removed, to be known as an 'auxiliary aircraft carrier'. The latter proposal met the need for low cost and fast construction by having no hangar or lift, and a simple arrester system comprising two wires and one safety barrier – all worked off one unit. The suggestion was that the aircraft complement, six Hurricanes, would be stowed on deck, allowing bulk cargo to be carried. However, the Ministry of Shipping representative argued that it was too complicated for such a ship to carry cargo and aircraft, and that it should be employed solely as an auxiliary aircraft carrier.⁸⁸

Following the debate at the December 1940 meeting, the DNAD submitted three proposals to the Board of Admiralty. Firstly, a small number of existing heavy-type catapults should be diverted from new construction or removed from warships undergoing repair and placed in existing merchant ships, to be designated FCSs. It was initially proposed that six ships be selected (either merchant ships or Navy OBVs),⁸⁹ later reduced to five.

Secondly, Slattery was to investigate, with MAP, the most suitable aircraft and the best form of projection, whether traditional catapult or rocket-assisted catapult (the latter being tested at the Royal Aircraft Establishment, Farnborough), for use with merchant ships. The merchant ships equipped with this rocket-assisted catapult were later known as CAM

⁸⁶ Ibid., pp.141-142. It was not considered feasible to use cargo-carrying merchant ships on North Atlantic trade routes as fighter pilots required considerable practice and the ship required RDF, without which interception chances were negligible. The Woolworth nickname was subsequently adopted for the auxiliary aircraft carrier vessel itself

⁸⁷ Ibid., p.142. It was reported that, without rocket assistance, Hurricanes required 350 feet of flight deck and headwinds of 20 mph. Rockets reduced the flight deck needed to 150 feet, or 75 feet of rails on a rocket catapult ship (Friedman (1998), pp.180-181)

⁸⁸ 'Provision of Ship-borne Fighters', 12 December 1940, ADM 1/11139, p.142. However, this idea materialised later as an auxiliary aircraft carrier capable of carrying cargo of grain or oil. It would become the MAC ship requisitioned for conversion in 1942

⁸⁹ Ibid., pp.142-143

ships.⁹⁰ The rocket-assisted trials proved particularly successful, with this new system relatively inexpensive and only requiring three weeks to produce.⁹¹

The third initiative was conversion of a merchant ship to an auxiliary aircraft carrier,⁹² a type of vessel which would become known later as the escort carrier (or CVE) - the focus of this thesis.

The three initiatives - the FCSs, CAMs and the auxiliary aircraft carrier - were a direct response to the rising loss of merchantmen to enemy surface vessels, U-boats and aircraft.⁹³ This shows clear thinking at the Admiralty, searching for the most effective and efficient way to address immediate needs with available resources. Indeed, the projects discussed above suggest the Admiralty was mindful of the scale of the problem, aware of the role of air power, and showed flexibility and imagination in its search for solutions in the face of conflicting priorities.

Following the conference, the Admiralty used existing Navy hulls to accelerate the introduction of FCSs, converting three OBVs and one auxiliary AA ship to join the existing catapult training ship *Pegasus*.⁹⁴ The five FCSs became operational between December 1940 and June 1941, conversion taking up to five months. Some vessels carried reserve aircraft but none, except for *Pegasus*, had lift or hangar. The ships flew the White Ensign and were crewed by the Navy.⁹⁵ The aircraft were catapulted when enemy aircraft were sighted. After combat, pilots either sought the nearest landfall or parachuted into the sea near an escorting vessel.⁹⁶ FCSs suffered heavy losses: only one of the five survived as an effective warship, being withdrawn in June 1942 on the introduction of escort carriers.⁹⁷ The five

⁹⁰ Ibid.

⁹¹ Friedman (1998), pp.180-181

⁹² 'Provision of Ship-borne Fighters', 12 December 1940, ADM 1/11139, pp.142-143

⁹³ 'Aide Memoire on Merchant Ships fitted with Catapults', 30 April 1941, ADM 1/11643, pp.4-5; Butler (1957), pp.571-573

⁹⁴ Barker (2000), pp.14-15; Hague (1990), pp.49-53

⁹⁵ Friedman (1988), p.181. The last three FCSs had rocket-assisted take-off

⁹⁶ Ibid.; Hague (1990), pp.49-53. The *FW Condor* often escaped before the fighter could attack. Crucially, once fired the aircraft could not return and the vessel lost its offensive capability unless it possessed a reserve aircraft which, except in the case of *Pegasus*, had to be manually mounted on the catapult without the assistance of an aircraft crane

⁹⁷ Hague (1990), pp.49-53. *Pegasus* carried up to three Fairey Fulmars; it reverted to a catapult training ship in July 1941 after being declared too slow. *Patia* was sunk by aircraft before becoming operational; *Springbank* was sunk by torpedo after four months; *Ariguani* was torpedoed after five months and forced to return to

vessels only achieved one enemy aircraft shot down, one damaged, and half a dozen driven off, and were labour-intensive operationally, but as a stop-gap measure they deterred German air attacks, which is also likely to have improved Merchant Navy morale.⁹⁸

CAM ships, operational some five months after *Pegasus* was designated an FCS, were the Merchant Navy equivalent of the FCS and designed to tackle the *FW Condor*, with one aircraft for use on a single rocket-assisted catapult. To simplify conversion, they had no hangar or lift. Initial plans for 250 vessels⁹⁹ were cut to 50 and then 35, requisitioned between December 1940 and June 1941. Conversion typically took five months; they were operational between May 1941 and July 1943, coming under the control of the Admiralty Trade Division.¹⁰⁰ Initially selected ships were large freight carriers of about 9,000 tons cargo capacity (usually bulk grain) chosen from suitable vessels under construction. It was intended to sail one vessel with each convoy to and from Canada, minimising disruption of imports to Britain by continuing to carry grain, while supporting an aircraft. The round-trip voyage averaged 46.5 days, including five days each way in the mid-Atlantic 'danger zone'. The alternative use of 10 full time AA vessels would have represented a significant loss of importing capacity, equivalent to an annual rate of 450,000 tons based on five voyages per year.¹⁰¹ The crew was a mixture of Merchant Navy and RAF air and maintenance crew,¹⁰² with the RAF establishing the Merchant Ship Fighter Unit (MSFU) at Speke Aerodrome (Liverpool) on 5 May 1941 to train RAF pilots sailing on CAMs with rocket-powered catapults.¹⁰³ Initially the Fulmar aircraft was chosen for the CAMs, but later a modified Mark I Hurricane, becoming known as the Sea Hurricane IA, was introduced; most aircraft required extensive rebuilding, many having served in the Battle of Britain.¹⁰⁴ The use of CAMs peaked in May 1942 with 29 ships operating on three trade routes; only five remained by June 1943. They were withdrawn in July 1943 with the increasing availability of escort

trade duties. *Maplin* survived but returned to trade on 30 June 1942, following the introduction of escort carriers

⁹⁸ Ibid. For likely impact on morale: Note by Director of Trade Division, 21 November 1940, ADM 1/11139

⁹⁹ ADM 234/384, p.281. 250 were originally ordered by Churchill

¹⁰⁰ Ibid., pp.281-287; Barker (2000), p.20; Friedman (1988), p.181

¹⁰¹ 'Aide Memoire on Merchant Ships fitted with Catapults', 30 April 1941, ADM 1/11643, pp.4-5

¹⁰² Friedman (1988), p.181. CAM ships held a small fighter direction team equipped with air search radar

¹⁰³ Barker (2000), pp.20-23; Poolman (1978), pp.39-44

¹⁰⁴ 'Hurricane Aircraft – Conversion to Sea Hurricanes', Rear Admiral Naval Air Stations to Admiralty, 21 September 1941, ADM 1/13522, p.9

carriers.¹⁰⁵ Like the FCS, CAMs barely threatened U-boats and their aircraft could only be effective against enemy aircraft once; few enemy aircraft were shot down, and only 69% of vessels survived,¹⁰⁶ but CAMs deterred German air attacks and reconnaissance flights,¹⁰⁷ and it is reasonable to assume they offered similar benefits for morale among convoy crews.

A series of other Admiralty initiatives attempting to improve oceanic air cover underline the importance it attached to the issue. Furthermore, the nature of the related debates illustrates the complex inter-service rivalry and political issues involved, as well as the inherent difficulty in judging the potential of some of the initiatives. Examples include the Battle Carrier, a hybrid battleship and carrier for up to 18 aircraft, with a flight deck over the central superstructure, designed to provide air cover, reconnaissance and strike capability, for the fleet,¹⁰⁸ and its alternative trade route version with a squadron of TSRs, which would have provided a 'self-contained hunting group' to combat air and naval threats to convoys.¹⁰⁹ A series of negative comments followed the identification of various problems, including the observation that trials on a *Queen Elizabeth*-class vessel indicated the main armament could not be used during the flying on and off of aircraft. In addition, layout of secondary armament and control positions might be compromised.¹¹⁰ Action was deferred in September 1941,¹¹¹ in March 1942 the concept was raised again, but deferred again and effectively dismissed.¹¹² This debate closely mirrored arguments over a 'Flight-deck cruiser' held in the USN throughout the 1930s.¹¹³

A further example is the Composite aircraft debate, which appears to have received little attention from historians, perhaps reflecting the failure to implement the initiative, but which is documented in Admiralty and Air Ministry files, from March to June 1941, and then resurrected briefly in 1942.

¹⁰⁵ Barker (2000), pp.147-155; Poolman (1970), pp.70-75

¹⁰⁶ Letter from MSFU to Air Ministry, 17 March 1943, AIR 20/4294. Friedman (1988), p.181: 'of 170 round trips by CAM ships between May 1941 and the end of the programme in August 1943, only eight aircraft were launched, achieving six kills, damaging two enemy aircraft and driving off three'

¹⁰⁷ Hague (1990), pp.49, 53; ADM 234/384, pp.286-287 for operational statistics, 1941-1943

¹⁰⁸ 'Aircraft in Battleships and Heavy Cruisers. Case for the Battle Carrier', 17 October 1940, ADM 1/11324, Memorandum by DAM (Slattery), and following pages for debate (4 November 1940-13 March 1941)

¹⁰⁹ 'Battleship Design', Memorandum by DOP, 3 April 1941, ADM 1/11324, paragraph 14

¹¹⁰ Debate on 'Battleship Design', 3 April 1941, from 10 April-14 September 1941, ADM 1/11324

¹¹¹ Comments dated 14 September 1941 on 'Battleship Design', 3 April 1941, ADM 1/11324

¹¹² 'Capital Ship Design, Alterations to counter Air Menace', 19 March 1942, ADM 1/11950

¹¹³ Hone, Friedman and Mandeles (1999), pp.193-195

The Composite (or 'Mayo') proposal placed a short-range fighter (Hurricane) on the back of a long-range bomber (Liberator) to provide aircover in mid-Atlantic, the fighter being released when an enemy aircraft was sighted. Memoranda and meetings in March 1941 discussed the Composite aircraft, or its alternative, a bomber towing a fighter.¹¹⁴

Attempting to close down the debate, the CAS, Air Chief Marshal Sir Charles Portal, took the issue to Churchill, firmly rejecting arguments favouring a Composite aircraft, and noting the use of shore-based aircraft at long range is, '...an extremely uneconomical means of providing constant protection to a convoy'.¹¹⁵ Portal noted the first ship-borne rocket-launched fighters were being introduced (a reference to FCS and CAM ships) and proposed a better use of bombers was an attack on the *Focke-Wulf* factory and aerodromes. However, while the initiative was formally closed in March¹¹⁶ it was resurrected following heavy losses of merchantmen in the Atlantic.¹¹⁷ The debate continued,¹¹⁸ illustrating the political infighting, and culminating in a letter from Archibald Sinclair (Secretary for Air) to Alexander (First Lord), regretfully refusing to reopen the case with the Prime Minister.¹¹⁹ The matter was raised again in 1942 but without the ferocity of the previous year.¹²⁰ The First Lord continued supporting the Composite and suggesting new reasons for its development, including providing fighter cover for opposed amphibious landings, ferrying fighters to overseas bases, and fighter escort of long-range bombers.¹²¹ The first two of these requirements would be met subsequently by escort carriers and their aircraft.

3.3.3 British-built auxiliary carriers

The known weakness of the first two Admiralty initiatives decided on in December 1940 – the stop-gap measures of the FCS and the CAM ship programmes – was the inability to recover aircraft. The third initiative, the auxiliary aircraft carrier, was a true carrier platform

¹¹⁴ 'Aircraft in North Western Approaches', DNAD Memorandum 261/41, 12 March 1941, initial memorandum; Memorandum by Slattery, 21 March 1941, commenting on DSR Reply of 14 March 1941. All ADM 1/11627

¹¹⁵ Note marked SECRET from Portal to Prime Minister, 26 March 1941, ADM 1/11627

¹¹⁶ Minutes of the Second Meeting of Battle of Atlantic Committee, 26 March 1941, CAB 86/1, p.35, reports the formal demise of the initiative, concluding 'the B-24 was nearly as fast as a Hurricane'

¹¹⁷ Roskill (1961a), pp.616-618. 529,706 tons of shipping was lost in March 1941, 68.8% in the North Atlantic theatre

¹¹⁸ For example, Memorandum from Fifth Sea Lord to First Lord and Sea Lords, 'Fighter Defence for Naval Forces, Aircraft-borne Fighter', 10 April 1941; Letter from Alexander to Beaverbrook, 22 April 1941; Letter from Alexander to Sinclair, 22 April 1941; Letter from Beaverbrook to First Lord, 25 April 1941. All ADM 1/11627

¹¹⁹ Letter from Sinclair to Alexander, 24 June 1941, ADM 1/11627

¹²⁰ Memorandum, First Lord to Prime Minister, 20 April 1942, ADM 1/11627

¹²¹ Reply from Sinclair to Alexander, 1 May 1941, Adm 1/11627

able to launch and recover aircraft, and so provide continuous daylight cover against submarine, air, and surface threats. Formal requirements for such a vessel were tabled with specifications on 12 December 1940.¹²² Hurricanes were originally the designated aircraft, to be fitted with deck-landing hooks, but as Hurricanes were unavailable Martlets were substituted.¹²³ A suitable vessel was identified - the captured German banana boat, *Hannover*, previously assigned for conversion to an OBV and renamed *Empire Audacity*. She was re-allocated for conversion to auxiliary carrier on 2 January 1941.¹²⁴ Instructions were given to Blythe Dry Dock and Shipbuilding on 17 January 1941, with final instructions issued on 7 March. Completed on 26 June, followed by trials until 7 July, she was worked up for one month, before being renamed HMS *Audacity*.¹²⁵ She did not even meet the very basic specifications given, with no hangar or lift (dropped possibly in the interests of austerity and speed), but critically incorporated the ability to fly off and recover six aircraft, despite a low speed of 14.5 knots.¹²⁶

The Admiralty, long seeking a vessel with auxiliary carrier features had, in December 1940, ordered a second such vessel, based on an Admiralty tanker.¹²⁷ This second vessel was cancelled almost immediately, possibly due to the severe shortage of tankers, an interpretation reinforced by later correspondence noting an immediate crisis because of shortages on North Atlantic trade routes.¹²⁸

The need for auxiliary carriers led in January 1941 to the Admiralty requesting further *Audacity*-type conversions, as well as four of the *Castle*-class vessels previously considered for conversion to auxiliary carriers in 1936.¹²⁹ However, the Navy's proposals failed because

¹²² 'Naval New Construction Requirements, September 1939-December 1941', CAB 102/536, pp.72-73 (Trade Route Carriers); Brown (1983a), pp.18-24; Friedman (1988), pp.179-182. Specification: six aircraft (fighter, TSR or TBR) with bombs for six aircraft and 18 depth charges. Flight deck: 450 x 60 feet, allowing 360 feet for take-off. Hangar with lift: 35 x 16 feet. Minimum speed 14 knots (14.5 achieved) with 12,000 miles endurance. AVGAS: 10,000 gallons. Oil: 700 gallons. Armament: one 4-inch dual-purpose gun, with four twin 0.5 inch machine guns. Four transmitters and receivers, and RDF

¹²³ Poolman (1972), p.13

¹²⁴ Cocker (2008), p.74; Hobbs (2003), p.37

¹²⁵ Brown (1983a), pp.19-20; Friedman (1988), p.182

¹²⁶ Brown (1983a), pp.19-21

¹²⁷ Friedman (1988), p.182. Admiralty Tanker 1044

¹²⁸ Letters from Sir Arthur Salter, Head, British Merchant Shipping Mission (in the US) to Admiral Land, United States Maritime Commission, 14 and 21 April 1941, MT 59/2218. RN fuel oil stocks were only 1.8m tons at the end of March 1941 (September 1939: 3m tons). By April Britain had only two months supply of War Office motor spirit

¹²⁹ Friedman (1988), p.182

of the opportunity costs of diverting refrigeration cargo-liners, needed for what was deemed essential imports and troop transports, with the proposal turned down at Cabinet level,¹³⁰ possibly influenced by the apparent US willingness to provide such vessels.¹³¹ Nevertheless, the Ministry of Shipping did agree in February 1941 to reserve, for later conversion, merchant hulls currently planned or being built.¹³²

The Admiralty turned to the domestic shipbuilding industry again in July 1941, requesting 13 auxiliary carriers, comprising seven modelled on *Audacity* (herself on promising trials in July) and six of a converted *Winchester Castle*-type vessel.¹³³ The Admiralty plans, again incorporating a small hangar and lift, were drawn up and preliminary designs completed in November 1941, but implementation never materialised.¹³⁴ Again, this reflects ongoing competition for alternative uses, illustrated by the Ministry of Shipping's needs for refrigeration vessels and troop transports.¹³⁵

Shortages of designers, material, shipyard capacity and skilled workers, exacerbated by competing demands for both naval and merchant vessels, and their repairs, led to slow construction of auxiliary carriers in British shipyards.¹³⁶ The number of British-built vessels eventually converted during the war as true escort carriers was small (six) given the task

¹³⁰ *Ibid.*, pp.179-185. For competing requirements see ADM 116/4276: Letter on behalf of Minister of Shipping to the Admiralty, 1 August 1940; 'Aviation Transport for Fighter Aircraft', from CNS to Secretary to COS(s) Committee, 30 October 1940; Extract from Minutes of COS(s), showing lack of support for an aircraft transport vessel, 370th Meeting, 2 November 1940. Hague (1983b), p.25: OBV requirements

¹³¹ Brown (1983a), p.20

¹³² Poolman (1972), p.111. Poolman refers to this being the Ministry of War Transport (MT), the successor organisation to the Ministry of Shipping. In fact, the latter was created in October 1939 and only merged with the Ministry of Transport to form the MT in May 1941; the Director of Sea Transport's division remained part of the new ministry but for naval planning purposes 'he was directly responsible to the Admiralty' (Adams (1994), pp.167-172)

¹³³ 'Air Requirements', Memorandum by Fifth Sea Lord to First Lord, 10 July 1941, ADM 1/12126, pp.2-10. Appendix I shows 13 British-built auxiliary carriers requiring 75 single-seat fighters and 84 TBRs by June 1943

¹³⁴ Friedman (1988), p.183

¹³⁵ Letter on behalf of Minister of Shipping to the Admiralty, 1 August 1940, ADM 116/4276; 'Aviation Transport for Fighter Aircraft', from CNS to Secretary to COS(s) Committee, 30 October 1940, ADM 116/4276; Extract from Minutes of COS(s), showing lack of support for an aircraft transport vessel, 370th Meeting, 2 November 1940, ADM 116/4276; Friedman (1988), pp.180-185; Hague (1983b), p.25. The attitude of the Ministry of Shipping did not apparently change until June 1942, as discussed in the next chapter

¹³⁶ 'Merchant Shipbuilding and Repairs in the Second World War', Volume I, CAB 102/440, paragraphs 320-321; Hague (1990), p.49; Moore (2003), pp.33, 62

required, and the pace very slow given the urgency, with just one commissioned in both 1941 and 1942 and the remainder during 1943 and 1944.¹³⁷

3.3.4 US-built auxiliary carriers

This section assesses the extent to which the Admiralty was effective between September 1939 and December 1941 in attempts to bypass procurement problems in Britain by accessing additional production capacity in the US for auxiliary aircraft carriers.

From the beginning of the war, a crucial role in British procurement of US auxiliary carriers was played by Roosevelt.¹³⁸ As early as November 1940, Roosevelt was consulting Churchill on the role of auxiliary carriers, discussing a possible joint US and British construction programme in the US.¹³⁹ To facilitate access, the British Purchasing Agency was established in Washington on 16 December 1940 to procure coastal craft and naval stores, with the British Admiralty Delegation (BAD) established in May 1941 and Naval Stores becoming part of BAD in November 1941.¹⁴⁰ During this period British and US Staff discussions were held in Washington, resulting in the framing of a combined naval strategy,¹⁴¹ with the Lend-lease Act of 11 March 1941 permitting funding of British requests for ships and aircraft.¹⁴² Shortly thereafter British warships were allowed into US Navy yards for repair, relieving some pressure on British shipyards.¹⁴³

USN procurement of AVGs suffered from similar political squabbles and technical delays as the British auxiliary carrier, and was only resolved in the autumn of 1940 when Roosevelt

¹³⁷ Hobbs (1996): *Audacity* (June 1941), pp.37-38; *Activity* (September 1942), pp.31-32; *Pretoria Castle* (July 1943), pp.151-152; *Vindex* (November 1943), pp.201-202; *Nairana* (November 1943), pp.139-140; *Campania* (February 1944), pp.68-69. See also Brown (1983a), p.21; Friedman (1988), pp.182-193

¹³⁸ Letter by Salter to Prime Minister, 8 August 1941, Progress Report April-July 1941, MT 59/2206, see initial letter 9 May 1941 for a political portrait of Roosevelt's position on assistance to Britain. For details of the modernisation and expansion of the USN during the 1930s, in the face of a Congress whose scepticism reflected US domestic isolationism, and the role of Vinson, see Cook (2004), pp.84-204. See also Friedman (1983), pp.159-199, 414-418; Hone, Friedman and Mandeles (1999), pp.140-143; Terzibaschitsch (1981), pp.24-60; Turnbull & Lord (1949), pp.296-323. These authors outline the development of US auxiliary aircraft carriers, then known as AVGs (Aircraft Escort Vessels), following a request in March 1939 by Captain John S. McCain for trans-ocean aircraft ferrying capacity in the Pacific, supported by Rear-Admiral Halsey and Admiral Stark, CNO

¹³⁹ Nailer (1980a), p.1

¹⁴⁰ 'History of Naval Stores Department 1939-1945' ('Naval Stores'), ADM 116/5813, pp.3-10

¹⁴¹ Roskill (1961a), p.612. 29 January-27 March 1941

¹⁴² Dobson (1986), pp.24-31; Roskill (1961a), p.612. Britain had exhausted her dollar reserves and was forced to sell British privately-owned US investments, as a condition of the Act passing through Congress

¹⁴³ Roskill (1961a), p.612, 4 April 1941; Bassett (1946), p.26. 180 British warships and auxiliary vessels were repaired in America during the war

intervened, countering a proposed cancelling of the initiative by the Secretary of the Navy, ordering two partially-completed cargo vessels to be converted to AVGs, one to be sold to Britain.¹⁴⁴ On 7 January 1941 the United States Maritime Commission advised the USN that two C3-type cargo ships would be available for conversion to auxiliary aircraft carriers. The Admiralty persevered with its plans, turning to the USN on 20 January 1941 to act as agents for procuring six auxiliary aircraft carriers to be built in US shipyards, converting C3 merchant hulls.¹⁴⁵

The estimated conversion time of the first two was eighteen months; Roosevelt insisted on three. The first, the former *Mormacmail*, was duly completed in three months and commissioned on 30 June 1941 as AVG 1, USS *Long Island* (the name of this class of vessel).¹⁴⁶ Unlike *Audacity*, the early US-built auxiliary carriers had a hanger, lift and a catapult, and could handle more aircraft (16) while the British versions of the US-built vessels usually held 12-15.¹⁴⁷ The second, formerly known as *Mormacland*, designated British AVG (BAVG) 1, was both completed and commissioned in the Royal Navy as HMS *Archer* on 17 November 1941.¹⁴⁸ She had been laid down on 7 June 1939 by Sun Shipbuilding & Dry Dock Corporation, Chester, Pennsylvania, launched on 14 December 1939, and on 24 April 1940 completed as a diesel-driven cargo vessel. The Admiralty purchased her on 6 March 1941, immediately prior to Lend-Lease arrangements being finalised. It took eight months for this vessel to be converted¹⁴⁹ to an AVG by Newport News Shipbuilding & Dry Dock Corporation, Newport News, Virginia.¹⁵⁰ *Archer* was the precursor to the *Avenger*-class BAVG vessels, of which four additional C3 hulls were acquired for

¹⁴⁴ Nailer (1980a), pp.1-3; Terzibaschitsch (1981), pp.24-27

¹⁴⁵ Friedman (1988), pp.181-187; Nailer (1980a), pp.1-4. America supplied six diesel vessels acquired by the USN for the RN on the following dates. *Archer/Avenger*-classes: *Archer* (6 March 1941), *Avenger* (31 July 1941), *Biter* (15 September 1941), *Dasher* (22 November 1941); *Charger* (4 October 1941), which was returned to the USN (3 March 1942) one day after formal transfer to the RN, becoming a training carrier for FAA and USN pilots. All were completed by mid-1942. *Charger* took five months to convert; the others eight. The sixth (*Tracker*, 2 May 1942), was completed with a modified steam turbine design, giving 18.5 knots versus some 16.5-17 knots of the *Archer/Avenger*-classes (sources vary on the latter's top speed). *Tracker* was the prototype of the *Attacker*-class

¹⁴⁶ Nailer (1980a), pp.1-3

¹⁴⁷ Hobbs (1996), p.38; Terzibaschitsch (1981), p.24. *Archer's* aircraft were reduced from 12 to 10; *Avenger*-class vessels usually held 12-15

¹⁴⁸ Nailer (1980a), pp.1-3

¹⁴⁹ Barlow (2013). Conversion began in early May, with delays caused by British-requested design alterations

¹⁵⁰ Terzibaschitsch (1981), pp.24-34. Specification of the sister-ship, USS *Long Island*, included 12,860 tons deep load, 17.6 knots, 16 aircraft, and 36,000 gallons AVGAS

conversion by the USN for Britain during the second half of 1941.¹⁵¹ While all ships of the *Archer-* and *Avenger-*classes were laid down and partially built at Sun Shipbuilding, conversion took place at a variety of yards on the East Coast,¹⁵² possibly to accelerate the process of conversion.

Heightened tension in the Battle of the Atlantic had prompted an attempt to increase the number of ships carrying aircraft by procuring further auxiliary carriers. In July 1941, the Admiralty requested from the US six additional C3 hull conversions for a fighter carrier role, but this was declined in the face of hull shortages.¹⁵³ Nevertheless, despite the many complications, the Admiralty's procurement programme in the US was proving highly effective. The US Secretary of the Navy signed a contract on 26 December 1941 which would lead to 10 of the more reliable, faster, *Attacker-*class vessels, which is discussed in the following chapter.

3.3.5 Naval aircraft

A report on the FAA for the First Lord immediately before the outbreak of war revealed shortages of every type of aircrew member and maintenance crew, that the majority of aircraft types were obsolete, and that spares and stores had 'serious deficiencies'.¹⁵⁴ Similarly, Coastal Command lacked suitable aircraft,¹⁵⁵ and was short of aircraft designated for trade protection,¹⁵⁶ reflecting RAF priorities. In January 1940 DOP had specified requirements for aircraft carriers to provide trade protection, concluding that Britain

¹⁵¹ Nailer (1980a), pp.1-4

¹⁵² *Ibid.*, pp.3-4

¹⁵³ Friedman (1988), p.183

¹⁵⁴ 'FAA – Progress Report for First Lord's Meeting on 27 July 1939', Head of Air Branch, 26 July 1939, ADM 116/3722, pp.1-11. For subsequent setbacks, see ADM 234/383-384; Brown (1974), pp.9-26, 69-74; Brown (1975), pp.7-61; Buckley (1995a), pp.175-197; Buckley (1995b), pp.91-129; Butler with Hagedorn (2004), pp.5-43; Till (1979), pp.60-136

¹⁵⁵ Memorandum by Bowhill to Undersecretary of State for Air, 12 September 1939, AIR 15/34, p.50A. The *Anson*, workhorse of Coastal Command in the early period of the war, suffered from two shortcomings. Ashworth (1992), p.245, notes insufficient endurance (4.5 hours) and insufficient bomb-carrying capacity (200 pounds); early Coastal Command aircraft compared unfavourably with later aircraft. See Ashworth (1992); Bowman (1998); Gunston (1978) for endurance ranges (in miles): *Anson* (255) and *Sunderland* (850); compared with the later *Liberator* Mark I (2,400), Mark V (2,300), Mark VI (2,200); *Fortress* Mark II (2,700), and the *Catalina* PBY-5 (3,100); subsequently, the *Sunderland* Mark III and V would achieve a range of 2,900 miles

¹⁵⁶ 'Shore-based Aircraft Required for Escort and Reconnaissance in Connection with security of Sea Communications', 30 October 1939, AIR 15/34, 72A. Bowhill noted it had been agreed that a war with Germany required a minimum of 261 aircraft to provide 'security of sea communications' (COS Paper, Number 640, November 1937); yet in 1939 only 218, mostly obsolete, aircraft were available and estimated requirements had proved inadequate in the light of war. As Bowhill noted, the war required more than a focus on the North Sea, with the need for long-range aircraft in the Western Approaches

needed seven to eight TPCs each with 24 aircraft.¹⁵⁷ DNAD noted that a small number of fighters to complement the TSRs had been approved and that he was:

...strongly of the opinion that Trade Route Carriers should have full capacity complements...and that no future carrier should be built with a capacity of less than 36 aircraft.¹⁵⁸

However, whilst such numbers of aircraft per carrier would have increased utility and flexibility in terms of the roles that the carrier could undertake, such sophistication in the form of numbers and types of aircraft was usually unnecessary in convoy escorting and the greatly increased costs would have reduced the number of carriers available.

The Admiralty, further illustrating awareness of the importance of air power, held a review in early 1940 of FAA fighter aircraft, pointing to difficulties faced by the service. Difficulties included lack of modern carrier aircraft, exacerbated by conflicts with the RAF over aircraft procurement, pilots reassigned to other duties and aircraft, and delays in the introduction of wing-folding models.¹⁵⁹ Whilst this was before the *FW Condor* threat had emerged, it was clear that fighters would be needed to tackle reconnaissance aircraft from enemy raiders such as pocket battleships, the new aircraft carrier *Graf Zeppelin*, or battleships *Bismarck* and *Tirpitz*.¹⁶⁰

Various papers illustrate ongoing internal battles for resources. They show a clear need for modern fighters on CVs, both single- and two-seater.¹⁶¹ Churchill was concerned that current fighters were outclassed by enemy land-based fighters, making CVs vulnerable to attack. He demanded armoured carriers and 'up to date fighters', proposing to order

¹⁵⁷ 'Aircraft Carriers', Memorandum from Captain Daniel, DOP, 24 January 1940, and subsequent comments, ADM 1/11971, pp.43-59. Should Britain be at war with Japan and Germany, the number of CVs required would rise to 15. In January 1940 Britain had only one modern CV (*Ark Royal*), with two modern armoured CVs planned to be commissioned in 1940 (*Illustrious*, April, and *Formidable*, October) and three further CVs in 1941

¹⁵⁸ Memorandum by DNAD, 5 February 1940, ADM 1/11971, pp.43-45

¹⁵⁹ 'Future Policy for FAA Fighter Aircraft', 4 February 1940, ADM 1/10752, pp.3-38

¹⁶⁰ Roskill (1961a), p.57. As noted above, the Admiralty expected these battleships and the aircraft carrier, *Graf Zeppelin*, to be completed by December 1940

¹⁶¹ Letters between Alexander and Beaverbrook, May 1940, ADM 1/12575, regarding the need for naval aircraft and in particular delivery of the two-seater carrier fighter-bomber, Fairey Fulmar I (first service delivery May 1940: Gunston (1978), p.98); Note to Ismay by Pound, 30 January 1941, AVIA 9/5, urging 'immediate production' of the N.11/40 Blackburn singer-seater naval fighter approved by Admiralty board in July 1940 (which was never produced)

Spitfires for the CVs,¹⁶² but this would have required lengthy modifications to the wings, and transfer of orders for fighters from Fighter Command to the FAA. In May 1940 Slattery, seeking priority for naval aircraft production, noted that the War Cabinet had given absolute priority to certain types of RAF aircraft, resulting in some key subcontractors prioritising components for RAF fighters at the expense of FAA production lines at Messrs Fairey and Messrs Supermarine.¹⁶³

The fall of France in June 1940 was not only a pivotal moment for the U-boat threat, but also for the air threat, which was transformed in August 1940 when a new unit of the *Luftwaffe* (KG40) was established, featuring the *FW Condor*. These aircraft, with a range of 2,206 miles¹⁶⁴ and more with extra tanks, could fly to and from bases in western France, such as the Bordeaux-Mérignac airfield, and Stavanger in Norway, attacking convoys and lone ships, while providing reconnaissance reports for U-boats in the Western Approaches.¹⁶⁵ The air threat represented by the *FW Condor* reinforced the requirement for air cover over convoys.

A report in June 1940 by Vice Admiral Aircraft Carriers illustrates another dilemma faced by the Admiralty. The small number of British naval aircraft ordered by the FAA demanded a multi-purpose design to minimise costs, resulting in compromises not required under the US policy of specific designs for specific roles. The result was that the speed of FAA aircraft was usually sacrificed. The aircraft were thus ‘hopelessly outclassed by everything that flies in the air’, particularly shore-based aircraft.¹⁶⁶

The Admiralty continued to press for modern ship-borne aircraft in 1941, including high-performance single-seat fighters and TBRs for auxiliary carriers. This is illustrated in the ‘Air

¹⁶² Personal Minute by Churchill as First Lord, No. 244, 11 March 1940, and Admiralty Paper on preceding pages (apparently by Churchill), ADM 116/3722

¹⁶³ ‘Production of FAA Aircraft. Priority’, Memorandum by Slattery, DAM, 20 May 1940, ADM 116/5348, Volume I, AM 5320/40; and ‘Production of Aircraft for Fleet Air Arm, 1940-1943’, 27 May 1940, ADM 1/12575. Beaverbrook responded to lobbying by the First Lord (Alexander had succeeded Churchill in May) by arguing for the essential ‘priority’ of aircraft production for the RAF in May 1940, referring to the needs of Britain’s air defences. Interestingly, Beaverbrook was later to promote the control of Coastal Command passing to the Admiralty because of the Air Ministry’s failure to allocate sufficient resources to meet maritime aircraft needs (see Benbow (2014), pp.67-69). Regarding ‘terminological mayhem’ over the meaning of ‘priority’, see Benbow (2014), pp.85-86

¹⁶⁴ Gunston (1978), p.35

¹⁶⁵ Roskill (1961a), pp.349-350

¹⁶⁶ ‘Operation “D.X.”. Report by V.A. Aircraft Carriers’, comparative review of British and US Ship-borne aircraft and RAF aircraft, 15 June 1940, ADM 1/11207, pp.3-26

Requirements' memorandum of July 1941, which noted the need for US-produced aircraft to augment insufficient British production¹⁶⁷ of what many felt were poorly-performing naval aircraft. In the early years of the war the US single-seat Grumman Wildcat (Martlet) was the only competitive Allied naval fighter available, the British prewar two-seat naval fighters being outclassed by faster, better armed, single-seat enemy shore-based fighters.¹⁶⁸

Admiralty requests for US-produced aircraft were handled by MAP, who transmitted them to the British Air Commission (BAC) in Washington. One key request for 200 single-seat naval fighters 'with folding wings for Auxiliary Fighter Carriers' faced a major hurdle because the USN urgently needed to re-equip their own aircraft carriers with modern fighter aircraft.¹⁶⁹ As part of efforts to procure Martlets, the Fifth Sea Lord, Rear Admiral Lyster, visited the US and discussed with his counterparts increasing output of naval fighter aircraft through increased manufacturing productivity and expanded capacity, to meet the needs of both navies.¹⁷⁰ However, on 9 October 1941 Admiral Stark stated that British needs for more Martlets would be taken into consideration only 'once an increased output is assured', and that Britain must in any case look to its own aircraft industry for an increased supply of carrier fighters.¹⁷¹

There followed a high-level change of US policy, perhaps indicating the involvement of the President, who was consulting Churchill during this period on aircraft production and

¹⁶⁷ 'Air Requirements', Memorandum by Fifth Sea Lord to First Lord, 10 July 1941, ADM 1/12126, pp.2-10

¹⁶⁸ Letter from Admiral Lister [*sic*] to Admiral Sir Charles Little, Head of BAD in Washington, 19 September 1941, in 'Allocation of F4F4 Single Seat Fighters to Royal Navy', Appendix III, 'The Navy's Desperate need of Single Seater Fighters', CAB 122/142

¹⁶⁹ BAC Memorandum, 17 July 1941, AVIA 38/580, mentions 200 Grumman 36-B Single Seat Fighters, and highlights the difficulties with Grumman's subcontractors and materials in the face of the highest priority (A-1-a) given to the US Army's Heavy Bomber Programme

¹⁷⁰ Memorandum First Lord to Prime Minister, 4 December 1941, PREM 3/171/3, pp.15-18, including details of Lyster's visit, for which no date is given. Whilst it had been reported to Lyster that steps had been taken to increase the Grumman factory's output from 60 to 75 fighters per month and the target was for the RN to receive 25 a month from April 1942, it was emphasised that an increase in output of US naval aircraft would necessarily curtail to a small extent the four-engine bomber programme which was overshadowing not only all US aircraft production but even the production of tanks and merchant vessels. 60,000 machine tools had been allocated to meet the production requirements of the bombers, effectively blocking supply of machine tools to other programmes. The First Lord noted, regarding the 25 a month, that 'target figures are never reached and we shall be lucky if we get 75% of the target'

¹⁷¹ 'Allocation of F4F4 Single Seat Fighters to Royal Navy', CAB 122/142, includes a series of letters. Covering note (25 September 1941) and a letter (24 September 1941) from Little to Stark, requesting a supply of single-seat fighters. Covering note and a letter (Annex) from Stark to Little, rejecting requests for acceleration of the delivery of the British allocation of Martlets, 9 October 1941

convoy losses,¹⁷² and who would have learnt that the US destroyer *Kearny* was torpedoed at 0200 hours on 17 October whilst escorting Convoy SC.48 in the North Atlantic,¹⁷³ itself a product of the 'limited, undeclared war' in the Atlantic between the USN and Germany confirmed by Roosevelt and Churchill at Placentia Bay, Newfoundland, in August 1941.¹⁷⁴ That day, 17 October, Stark decided to expedite delivery of 48 Grumman Martlets to Britain by early December, following which the USN would receive 95 Grumman Wildcats. It was proposed that subsequently deliveries of Grumman aircraft to the USN and RN would be in the ratio of 2:1.¹⁷⁵

Nevertheless, securing suitable fighters for auxiliary carriers proved problematic given competing needs. In a November 1941 memorandum, the Admiralty's Head of Air Branch noted the TBR aircraft requirements for 15 new auxiliary carriers had been discussed and an order placed with MAP for 400 more Swordfish.¹⁷⁶ This raised the question of how many fighters were required in addition to TBRs on the nine US- and six British-converted auxiliary carriers now on order for the Royal Navy. The following day DNAD noted that the US-converted vessels should carry six fighters in addition to nine torpedo aircraft (TBR), while the British-converted vessels would not carry fighters to complement their six TBRs.¹⁷⁷ While fighters were required to counter enemy aircraft, the use of TBRs exclusively suggests an A/S role. However, not providing both aircraft on one platform would reduce operational flexibility and effectiveness. Two reasons for this disparity seem most likely. The first, hinted at in the memorandum, suggests there was some uncertainty regarding the 'capacity of the ships envisaged for conversion', and therefore the proposed British vessels may have lacked space, based as they were on the *Audacity* design. Secondly, there were no suitable modern

¹⁷² Churchill & Roosevelt (1984a), p.241, 12 September 1941: Kimball (editor) notes, 'As he had done earlier with aircraft, the President simply refused to accept the relatively conservative production estimates [of tank production] given to him'

¹⁷³ Morison (1950a), pp.92-93

¹⁷⁴ Bailey and Ryan (1979), pp.197-198; Wilson (1969), p.203

¹⁷⁵ Letter from Rear Admiral Towers, USN, Chief of the Bureau of Aeronautics, to Sir Henry Self, Director General, BAC, 24 October 1941, AVIA 38/580, stating that Stark had made the decision on 17 October to accelerate the British order for delivery to be completed by early December 1941

¹⁷⁶ 'Requirements of fighter aircraft for additional Auxiliary Carriers', Minute by Head of Air Branch, 29 November 1941, ADM 1/11851, Minute Sheet 1, p.3

¹⁷⁷ 'Requirements of fighter aircraft for additional Auxiliary Carriers', Comments by DNAD on Minute by Head of Air Branch, 30 November 1941, ADM 1/11851, Minute Sheet 1, p.3. See also Enclosure, p.5: Naval Air Expansion programme for the end of 1943 refers to the existing seven auxiliary aircraft carriers on order (*Audacity*, and the six vessels of the *Archer*- and *Avenger*-classes) and outlines, '9 additional Archer Type Carriers' and '6 additional Audacity Type Carriers'

British naval fighter aircraft, a shortage discussed in the First Lord's review for Churchill of FAA aircraft required from Britain and the US.¹⁷⁸

His review stated that the Admiralty wished to increase the number of auxiliary carriers by 15 in 1942, with a possible further 15 in each of 1943 and 1944. This would have impacted on numbers and types of aircraft required; while the Swordfish was adequate in an A/S role, the auxiliary carriers' needs for naval fighters would be 'accentuated' if Germany were to develop very long-range bombers for maritime work. Unmodified RAF Hurricanes and Spitfires were unsuitable for carrier operations, and the Navy was already under RAF pressure regarding the share of British aircraft production allocated to the FAA.¹⁷⁹ This need for naval fighters required decisions to be made on priorities. Illustrating his priorities, at a War Cabinet meeting on 9 December 1941, Churchill stated that fighter aircraft for armoured fleet carriers had first priority; 'aircraft for auxiliary carriers were not of the same degree of importance'.¹⁸⁰ This ranking is reflected in the serious delay in procuring British-built auxiliary carriers, as discussed above.

The prevailing uncertainty and service infighting on both sides of the Atlantic is further illustrated in a debate on the most efficient allocation of aircraft production in the US, and the US government's request for a statement from the British government as to the priority of production of heavy bombers versus naval fighter aircraft.¹⁸¹ In a despatch of 1 December 1941 the USN pointed out that they, too, badly needed the aircraft and it would assist their decision-making process if Britain stated where it would operate its new additional auxiliary carriers;¹⁸² the USN was apparently attempting to use the British requests as a means of overturning the priority given to USAAF heavy bombers in the US procurement cycle.¹⁸³

¹⁷⁸ First Lord to Prime Minister, Memorandum, 4 December 1941, PREM 3/171/3, pp.15-18

¹⁷⁹ Ibid., pp.15-18, and OPNAV despatch p.19, from Colonel Knox, Secretary of the Navy, to Averell Harriman, Special Representative of the President in London. The RAF views had been expressed in 'Fleet Air Arm', a Minute from Secretary of State for Air to the Prime Minister, 24 May 1941, CAB 127/252

¹⁸⁰ 'The Aircraft Programme, Fighters for the F.A.A.', Extract from Minutes of War Cabinet Defence Committee (Supply), 9 December 1941, AVIA 46/136, p.23B, plus preceding and following pages. CVs were to get 225 Initial Equipment (IE) fighters with allowance for 20% monthly wastage and priority over auxiliary aircraft carriers, which would only get 186 IE fighters when CV requirements were satisfied

¹⁸¹ Memorandum, First Lord to Prime Minister, 4 December 1941, PREM 3/171/3, pp.15-19

¹⁸² Ibid., p.19, paraphrase of OPNAV despatch, 1 December 1941

¹⁸³ BAC Memorandum, Lt-Commander Smeeton to Sir Henry Self, 31 October 1941, AVIA 38/580. See also Draft Signal, 'FAA Requirements' (responding to message 1501A/10), 10 November 1941, apparently from BAC (Washington) to MAP (London), AVIA 38/580: 'As regards Martlets the Navy Department's view is that present output is insufficient for the needs of both Navies and Admiral Towers pressed Admiral Lyster to bring this on

There is no recorded answer evident in this file. However, a War Cabinet meeting on 9 December 1941 debated the conflicts in the US over allocation of resources, Sinclair feeling that it was not correct to interfere in this American inter-service controversy; Churchill also declined to become involved.¹⁸⁴

3.4 Deployment

3.4.1 Introduction

This section examines the background to the first deployment by the Navy of an auxiliary carrier, its unquestionable success in trade protection, and early indications of competing demands for this versatile vessel.

A potentially significant political milestone in the Admiralty's campaign for aerial trade protection resources was reached on 6 March 1941 when the 'Battle of the Atlantic' Directive was issued by Churchill with the stated intention of galvanising all commands to counter losses of merchantmen in the Atlantic.¹⁸⁵ This followed a number of organisational changes impacting on the Navy's handling of the Battle of the Atlantic. The most relevant occurred in February 1941, when Western Approaches Command (WAC) moved from Plymouth to Liverpool, allowing the new C-in-C (Admiral Sir Percy Noble) to be closer to Atlantic Shipping Control, commanders of the naval escort groups, and No. 15 Group – Coastal Command.¹⁸⁶ Other important changes included transferring operational control of Coastal Command to the Admiralty, on 15 April 1941.¹⁸⁷

to the highest plane in England with the object of a message to the President asking for capacity for naval single seater fighters in this country to be increased'. See also 'Cypher', BAC to MAP, 13 November 1941, AVIA 38/580, for the US inter-service battle between USN (naval fighter) and US War Department (four-engine bomber) over priority of aircraft assembly capacity

¹⁸⁴ 'The Aircraft Programme, Fighters for the F.A.A.', Extract from Minutes of War Cabinet Defence Committee (Supply), 9 December 1941, AVIA 46/136, p.23B, plus preceding and following pages

¹⁸⁵ 'Battle of the Atlantic Directive', AIR 41/73, pp.298-300. The first committee meeting was on 19 March 1941. The Battle of the Atlantic (and, within it, the Battle of the Air between the Air Ministry and the Admiralty/Coastal Command over the provision of aircraft for the North Atlantic campaign) is well covered in the literature. For example, Bell (2013), pp.254-282; Bell (2015); Benbow (2014); Doenitz (1946); Faulkner and Bell (2019); Gardner (1999); Goette (2005); Grove (1997), pp.14-164, 291-356; Grove (2019); HMSO (2005); Howarth & Law (1994); Milner (2003, 2017); O'Connell (2012); Redford (2009); Showell (1989); Syrett and Douglas (1986); Terraine (1993). For the 'Battle of the Atlantic White Paper', covering the early years, see AIR 15/284, pp.61-70

¹⁸⁶ AIR 41/73, p.294. Fully operational 16 February 1941. In January 1942 the Western Approaches Tactical Unit (WATU) was established in Liverpool, proving vital to understanding and responding to U-boat tactics (Sloan (2019); Williams (1979))

¹⁸⁷ Roskill (1961a), p.361

However, whilst the Directive led to some better co-ordination, it was a lost opportunity to enable the earlier provision of auxiliary aircraft carriers, or indeed of sufficient long- and very long-range aircraft¹⁸⁸ and, as the literature shows, the RAF bombing of U-boat yards and pens was not particularly effective.¹⁸⁹ It has been argued that the Battle of the Atlantic Committee often focused on logistics and land-based issues, rather than operational matters in the North Atlantic, spilling over into inadequate support for air cover of convoys in the mid-Atlantic as the year progressed.¹⁹⁰ Whilst study of the Battle of the Atlantic Committee minutes for March 1941 to June 1942 reveals regular discussion of oceanic operational matters,¹⁹¹ certainly these deliberations failed to address the need for more auxiliary carriers and maritime air cover despite this need becoming increasingly evident across the North Atlantic trade routes following the fall of France.¹⁹² The Admiralty could do little to address this as its deployment choices were severely limited by the single auxiliary carrier available in this period, as discussed above: the first and only, *Audacity*, was deployed in September 1941, after trials, to meet the threat from *FW Condors* on the Gibraltar-UK trade route, and the second, the US-built *Archer*, only became operational in March 1942.

Furthermore, there can be no doubt of Churchill's bias towards Bomber Command, which impacted on supplies of long-range aircraft to Coastal Command.¹⁹³ The unfulfilled need for such aircraft would create an even greater requirement for ship-borne aircraft supporting convoys in mid-Atlantic; however, supporting procurement of more auxiliary carriers for the mid-Atlantic would have required political acceptance of the scale of the threat from U-

¹⁸⁸ Letter marked Secret from ACM Joubert de la Ferté, AOC-in-C Coastal Command, to Pound, 2 November 1941, and attachment dated 9 September 1941, AIR 15/343

¹⁸⁹ Doenitz (1990), p.409; Roskill (1961a), pp.361, 459; Terraine (1989), pp.353-355

¹⁹⁰ Bell (2015); Dimpleby (2015), pp.364-375; Padfield (1995), pp.116-118. Schoenfeld (1988), gives a more favourable review of Churchill's handling of the Committee, noting the poor performance of catapult ships

¹⁹¹ 'First Sea Lord's Personal War Records, 1939-1945', September 1941-June 1942, File 28, ADM 205/23. Debates covered Catalinas and Sunderlands, and airfields in Iceland, the Hebrides and Northern Ireland, as well as catapult aircraft on CAM ships. The loss of *Audacity* was noted, as well as the ineffectiveness of early aerial depth charges

¹⁹² Benbow (2014), p.47. For quarterly losses in the North Atlantic in 1940 and 1941 see above

¹⁹³ *Ibid.*, p.44. In mid-1940 to early 1943, despite 'abundant evidence' known to the RAF and Churchill, that 'the costly strategic bombing campaign was failing to deliver what had been promised, and also that long-range aircraft were desperately needed for the Battle of the Atlantic...they refused to accept even the small diminution of the effort devoted to the bombing offensive that would have turned the campaign against the U-boats decisively in Britain's favor'

boats and aircraft, the very threat being downplayed in discussions perhaps because it ran contrary to Bomber Command's demands for more aircraft.

The difficult political environment in which the Admiralty was operating is further illustrated by a significant memorandum on 20 August 1941. General Hastings 'Pug' Ismay recorded a conversation with Churchill, reporting that the latter was inclined to think, 'the corner had been turned in the Battle of the Atlantic and that the drop in the rate of sinkings might be maintained'.¹⁹⁴ Ismay also states the Prime Minister was concerned about the 'steady decrease in the strength of Bomber Command', and was therefore considering the case, 'for diverting to Bomber Command some of the effort at present going into Coastal Command'. Ismay thought this meant not only the possible diversion of squadrons whose aircraft would be suitable for Bomber Command but 'also a reduction in the number of new aircraft of suitable types now being specially equipped and supplied to squadrons of Coastal Command, to maintain its strength'. While caveated by a statement that the Prime Minister merely wished to judge the implications of any change,¹⁹⁵ his concerns over Bomber Command's resources perhaps explain why there appeared a persistent lack of political support for North Atlantic air cover, expressed in the continued shortage of resources for this theatre in Coastal Command throughout the rest of 1941¹⁹⁶ and the delay in converting auxiliary carriers. Crucially, political emphasis on this critical North Atlantic theatre was only re-established with the activation of the Cabinet Anti-U-boat Warfare Committee (AU Committee) in late 1942,¹⁹⁷ when sinkings had once again reached crisis levels.¹⁹⁸

¹⁹⁴ Memorandum by Ismay to CAS, 20 August 1941, AIR 20/3045

¹⁹⁵ Ibid.

¹⁹⁶ Letter marked Secret from ACM Joubert de la Ferté, AOC-in-C Coastal Command, to Pound, 2 November 1941, and attachment dated 9 September 1941, AIR 15/343. Joubert refers to 'a gap that now exists from the point at which shore-based aircraft in the Eastern Atlantic cease to operate and the point at which shore-based aircraft in the Western Atlantic can reach'. This letter refers to time being short. He had 53 long-range aircraft (36 Catalinas with an effective range of 600 miles from base and 17 Sunderland flying boats with an effective range of 430 miles) and an additional nine Liberators (of which he had no operational experience but estimated had an effective range of 600 miles). He calculated an additional 430 aircraft would be required to provide 'long-range' cover (400-600 miles from base). In the expected absence of very long-range aircraft (over 600 miles) 'for a considerable time', Joubert called for carrier-based aircraft on some 30 auxiliary aircraft carriers, or the establishment of Greenland bases, to provide air cover in the very long-range gap he identified. See also Benbow (2014), pp.41-88 for a discussion of the impact of the focus on Bomber Command resources at the expense of Coastal Command

¹⁹⁷ Dimpleby (2015), pp.374, 387; Roskill (1962b), p.88. Created by the Cabinet on 12 August 1942, the first meeting of this Committee was on 4 November 1942

¹⁹⁸ Roskill (1962b), p.485

The inter- and intra-service differences, exacerbated by scarce resources, are further illustrated by a Battle of the Atlantic Committee meeting in September 1941, at which shortages of the Liberator aircraft, whose deliveries to the RAF had just begun, were discussed.¹⁹⁹ The Director of A/SW noted the 'uneconomic' use of current shore-based aircraft in A/SW, as U-boats were forced further west – illustrating his understanding of the distinction between the economic/efficient use of resources, and their effectiveness. Current aircraft could only patrol for three hours between the range 400-600 miles. He stated that 'we could not afford to convert, man, or equip the 30 or so auxiliary carriers which would be required to give all convoys their own air escort', and suggested using catapult aircraft. The Fifth Sea Lord stated that he did not have large numbers of such aircraft. The AOC-in-C Coastal Command considered that provided the ships could be secured the Air Ministry would probably be prepared to help with aircraft and pilots in preference to carrying out very long-range patrols. A debate followed on the effectiveness of CAM ships and aircraft against the *FW Condor*, and the use of bombers to attack U-boats in their pens rather than at sea.²⁰⁰

Faced with these different positions, the real problem remained unresolved: the need for air cover in the Atlantic provided by either ship-borne aircraft on auxiliary carriers accompanying convoys or shore-based aircraft with sufficient range. The former, although requiring longer lead times and use of scarce merchant hulls, could provide continuous close convoy air cover and additionally overcome the difficulties sometimes experienced by shore-based maritime aircraft in locating a convoy, prior to defending it. These difficulties are clear in a letter describing the US Catalina flying boats recently stationed in Iceland: 'While I am told that out of six to eight attempts to escort a convoy on not one occasion to date have they succeeded in finding the convoy.'²⁰¹

¹⁹⁹ AIR 41/47, pp.10, 44: Coastal Command's 120 Squadron at Nutts Corner Aerodrome, Northern Ireland, was 'allocated' 20 Liberator Mark Is on its formation (June 1941) to form an IE of nine and provide for 'wastage, loans and allotment of these Liberators during August and October to Ferry Command and B.O.A.C.', which reduced the total to ten by 9 October with no reserves (plus two on 'experimental trials'). Following 'modifications and fitting of long range A.S.V. the first operational Sortie did not take place until 20 September 1941'

²⁰⁰ Battle of the Atlantic Committee, 18th Meeting, 2 September 1941, ADM 205/23, pp.4-10

²⁰¹ Extract of letter from Air Vice Marshal Robb to Admiral Noble, C-in-C Western Approaches (for quotation), and Letter from Noble to Pound, 10 October 1941, ADM 205/7

3.4.2 Atlantic

Audacity, the first operational auxiliary aircraft carrier, was deployed in the Atlantic. She sailed as part of the escort of convoy OG.74 to Gibraltar in September 1941, proving successful over the next three months as a fighter carrier on the Gibraltar-UK trade route.²⁰² Her Martlet aircraft were highly effective against the *FW Condor*, shooting down five, damaging three and chasing four away, and assisted with sighting nine U-boats, including the sinking of one in conjunction with surface vessels.²⁰³ This success did not go unnoticed. Doenitz recognised the serious tactical threat posed by *Audacity's* aircraft and issued instructions to U-boat captains to sink her.²⁰⁴ His war diary noted the value of the carrier to convoys:

...the worst feature was the presence of the aircraft carrier. Small, fast, manoeuvrable aircraft circled the convoy continuously, so that when they were sighted, U-boats were repeatedly forced to submerge or withdraw. The presence of the enemy aircraft also prevented any protracted shadowing or homing procedure by German aircraft. The sinking of the aircraft carrier is, therefore, of particular importance not only in this case but in every future convoy action.²⁰⁵

Audacity was lost to U-751 on 21 December 1941 while escorting convoy HG.76 to the UK.²⁰⁶ The Commodore of the convoy reported:

The value of H.M.S. AUDACITY and her very gallant pilots was beyond measure and if she had also had a fighter bomber, I think few of the many enemy submarines would have escaped...A convoy provided with an AUDACITY carrying fighter bombers and a couple of fast destroyers in addition to escort vessels should go very far towards overcoming the submarine menace.²⁰⁷

Despite *Audacity's* success, supporting the argument for further similar vessels,²⁰⁸ the complexities and brutal choices facing the Admiralty remained. This is illustrated by a Battle of the Atlantic Committee meeting in early November 1941 where Pound noted the recommendation of the AOC-in-C Coastal Command that every convoy should be

²⁰² Friedman (1988), pp.178, 182. She was very small for an aircraft carrier (10,230 tons deep displacement) and carried only six Martlets parked on her flight deck. She had no catapult or hangar

²⁰³ Hobbs (2003), pp.37-38

²⁰⁴ Terraine (1989), pp.395-396

²⁰⁵ Hobbs (2003), p.9. Hobbs (1996), p.55, dates this War Diary entry as 23 December 1941

²⁰⁶ Roskill (1961a), p.479

²⁰⁷ 'Battle Summary No. 51, Convoy and Anti-Submarine Warfare Reports', ADM 234/370, pp.12-20. Quotation p.20

²⁰⁸ 'Auxiliary Aircraft Carriers', Memorandum by First Lord, 29 December 1941, CAB 66/20

accompanied by an auxiliary carrier, necessitating the procurement of some 30 such vessels. The alternative use of appropriate hulls articulated by the Ministry of Shipping at earlier meetings in 1941 underlined the necessity for a 'guns or butter' decision.²⁰⁹

3.4.3 Competing needs for auxiliary carriers

Another key issue was the Admiralty's efforts to procure ship-borne aircover for convoys competed with other uses for these vessels and their aircraft. Indeed, the latter half of 1940 saw demand for alternative uses from the Air Ministry and, from 1941, the War Office. This is illustrated in a series of conferences, debates and papers covering types of aircraft and platforms.

For example, addressing RAF needs at an Inter-Services Planning Staff meeting for a proposed auxiliary carrier to transport shore-based fighters, the DNC noted in August 1940 that the most suitable type of vessel would be diesel driven, capable of 18-19 knots, that could be fitted with a flying-off deck at least 400 feet long.²¹⁰ Conversions would take six to nine months, depending on priority given to the project, and be undertaken by a large firm of shipbuilders, thus delaying construction of new warships. Clearly, Air Staff planners were already thinking of a 'ferry' auxiliary carrier, which would have assisted the air reinforcement of Malta in the Mediterranean campaign. The day after the August memorandum was issued, the DOP stated the vessel would have two purposes: air reinforcement and 'provision of aircraft at short notice in the establishment of air bases in combined operations' far from the UK.²¹¹ This illustrates the multiple potential uses of auxiliary carriers being considered even before *Audacity's* deployment as an auxiliary fighter carrier for trade protection.

However, in an addendum the Ministry of Shipping's Director of Sea Transport noted that most cargo-liners were already requisitioned for transporting military personnel – it was a matter of priorities between naval and military needs, which if pressed would have to go to

²⁰⁹ Battle of the Atlantic Committee, 24th Meeting, 11 November 1941, First Sea Lord's Records, 1939-1945, ADM 205/23, pp.3-5. Many hulls suitable for conversion were refrigeration vessels (Hague (1983b), p.25)

²¹⁰ 'Transport of Shore Based Fighter Aircraft', DNAD, 3 August 1940; Note by DNC, 19 August 1940. Both ADM 116/4276. Ships mentioned included the *Winchester Castle*, with existing superstructure above D deck replaced by a hangar with a flying-off deck above. However, these vessels were 'at present required for troop moves'

²¹¹ Note by DOP, 4 August 1940, ADM 116/4276

the War Cabinet for a decision in the light of shipping shortages.²¹² Despite noting the benefits, the DOP in October appears to have conceded that employment of such a vessel for transporting aircraft would be infrequent and thus conversion could not be justified at this time.²¹³ The same day DNAD and DOP concluded the proposed conversion of a merchant ship for aircraft-ferrying purposes should not proceed.²¹⁴ Surprisingly, the file shows no dissenters.

One competing use was discussed again at a meeting held by the Fifth Sea Lord in April 1941, attended by representatives of the Admiralty, War Office, Air Ministry, MAP and the Director of Combined Operations.²¹⁵ A report by DNAD outlined requirements for fighter protection for amphibious assaults between landing on enemy shores and capture of an aerodrome from which British fighters might operate. The problem was the few aircraft which would be available and their relative performance against shore-based enemy fighters. At a subsequent meeting of the COS(s) Committee on 6 August 1941, Vice Admiral Phillips (VCNS) recognised the need for an assault carrier version of the auxiliary carrier to provide such fighter protection. He mentioned the small aircraft carriers under development, referring to *Audacity*, and the *Archer*- and *Avenger*-classes of vessel, the latter able to carry 12-18 aircraft each.²¹⁶ He did, however, point out these vessels' vulnerability to attack by shore-based aircraft.

3.5 Conclusion

This chapter examined the development of the Navy's response to changing threats in the opening two years of the war and the impact of this on the procurement and use of what would become known as escort carriers. Key official documents reviewed reveal an Admiralty clearly recognising the need for uninterrupted air cover over convoys and determined to find realistic stop-gap solutions in the face of severe capacity constraints and

²¹² Note by Director of Sea Transport, 14 September 1940, ADM 116/4276

²¹³ Note by DOP, 18 October 1940, ADM 116/4276

²¹⁴ Notes by DNAD and DOP, 18 October 1940. See also 'Aviation Transport for Fighter Aircraft', 30 October 1940, for inclusion in papers by CNS for COS(s) Meeting, 2 November 1940; Extracts from Minutes of COS(s), 370th Meeting, 2 November 1940. All ADM 116/4276

²¹⁵ 'Meeting to discuss the provision and use of Floatplane Fighters in Combined Operations', 15 April 1941, ADM 116/4457, Report, pp.1-2. The least bad option was a floatplane version of the Spitfire, which could not compete with enemy land-based aircraft

²¹⁶ Extract from COS(s), 278th Meeting, 6 August 1941, ADM 116/4457. Other sources state up to 15 aircraft (Hobbs (2013), p.133)

ongoing internal battles at the highest levels over possible solutions. Records of the crucial meeting held in December 1940 demonstrate an Admiralty able to assess and prioritise the most effective available options regarding ship-borne aircraft to provide air cover over convoys. However, the struggle to secure additional auxiliary aircraft carriers illustrates the necessary but difficult trade-offs between different priorities – both between land, air and sea and then within the war at sea – with uncertain consequences and different institutions championing different priorities and solutions.

By the end of the period, British naval strategy was grappling with the impact of Pearl Harbor and the destruction of Force Z, whilst operationally the RN had to deal with the loss of HMS *Audacity*. Nevertheless, as this chapter has shown, the Admiralty had not only commissioned and proved the effectiveness of its first auxiliary carrier, it had commissioned its second, *Archer*, which was the first of the US-built auxiliary carriers destined for Britain, and had set in train the procurement of further vessels from British and US shipyards, which would prove vital as the war progressed.

4. Chapter 4: Endurance: December 1941–May 1943

4.1 Introduction

This chapter examines the Admiralty's procurement and deployment of escort carriers in the period from Pearl Harbor to the defeat of the U-boat wolf packs in the North Atlantic in May 1943.¹ It looks at the strategic context in which the Admiralty was operating and at the effectiveness of procurement in Britain and America, when Britain's shipyards were already severely overstretched due to multiple needs, and when turning to America was complicated by the latter seeking to meet the rapidly expanding demands of its own services. The chapter then assesses the Admiralty's innovative deployment of these vessels and its foresighted determination to modify them to perform many more operational roles than the defensive one of convoy protection, enabling it to respond to evolving and varied requirements of different theatres despite the shortages of CVs and absence of CVLs.

4.2 Strategic Overview

4.2.1 Impact of Pearl Harbor

Immediately following Pearl Harbor, the Arcadia Conference (December 1941-January 1942) formally established an Anglo-American strategy, reaffirmed the 'Germany First' policy, and defined the Royal Navy's responsibilities to include trade protection in the Eastern Atlantic, protecting Arctic convoys to Russia, and supporting activity in the Mediterranean theatre and Indian Ocean.² Meanwhile, America, while responding to Japanese attacks in the Pacific, would ensure aid to Britain, Russia, and China, to sustain these new formal allies.³

Britain's commitments placed a severe strain on the Royal and Merchant Navies, compounded by partial switching of US aid from herself to Russia, competition with America's armed services for vital supplies, and the impact of Japan's offensive in the South Pacific and resulting logistical demands on the US mercantile marine.⁴ There were simply

¹ Subsequent references to this type of vessel are to 'escort carriers' (RN use from August 1942; USN later) or 'CVEs' (USN use from 15 July 1943; RN later), subject to the context requiring otherwise

² Arcadia Conference, psfa0005, PSF Box 1. For the naval strategic background: Gray (1992), pp.212-290; Gwyer (1964), pp.291-402; Morison (1950a), pp.202-409; Roskill (1962a), pp.179-209

³ Butler (1964), pp.545-600; Gwyer (1964), pp.403-420, 463-498

⁴ Barnett (1992), pp.429-572; Roskill (1962b), pp.175-278; Roskill (1977), pp.116-210

not enough vessels, and the Allies had to prioritise theatres and war objectives.⁵ Grand strategy was settled by Roosevelt and Churchill⁶ with military advice from a new Combined Chiefs of Staff (CCS: the British Chiefs of Staff and US Joint Chiefs of Staff),⁷ and shipping advice from the new Combined Shipping Adjustment Board. The latter combined the MT in London and the US War Shipping Administration in Washington, attempting to adjudicate on shipping allocations.⁸

The threat to convoys, already severe in the North Atlantic and Arctic, increased in the South Atlantic and Indian Ocean, with convoys to the Middle East, Persian Gulf, India, and Australasia under threat from U-boats and AMRs.⁹ Losses threatened the Allies' capacity to move men and matériel,¹⁰ needed for strategic opportunities, and particularly impacted on the critical trans-Atlantic lifeline to Britain, essential if the latter were to be used as a springboard to invade North West Europe.

4.2.2 Impact of Axis successes

Hitler's overriding strategic concern was Russia, whose ground forces counter-attacked during the winter of 1941-1942.¹¹ He recognised the need to cut Britain's lifeline from the New World, and her lifeline to North Russia. Early 1942 saw increasing attempts by German aircraft, U-boats, and surface warships to interrupt British convoys to North Russia, with *Tirpitz* making a sortie in early March against PQ.12.¹² German successes increased, culminating in the destruction by U-boats and the *Luftwaffe* of over half the ships assigned

⁵ War Cabinet Defence Committee (Operations), 9 January and 16 February 1942, CAB 69/4; Roskill (1962b), pp.5-146, 199-239, 277-351, 397-427; Smith (1966), pp.64-176. The need to prioritise when strategic planning and deployment programmes outpaced logistical capabilities is illustrated by Operation Torch (the invasion of North West Africa), which impacted on British imports and shipping in other areas such as the Indian Ocean. Churchill cut imports by 500,000 tons per month and reserves of food and raw materials fell by 1.5m tons in November and December 1942; by March 1943 stocks of several key commodities had fallen towards 50% of minimum levels

⁶ For example, see Prime Minister's Personal Telegram to President, 5 March 1942, T.323/2, No. 37, CAB 69/4

⁷ 'Post-Arcadia Collaboration', Memorandum by CCS, 14 January 1942, Arcadia, psfa0005, PSF Box 1; Gwyer (1964), pp.381-388

⁸ Roosevelt (1950), pp.65-66. Leighton and Coakley (1955) give a US perspective on global logistics and its impact on strategy

⁹ Behrens (1955), pp.269-358; Butler (1964), pp.481-513; Milner (2003), pp.83-155; Roskill (1962b), pp.5-42, 91-114, 175-195

¹⁰ Prime Minister's Personal Telegram to President, 5 March 1942, T.323/2, No. 37, CAB 69/4

¹¹ 'Report by the Joint Intelligence Sub-Committee on Enemy Intentions', 20 March 1942, CAB 69/4, pp.205-206; Werth (1964), pp.261-274. Gwyer (1964), pp.139-161, regarding British sacrifices to sustain Soviet resistance

¹² Admiralty (1954), pp.5-107; Roskill (1962b), pp.115-146

to PQ.17 in June-July 1942,¹³ leading to a temporary suspension of these convoys. However, Churchill's repeated insistence on their strategic importance¹⁴ forced the Admiralty to resume them in early September and to divert resources to their support, including deployment of CAM ships and one of its only two operational escort carriers.¹⁵ The strategic importance of supporting Russia, in this case by bombing Germany, also featured in the Air Ministry's arguments against sparing aircraft urgently requested by the Admiralty to provide support at sea,¹⁶ a spurious argument as Russia badly needed war matériel carried in the convoys and Bomber Command's strategic bombing offensive was largely ineffective at this stage.¹⁷

Meanwhile, following successful U-boat activity in the first half of 1942 on the Eastern Seaboard of America,¹⁸ where an initial lack of convoys and air cover, exacerbated by the lack of a US coastal blackout, led to heavy losses of Allied merchantmen,¹⁹ Doenitz switched his focus to the Air Gap south of Greenland.²⁰ Here, lack of Allied aircraft (both carrier-borne and maritime) provided tactical opportunities to achieve his ultimate strategic goal of severing trade routes between North America and Britain.²¹ Germany's successes²² forced the Admiralty to seek various stop-gap measures, discussed below.

Throughout 1942, the strategically important land campaign in North Africa demanded supplies which for both sides required shipping capacity and control of sea

¹³ Paterson (2019), pp.388-396; Woodman (1994), pp.185-257

¹⁴ 'The Future Conduct of the War, Part I', Memorandum by Prime Minister for COS(s) Committee (dated 16 December 1941), circulated 1 February 1942, CAB 69/4, p.159. Reiterated in Prime Minister's Personal Telegram to President, 5 March 1942, T.323/2, No.37, CAB 69/4. See references to Russia in War Cabinet Defence Committee (Operations) Minutes of 1942, CAB 69/4: 16 February, pp.32-35; 22 April, p.81; 29 April, pp.84-87; 10 July, pp.93-94. Note also Cherwell's Minute to Prime Minister, reference return cargoes (29 April 1942, p.91)

¹⁵ Admiralty (1954), p.74. *Avenger*, operational in August 1942, supported PQ.18 (2-17 September)

¹⁶ 'Requirements in Long-Range General Reconnaissance Aircraft', Memorandum by the Secretary of State for Air, 18 March 1942, CAB 69/4, pp.195-200. See Map 1 below

¹⁷ Overy (2013), pp.288-301. Even Churchill admitted that the current bombing campaign was only 'better than doing nothing' (p.297)

¹⁸ Letter, FDR to Winston S. Churchill, March 18, 1942, FDR-39; Gannon (1990)

¹⁹ Costello & Hughes (1977), pp.194-196; Morison (1950a), pp.200-201; Roskill (1962b), pp.97-98

²⁰ Doenitz (1990), pp.241-244

²¹ Barnett (1992), pp.441-443

²² Doenitz (1990), pp.195-224; Roskill (1961a), pp.616-618; Roskill (1962b), pp.485-486. Merchant shipping losses rose from 4.3m tons (1941) to 7.8m (1942), with submarines the greatest threat (80% of sinkings). 70% of sinkings were in the North Atlantic

communications.²³ However, in the Mediterranean, the *Luftwaffe* commanded much of the central basin from airfields stretching from Sardinia to Sicily and Southern Italy, as well as others on the North African shore.²⁴ Furthermore, Doenitz had moved U-boats into the Mediterranean from the Atlantic.²⁵ Whilst this eased pressure on North Atlantic convoys, in the Mediterranean the Navy was forced to operate in hostile waters under almost constant air and U-boat attack as well as threats from the Italian surface fleet.²⁶ In order to maintain offensive capability (surface, submarine, and air) against Italian and German supply ships transporting matériel to the *Afrika Korps* in North Africa, military convoys to Malta were required,²⁷ the costs of which included losing *Eagle* and serious damage to *Indomitable* in supporting Operation Pedestal (a Gibraltar to Malta convoy) in August 1942.²⁸ In the absence of escort carriers such CVs ferried aircraft, or provided air and surface defence as well as A/S support for convoys. This demonstrated the vital part that aircraft carriers and maritime aircraft now played in naval operations and that ships alone were unable to maintain command at sea.²⁹

Japan took a neutral stance towards Russia, avoiding war, and drove south to the raw materials of the British and Dutch empires, placing further pressure on RN resources.³⁰ Japan enjoyed a number of successes,³¹ following which the US assumed responsibility for the entire Pacific theatre (17 March 1942), including Australia and New Zealand, while Britain assumed responsibility for the Indian Ocean, Malaya, and Sumatra³² with naval reinforcements proposed.³³ Japan's use of carrier aircraft to attack Ceylon in April 1942

²³ Bragadin (1957), pp.126-250; Butler (1964), pp.605-615; Hammond (2020), pp.107-172; Jones (2011), pp.79-98; Tomblin (2004), pp.23-123

²⁴ Roskill (1962b), pp.43-76; Paterson (2019), pp.289-307; Paterson (2020), pp.39-83

²⁵ Barnett (1992), p.441; Doenitz (1990), pp.153-155. In January 1942, of 91 operational U-boats, 23 were in the Mediterranean

²⁶ For the naval campaign in the Mediterranean: Doenitz (1990), pp.115, 155-163, 178, 276-286; Greene and Massignani (2011), pp.192-282; Hammond (2020); Jones (2011), pp.79-98; Jones (ed.) (2018), pp.3-418; Roskill (1962b), pp.43-76, 301-346, 427-444; Ruge (1957), pp.189-196, 255-260; Tomblin (2004)

²⁷ Woodman (2000), pp.275-467; Hammond (2020), pp.107-172

²⁸ Roskill (1962b), pp.301-308; Woodman (2000), pp.372-454. Other CVs involved were *Victorious* and *Furious* (the latter ferrying 38 Spitfires for Malta)

²⁹ Future Building Committee, 14 September 1942, Adm 116/5152, p.169

³⁰ Prime Minister's Personal Telegram to President, 5 March 1942, T.323/2, No.37, CAB 69/4; Butler (1964), pp.475-498; Gwyer (1964), pp.267-314

³¹ Gwyer (1964), pp.403-420; Roskill (1961a), pp.553-570; Roskill (1962b), pp.5-38. This included Japanese maritime aircraft sinking *Prince of Wales* and *Repulse*

³² Roskill (1962b), p.21

³³ Boyd (2017), pp.355-390, mentions *Indomitable* and *Formidable*, with a promise of a third, *Illustrious*. These could not remain with the Eastern Fleet throughout 1942, being needed elsewhere

resulted in the loss of *Hermes* and the heavy cruisers, *Dorsetshire* and *Cornwall*. This coincided with a Japanese sweep of the Bay of Bengal,³⁴ forcing Admiral Sir James Somerville, C-in-C Eastern Fleet, into a strategic retreat to Kilindini (Mombasa, East Africa).³⁵

4.2.3 The tide turns

The tide turned in the Pacific with USN victories using carrier-borne aircraft at the Battle of the Coral Sea (May 1942), followed by the Battle of Midway (June 1942), where the destruction of four Japanese fleet carriers and the loss of experienced Japanese naval aviators provided a strategic victory.³⁶

In the Indian Ocean³⁷ the strategic goal of Somerville in 1942-1943 was to maintain convoys³⁸ despite increased activity of German and Japanese U-boats and AMRs.³⁹ The need to support these convoys led in May 1942 to the capture of Diego Suarez and eventually Madagascar, the importance of carrier air power in assaulting a hostile shore being demonstrated by the use of *Illustrious* and *Indomitable*. Throughout the period under review, the Admiralty lacked basic escort carriers to defend Indian Ocean convoys or, in a modified form, to provide air defence.⁴⁰ This further illustrates how stretched resources impacted the Admiralty's decisions over escort carrier deployment despite, as Boyd reasonably concludes, control of the Indian Ocean ranking second only to the North Atlantic lifeline for Britain because it was 'essential to generate maximum empire war effort'.⁴¹

³⁴ Ibid., pp.363-385

³⁵ Ibid., pp.385-390

³⁶ Roskill (1962b), pp.32-42

³⁷ 'Appreciation of Indian Ocean situation from C-in-C Eastern Fleet to Admiralty', 17 February 1942, CAB 121/729

³⁸ Message from Admiralty to C-in-C Eastern Fleet, 13 March 1942, ADM 223/867. The need to hold Ceylon as key to the Indian Ocean was noted

³⁹ Boyd (2017), pp.355-409; Jones (ed.) (2018), pp.86-88, 200, 301-302, 335; Motter (1952); Munro (2006); Roskill (1962b), pp.5-42, 219-238, 269-273, 413-426; Somerville (1995), pp.351-456. This reflected the importance of Winston Specials (convoys from Britain via Cape Town to Alexandria), convoys to India (including aid to China) and Australasia, and traffic to and from the Persian Gulf (military aid to Russia and oil from Abadan (Persia)) to the Middle East, India, and Australasia. See Map 6 below

⁴⁰ Note to First Sea Lord from DOP, 18 May 1942, ADM 205/13. DOP proposed escort carriers accompany a CV to provide air protection to R-class battleships already there, but these never materialised; Roskill (1962b), pp.185-193

⁴¹ Boyd (2017), pp.400-409

It was only for the strategically-important Torch that a balanced force of CVs and escort carriers was made available to support amphibious landings.⁴² This was followed by the Casablanca Conference (14-24 January 1943), at which it was agreed that the defeat of the U-boats must remain paramount.⁴³

4.3 Procurement

4.3.1 Introduction

This section examines the Admiralty's response to the urgent need for aircraft-carrying platforms to assist in trade protection and, increasingly, in support of other activities. The context of the assessment is the pressure on resources, the political and operational considerations inherent in the new combined Anglo-American strategy,⁴⁴ and the Admiralty's difficulty in securing sufficient support from Churchill, as well as the COS(s) and key Cabinet committees. It looks separately at the two areas of focus for the Admiralty's procurement efforts: Britain and America. In Britain, the Admiralty suffered from shipbuilding conversion capacity constraints,⁴⁵ shortage of skilled labour in shipyards,⁴⁶ and competition with merchant ship construction,⁴⁷ particularly cargo-liners, the most suitable vessels for conversion to escort carriers.⁴⁸ The Admiralty also had a major dispute with the Air Ministry over the provision of FAA aircraft,⁴⁹ and long-range maritime aircraft, although

⁴² 'Battle Summary No. 38, Operation "Torch", Invasion of North Africa, November 1942 to February 1943', dated 1948, ADM 234/359; Barnett (1992), pp.537-572

⁴³ Churchill (2015d), p.554. The CCS stated: 'The defeat of the U-boat must remain a first charge on the resources of the United Nations'

⁴⁴ Hancock and Gowing (1949), pp.378-435, discuss British and American joint strategy on procurement. For merchant ship losses: Central Statistical Office (1995), pp.153-154; Roskill (1962b), pp.485-486. British output in 1942 was 1.3m gross tons (1.7m including overseas completions on Britain's account). Britain turned to foreign-owned vessels, which had fled Axis occupation, and the rapidly-expanding US shipyards (Behrens (1955), pp.284-296)

⁴⁵ Brown (1983a), pp.18-24; Brown (1983b), pp.182-185; Brown (1995), pp.82-96; Brown (2000), pp.57-66, 178-186; Moore (2003), pp.62-75, 142, 168-176

⁴⁶ Manpower was becoming a major issue. 'Man-Power Survey' (recirculated November 1942) and War Cabinet Minutes of 1942: 20 November and 9 December, CAB 66/31; Hall (1955); Hancock and Gowing (1949); Postan (1952)

⁴⁷ War Cabinet Defence Committee (Supply), 13 May 1942, CAB 70/5, pp.1-3

⁴⁸ Central Statistical Office (1955), p.154. 126 cargo-liners, some fully refrigerated, were completed in Britain in 1941, 167 in 1942, and 282 in 1943. They were relatively large and fast, but took longer to build than smaller vessels

⁴⁹ 'Analysis of Fleet Air Arm Expansion Figures', AIR 19/243, Memoranda to/from CAS, 3-26 April 1942, pp.37A-40B. The files reveal Air Ministry fears over the number of aircraft which the FAA was supposedly planning to operate (currently 2,144, rising to 5,959 by December 1943), which would impact on demand for aircrew and maintenance personnel and on aircraft for Bomber Command. Mention is made of 16 auxiliary carriers in Home Waters, six in the Atlantic, and six in the East Indies, all by December 1943

the latter was seen by the Admiralty as only a partial solution to the needs of convoy air cover.⁵⁰ In the case of America, while the Admiralty operated successfully in a highly bureaucratic structure⁵¹ and American output of ships and aircraft expanded rapidly, Britain inevitably suffered from competing with USN requirements.⁵²

The Admiralty was clear regarding the value of escort carriers, noting that attacks by 'packs of submarines' beyond the reach of shore-based aircraft could only be protected against by an 'auxiliary aircraft carrier'.⁵³ Captain George Creasy (Director A/SW), commenting on a paper (22 May 1942) by the Naval Adviser to the First Sea Lord, stated, 'A/S protection of a convoy will never be complete until the convoy carries, in one form or another, its own ship-borne aircraft'.⁵⁴ However, until early 1943 this air power was largely lacking in trade protection, reflecting the critical decision in early 1942 of not granting the Admiralty's request for many more British escort carriers after the proven success of *Audacity*,⁵⁵ exacerbated by the failure of the War Cabinet, and Churchill in particular, to sanction transfers of a relatively few more long-range aircraft from the bomber offensive to Coastal Command for much of 1942.⁵⁶

Nevertheless, in the period from December 1941 to May 1943 the Admiralty initiated the procurement of 34 more escort carriers from America and the conversion of 24 British vessels.⁵⁷ None of the 34 vessels from America were operational in this period; the only American ones to be operational were the previously-procured four which had arrived in Britain and been modified.⁵⁸ The 34 would become operational between the end of this period and January 1945.⁵⁹ Of the British vessels, 19 were based on the lower specification

⁵⁰ 'Air Requirements for the Successful Prosecution of the War at Sea', Memorandum by First Sea Lord, 5 March 1942, CAB 69/4, pp.189-190; 'Minute by Director A/SW', 30 May 1942, ADM 1/11848, pp.17-20

⁵¹ 'Naval Stores', ADM 116/5813, pp.3-7

⁵² Hall (1955), pp.293-393

⁵³ War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, pp.12-14. Comments by Vice Admiral Moore, VCNS

⁵⁴ 'Minute by Director A/SW', 30 May 1942, ADM 1/11848, pp.17-18

⁵⁵ 'Auxiliary Aircraft Carriers', War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, p.12

⁵⁶ Benbow (2014), pp.41-88

⁵⁷ Brown (1995), pp.82-96

⁵⁸ Hobbs (2003). *Archer, Avenger, Biter, and Dasher*, had been fully operational for periods up to May 1943, by which time two had been sunk

⁵⁹ Friedman (1988), pp.177-201; Hobbs (1996, 2003, 2013). The last, *Empress (Ruler class)*, became operational in January 1945. The 34 excludes *Charger*, retained by the USN for deck-landing training (DLT)

MAC ship and only one, the escort carrier *Activity*,⁶⁰ was deployed in this period. British production, including the MAC ships, only ever reached 25 – beginning in 1941 and ceasing in 1944.⁶¹ During this period there were also shortages of suitable FAA aircraft, discussed below.

4.3.2 British-built escort carriers and MAC ships

The Admiralty's determination to procure escort carriers is evident in major contemporary documents. Building Programme B for 1942 prioritised construction of aircraft carriers over capital ships while 'a large conversion programme of auxiliary carriers is also advocated'.⁶² This was in the context of an expected large increase in future US merchant shipbuilding, allowing British yards to focus on warships.⁶³ However, at a key meeting in January 1942, Lord Leathers, Minister of War Transport, argued that merchant vessels could not be spared for conversion to escort carriers, despite the 'beneficial effect' they would 'ultimately confer', describing them as an 'insurance benefit' for which Britain could not afford the premium, and advocating their procurement from the US.⁶⁴ His comments reflected the strong demand for these hulls for troop transporting and food imports to Britain, especially of refrigerated meat,⁶⁵ illustrating the multiple, complex, and inter-connected dilemmas facing politicians. Alexander argued in the same meeting that experience with *Audacity* suggested, 'a fleet of these ships would pay a handsome dividend'.⁶⁶ As documents show, the Admiralty persisted. In a further memorandum, it proposed that the number of 'auxiliary carriers' should be based on one with every convoy operating outside Coastal Command air cover, leading to a recommendation of 40 vessels.⁶⁷ The Fifth Sea Lord noted,

⁶⁰ Hobbs (2003), p.17

⁶¹ Brown (1983b, 1995); Lenaghan (1983); Moore (2003); Poolman (1970). The 25 excludes the FCS (five) and CAM ships (35)

⁶² 29 November 1941, ADM 1/11851, p.5. The Naval Expansion Programme of November 1941 (to be completed by end 1943) mentioned seven auxiliary aircraft carriers under construction (six from the US) with a further 15 proposed: nine from the US and six from Britain (six later increased to eight: Moore (2003), p.63)

⁶³ Letter from D.H. Everett, Plans Division, to C. Hannaford, Director Contract Work at Bath, 2 January 1942, ADM 229/25, pp.354-357

⁶⁴ War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, pp.12-13

⁶⁵ Ibid.; 'The Shipping Situation', Report by COS(s), 13 February 1942, CAB 69/4, pp.172-178; Prime Minister's Personal Telegram to President, 5 March 1942, T.323/2, No. 37, CAB 69/4

⁶⁶ War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, pp.12-13

⁶⁷ 'Aircraft Carrier Requirements', Memorandum by DOP and DNAD, 17 January 1942, ADM 1/11971, pp.78-79, and attached memorandum, 20 January 1942, pp.79-80

‘The essential matter is to have the number of Carriers with the convoys even if they only have 6 aircraft each, although obviously the more aircraft the better’.⁶⁸

Admiralty Board minutes illustrate the recurring issue of competing priorities, here within the Admiralty, with three notes outlining the conflicting demands placed on shipyards.⁶⁹ Firstly, the Controller noted delays in completion of all warships and requested merchant shipbuilding be restricted to 90,000 tons per month, presumably as the two competed for skilled labour and shipyard capacity. Secondly, Alexander pointed out that the merchant shipbuilding programme had already been reduced twice and delays in naval shipbuilding were due in part to government priorities, air raids on British shipyards, and the Admiralty giving precedence to urgent naval repairs. Thirdly, DOP discussed the relative needs of escort craft and merchant ships. Switching from merchant to more complex and time-consuming naval construction was expected to lead to reduced net output, inevitably constraining the conversion of merchant hulls to escort carriers. In subsequent discussions, the Controller noted that government was giving priority to aircraft and tank production at the expense of naval construction, and he wanted the first priority to be new naval construction. Pound warned that the need for merchant shipping was likely to be greater in coming months, with everything dependent on large increases in US shipbuilding (on which, notably, he was evidently wary of relying). It was decided to review the situation when net joint US-UK merchant shipping tonnage stabilised.

Early 1942 saw dramatic statements by the Admiralty in two further papers submitted to the War Cabinet regarding air support.⁷⁰ Pound’s paper opened starkly: ‘If we lose the war at sea we lose the war’. Requirements included better co-ordination between the Services, an increase of air resources to combat Axis successes on convoy routes through its own efforts to procure escort carriers and A/S craft to operate on convoy routes, and greater numbers of shore-based aircraft, including 250 ‘long-range’ aircraft (defined as an operating radius of 650 miles or over, which would become known as ‘VLR’) of which 100 were for

⁶⁸ Fifth Sea Lord, Note, 5 February 1942, ADM 1/11971, p.83

⁶⁹ Admiralty Board Minutes, 23 January 1942, ADM 229/25, p.165

⁷⁰ ‘Bombing Policy and Annex, Requirements of Long Range G/R Aircraft for Coastal Command and in the Indian Ocean’, Memorandum by First Lord, 14 February 1942, CAB 69/4, pp.165-170; ‘Air Requirements for the Successful Prosecution of the War at Sea’, Memorandum by First Sea Lord, 5 March 1942, CAB 69/4, pp.189-194 (Pound quotation p.189)

Coastal Command in the UK, Iceland, and Gibraltar. The arguments and requests by the Admiralty for greater air support elicited strong ripostes and little immediate help from the Air Ministry, including the response that the Middle East was the priority for Liberators, that there were no more Liberator Is available, and that Liberator IIs were not fitted with ASV radar and could not be fitted as quickly as the Fortress.⁷¹ There was a similar response to Joubert de la Ferté of Coastal Command when he noted the inadequate range of aircraft by 'Atlantic War Standards' and requested 'a long range type such as the Lancaster diverted to the immediate threat on our Sea Communications'.⁷² CAS, expecting US objections to diverting Liberators, was also 'strongly opposed to the transfer of either Liberators or Lancasters from the bomber offensive as the former were earmarked for the Middle East...while the latter was the only aircraft which could carry 8,000 lbs of bombs to Berlin'.⁷³

Bitter feelings between the Admiralty and Air Ministry at this time are reflected in a letter from the Second Sea Lord, Admiral Whitworth, to Cunningham:

Our fight with the Air Ministry becomes more and more fierce as the war proceeds. It is a much more savage one, than our war with the Huns, which is really very unsatisfactory and such a waste of effort.⁷⁴

Admiral Dreyer (CNAS) also expressed strong frustration over the distribution of resources, arguing that Britain should not 'bomb Germany with the Blood of the Merchant Navy'.⁷⁵

Churchill should have supported the Navy in its tussle with the MT over hulls for conversion in early 1942, following *Audacity's* proven success, but as has been noted preoccupation with strategic bombing led Churchill to focus on convoy air cover only when shipping losses reached dangerous levels.⁷⁶ This could have been addressed if the COS(s) had presented a united front but animosity between the Air Ministry and Admiralty may have caused both to

⁷¹ 'Requirements in Long-Range General Reconnaissance Aircraft', Memorandum by Secretary of State for Air, 18 March 1942, CAB 69/4, pp.195-200; 'Air Forces for Co-Operation with the Army and the Navy', Memorandum by CAS, 1 April 1942, CAB 69/4, pp.229-231

⁷² 19 February 1942, AIR 41/47, p.10

⁷³ Minute by CAS, 29 March 1942, AIR 41/47, p.11. Bowman (1998), pp.8-9: the operating range of the B-24 Liberator Mark I when converted was 2,400 miles; the Short Sunderland was by then 1,300 miles. See also Secretary of State for Air to Prime Minister, 17 September 1942, AIR 41/50, p.634: between 1 May 1942-17 September 1942 the RAF sent 32 Halifaxes, 25 Liberators, and 259 Wellingtons to the Middle East

⁷⁴ Letter from Whitworth to Cunningham, 15 December 1942, MS 52570, Cunningham Papers, BL

⁷⁵ 'Report by Admiral Dreyer', 13 January 1943, ADM 1/13484, p.5

⁷⁶ Bell (2015), pp.7-8

see the situation as a 'turf war' rather than one requiring the escort carrier, which would have diminished RN demand for four-engine VLRs. VLR maritime aircraft were seen by Portal as a distraction and a means of stripping the bomber offensive of yet more bombers.⁷⁷

The root cause was the inability of the COS(s) Committee⁷⁸ to function effectively in prioritising resources for the Battle of the Atlantic and Churchill's disappointing inability to act as an impartial referee. The North Atlantic crisis called for more escort carriers.

Continuous air cover for convoys was the best method of tackling the U-boat threat, and carrier-borne aircraft the best means of achieving this. Long-range aircraft were a necessary supplement, often attacking U-boats some distance from the convoy, but not the substitute some appear to have believed. Carrier-borne aircraft could strike and rearm within one to two hours, whereas long-range aircraft could make only one attack in perhaps twelve hours of flying.⁷⁹ Whilst long-range aircraft could be *effective*, as Portal and Joubert de la Ferté argue they could not be *efficiently* employed far from base – Joubert uses the term 'uneconomic' beyond 600 miles.⁸⁰

When Pound had pressed for air cover in the mid-Atlantic during 1941, Portal was only too keen to promote the use of auxiliary carriers in place of long-range aircraft,⁸¹ but apparently not enough to support Pound the following year in his exchanges with Churchill regarding additional auxiliary carriers. Portal felt that Pound in arguing with Churchill was 'not resourceful in argument' and often 'dominated by the Naval Staff' who were 'entirely *defensive* in their thinking'.⁸² However, whilst Pound could have been more robust, the power of the COS(s) committee was only evident when the members presented a united front⁸³ and were supported by Ismay.⁸⁴ Any dispute left Churchill to act as final arbiter and

⁷⁷ See Benbow (2014) for an analysis of Portal's focus on strategic bombing

⁷⁸ Roberts (2008), pp.109-110. It reported to the Defence Committee, a War Cabinet sub-committee, and comprised the political leaders of the three services, the service COS(s), and ministers relevant to the agenda. It became known as a Staff Conference when attended by Churchill as Minister of Defence and was the powerhouse of Britain's war effort according to Roberts. Portal, attending as CAS, had the advantage that he and his wife Joan were part of Churchill's social circle (Richards (1977), pp.179-198)

⁷⁹ ADM 234/384, p.116

⁸⁰ Note marked SECRET from Portal to Prime Minister, 26 March 1941, ADM 1/11627; Letter marked Secret from ACM Joubert de la Ferté, AOC-in-C Coastal Command, to Pound, 2 November 1941, AIR 15/343

⁸¹ Memorandum CAS to COS(s), 3 March 1941, AIR 41/73, pp.298, 358

⁸² Richards (1977), pp.199-200, 204. Italics in original

⁸³ Wilson (1995), p.21, cites John Martin, Churchill's Principal Private Secretary

⁸⁴ Roberts (2008), p.110. Ismay, member of COS(s) Committee, and Military Secretary to the War Cabinet and chief staff officer to the Minister of Defence (Churchill). Roberts quotes General Fraser, 'Ismay was the oil can

his predilection for the bomber offensive⁸⁵ almost always caused him to support the RAF in its battle with the Navy.⁸⁶

Arguably, Churchill's bias coloured his judgement of the dire position in the North Atlantic and was encouraged by support from Lord Cherwell⁸⁷ for strategic bombing and by Leathers who declined to release fast cargo-liners for conversion to escort carriers.⁸⁸ The resulting dilatory progress of procurement of British-built escort carriers during the first half of 1942 stemmed from this dispute at the heart of the COS(s) committee.

In need of a practical short-term solution, the Admiralty responded with a mixture of innovation and pragmatism. A good example of innovation is its attempts to develop a superior 'fighter support' version of the assault carrier or air defence variant of the escort carrier, based on a passenger liner conversion, with increased transverse bulkheads, powered by machinery from a *Fiji*-class cruiser already ordered, giving a speed of 25 knots and able to carry 15 aircraft.⁸⁹ Competing priorities,⁹⁰ in this case the value of passenger liners as troop transporters, trumped trade protection and combined operations, and the development did not proceed.⁹¹ This was despite the need for assault carriers envisaged by the CCS in February 1942 to provide air cover for amphibious landings in 1943, and demand for air defence carriers on the UK-Gibraltar route where German shore-based aircraft had revived their attacks.⁹² Admiralty pragmatism is illustrated in its February 1942 proposal for

that greased the relationship between Churchill and Brookie'. See Richards (1977), pp.199-229 on the COS(s) inter-personal relationships

⁸⁵ Benbow (2014), examines the background of the 'Battle of the Air' and Churchill's preference for the bomber offensive, supported by Cherwell. See also Redford (2009)

⁸⁶ Wilson (1995), pp.120-125

⁸⁷ Roskill (1977), p.133-139; Wilson (1995), pp.54-93

⁸⁸ War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, pp.12-14. Alanbrooke (2001), 3 April 1944, p.537: 'Cherwell with one thought only namely shipping for home imports! Leathers as slippery as ever and trimming his sails to the wind all the time'. Lord Moran (Churchill's personal physician) saw Leathers, a successful shipping executive brought into government as Minister of Shipping, later War Transport, and created a peer, as a weak individual only too anxious to please Churchill (Moran (1966), pp.448-449). This unflattering image was not universally held. Churchill's private secretary, John Colville, respected Leathers' 'quiet efficiency that won the admiration of all his cabinet colleagues' (Colville (1985), p.754)

⁸⁹ Statement taken to Vickers Armstrong at Barrow, 7 January 1942, ADM 229/25, pp.372-374

⁹⁰ 'Relation of Merchant Shipping Losses to the Prosecution of the War', Note by the Representative of the British COS(s) and attached Memorandum by Sir Arthur Salter, 14 February 1942, CCS 39, CAB 88/5, pp.178-180, which noted the shortfall in Allied shipping capacity and the additional needs in 1942 for Russia convoys, the Pacific theatre, US troop transporting, and 'Naval demands for additional Merchant Ships (as air carriers, etc.)'

⁹¹ Hague (1983a), pp.8-24; Friedman (1988), p.185

⁹² ADM 234/384, p.110

three escort carrier specifications, based on experience with *Audacity*. These were formalised into variants A, B, and C, with C likely to feature certain lower standards such as limited lift capacity, fewer arrester wires/barriers, and only a catapult if practicable.⁹³

Conversion work in British yards was still a craft-based process,⁹⁴ but the C variant could be produced relatively quickly. For example, the second British-built escort carrier, *Activity*, which became a Type C vessel, was requisitioned on 10 January 1942, laid down on 1 February, launched on 30 May, commissioned on 29 September, and became operational on 1 January 1943 as a DLT carrier.⁹⁵ Hobbs states that *Activity* represented a major advance on *Audacity*, with a lift and hangar and able to handle 10 aircraft, although her single lift limited her ability to range aircraft quickly.⁹⁶ Compared to *Archer* and the *Avenger* class, she enjoyed better machinery and her riveted hull was believed to withstand the North Atlantic and Arctic weather better than the welded hulls of American contemporaries.⁹⁷ *Audacity* was to have been followed by at least eight further British-built/converted escort carriers by the end of 1943,⁹⁸ but Admiralty plans were undermined once again by competing demands on shipyards. Apart from *Activity*, only four more British-built 'true' escort carriers were commissioned in the rest of the war, none of which became operational in the period covered by this chapter.⁹⁹

Analysis of attempted procurement of further vessels illustrates the impediments faced by the Admiralty. The third British-built vessel, *Pretoria Castle*, serving in the South Atlantic as an AMC, was designated for conversion on 24 March 1942; however, conversion of another

⁹³ Friedman (1988), p.182. Possibly issued in draft form in late February 1942. Specifications mostly differed in maximum speed (knots) (A, 20; B, 18; C, 16.5); in aircraft carried (A, 25; B, 15; C, 10); and in petrol storage (gallons) (A, 75,000; B, 50,000; C, 33,000)

⁹⁴ Meeting of the War Cabinet, 28 July 1942, CAB 65/27/14, p.47. It was asked whether Britain could adopt any of America's 'new methods' of shipbuilding, but this was considered not practicable without disrupting 'other essential war industries'

⁹⁵ Hobbs (2003), p.17. Built by Caledon Shipbuilding Company, Dundee

⁹⁶ Hobbs (2013), pp.116-117. In practice, she carried only 10 aircraft operationally (Hobbs (2003), p.188)

⁹⁷ Hobbs (2013), p.117

⁹⁸ 'Requirements of fighter aircraft for additional Auxiliary Carriers', ADM 1/11851, 29 November 1941, pp.3-5; Moore (2003), p.63. These eight were to be joined by 15 US-built auxiliary aircraft carriers and *Audacity*, giving a total of 24 by December 1943

⁹⁹ Hobbs (2003), pp.17, 54, 88, 99, 175

AMC and other large merchant ships of the *Winchester Castle* class¹⁰⁰ was vetoed by the MT, prioritising alternative uses such as troop transporters and refrigeration vessels.¹⁰¹

These delays in introducing escort carriers led to further Admiralty initiatives, illustrated in debates on various types of auxiliary carriers and novel types of aircraft.¹⁰² For example, converting the large passenger liners, *Queen Mary* and *Queen Elizabeth*, into aircraft carriers, each capable of handling 60-80 aircraft, was considered. However, demand for these 'monsters' as troop transporters in the build-up to the invasion of Europe was too great, and the scheme was effectively abandoned in June 1942.¹⁰³ It is clear from the files that some escort carriers, if successful, were expected inevitably to be diverted to 'Fleet Operations' to compensate for the 'acute' shortage of fleet carriers,¹⁰⁴ thus illustrating the need for both air defence and assault carrier variants, and contributing to the consideration of a merchant ship able to act as a TPC in addition to her normal work.¹⁰⁵ The novel aircraft included an Auto-Gyro (or helicopter); and a low performance aircraft (the lightweight Taylorcraft), capable of landing on a merchant ship with a platform.¹⁰⁶ The light aircraft was a failure and the helicopter/Auto-Gyro 'show promise but there is no likelihood of production for a long time'; however, as 'our need is urgent', Director A/SW proposed to 'press on at maximum speed with a simplified auxiliary carrier capable of operating as a Merchant ship'.¹⁰⁷

Whilst neither of these aircraft was successful, the MAC ship, capable of operating Swordfish aircraft, was an initiative which did proceed.¹⁰⁸ It was based on the idea that 'the

¹⁰⁰ Hague (1983a), pp.8-24; Friedman (1988), p.185: conversion time for these *Winchester Castle*-class vessels was estimated at 12-15 months, compared with six for *Audacity* and a forecast of nine for an 'improved' *Audacity* (i.e., *Activity*)

¹⁰¹ Brown (1983a), pp.21-22; Friedman (1988), p.185; Hobbs (2013), p.117. The MT allocated slower cargo vessels on 29 June, 29 July, and 20 October 1942, becoming, respectively, the escort carriers *Vindex*, *Campania*, and *Nairana*, operational in 1944 (Hobbs (2003))

¹⁰² 'Aircraft in Merchant Ships', Memorandum from Naval Adviser to First Sea Lord on U/B Warfare, 22 May 1942, ADM 1/11848

¹⁰³ 'Monster Liners as Aircraft Carriers', 17 July 1942, pp.29-30, 'Dual Purpose Vessels and Monster Liner Conversions', 14 September 1942, p.20, both ADM 1/11940; Brown (1983a), p.22. The two critical characteristics were high speed (28 knots) (Barnett (1992), p.490); and troop capacity (12,000 was not uncommon and occasionally up to 14,800, ADM 234/384, p.111). The *Aquitania* and *Mauretania* were also considered but rejected

¹⁰⁴ Response by Director A/SW, 30 May 1942, ADM 1/11848, pp.17-18

¹⁰⁵ Response by Director of Trade Division (DTD), 11 June 1942, ADM 1/11848, p.18

¹⁰⁶ Response by Director A/SW, 30 May 1942, ADM 1/11848, pp.17-18

¹⁰⁷ Response by Director A/SW, 27 June 1942, ADM 1/11848, p.22

¹⁰⁸ Note by DTD, 30 June 1942, ADM 1/11848, p.22

most immediate method of providing more aircraft with the convoys is to pursue the question of a 'simplified auxiliary carrier',¹⁰⁹ capable of remaining a merchant ship. Delays in procuring escort carriers sought for a variety of roles, combined with the lack of sufficient VLR aircraft,¹¹⁰ appears to have left the Admiralty with no choice but to sanction MAC ships as the least bad alternative, and the one most likely to gain MT support; the proposals were finally approved in June 1942.¹¹¹ In fact, the idea of a 'simplified Auxiliary Carrier',¹¹² built solely for trade protection and converted in a relatively short time, proved a highly successful stop-gap measure. They were originally based on bulk grain carriers able to accept a full-length flight deck over their cargo holds, thus retaining the majority of their cargo capacity.¹¹³ Original requirements of a 490 x 62 feet flight deck, a hangar for six aircraft, and a 14-15 knot speed could not be met by the Controller of Merchant Shipbuilding and Repair.¹¹⁴ The plans (for 30-32 ships)¹¹⁵ were modified to utilise a standard 11 knots tramp merchant vessel with a deep load of 13,000 tons, a flight deck of at least 390 x 62 feet, and a hangar for four aircraft.¹¹⁶ No catapult was fitted. These constraints were partially overcome by using a 3,300 bhp engine, giving 12.5 knots, and Swordfish aircraft, needing only a very short flight deck.¹¹⁷ Crucially, they could be constructed quickly and converted to a MAC ship, all in the same merchant yard, to meet the crisis on North Atlantic routes. Although it would be wrong to equate the effectiveness of the MAC ship with that of the escort carrier, the former's limited aircover was sufficient for A/S convoy protection, although it lacked the speed and aircraft capacity for the many other tasks increasingly required of escort carriers, such as supporting amphibious operations.

The first contracts were awarded in June 1942 for two vessels each possessing a steel flight deck and a small hangar (142 x 38 x 24 feet high) above their aft holds, serviced by a single

¹⁰⁹ Note by DNAD, 23 June 1942, ADM 1/11848, pp.20-21. Quotation from Caspar John, Director General of Naval Development and Production MAP, 26 June 1942, ADM 1/11848, p.21

¹¹⁰ Goette (2005), pp.25-26: nine Liberator Mark Is entered service with 120 Squadron Coastal Command at the end of September 1941 after modification to VLR; by February 1942 one more VLR aircraft had been added, taking the total to 10. See also AIR 41/47, p.521: following wastage, on 18 November 1942 only six of Coastal Command's total of 39 Liberators were VLR

¹¹¹ Note by DTD, 8 July 1942, ADM 1/11848, p.23; Friedman (1988), p.193

¹¹² Response by Director A/SW, 30 May 1942, ADM 1/11848, pp.17-18

¹¹³ Friedman (1988), pp.193-194

¹¹⁴ *Ibid.*, p.193

¹¹⁵ *Ibid.*, p.194. Only 19 MAC ships were commissioned

¹¹⁶ Brown (1995), p.94; Lenaghan (1983), pp.46-48

¹¹⁷ Lenaghan (1983), pp.45-48

lift.¹¹⁸ The first, *Empire MacAlpine*, was laid down in August 1942, launched in December, and converted and completed in April 1943, joining a convoy in May; four other grain vessels were commissioned and became operational between July 1943-March 1944.¹¹⁹

In July 1942 a meeting was held at the Admiralty to discuss programmes of major vessel conversions and assess their relative priority.¹²⁰ This meeting further illustrates the hard choices over resource allocation, complicated by the introduction of innovative platforms built from the keel up. Alternative uses of large vessels included AMCs, troop transporters, refrigeration ships, and escort carriers, all competing for scarce shipyard space with the recently-proposed Intermediate (or Light) Fleet Carrier (CVL). The CVL offered faster construction at a lower cost compared with traditional fleet carriers, but with similar capabilities (albeit fewer aircraft) and the Controller was therefore 'very anxious'¹²¹ that work on it, now underway,¹²² was not delayed by placing a number of large conversions with those yards capable of building larger naval vessels.¹²³ Presumably in the knowledge that the MAC ship programme was underway, the decision was taken to prioritise conversions to other types of equally-needed large naval vessels (e.g., Repair Ships and Destroyer Depot Ships).¹²⁴

The autumn of 1942 saw U-boats continue to inflict heavy losses on North Atlantic trade routes,¹²⁵ prompting some important developments.

¹¹⁸ Admiralty meetings on MAC ships, January-July 1943, ADM 1/13087, see p.42 for construction specifications (flight decks: grain 400 x 62 feet; tanker 460 x 62 feet); for further details including hangar see Lenaghan (1983), pp.45-62. Three shipbuilders worked with designers at Admiralty conferences (7 and 20 May, and 2 June 1942), to ensure a standardised design and minimum production delays

¹¹⁹ ADM 234/384, p.317; Friedman (1988), p.364. Lenaghan (1983), p.50: MAC ships cost some 25% more than the original tramp vessels

¹²⁰ DOP Meeting, Programme of Major Conversion Work, 20 July 1942, ADM 229/26, pp.194-195

¹²¹ Ibid., p.194

¹²² Moore (2003), pp.63-65, 142. The *Colossus* class (CVL) was ordered under the 1942 Programme. See also 'Amendments to New Construction Programme, 1942', Memorandum by First Lord, War Cabinet, 4 August 1942, PREM 3/322/10, which refers to proposed orders for nine additional CVLs and their aircraft for delivery 1944-1945

¹²³ DOP Meeting, Programme of Major Conversion Work, 20 July 1942, ADM 229/26, pp.194-195

¹²⁴ Ibid.

¹²⁵ Roskill (1962b), p.486

In October Alexander expressed great concern over the serious manpower shortages experienced by the Navy and its supply departments compared to the other fighting services, and again emphasised the need for general-purpose aircraft platforms:¹²⁶

The number of aircraft carriers available is still totally insufficient for the deployment of adequate aircraft to support a large combined operation...Auxiliary aircraft carriers have great potential value in countering the U-boat attack; by the same date [end of 1943] we should have at the best only 28 of the 41 vessels we require.¹²⁷

Alexander argued that mounting any major offensive operation would severely impact the Eastern Fleet, greatly increase risk within the Home Fleet as well as 'reduce drastically our imports by stopping convoys',¹²⁸ the latter reflecting the withdrawal of surface escort vessels and the need to convert trade protection escort carriers to assault carriers.

Importantly, this was followed by Leathers belatedly supporting the Admiralty's case, calling for the provision of more escort carriers and an acceleration of MAC ships based on tankers to provide air cover of 'sea communications', which he *now* considered essential.¹²⁹ He argued that shore-based aircraft could not cover the entire North Atlantic convoy routes and that ship-borne aircraft were essential for adequate air protection of convoys. The Minister had no doubt been attracted to the MAC ship as it continued to transport the bulk of its cargo, whilst the heavy losses of merchantmen during 1942 would have undermined his previous illogical stance to refuse a conversion when the severe losses were caused by a lack of continuous air cover.¹³⁰

The Admiralty attempted to increase the number of British-built MAC ships. Accordingly, besides grain carriers,¹³¹ oil tankers were considered for conversion but initially little

¹²⁶ 'The Needs of the Navy', Memorandum by First Lord, War Cabinet Defence Committee (Supply), 5 October 1942, CAB 70/5, pp.1-8. June 1942 manpower: RN 500,000; Army 2.4m; RAF 833,000. The Admiralty and merchant shipbuilding industry's supply department manpower totalled 717,000; the Ministry of Supply for the Army 1.4m; and MAP for the RAF and FAA 1.2m (of which the FAA's allocation was 9%)

¹²⁷ *Ibid.*, pp.3-4

¹²⁸ *Ibid.*, p.3

¹²⁹ 'Protection of Merchant Shipping', Memorandum by Leathers to War Cabinet Defence Committee (Supply), 9 October 1942, CAB 70/5, pp.1-2

¹³⁰ 'Auxiliary Aircraft Carriers', War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, pp.12-14

¹³¹ Brown (1995), pp.94-95; Lenaghan (1983), pp.46-50, provide details of the six grain carriers and 13 oil tankers, of 32 officially sanctioned (subsequently reduced). Cargo capacity decreased to 80% of normal for grain carriers and 90% for oil tankers. The lack of a hangar on oil MACs was partially compensated for by a

progress was made because appropriate tankers transported low flash-point fuel and were therefore unsuitable to handle aircraft. However, operational demands were such that later in 1942 nine existing tankers were converted while four further tankers still under construction were acquired and converted, with the fuel transported being required to have a higher flash-point (150°F or higher).¹³² Existing tankers were converted on average in six months in a variety of yards¹³³ and became operational between July 1943 and May 1944,¹³⁴ although the first was delayed by difficulties in procuring ancillary equipment.¹³⁵ Early 1943 also saw the Admiralty anticipate the need for more general-purpose escort carriers, requesting that the MAC-ship design incorporated the potential to upgrade the vessel to that of a Type C auxiliary carrier.¹³⁶

Underlying these procurement issues was the fact that final decisions rested with the War Cabinet or its sub-committees, usually chaired by Churchill, and their assessment of resource allocation in the context of strategic priorities.¹³⁷ The result is evident in minutes of the AU Committee, activated by Churchill in November 1942 in response to German U-boat successes on North Atlantic trade routes.¹³⁸ The minutes show that the urgent need for continuous air cover of convoys was met by further reviews, spurious concerns about the viability of escort carriers and MAC ships,¹³⁹ delayed deliveries and debates about suitable aircraft for VLR conversion and the necessary numbers,¹⁴⁰ and suggestions of sourcing additional MAC ships from America.¹⁴¹

The first meeting proposed that 12 additional converted MAC ships could be built in Britain by 'special priority' in 'two months, provided the necessary arrester gear could be made

larger flight deck. Grain carriers carried four Swordfish and oil tankers usually three (Hobbs (2013), pp.123-124); occasionally four were seen on oilers' decks (see photograph, Hague (2000), p.86)

¹³² Lenaghan (1983), p.50

¹³³ Ibid., p.54. Conversion under construction extended build time by just under three months

¹³⁴ ADM 234/384, p.317

¹³⁵ Lenaghan (1983), p.54. Late delivery of arrester gear and lifts reportedly delayed completion of the first vessel by one to two months

¹³⁶ Note from DNC, S.V. Goodall, 12 January 1943, ADM 229/28

¹³⁷ War Cabinet Minutes, 7 October-30 December 1942, CAB 65/28

¹³⁸ 1st Meeting, AU Committee, 4 November 1942, CAB 86/2, pp.19-21. It was established (12 August 1942) to focus on anti-U-boat warfare (Roskill (1962b), p.88). The Allies were only sinking a third of the monthly output of 20-30 new U-boats and more U-boats in the North Atlantic made it harder to employ evasive tactics

¹³⁹ 2nd Meeting, AU Committee, 13 November 1942, CAB 86/2, pp.22-27

¹⁴⁰ AU Committee meetings: November 1942-May 1943, CAB 86/2; Roskill (1977), pp.116-247; Roskill (1962b), pp.363-364

¹⁴¹ 4th Meeting, AU Committee, 25 November 1942, CAB 86/2, p.38

available in the time'.¹⁴² This idea was reviewed in the second meeting when Churchill stated that 'apart from the provision of additional escort vessels the chief ways of reducing U-boat losses in mid-Atlantic were the provision of ship-borne aircraft, and the provision of long range aircraft'.¹⁴³ However, it was alleged (the layout of the minutes suggest by Churchill) that there was a 'shortage of carriers' already required for future operations; that escort carriers or MAC ships were as vulnerable as the merchant ships they protected; 'aircraft could not be flown off in very bad weather';¹⁴⁴ and carriers generally had to operate outside the anti-submarine screen¹⁴⁵ (the latter two statements were inaccurate). Furthermore, it was suggested considerable time was needed to provide sufficient MAC ships for one to accompany every convoy,¹⁴⁶ while VLR Liberator aircraft could be readily available.¹⁴⁷ In the third meeting Churchill proposed trying to source 30 VLR Liberators from America, alongside requesting a list of items most needed to make existing A/S weapons more effective.¹⁴⁸ Following Churchill's departure from the meeting the Lord Privy Seal, Sir Stafford Cripps, took the chair and noted that, following a discussion, the most pressing matter under the first heading of weapon improvements was the 'provision of escort vessels and merchant-ship aircraft carriers'. The fourth meeting saw a progress report on the MAC-ship programme (12 vessels), with the US asked to build 30 additional MAC ships for completion in the first half of 1943.¹⁴⁹ The sixth meeting (December 1942), heard of

¹⁴² 1st Meeting, AU Committee, 4 November 1942, CAB 86/2, pp.19-21. The previously-ordered MAC ships were due in April 1943, at the earliest

¹⁴³ 2nd Meeting, AU Committee, 13 November 1942, CAB 86/2, pp.22-27. Quotations p.25

¹⁴⁴ Swordfish had been operating off fleet carriers successfully in bad weather for some years. There was no evidence of their abilities with MAC ships at this stage but they were to prove very successful, operating even in atrocious weather (see Lenaghan (1983), p.61)

¹⁴⁵ A reference to the loss of *Audacity*, which had moved unescorted outside the A/S screen at night when it was torpedoed (December 1941). This was addressed at a meeting convened at the Admiralty by C-in-C Western Approaches (6 January 1942), which reviewed *Audacity's* loss and made firm recommendations regarding the position of escort carriers in convoy at night (see ADM 234/348, pp.88-89)

¹⁴⁶ Whilst this was true, even a relatively modest number was extremely effective for the convoys they accompanied (see deployment below). As noted in a letter from Air Vice-Marshal John Slessor, ACAS(Policy) to Rear-Admiral Patrick Brind, ACNS(Home), which stated that shore-based aircraft were 'a very uneconomic way of doing the job... could be done by a comparatively few auxiliary carriers' (Letter from ACAS(Policy) to ACNS(Home), 31 October 1942, ADM 205/23, p.69)

¹⁴⁷ At the 2nd AU Meeting (13 November) it was suggested that the best solution for effective air cover was 40 B-24 Liberator Mark Vs, converted to give a range of 2,300 miles, convertible at a rate of 10 per month, commencing in about three weeks; at the 3rd AU Meeting (18 November) CAS reported that only six of Coastal Command's 39 Liberators were VLR, but that he would arrange for the balance to be modified to VLR standards. Both CAB 86/2. See also AIR 41/47, p.521: the completion target date was February 1943 (which was not met)

¹⁴⁸ 3rd Meeting, AU Committee, 18 November 1942, CAB 86/2, pp.29-34

¹⁴⁹ 4th Meeting, AU Committee, 25 November 1942, CAB 86/2, p.38

America's decision not to build MAC ships, and the Admiralty's request to America for an additional 12 *Kaisers* (*Casablanca*-class escort carriers) during the first half of 1943 (subsequently refused), while Britain would build eight additional MAC ships, making 20 in total.¹⁵⁰ Eventually Britain built 19 MAC ships, the last batch of which only became operational during 1944.¹⁵¹

Pressures on escort carrier procurement continued. On 27 March 1943, following an internal explosion, caused by an accident rather than enemy action, the US-built escort carrier, *Dasher* (*Avenger* class), sank in eight minutes leaving only 149 survivors out of a company of 526.¹⁵² Following an enquiry into the loss, the British further modified all American-built escort carriers,¹⁵³ exacerbating manpower shortages in British shipyards. The need for safety modifications provided the opportunity to introduce the changes necessary to meet the strategic need to expand the operational role of escort carriers by making some capable of handling fighter operations. The air defence variant was borne out of experience in an AA role against bombers in the Arctic and on the UK-Gibraltar trade route. Another fighter variant (the assault carrier) offered fighter cover for amphibious assaults, with specialist equipment and fighter-direction radar sets required for both variants.¹⁵⁴ Seven weeks were allotted for alterations deemed critical.¹⁵⁵ This proved hopelessly optimistic

¹⁵⁰ 6th Meeting, AU Committee, 9 December 1942, CAB 86/2, pp.46-49

¹⁵¹ Lenaghan (1983), pp.50-54

¹⁵² 'Report into loss of HMS *Dasher*', 31 March 1943, ADM 1/15072, pp.24-26. The cause was a petrol vapour explosion, blamed by the Admiralty on inadequate protection of the AVGAS tank, reflecting US practice of using internal hull tanks. The USN blamed poor RN protection regulations; the Admiralty Board of Enquiry blamed poor design, resulting in petrol vapour accumulating, possibly ignited by a cigarette or faulty lighting system (see Crosley (2014), pp.90-91, 99-100). Brown (2000), p.64, states both were correct, 'the extreme care taken in British petrol arrangements allowed rather sloppy obedience to rules on smoking'. Subsequently, all British escort carriers were modified with a reduction of about half of their AVGAS capacity, further delaying operational readiness (Friedman (1988), p.187). Roskill (1960b), p.34: the USN accepted the precautions and improvised by injecting salt water into empty fuel tanks

¹⁵³ Friedman (1988), pp.185-188; Hobbs (1996), pp.31, 55, provide details of the alterations undertaken, initially in Britain and later in Vancouver, BC. Talbot (1949), pp.200-201, stresses that manpower shortages, rather than finance, restricted conversion work. Modifications included the bomb room being placed behind longitudinal bulkheads (following the loss of *Avenger*); petrol storage system modifications (following the loss of *Dasher*); ballast introduction (British experts recommended 1,200-2,000 tons to increase stability); and flight deck extensions. The steel flight decks of early British-built carriers were: *Audacity*, 453 x 60 feet, and *Activity*, 498 x 66 feet. The US-built *Archer* and *Avenger* classes had flight decks of 410 feet (steel plate over which wooden planks were laid athwartships to provide a rough surface, reducing the risk of aircraft skidding), lengthened to approximately 440 feet in Britain. Where necessary, fighter-direction equipment was installed and 'Arcticization' carried out in Britain

¹⁵⁴ Roskill (1960b), p.34

¹⁵⁵ *Ibid.*

with the introduction of additional equipment and systems such as HF/DF, ASDIC, better radar, an operations room, and briefing rooms for army personnel.¹⁵⁶ Furthermore, beyond the planned seven weeks (in reality over 11), five or six weeks were needed to 'work-up' the ships and aircrew.

Arguments about delays in modification in Britain had taken place within the Admiralty, illustrating the key issue of needing escort carriers to be capable of filling different roles and the underlying tensions over the need to prioritise. For example, one paper noted *Battler* would be in a dockyard for over ten weeks and talked of possibly being 'too "Rolls Royce" in fitting these ships with modern equipment', suggesting ships be modified to a specialist role.¹⁵⁷ This was challenged by a statement that little time would be saved by eliminating one or more of the major modifications.¹⁵⁸ It was also argued that major alterations 'are essential if these carriers are to be general purpose vessels' and 'to restrict their employment may be a great operational disadvantage', given the difficulty of forecasting operational requirements.¹⁵⁹ DOP stated that the modifications to the *Tracker (Attacker)* class were operationally essential, but proposed examination of the issues in relation to the later *Ruler* class,¹⁶⁰ countered by DAM even suggesting cancelling flight deck extensions, citing urgency in light of the U-boat campaign.¹⁶¹

4.3.3 US-built escort carriers

Admiralty minutes show the plan for escort carrier procurement from the US: 15 were to be provided under the first and second Lend-Lease appropriations, already agreed in the Controller's list, with another 15 agreed to be financed under RN appropriations.¹⁶² Five were to be available in the first half of 1942 (*Archer* and the *Avenger* class), with a further 10 in the second half (the *Attacker* class). Deliveries from America were still to be arranged for the remaining 15 between 1943 and 1945.

¹⁵⁶ Ibid., pp.34-35. The average time taken for such work exceeded 11 weeks (Hobbs (2003))

¹⁵⁷ 'Delay in Completion of Escort Carriers', Note by Captain John Eccles, Director of Operations (Home), 18 January 1943, ADM 1/14842

¹⁵⁸ Handwritten response by Captain Talbot, Director of Dockyards, 23 January 1943, ADM 1/14842

¹⁵⁹ Response by Captain Wright, Director of Air Warfare and Flying Training (DAWT), 5 February 1943, ADM 1/14842 (underlining in original)

¹⁶⁰ DOP Memorandum, 7 February 1943, ADM 1/14798

¹⁶¹ Response by GF Renwick for DAM, 17 February 1943, ADM 1/14842

¹⁶² Controller's Meeting, 10 February 1942, ADM 229/25, p.204

However, the Admiralty's caution over delivery dates following Pearl Harbor¹⁶³ proved justified in the short term. Besides *Archer*, and the three *Avengers* (*Avenger*, *Biter* and *Dasher*), only five vessels (*Attacker*, *Battler*, *Fencer*, *Hunter*, and *Stalker*) of the *Attacker* class reached Britain by the end of May 1943¹⁶⁴ and in this period only one (*Battler*) had completed modification to RN standards in British shipyards, worked up, and become operational.¹⁶⁵ While the Admiralty benefited from rapidly increased US output, it still faced competition from the USN and other services for resources, no control over production, and needed to modify vessels prior to deployment.¹⁶⁶

While the good relationship between Roosevelt and Churchill was crucial,¹⁶⁷ a key Admiralty achievement was the development of a close working relationship with the USN,¹⁶⁸ assisted by BAD moving into the USN Department Building on 1 July 1942.¹⁶⁹ This was particularly important because RN officers based within Britain's Naval Stores Department were largely dependent on people and organisations over which they had no control – procedurally they 'could request but not direct'. Inevitably, perhaps:

The Department became a turntable, swivelling from one track to another, rather than a well-defined line developed by past experience through which the results of our labours could flow smoothly.¹⁷⁰

¹⁶³ War Cabinet Defence Committee (Operations), 9 January 1942, CAB 69/4, pp.12-14. Alexander noted that it now seemed 'very doubtful' that Britain would get the number of US-built escort carriers it had been relying on and that conversion work in Britain should commence as soon as possible on ships nearing completion

¹⁶⁴ Hobbs (2013), pp.126-151

¹⁶⁵ *Ibid.*, pp.132-151. *Attacker*, *Fencer*, *Hunter*, and *Stalker* were undergoing modification on 31 May 1943. *Tracker's* modifications commenced 4 June 1943

¹⁶⁶ The controversy over modification and its impact on deployment is addressed in chapter 5

¹⁶⁷ Churchill & Roosevelt (1984a, 1984b, 1984c); see also chapter 3. Danchev (1986) covers the often overlooked 'special relationship' between Field Marshal Sir John Dill and General George Marshall, the US Army Chief of Staff

¹⁶⁸ Furer (1959)

¹⁶⁹ 'Naval Stores', ADM 116/5813, pp.1-7, handwritten date 10 March 1959. It had three defined groups; one, Air Stores and Equipment, was initially based in Washington, D.C., but was transferred to Philadelphia Navy Yard. 36 RN officers were on attachment from Britain, supported by 170 locals (USN employees) plus manual labourers

¹⁷⁰ 'Naval Stores', ADM 116/5813, p.6

Furthermore, the process of procurement was mired in the bureaucratic nature of the relationship between the two navies and ultimately dependent upon the dominant role played by Admiral King.¹⁷¹ The procedure was that:

On receipt of an Admiralty request for the procurement of material, the matter had first to be discussed with the Lend Lease Section of the [US] Navy Department Bureau concerned, and with the Technical Officers of the Bureau. If they agreed...there were many hurdles still to be crossed.

These hurdles included the approval of the WPB 'if critical material was concerned':

The requisition then went to the representative of Chief of Naval Operations for approval, where it was subjected to exacting consideration, U.S. Navy requirements and overall logistic considerations being taken into account.¹⁷²

If approved, it went back to the appropriate bureau where a supply contract was raised. When available, the product was assigned by the Munitions Assignment Committee (Navy), nominally a joint committee of a US and British naval officer, but the USN had the chair and 'in effect power of veto'. Even when procured, items would pass through 'no less than 18 different stages' of shipment.¹⁷³

Despite the issue of bureaucracy, the US proved an invaluable source of both escort carriers and aircraft, and although early vessels suffered from design faults, operational feedback from the RN and the USN led to notable improvements in successive classes.¹⁷⁴ Some of these faults are illustrated in the first US-built British carrier prototype, *Archer* (US *Long Island* class/British *Archer* class), which suffered a series of engine failures following commissioning in Newport News in November 1941. Eventually, after six engine repairs and defect rectifications carried out during her short operational career, in late 1943 she was paid off into care and maintenance.¹⁷⁵ The subsequent class, *Avenger* (US *Long Island* again), of five vessels, with Doxford rather than Sulzer diesel engines,¹⁷⁶ was still prone to

¹⁷¹ Vat (1998), p.233. Vat accuses King of being highly Anglophobic. Coles (2001), p.107, quotes a contemporary who suggests that King was more 'pro-American rather than anti-British'

¹⁷² 'Naval Stores', ADM 116/5813, pp.9-10

¹⁷³ Ibid.

¹⁷⁴ Friedman (1988), pp.186-187. For US escort carrier construction: Foster (1989), pp.68-89; Heiner (1991), pp.117-150; Heinrich (2012), pp.155-180; Mawdsley (2002), pp.21-27, 120-131

¹⁷⁵ Friedman (1988), pp.182-183; Hobbs (2003), pp.26-27

¹⁷⁶ Friedman (1988), pp.182-183

mechanical failures although less severe. The process of incremental development saw the second *Avenger*-class ship (*Biter*), fitted with an island forward on the starboard side, with British-Type 79B air-warning and Type 271 surface-warning radar sets fitted at modification in British yards.¹⁷⁷ *Tracker*, the fifth *Avenger*-class vessel, was further modified following experience with her sister vessels.¹⁷⁸ She was acquired by the USN on behalf of Britain in May 1942 and became the prototype of the British *Attacker* class (based on the US *Bogue* class).¹⁷⁹

A further factor was delays. The Admiralty had no control over US shipyards designated by the USN,¹⁸⁰ whose process of usually moving completed hulls to separate yards for conversion to carriers changed over time. Production time for the three *Avengers* prior to delivery to the RN for transit to Britain varied between 28 and 29 months,¹⁸¹ although this fell over the next two classes (*Attacker* and *Ruler*) as US shipyard management and procedures were transformed. Another delay was caused by modification of the vessels to RN standards. These modifications were not undertaken in US shipyards to avoid interrupting production runs and, in Britain, space had to be found in different busy shipyards. The *Avenger*-class vessels' modifications in Britain typically took over two to three months.¹⁸² Together with a period of working-up, the average time from being laid down to becoming fully operational was approximately 33 months.¹⁸³

¹⁷⁷ *Ibid.*, p.188; Hobbs (2013), p.131. For technical details: Friedman (1981b), pp.190-192. Eventually all *Avenger*- and *Attacker*-class vessels had such radar fitted on arrival in Britain

¹⁷⁸ Friedman (1988), p.183

¹⁷⁹ *Ibid.* Hobbs (2003) and Hobbs (2013), pp.131-136, provide details of *Archer* and the *Avenger* class, and comparison with the *Attacker* class. The *Attacker's* larger lift allowed a greater variety of aircraft to be ferried. However, as Hobbs notes, the 'anomaly' was that 'escort carriers could only catapult American aircraft by the tail down method with a strop and British aircraft could only carry out a free take-off from them'. Whilst this increased flexibility in launching US aircraft from a crowded flight deck, the *Swordfish* was at a distinct disadvantage in light winds when it was unable to carry a full load of rockets or depth charges (Hobbs (1996), p.17). This was only corrected by the later introduction of Rocket-Assisted Take-Off Gear (RATOG), discussed below

¹⁸⁰ United States Maritime Commission (1946). Lane *et al.* (1951), pp.1-100, 173-183, 322-361

¹⁸¹ Hobbs (2013), pp.131-136; Nailer (1980a), pp.3-4

¹⁸² Hobbs (2013), pp.131-136. The *Avenger* class is sometimes classified as part of the *Archer* class. For modification details: Friedman (1988), pp.180-187; Hobbs (1996), pp.31, 55. Compared with *Activity*, *Avenger* had a larger lift, and a single H2 hydraulic catapult forward, capable of launching a 7,000-pound aircraft at 60 knots

¹⁸³ Hobbs (2003), pp.39, 50, 61

The *Attacker* class represents an example of improvements in design and average time to becoming fully operational (24 months),¹⁸⁴ as well as the Admiralty's success in securing a relatively high proportion of US output. These were the superior steam-driven C3 hulls (based on *Tracker*), giving a more reliable and faster speed of some 18 knots, a great improvement on the unreliable diesel-powered *Archer* and *Avenger* class previously ordered from the US.¹⁸⁵ This class (sometimes known as *Tracker*) was ordered on 26 December 1941 as part of a 25-vessel order for the US *Bogue* class issued by the Secretary of the US Navy. Only 20 new C3 hulls were available¹⁸⁶ but 10 were allocated to the RN, with the remainder allocated to the USN along with four escort carriers to be converted from T-3 USN oilers.¹⁸⁷ Unpublished WPB papers and the literature provide details of these *Attacker*-class vessels,¹⁸⁸ and the different yards.¹⁸⁹

During the autumn of 1942 the Admiralty faced increasing USN competition for hulls, but as part of a contract covering two US classes of vessel (*Bogue II* and *Casablanca*) it secured a large number. In November the Admiralty bid for five C3 hulls (*Bogue II*) and 14 *Casablanças*, a subsequent request for another 12 *Casablanças* being rejected. In May 1943 the USN rationalised the allocation between the two navies, taking all the *Casablanças* and giving the RN 23 of the 24 *Bogue II* class, which the RN named the *Ruler* class.¹⁹⁰ Ultimately, the Admiralty's effectiveness in procuring escort carriers in the period of this chapter is illustrated by the agreement to procure 34 US-built carriers, despite the supply shortages.¹⁹¹

¹⁸⁴ Friedman (1988), pp.177-201; Hobbs (2003); Hobbs (2013), pp.132-151; Nailer (1980a), pp.4-5; Nailer (1980b), pp.31-32; Woodman (1987), pp.8-43

¹⁸⁵ Terzibaschitsch (1981), pp.25, 201, states 18 knots; Nailer (1980a), pp.3-5, states 18.5 knots

¹⁸⁶ Friedman (1988), p.183; Terzibaschitsch (1981), p.36

¹⁸⁷ Terzibaschitsch (1981), pp.36, 61. The four oilers, formerly converted from merchant tankers, became known as the *Sangamon* class

¹⁸⁸ Hobbs (1996), pp.53-182; Hobbs (2013), pp.132-151; WPB, RG 179, p.68. The flight deck was 442 x 80/88/102 feet. There appears no obvious explanation for different widths, as they appear in vessels from all three yards and in no chronological order. The class had a deep displacement of 14,400 tons and was laid down between April 1941-April 1942, and launched between September 1941-July 1942, many of the hulls being acquired by the USN for Britain before launching. There was a single catapult (H2 7,000 pounds at 61 knots – tail-down method only), with a lift at each end of the hangar (262 x 62 x 18 feet) which made it easier to range/strike down aircraft. The flight deck was again wood over steel

¹⁸⁹ Friedman (1988), pp.177-201; Hobbs (2003); Hobbs (2013), pp.132-151; Mawdsley (2002), pp.70-71; Nailer (1980a), pp.4-5; Nailer (1980b), pp.31-32; Woodman (1987), pp.8-43. One shipyard was in the Gulf of Mexico and two on the West Coast

¹⁹⁰ Hobbs (2013), p.152; Terzibaschitsch (1981), pp.36, 68, 193-194. The *Bogue II* (or *Prince William* class) (the C3-S-AI hull), primarily built at the Seattle-Tacoma shipyard in Tacoma, Washington State, was laid down between May 1942-June 1943

¹⁹¹ Hobbs (2003). 11 *Attacker* class; 23 *Ruler* class

4.3.4 Naval aircraft

The Admiralty similarly lacked access to sufficient production capacity in the British aircraft industry, which was unable to meet the needs of the RAF and FAA. Issues the FAA faced included the prioritisation of components for RAF fighters over FAA aircraft,¹⁹² and the multi-purpose design to minimise costs for relatively short production runs, leading to compromises in performance, particularly speed.¹⁹³ War Cabinet meetings illustrate the difficulties facing the Admiralty regarding allocation of production capacity and its implications. The meetings record Churchill refusing the Admiralty's request to switch output of Halifax bombers to Barracudas,¹⁹⁴ discussions of estimated TBR shortages, and the obsolescence of the Swordfish.¹⁹⁵

To gain access to greater production capacity and superior aircraft, in particular modern single-seat naval fighters, the Admiralty turned to America.¹⁹⁶ However, the supply of American aircraft for the RN suffered during 1940-1942 from serious delays in delivery, initially reflecting the limited capacity amongst US manufacturers and then increasingly the competing needs of the USN.¹⁹⁷ The predominant naval fighter in these years was the Grumman Wildcat single-seater (Martlet), and deliveries were well behind schedule.¹⁹⁸ Whilst the initially slow pace of deliveries later accelerated, in this period it was far below the needs of Britain's fleet and escort carriers.¹⁹⁹ The impact of this on escort carriers was compounded by delays with the British Firefly and Firebrand aircraft in development for the FAA.²⁰⁰ The delay in these aircraft, intended for CVs, meant that escort carriers were in

¹⁹² 'Production of FAA Aircraft. Priority', Memorandum by Slattery, DAM, 20 May 1940, ADM 116/5348, Volume I, AM 5320/40; 'Production of Aircraft for Fleet Air Arm, 1940-1943', 27 May 1940, ADM 1/12575

¹⁹³ 'Operation "D.X.". Report by V.A. Aircraft Carriers', comparative review of British and US ship-borne aircraft and RAF aircraft, 15 June 1940, ADM 1/11207, pp.3-26

¹⁹⁴ War Cabinet Defence Committee (Supply), 30 March 1943, Minutes, PREM 3/171/9

¹⁹⁵ 'Aircraft for the Fleet Air Arm, Forecasts for 1944 and 1945', 5 April 1943, Memorandum by First Lord, War Cabinet Defence Committee (Supply), PREM 3/171/9, pp.11-12

¹⁹⁶ 'Naval Stores', ADM 116/5813, pp.138-142, 161; Bowman (1998), pp.121-144; Slessor (1957), pp.433-538; Tillman (1979)

¹⁹⁷ 'Naval Stores', ADM 116/5813, pp.138-142, 161

¹⁹⁸ 'Fleet Air Arm Fighters', 16 June 1942, CAB 69/4, pp.293 and following page; Bell (2012)

¹⁹⁹ 'Naval Stores', ADM 116/5813, pp.138-139, 161. Deliveries for the FAA reached 81 (81 Martlets) in 1940; 138 (88 Martlets) in 1941; 400 (264 Martlets) in 1942

²⁰⁰ 'Report by Fifth Sea Lord to First Sea Lord and First Lord', 27 June 1942, ADM 205/24, p.5; Jones (2018), p.130

competition with CVs for the Wildcat with CVs enjoying a higher priority.²⁰¹ The forecast for December 1942 showed a shortfall of 422 fleet fighters.²⁰²

The Admiralty recognised the need for a suitable structure to manage aircraft procurement in America. In particular, US manufacturers wanted a single point of contact and delivery.²⁰³ Britain accepted new US aircraft on Roosevelt Field (an airfield on Long Island) where modifications were carried out under RN personnel. Receipt of spares for shipment overseas were handled by the British Aviation Supply Depot (BASD) in Philadelphia, which had moved from Washington and was fully effective by August 1942.²⁰⁴ Similarly, US Naval Air Supply activities were transferred from Washington to Philadelphia in 1943.²⁰⁵ British personnel worked alongside USN personnel, in 'a co-ordination of effort which could not have been excelled'.²⁰⁶ USN records were available to the British and vice versa, 'eliminating a great deal of record keeping', and files refer to 'the close liaison facilitated by our working under the same roof'.²⁰⁷ This demonstrates the effectiveness of the collaboration machinery the Admiralty helped to build.

In 1943 US aircraft production accelerated and a range of high-performance naval aircraft became available to Britain, most of which, significantly, could operate off escort carriers.²⁰⁸ As noted below, these included Grumman Wildcat and Grumman Hellcat, both single-seat fighters; Grumman Avenger torpedo bombers; and Vought Corsair single-seat fighter-bombers, although deployment of the Corsair on CVEs was forestalled first by lower priority for CVEs and then by the cessation of hostilities.

²⁰¹ 'The Aircraft Programme, Fighters for the F.A.A.', Extract from Minutes of War Cabinet Defence Committee (Supply), 9 December 1941, AVIA 46/136, p.23B plus preceding and following pages

²⁰² 'Fighter Aircraft for the Fleet Air Arm', War Cabinet Defence Committee (Supply), 17 August 1942, CAB 70/5, p.1

²⁰³ Ibid., pp.138-139

²⁰⁴ Ibid., pp.139-140. The US aircraft industry was getting into its stride and the large RN procurement programme for escort carriers required more staff at BASD. Six additional British officers had arrived by May 1943

²⁰⁵ Ibid., p.140. Policy matters, including Lend-Lease, in both services continued to be settled in Washington, D.C.

²⁰⁶ Ibid.

²⁰⁷ Ibid., pp.140, 160. Engines and spares procurement for the US Army, USN, and RN was standardised (becoming known as ANB lists), streamlining procurement

²⁰⁸ Ibid., p.161

4.4 Deployment

4.4.1 Introduction

At the start of the period covered in this chapter, following the loss of *Audacity* in December 1941, the only British convoy aircraft platforms were a single FCS²⁰⁹ and the CAM ships, of which 31 were still operational, four having been sunk.²¹⁰ From March 1942 to 1 May 1943, six RN escort carriers became operational which, in a further example of the trade-offs involved, were to be deployed in support roles (e.g., ferrying); or the different active applications of airpower: defensively in trade protection (A/S, anti-surface raider, and air defence), and offensively in assault (in support of amphibious landings). These roles were in one or more of three theatres: the Atlantic, the Arctic, and in support of Torch in the Mediterranean.²¹¹ Rapid switching between theatres and sometimes even roles reflected the vessels' tactical flexibility and was a measure of the strategic shortage of RN aircraft platforms during this stage of the war.

The pressures underlying deployment choices are evident in another warning by Pound in July 1942.²¹² Britain had lost control of sea communications in the Mediterranean and on the route to North Russia, she 'used the Bay of Bengal only on sufferance', and the enemy threatened the Allies in the North Atlantic, Caribbean, the Gulf of Mexico and Mozambique Channel. Allied fleets were under attack, while merchant shipping losses were on the same scale as April 1917. The oil tanker situation was so bad that if the Allies lost the Abadan refinery in Persia, 'our war effort in India, West and South-West Australia and East Africa could not be maintained'.²¹³ Unless help came from the US, Britain would have run down her stocks by mid-1943 to the point where she would 'have to reduce the war effort in this country'. U-boat strength was likely to double by mid-1943, while Allied A/S escort numbers would not increase proportionately. Furthermore, we would be unable to fully deploy the

²⁰⁹ Hague (1990), p.52. *Maplin* (withdrawn in June 1942)

²¹⁰ Hague (2000), p.80. Increasing numbers of escort carriers during early 1943 saw the Air Ministry request the return of CAM ships' pilots and maintenance crews, 'badly needed' elsewhere: see Letter from CAS Portal to First Sea Lord, 24 February 1943, AIR 20/4294; 'Message, regarding formal disbandment of MSFU', 17 June 1943, AIR 20/4294. Some CAM ships continued to operate until July (Freidman (1988), p.181), by which time 11 had been sunk (Hague (2000), p.80)

²¹¹ AL to BAD, 7 September 1943, ADM 1/12857, pp.20-24; Hobbs (2013). *Archer, Avenger, Biter, Dasher, Activity, and Battler* (*Avenger* and *Dasher* were sunk in the period)

²¹² 'The War at Sea – Present Situation', Memorandum of 15 July 1942 by First Sea Lord to War Cabinet, CAB 121/134, 17 July 1942

²¹³ *Ibid.*, p.1

potentially 'huge forces' from the US 'solely because the shipping and escort situation will preclude their movement by sea'. Pound concluded that the Navy could not do more to address the situation and, under the existing programme, would be unable to help until April 1943.²¹⁴ This blunt memorandum was withdrawn after pressure from the CAS and discussions amongst the COS(s) Committee, although only after Pound gave the reassurances requested by the committee that the 'gravity of the situation at sea' would be conveyed through other papers to a forthcoming War Cabinet meeting on shipping.²¹⁵ Four months later, he wrote again about deployment choices, noting severe shortages of carriers available to the Navy globally, pointing out the need for carriers in all theatres, and that failure to support American operations in the South West Pacific with carriers might have serious political ramifications, although their provision would leave theatres such as the Arctic convoys lacking any effective air cover.²¹⁶ This was followed by a 'most secret' internal Admiralty document issued in December 1942 to heads of department regarding the critical role that air power now played in naval strategy and deployment. Significantly, it also showed the varied nature of the roles to be played by different aircraft platforms.²¹⁷ In the absence of the CVs and CVLs specified in this document, the Admiralty rightly insisted on modifications to enable escort carriers to perform many of the multiple roles required in a modern fleet.

The many theatres requiring carrier-borne air cover by escort carriers led to a priority list of convoy routes being drawn up by key department heads in early 1943. In descending order these were North Russia, West Indies-UK, North Atlantic, and other Atlantic convoys. The crisis in the North Atlantic during March 1943 saw this policy overturned, again underlining the hard choices being made in a dynamic situation.²¹⁸ Early 1943 also saw proposals regarding a 'Super-Commander-in-Chief' for the Battle of the Atlantic together with a 'Super-Air Officer Commander-in-Chief' to manage the Allied air forces in that theatre.²¹⁹

²¹⁴ Possibly a reference to the planned introduction of the first MAC ship

²¹⁵ Letter to Secretary to First Sea Lord from Hollis, Secretary to COS, 22 July 1942, p.88; COS(s) Committee Extract from 214th Meeting, 22 July 1942, p.89. Both CAB 121/134

²¹⁶ Minute from Admiralty to Prime Minister, 5 November 1942, PREM 3/163/1

²¹⁷ 'Naval Building Policy for the Present War', Internal Admiralty Document, 28 December 1942, ADM 229/28, pp.483-504. A balanced Fleet would include 22 CVs, 19 CVLs, and 83 CVEs, carrying 2,757 aircraft

²¹⁸ Joint Minute by DOP, DNAD, and the Directors of Operations (Home and Foreign), January 1943, ADM 234/384, pp.115-116

²¹⁹ Roskill (1962b), pp.361-362

These foundered because of severe disagreements between Washington and London, but Pound attempted to ensure efficient allocation of resources by suggesting to King that a committee (AASSB) be established to review Allied anti-U-boat operations in the Atlantic and make recommendations to the CCS regarding improvements.²²⁰

The Admiralty also needed to counter the threat to North Atlantic and Arctic convoys posed by *Tirpitz*, and the risk of *Graf Zeppelin*, an aircraft carrier capable of operating 40 aircraft, becoming operational during this period and forming a powerful strike force with *Tirpitz*. This threat required Britain to maintain two CVs in Home Waters, preventing reinforcement of other theatres badly in need of naval air assets, such as the Indian Ocean.²²¹

An important CCS paper at Casablanca emphasised the different theatres needing escort carriers and recognised that besides trade protection (both A/S and A/A) and ‘offensive operations’ (e.g., amphibious landings) there was a need for such carriers to provide training, anti-raider duties and aircraft ferrying, while ‘20% will be undergoing refit at any one time’,²²² resulting inevitably in severe shortages. An example of a planned use of escort carriers as assault carriers in support of an amphibious landing was noted at Casablanca, with the British planners assuming eight USN escort carriers in support of the forthcoming Allied invasion of Sicily (Husky).²²³ The remainder of this section examines the Admiralty’s deployment choices in the context of these shortages and threats.

4.4.2 Atlantic

In the first half of the war, the North Atlantic was the theatre in most need of combined sea and air power to combat German attacks on convoys.²²⁴ However, until early 1943 air power

²²⁰ Admiralty to CNS Ottawa, Telegram, 7 January 1943, AIR 20/2569; Cheska (2014), pp.5-6; Roskill (1962b), pp.360-362. The Allied Anti-Submarine Survey Board (AASSB) was formally proposed (19 January 1943) at Casablanca and established under co-heads Rear Admirals J.L. Kauffman, USN and J.M. Mansfield, RN (8 March) at the Atlantic Convoy Conference. Mansfield had been COS to Admiral Noble at WAC

²²¹ Minute from Admiralty to Prime Minister, 5 November 1942, PREM 3/163/1; Faulkner and Bell (2019), pp.169-195

²²² ‘Minimum Escort Requirements to Maintain the Sea Communications of the United Nations’, Report by the Combined Staff Planners, 19 January 1943, Casablanca, CCS 160, pp.53-54

²²³ ‘Operation “Husky”’, Report by British Joint Planning Staff, 21 January 1943, Casablanca, CCS 161/1, pp.63-71: no RN escort carriers are listed. Indeed, no USN escort carriers appeared off Sicily (Faulkner (2012a), pp.182-183)

²²⁴ The Battle of the Atlantic is covered in the literature. For escort carriers and their role as TPCs from a technical standpoint: Brown (1995, 1983b, 2000); Hobbs (2013). For an operational perspective: Bell (2015, 2016); Farago (1962); Hobbs (1994); Jones (2018, 2019); Poolman (1982, 1983); Y’Blood (1983). For the impact of US merchant shipping on the British import crisis of 1942-1943: Leighton (1987)

was largely lacking in mid-Atlantic. WAC had, by June 1942, 26 Escort Groups,²²⁵ on average comprising three destroyers and six corvettes, acting as close escorts to convoys traversing the Atlantic. To reinforce these vessels and take the fight to the U-boats a number were selected for support duties and classified as Support Groups. First introduced in September 1942, this initiative was suspended for Torch (November 1942) and reactivated in early 1943.²²⁶

With the impending deployment of escort carriers and MAC ships in this theatre, the Admiralty addressed the tactical issues at a meeting in January 1943,²²⁷ and amended the Western Approaches Convoy Instructions.²²⁸ FAA flying operations should aim at aircraft conservation allowing maximum effort when the convoy was threatened, while dawn and dusk air patrols were discouraged unless warranted by U-boat activity. Similarly, night flying was only to be undertaken if submarine intelligence indicated the necessity. These instructions reflected shortages of maintenance crews on British escort carriers²²⁹ and the propensity of British aircraft to suffer when deck-landing in adverse conditions, reflecting the absence of robust undercarriages found on modern American naval aircraft.

The need for air power to address rising losses in the North Atlantic was addressed at Casablanca in January 1943, with the recognition that the escort carrier programme could not be 'greatly accelerated' and that for 'the immediate future' shore-based aircraft would be required.²³⁰ Subsequently deployment was reviewed at the Atlantic Convoy Conference in March, when it was recommended that the USN despatch an Air Support Group to Newfoundland to operate under RN control and as there was 'such urgency' it was also recommended that 128 VLR aircraft should be diverted to A/SW duties from other planned

²²⁵ Roskill (1962b), p.109

²²⁶ *Ibid.*, p.201

²²⁷ Admiralty Meeting, January 1943, ADM 234/384, p.112

²²⁸ ADM 234/384, pp.112, 116-119, 314-315

²²⁹ Defence Committee (Supply), Minutes, 7 April 1943, CAB 70/6, p.2. A shortage of repair ratings was noted

²³⁰ 'Minimum Escort Requirements to Maintain the Sea Communications of the United Nations', Report by the Combined Staff Planners, 19 January 1943, Casablanca, CCS 160. It was stated that 13 escort carriers were required for Transatlantic and Freetown convoys and 80 VLR maritime aircraft were required in the North Atlantic (60 in UK/Iceland; 20 in North America)

deployments ‘immediately’.²³¹ Despite the urgency expressed at the conference, VLR redeployments only occurred following Roosevelt’s intervention later in March.²³² By March 1943, Admiral Sir Max Horton (C-in-C Western Approaches)²³³ had five British Support Groups,²³⁴ but was facing heavy losses on the North Atlantic trade routes²³⁵ despite nearly two-thirds of the ships sunk in March being in convoy.²³⁶ As the Admiralty noted later in the year: ‘the Germans never came so near to disrupting communication between the New World and the Old as in the first twenty days of March 1943’.²³⁷ The same concerns were expressed at the time. An AU Committee discussed a Staff Memorandum by Pound and Portal examining Professor Blackett’s analysis of convoy protection and concluded that:

...in the critical next six months the four main factors which contributed towards the safety of shipping, namely, surface escorts, escort carriers, shore-based air cover and speed of convoys fell short of their desired targets. The time factor was of great importance. The most effective way to improve the situation would be by the early provision of constant air cover by shore-based and carrier-borne aircraft.²³⁸

Blackett’s operational research paper had gone even further, with its analysis suggesting:

If escort carriers were employed, apart from the direct protection they offered, it would be unnecessary to “seek shore-based air cover”, so convoys could sail on more direct, southerly routes, effectively increasing the delivery rate.²³⁹

²³¹ ‘Atlantic Convoy Conference, Washington DC, Report of Conference’, 1-12 March 1943, AIR 8/1083. The conference saw the creation of a separate Canadian Northwest Atlantic Command and the AASSB. 132 VLRs were already planned for the North Atlantic (North West Africa, UK-Iceland and Newfoundland) by 1 June 1943 (48 from the USN and USAAF for deployment to Newfoundland). Of the total 260 VLR aircraft (‘VLR’ included the Coronado, and specially fitted B-24s and Halifax) deemed the ‘immediate minimum requirement’, 120 were for UK-Iceland A/SW. It was suggested that Canada approach the US regarding an allocation of VLRs for the Royal Canadian Air Force (RCAF). See also AIR 41/48, pp.24-26: 15 VLR aircraft were subsequently diverted from the RAF allocation for deployment with the RCAF. Other matters discussed included the increase in a convoy’s size. See also Douglas, Sarty, Whitby (2002), pp.579-630

²³² It was reported that Roosevelt had enquired how many VLR aircraft were operating in the North Atlantic: recorded in note dated 30 March 1943, AIR 20/2569. A report at this time noted ‘there was not a single VLR aircraft based west of Iceland’ (AIR 41/48, p.26). See also Churchill & Roosevelt (1984c), pp.164-165: Messages, 18 March 1943 (C-272-A) and 20 March 1943 (R-263)

²³³ ADM 234/384, pp.113-114. Horton succeeded Noble (19 November 1942), while Air Marshal Sir John Slessor succeeded ACM Joubert de la Ferté as Air Officer C-in-C Coastal Command (5 February 1943)

²³⁴ Roskill (1962b), pp.366-367. Support Groups, whose composition varied constantly, typically had four to eight vessels comprising destroyers, *Black Swan* escort sloops, and corvettes

²³⁵ *Ibid.*, pp.485-486. British, Allied, and neutral merchant shipping sunk by the Axis in the North Atlantic totalled 5.5m tons in 1942; 1943 monthly losses (tons) were as follows: January, 172,691; February, 288,625; March, 476,349

²³⁶ *Ibid.*, p.367. See Map 1 below

²³⁷ *Ibid.*, p.367

²³⁸ 10th Meeting, AU Committee, 10 March 1943, CAB 86/2, p.130

²³⁹ Llewellyn-Jones (2003), p.141 on Blackett

In view of the 'inadequate number of escort carriers available and the lack of sufficient air cover on both sides of the Atlantic', and in remarks reminiscent of his July 1942 memorandum, withdrawn under pressure (see above), Pound stated he had informed the American authorities that he could not be held responsible for Atlantic convoy routes unless he had sufficient Support Groups to reinforce convoys under attack. The meeting noted that provision of American Escort Groups for the North Atlantic was 'under urgent consideration at Washington'.²⁴⁰

Bell and Jones have criticised the Admiralty for not deploying escort carriers on North Atlantic trade routes sooner,²⁴¹ although Grove argues that the Germans 'never attained their enlarged sinking objectives' and lost the war of attrition being fought in the Atlantic.²⁴² However, there was clearly great concern at the Admiralty about shipping losses in March 1943 and earlier,²⁴³ and the initial deployment of *Archer* elsewhere possibly reflected concern about the unreliability of her engines following frequent breakdowns.²⁴⁴ In the case of *Avenger*, she was initially allocated to the politically-sensitive PQ.18 convoy of September 1942 to North Russia, a strategically critical route,²⁴⁵ prior to being redeployed to Torch, alongside the newly operational *Biter* and *Dasher*. The decision to prioritise modifications as assault carriers and deployment for Torch²⁴⁶ reflected the strategic and political significance of this, the first major combined amphibious operation of the two allies, originally raised at Arcadia and a source of considerable debate amongst the CCS.²⁴⁷ As always, it was a matter of trade-offs, in this case between convoy protection and combined operations.

²⁴⁰ 10th Meeting, AU Committee, 10 March 1943, CAB 86/2, p.131. Presumably at the Atlantic Convoy Conference

²⁴¹ Bell (2015), pp.18-23; Jones (2019), pp.137-149. Previous critics include Syrett (1994), pp.16-17. Bell argues that the Admiralty and Coastal Command were slow to recognise the potential threat in mid-Atlantic

²⁴² Grove (2019), pp.302-303

²⁴³ 11th Meeting, AU Committee, 17 March 1943, CAB 86/2; 'The War at Sea – Present Situation', Memorandum of 15 July 1942 by First Sea Lord to War Cabinet, 17 July 1942, CAB 121/134; 'Auxiliary Aircraft Carriers', Memorandum by the First Lord, 29 December 1941, CAB 66/20/31

²⁴⁴ For example, *Archer* had deployed with the cruiser *Devonshire* as a Support Group off Sierra Leone in mid-March 1942, but entered Freetown on 4 April after another machinery breakdown (See Hobbs (2003), pp.26-27)

²⁴⁵ War Cabinet Defence Committee (Operations), 29 April 1942, CAB 69/4, pp.83-89. Churchill, despite strong opposition based on Britain's own competing needs, argued that supplies to Russia were 'in our own vital interests'

²⁴⁶ Gelb (1992), p.102. Torch (formerly *Gymnast*) became inevitable with the postponement of *Sledgehammer* (the invasion of North West Europe) on 22 July 1942

²⁴⁷ Meyer (1987), pp.174-198. See also: 'Future Conduct of the War, Part I', Memorandum by Prime Minister for COS(s) Committee (dated 16 December 1941), circulated 1 February 1942, CAB 69/4, pp.159-161. Churchill

In March 1943, an escort carrier was, for the first time, deployed on the North Atlantic trade routes supporting convoys, with USS *Bogue*²⁴⁸ and her five destroyers operating out of Argentia under Horton's direction.²⁴⁹ Prior to the loss of *Dasher*,²⁵⁰ it was hoped the Allies would have four Air Support Groups each with an escort carrier in the North Atlantic by 19 April,²⁵¹ and on 1 April 1943 the Support Groups were given operational freedom to roam under the general strategic control of the command to which they belonged.²⁵² The conclusion of Torch had released *Biter* which, with the repaired and redeployed *Archer*, provided Horton with just three escort carriers in the North Atlantic by early May, which nevertheless enabled continuous air cover over many convoys in the Air Gap.²⁵³ In addition, the number of VLR Liberators operated by Coastal Command in this theatre increased from six in November 1942²⁵⁴ to 34 at the end of March 1943 (20 operational) with the total number of VLRs in this theatre peaking at 41 (including six RCAF VLR Liberators) prior to the defeat of the U-boats in the North Atlantic by mid-May.²⁵⁵

Whilst April 1943 saw 98 U-boats sailing from port, many bound for the North Atlantic, Allied losses were less than half those of March.²⁵⁶ Furthermore, the combined air and surface escorts now had the capacity to operate more offensively against U-boats, reflected in the move from the 'safe and timely' arrival of convoys to a more aggressive approach.²⁵⁷

recognised Roosevelt's political imperative for the US Army to engage German troops in battle (Simms and Laderman (2021), pp.376-377)

²⁴⁸ Y'Blood (1983), p.35. USS *Bogue* left Norfolk, Virginia, on 24 February 1943, for Argentia, Newfoundland

²⁴⁹ 11th Meeting, AU Committee, 17 March 1943, CAB 86/2, pp.139-140

²⁵⁰ Roskill (1962b), p.367. *Dasher* blew up (27 March 1943); *Biter* and *Archer* joined USS *Bogue* in the North Atlantic

²⁵¹ 11th Meeting, AU Committee, 17 March 1943, CAB 86/2, p.139; Roskill (1962b), p.358. King wished to focus US naval forces on the US-North Africa routes. To offset strain on the Canadian and British in the North Atlantic, America would take over the tanker convoys (CU/UC) running from the Dutch West Indies to Britain, and provide the USS *Bogue* Air Support Group mentioned above

²⁵² Roskill (1962b), p.359

²⁵³ Chalmers (1954), pp.185-186. Horton urged that each escort carrier had an escort of two destroyers and set great store by their deployment, writing on 13 March 1943, 'Much depends on the successful employment of these carriers'

²⁵⁴ AIR 41/47, p.521. As noted above, at this date Coastal Command had a further 33 non-VLR Liberators, with plans for their conversion to VLR

²⁵⁵ AIR 41/48, pp.26-27, which also notes the confusion arising from the absence of a precise definition of 'VLR', with the non-VLR Liberator, Halifax, and Coronado being included in some returns; see Roskill (1962b), pp.358-364, for VLR aircraft expansion in the Western Atlantic by both USN and USAAF

²⁵⁶ Roskill (1962b), pp.372, 485-486. Allied losses totalled 39 ships (235,478 tons), the great majority by U-boats

²⁵⁷ Milner (2017), p.57

Biter, the first British (second Allied) escort carrier to be deployed on North Atlantic convoy routes as a TPC, was allocated to WAC in spring 1943, and commenced A/S operations with 811 (composite Swordfish/Martlet) NAS as part of 5th Support Group, comprising herself and three destroyers.²⁵⁸ The Group supported convoy ONS.4,²⁵⁹ and on 25 April U-203 was sunk having been located by *Biter's* aircraft and depth charged by the destroyer *Pathfinder*.²⁶⁰ On 1 May 60 U-boats were at sea in four wolf packs, positioned adjacent to or in the Greenland Air Gap.²⁶¹ The story became one of convoys under attack by U-boats who were largely frustrated by Air Support Groups, with air cover provided by escort carriers' aircraft and VLR aircraft.

Following further defect rectifications, *Archer* sailed on 2 May to join 4th Support Group²⁶² off Iceland where, with 819 (Swordfish) and 892 (Martlet) NAS embarked, she was employed in North Atlantic convoy protection covering convoys ON.182 and HX.239. Convoy HX.239 saw carrier aircraft from USS *Bogue* and the recently-arrived *Archer* assist in fending off U-boats.²⁶³ On 23 May Swordfish B from *Archer* sank U-752 with Rocket Projectiles (R/P), the first time a U-boat was sunk by rocket missiles.²⁶⁴

The key tactical points illustrated in these early uses of escort carriers were that they could be redeployed quickly and effectively from one threatened convoy to another, and were able to provide almost continuous air cover over the convoy during periods of maximum danger. This reflected the ability of carrier-borne aircraft to rearm and refuel in a relatively short time (one to two hours) after attacking a U-boat, unlike VLR aircraft which had to return to a distant land base to rearm and refuel.²⁶⁵

²⁵⁸ 'Report of Proceedings – 5th Support Group Supporting Convoy ONS 4', from Captain Abel-Smith to C-in-C WAC, 3 May 1943, ADM 237/112

²⁵⁹ Hague (2000), p.163. A slow convoy leaving Liverpool on 13 April 1943, bound initially for Halifax, Nova Scotia

²⁶⁰ 'Remarks on the Operation of Air Support Groups by Captain Abel-Smith', Appendix to letter of 3 May 1943 and subsequent appendices, ADM 237/112. Abel-Smith saw escort carrier aircraft/destroyers as the best combination to kill U-boats

²⁶¹ Roskill (1962b), p.373

²⁶² Hobbs (2013), pp.133-134. *Archer* was reallocated to WAC (17 February 1943), following defect rectifications and flight-deck lengthening

²⁶³ Hobbs (2003), pp.26-27

²⁶⁴ Roskill (1962b), p.376; Hobbs (2003), pp.26-27

²⁶⁵ ADM 234/384, p.116

Horton praised the combined air and surface escort teams, with their new methods and technology:

The Support Groups inaugurated the change, when we got reinforcements from the Home Fleet late in March – then came our own Support Groups and the escort carriers (very well trained too) – then new weapons and increased V.L.R. aircraft of Coastal Command. The combination was too much for the Hun.²⁶⁶

Throughout this phase of the Battle of the Atlantic (14 April-31 May 1943), ‘only two ships were sunk in convoy in the Atlantic while an air anti-submarine escort was present’.²⁶⁷ In this period Germany suffered decisive U-boat losses,²⁶⁸ together with many experienced U-boat commanders and crews.²⁶⁹

As Roskill states, ‘it was the advent of the Support Groups, the Escort Carriers, and the Very Long Range Aircraft which turned the tables on the U-boats - and did so with astonishing rapidity’.²⁷⁰ This reflected incremental improvements in technology and tactics, coupled with deployment of the above-mentioned vessels and aircraft, and the breakthrough in decoding U-boat transmissions from the beginning of 1943, which had eluded the Allies through most of 1942.²⁷¹

In May 1943 Doenitz withdrew most U-boats from North Atlantic shipping lanes because of unsustainable losses.²⁷² That month the first MAC ship entered convoy service, while King established the Tenth Fleet in Washington to coordinate US A/SW in the Atlantic.²⁷³ Their impact will become apparent in the next chapter.

²⁶⁶ Chalmers (1954), p.200. Letter from Horton to Admiral Darke, 15 June 1943

²⁶⁷ Roskill (1962b), pp.376, 380-381, 486. North Atlantic Allied losses fell in May to 34 ships (163,507 tons)

²⁶⁸ *Ibid.*, pp.377, 470-471. 41 globally in May, of which 29 were in the North Atlantic (including the area around Iceland)

²⁶⁹ ‘Estimate of the Enemy Situation, 1943-1944, European-Mediterranean Area’, Memorandum by US COS(s), 7 August 1943, Quadrant Conference (Quebec, 14-24 August 1943), pp.53-54, CCS 300/1

²⁷⁰ Roskill (1962b), p.368

²⁷¹ Hinsley (1991), pp.163-233, 525-572. Gardner (1999) covers the impact of signals intelligence on the Battle of the Atlantic. See also Beesly (2000); Erskine (2004); Kahn (2012); Syrett (1998)

²⁷² Doenitz (1990), pp.340-341; Roskill (1962b), pp.377-378, 467-475: decision to withdraw 22 May 1943. Operational U-boats peaked globally at 240 in April 1943. Of the 56 German U-boats sunk in April-May 1943, 59% involved some Allied air support

²⁷³ Farago (1962), pp.163-173

4.4.3 Arctic convoys

The strategically- and politically-important Arctic convoys had commenced on 12 August 1941 with *Victorious* and five warships providing distant cover.²⁷⁴ As the frequency and size of the convoys increased, Germany responded with increasingly successful attacks by surface, air, and submarine forces.²⁷⁵ The Admiralty warned of the 'Naval situation' on 8 April 1942, noting that it had:

...already increased the scale of close A/S escorts by withdrawing craft from other very important services...Geographical conditions are so greatly in favour of the Germans that losses both in the ships of the Convoy and their escorts may become so great as to render the running of these convoys uneconomical.²⁷⁶

On 10 April, PQ.15 saw the first use of a CAM ship (*Empire Morn*) to provide some limited counter to the air threat.²⁷⁷ The apparent opportunity to attack *Tirpitz* prompted the withdrawal of protection for PQ.17 (June-July 1942), which suffered particularly severe losses.²⁷⁸ In response, and as 'no additional protective measures were possible', and there could be no guarantee that, 'a single ship would get through', the British COS(s) recommended suspending convoys to Russia.²⁷⁹ Churchill finally concurred, as it would only be 'justifiable' to continue if 50% of the ships got through. The importance of these convoys is illustrated by the concerns expressed in the same meeting about the impact on Stalin and the need to consult Roosevelt, particularly as the majority (25 ships) of the next convoy would be American.

The convoys resumed on 2 September 1942 with PQ.18 closely accompanied by a strong detachment of destroyers and, for the first time, an escort carrier – *Avenger* – to support

²⁷⁴ Admiralty (1954); Roskill (1962b), pp.277-300, 397-403; Ruegg and Hague (1993); Woodman (1994)

²⁷⁵ 'Battle Summary No. 22, Arctic Convoys, 1941-1945', ADM 234/369; Ruegg and Hague (1993), p.27. The Home Fleet, with *Victorious*, provided distant cover for QP.8 (March 1942) to counter the possible threat by *Tirpitz*, and this heavy but distant support became a regular feature until the destruction of *Tirpitz* (November 1944)

²⁷⁶ 'Supplies to Russia', Memorandum by First Sea Lord to War Cabinet Defence Committee (Operations), 8 April 1942, CAB 69/4, pp.243-244. This refers to the proximity of convoy routes to German bases on the Norwegian coast, which assisted heavy surface, submarine, and air assaults on Russia convoys, with heavy surface forces particularly making the light escorts used for trans-Atlantic convoys inadequate. Further, long summer days in the Arctic Circle assisted German air reconnaissance. See Map 2 below

²⁷⁷ Ruegg and Hague (1993), p.33

²⁷⁸ 'Assistance to Russia', War Cabinet Defence Committee (Operations), 13 July 1942, CAB 69/4, pp.96-97A. Minutes reported an estimated 27 merchant ships lost (19 were US) out of 35; subsequently corrected to 24 out of 39 (Ruegg and Hague (1993), pp.39-40)

²⁷⁹ 'Assistance to Russia', War Cabinet Defence Committee (Operations), 13 July 1942, CAB 69/4, pp.96-97A

Empire Morn.²⁸⁰ The newly available *Avenger* was one of only two British escort carriers operational,²⁸¹ underlining the importance of these convoys. The experiences of PQ.18 are recounted by Peter Smith,²⁸² and indicate *Avenger's* impact on attacks by German U-boats and aircraft on the 40-strong convoy. She is mentioned more than 26 times and Smith draws some broad conclusions. Her captain and crew quickly learnt the art of fighter direction,²⁸³ differentiating between shadowing aircraft and serious attacks, while attempting to keep at least four aircraft airborne to disrupt air attacks and force U-boats down. Good co-operation between aircraft and surface escorts proved highly effective in discouraging U-boats.²⁸⁴ U-589 was spotted by a patrolling Swordfish and sunk by the destroyer *Onslow*.²⁸⁵ Overall, *Avenger* was seen as an invaluable addition to the solitary CAM,²⁸⁶ and her presence together with a stronger escort than usual saw losses, whilst still bad, nowhere near those of PQ.17.²⁸⁷

Torch forced the Admiralty to suspend convoys to North Russia²⁸⁸ until JW.51A sailed on 15 December 1942 from Loch Ewe, although without air escort.²⁸⁹ In January at Casablanca it was noted that air attacks on Russia convoys required two escort carriers per convoy to provide fighter protection in addition to the traditional A/S role, and that this theatre required a total of six escort carriers.²⁹⁰ However, it was not until February 1943 that another escort carrier, *Dasher*, was designated. *Dasher*, returning to Britain from her first operational role, in Torch, had been further modified for air defence operations and was allocated to the Home Fleet at Scapa Flow. She sailed on 15 February as part of the escort to

²⁸⁰ Ruegg and Hague (1993), pp.42-44

²⁸¹ Hobbs (2003), pp.39-41. *Avenger* was the Navy's second US-built escort carrier, operational in August 1942 with the Home Fleet

²⁸² Smith (1994a)

²⁸³ *Ibid.*, pp.142-143. Type 79M radar was highly praised

²⁸⁴ Hobbs (2003), p.189; Smith (1994a), Appendix Five. The 12 Hurricanes made 59 sorties, were in combat 31 times, claimed five certain kills, three probables, and damaged 18 German aircraft. The three Swordfish had 32 sorties, sighted 16 U-boats, made six depth-charge attacks, and witnessed six destroyer depth-charge attacks

²⁸⁵ Smith (1994a), pp.132-134; Jane's (1997), p.54

²⁸⁶ Smith (1994a), pp.166-167

²⁸⁷ *Ibid.*, Appendix Five; Woodman (1994), pp.258-283

²⁸⁸ Prime Minister's Personal Telegram to President, T.1300/2, No. 159, 7 October 1942, and enclosed Admiralty note, CAB 65/28, pp.37-40

²⁸⁹ War Cabinet Minutes, 28 December 1942, CAB 65/28, p.194; Ruegg and Hague (1993), p.48. They were undiscovered, suffering no losses

²⁹⁰ 'Minimum Escort Requirements to Maintain the Sea Communications of the United Nations', Report by the Combined Staff Planners, 19 January 1943, Casablanca, CCS 160, pp.53-54

JW.53 but storm damage forced her return to Britain for repairs.²⁹¹ Arctic convoys were again suspended in March as escort surface ships and escort carriers were needed on the North Atlantic trade routes,²⁹² an example of the crucial role of air cover and its inadequate supply, both predicted by the Admiralty, and which once again forced difficult decisions to be made as to priorities.

4.4.4 North Africa invasion

Torch involved amphibious landings by the Allies in early November 1942, and the use of escort carriers in a vital new role as assault carriers. In this combined operation, the Allies deployed five CVs to counter any enemy surface warships, and seven escort carriers in the covering forces to provide direct support for the amphibious landings, a measure of the campaign's importance and the value of escort carriers.²⁹³

The Navy supplied three CVs, *Victorious*, *Formidable*, and *Furious* (116 aircraft) in Force H covering the Central Naval Task Force (Oran), which also comprised the escort carriers *Biter* (15 aircraft) and *Dasher* (12 aircraft).²⁹⁴ *Biter's* and *Dasher's* Sea Hurricanes escorted Albacores of 822 NAS for a strike on La Senia airfield during 8 November. *Biter's* aircraft from 800 NAS shot down five Vichy D520 aircraft, while other aircraft from both carriers flew Tactical Reconnaissance (TAC R) sorties and Combat Air Patrols (CAPs).²⁹⁵

Air support for the Eastern Naval Task Force (Algiers) was provided by the aging *Argus* (21 aircraft) as well as the escort carrier *Avenger* (15 aircraft).²⁹⁶ Returning to Britain with

²⁹¹ Ruegg and Hague (1993), p.53

²⁹² *Ibid.*, p.55

²⁹³ 'Future Conduct of the War, Part I', Memorandum by Prime Minister for COS(s) Committee (dated 16 December 1941), circulated 1 February 1942, CAB 69/4, pp.159-161. Churchill stated that 'the war in the West in 1942 comprises, as its main offensive effort, the occupation and control'...of the North African shore, 'thus giving, if the Naval situation allows, free passage through the Mediterranean...' See also 'Battle Summary No. 38', ADM 234/359

²⁹⁴ Roskill (1962b), pp.464-466; Hobbs (2003), p.190

²⁹⁵ Hobbs (2003), pp.50, 61-62. *Biter*, after arriving in Britain (June 1942) from New York, was modified and worked-up for operations in the Mediterranean. She sailed (22 October) with 800 (15 Sea Hurricanes) NAS, and 833 (three Swordfish) NAS in an A/S role, the latter disembarking at Gibraltar. On completion of operations, *Biter* returned to Britain for deployment in the North Atlantic. *Dasher*, following modifications to RN standards, sailed from the Clyde (27 October 1942) for the Mediterranean with 804 and 891 (Sea Hurricanes) NAS. During Torch, 30 sorties were carried out in two days. In November *Dasher* sailed to Britain, arriving in Liverpool for repairs and the fitting of an air defence operations room, for escort duty to North Russia

²⁹⁶ Barnett (1992), pp.552-553; Roskill (1962b), pp.464-466. Hobbs (2003), p.41: *Avenger*, with 802 and 883 (Sea Hurricanes) NAS plus 833B (Swordfish) NAS in an A/S role embarked, had sailed with convoy KMS.1 to Algiers, with the Swordfish disembarking at Gibraltar

convoy MKF.1Y, *Avenger* was sunk by U-155 in the Atlantic off Gibraltar on 15 November 1942.²⁹⁷ The torpedo struck adjacent to the bomb room, which abutted the hull, causing an explosion which sank the ship in under five minutes.²⁹⁸

To deploy the above carriers in Torch the Navy needed to suspend carrier-borne activities with convoys to Russia and air cover for the Home Fleet, and delay the introduction of air cover from escort carriers for North Atlantic convoy protection, all of which proved costly. Indeed, Barnett criticises the total investment required to execute Torch at 1,781,809 tons of merchant shipping capacity between August and December 1942, with the added cost of 208,824 tons of shipping associated with the invasion sunk by U-boats and the *Luftwaffe* from October 1942 to February 1943 inclusive.²⁹⁹ However, undeniably, Torch proved a major strategic and political achievement.³⁰⁰ The subsequent surrender of Axis forces in Tunisia³⁰¹ opened up the 'soft underbelly' of Europe, with multiple targets for amphibious landings and the possible removal of Italy from the Axis; while May 1943 saw the first through Mediterranean convoy since 1941, a precursor to the invasion of Sicily and the release of a prospective million tons of shipping from circumnavigating the Cape of Good Hope.³⁰²

4.5 Conclusion

This chapter examined the procurement and deployment of escort carriers in the period from Pearl Harbor to May 1943. Having lost *Audacity* in December 1941 Admiralty requests for more escort carriers, based on her success, were undermined by lack of political support in competition for resources as detailed in the section on procurement. As a key meeting in January 1942 illustrates, Leathers, close to Churchill, resisted demand for merchant hulls suitable for conversion to escort carriers, which proved a major barrier in the face of shipbuilding capacity shortages and a lack of skilled men. It was only in mid-1942 that the

²⁹⁷ 'Loss of *Avenger* – Informal Enquiry into the Cause by DNC', 4 January 1943, ADM 1/12605; Hobbs (2003)

²⁹⁸ Brown (1983b), p.184; Hobbs (2003), p.41

²⁹⁹ Barnett (1992), p.572

³⁰⁰ War Cabinet Minutes, 12 November 1942, CAB 65/28, pp.107-109, including telegrams between Churchill (T.1480/2) and Roosevelt (T.1483/2); Boyd (2017), pp.395-399

³⁰¹ Hammond (2020), p.155: 250,000-275,000 Axis soldiers surrendered

³⁰² Roskill (1962b), pp.349, 442-443; Smith (1996), pp.207-208. Winston Specials, 1940-1943, are covered in Munro (2006)

MT accepted the logic that significant tonnage could be preserved by ship-borne aircraft at the cost of a marginal loss in new capacity.

The decision to build MAC ships in June 1942 was an innovative response by the Admiralty, born of desperation. An inferior vessel to the escort carrier and lacking the latter's operational flexibility, it secured the MT's endorsement because it could continue to transport cargo while providing continuous air cover over the convoy. Britain only completed one new 'true' escort carrier in the period (*Activity*), albeit one which became fully operational in just 11 months and with an increase in the number of aircraft carried operationally from *Audacity's* six to 10.

The underlying lack of British political support and unrealistic expectations of America as a source for vessels and aircraft is a recurrent theme, particularly evident in later AU Committee meetings, where the proven effectiveness of escort carriers was spuriously questioned. Japan's entry into the war hindered attempts to source further vessels and their aircraft from America, and the Anglo-American combined maritime strategy placed further pressure on RN resources. Nevertheless, procurement from the US, despite a bureaucratic context and competition with America's own services in a period when the latter's shipyards were in the process of transformation, was ultimately the source of 34 escort carriers ordered in this period. Delays in getting such vessels into operation reflected initial reliability issues and the ongoing need to modify them to RN standards, often for a variety of roles, in crowded British shipyards. However, over the period procurement benefited from increased efficiency in American shipyards, with a reduction in the time taken from keel-laying to become fully operational from 33 months for the *Avenger* class to just under 24 months for the *Attacker* class. There was a steady enhancement of the US-built British escort carriers' effectiveness, achieved by more reliable vessels carrying more effective aircraft, many of which were modern US models.

The analysis of deployment shows how the Admiralty initially used escort carriers to address the underlying tactical need for a platform based on the convoy with the ability to work closely with surface escorts on a continuous basis, and assesses their effectiveness in such a role. However, in the absence of sufficient fleet carriers, the Navy was also beginning to develop other roles for the vessel, such as an assault carrier in the Mediterranean and for

air defence on the Arctic and UK-Gibraltar routes. Documents show how overriding strategic concerns restricted the deployment of the few available vessels to just three theatres, with redeployment required as circumstances dictated. Whilst the Admiralty has been criticised for its deployment choices, particularly for its delayed use of escort carriers in the North Atlantic, War Cabinet minutes and communications between Churchill and Roosevelt show the strong political and strategic priorities attached to earlier deployments in the Arctic and for Torch.

5. Chapter 5: On the Front Foot: 1 June 1943–31 May 1944

5.1 Introduction

This chapter examines the Admiralty's procurement and deployment of escort carriers from June 1943 to May 1944. It looks at strategic issues facing the Admiralty and assesses the effectiveness of procurement in Britain, where shortages of capacity and skilled shipyard labour affected new builds, repairs and necessary modifications to RN standards of US-built carriers, the latter being solely undertaken in Britain until mid-1943. It examines the Admiralty's success in securing US-built carriers and the extent to which this programme was undermined by RN manpower shortages, bottlenecks in modification capacity, and the need for persistent defect-rectifications or repairs, carried out in the US or British Columbia after the ship had been commissioned into the RN upon completion in a US shipyard. The delays from this point of initial completion to full operational activity resulted in a confrontation between the Admiralty and the USN, its principal supplier of escort carriers, and challenged the Admiralty's policy of modifying its escort carriers to be capable of multiple functions.

The remainder of the chapter assesses the deployment of these vessels, as the Admiralty responded to the changing needs of trade protection in the Atlantic, Arctic, and Indian Ocean, and the increasingly offensive strategy of the Allies in these waters and the Norwegian and Mediterranean Seas. The greater and increasingly sophisticated applications of air power required fighter carriers for trade protection and assault carriers for combined operations, a vindication of Admiralty policy. Meanwhile, a greater need for aircraft ferrying capacity placed further demands on the limited supply of escort carriers and manning remained a key issue, with crew shortages causing delays and reducing operational effectiveness.

5.2 Strategic Overview

The Navy's role between 1 June 1943 and 31 May 1944 reflected the outcome of the Casablanca Conference, and strategic developments agreed at subsequent conferences. At

Casablanca, the overriding goals were defeating the U-boat and sustaining Russian forces.¹ The Allies agreed to concentrate on the defeat of Germany, applying sufficient force to contain Japan.² Germany and Japan increasingly focused on their own respective crises, their strategy now being one of defending conquered territories.³

To achieve Allied strategic goals, Atlantic convoys required more escort vessels and continuous air cover to protect increased shipping tonnage.⁴ As noted above, projected demands on naval resources were detailed in a report by the Combined Staff Planners, which argued that both shore-based and carrier-borne aircraft were required but that the escort carrier construction programme could not be 'greatly accelerated', and therefore in the 'immediate future' air escort 'can only be insured' by shore-based aircraft.⁵

In the Mediterranean shortages of shipping and landing craft were a major constraint in the preparation for Operation Husky, the invasion of Sicily,⁶ but the latter's success was needed to ease the Allies' shipping crisis by opening up the Mediterranean route to the east. The need to enlarge the amphibious assault component meant the planned cross-Channel invasion of 1943 was cancelled, while talk of a landing in the Balkans involving two auxiliary carriers and 88 landing ships came to nought, as did Churchill's efforts to involve Turkey in the war or liberate the Dodecanese Islands.⁷

The shifts in strategy over the period covered in this chapter required new trade-offs, with the RN adapting its limited resources in response to new priorities including, importantly, modifying more escort carriers to assault carriers to meet the new emphasis on amphibious

¹ 'Conduct of the War in 1943', Memorandum by the CCS, 19 January 1943, Casablanca, CCS 155/1, p.18.

Grand strategy agreed at Casablanca is covered by Howard (1972a), pp.239-259

² 'Conduct of the War in 1943', Memorandum by the CCS, 19 January 1943, Casablanca, CCS 155/1, pp.18-19

³ 'Estimate of the Enemy Situation 1943-1944, European-Mediterranean Area', Quadrant, CCS 300/1, 7 August 1943, pp.46-61; 'Estimate of the Enemy Situation 1943-44, Pacific-Far East Area', 6 August 1943, Quadrant, CCS 300, pp.36-44

⁴ 'Shipping Capabilities for Bolero Build-up', Note by Lieutenant General B.B. Somervell, 22 January 1943, Casablanca, CCS 172, pp.129-133. It concluded that 1.1m US troops could be moved to Britain by the end of 1943, the majority crossing the Atlantic in the second half of 1943. Howard (1972a, p.272) correctly refers to this as 'wildly optimistic'

⁵ 'Minimum Escort Requirements to Maintain the Sea Communications of the United Nations', Report by the Combined Staff Planners, 19 January 1943, Casablanca, CCS 160, pp.45-57 (quotation pp.47-48)

⁶ ANFA 3rd Meeting, 23 January 1943, Casablanca, CCS Minutes, pp.154-168. Pound stated that the continuation of Russia convoys must depend on loss rates, 'because if we were committed to continuing these convoys, the Royal Navy could not play its part in Operation HUSKY' (pp.157-158). It was agreed that the continuation of Russia convoys would be reviewed in the light of the prevailing shipping situation

⁷ Howard (1972a), pp.375-384, 479-493

warfare. Meanwhile, inevitable uncertainties impacted on new resources available from the Cabinet, illustrated by a paper showing how manpower allocations depended upon the most likely dates for the defeat of Germany.⁸ These strategic shifts and their implications, which illustrate the external pressures faced by the Admiralty, are evident in the major conferences. For example, the Second Washington Conference (Trident, 12-25 May 1943) settled strategy for the next phase of the war, including operations in the Mediterranean after Husky,⁹ while the planned Anakim offensive in Burma was 'now considered to be impracticable'.¹⁰ In August 1943, at Quadrant, after the success of Husky in July and the imminent collapse of Italy,¹¹ the debate moved to the invasion of mainland Italy.

Whilst in January 1943 the thinking had been that an Allied success in the Mediterranean would draw German forces from the Eastern Front, thereby supporting Russia,¹² in August it was argued that an invasion of Italy might lead to the withdrawal of German forces from Western Europe, including Italy, to bolster a vulnerable Eastern Front and potentially allow an early Anglo-American occupation of Germany.¹³ Even if German troops were maintained in Western Europe, it would at least tie down strategic reserves. Repeatedly, strategic discussions revolved around shipping and assault craft availability, integral to which was manpower.¹⁴

⁸ 'Man-Power', Note by the Prime Minister and Minister of Defence, 1 November 1943, CAB 121/323

⁹ 'Implementation of Decisions Reached at the Trident Conference', Memorandum by the Combined Staff Planners, 25 May 1943, Trident, CCS 250/1, pp.238-243

¹⁰ White House 2nd Meeting, 14 May 1943, Trident, CCS Minutes (Revised), p.276

¹¹ Roskill (1960b), pp.118-141, 166. The Sicilian landing (10 July 1943) accelerated a coup in Italy (25 July), preceding the capitulation to the Allies (8 September 1943)

¹² CCS 60th Meeting, 18 January 1943, Casablanca, CCS Minutes, p.237

¹³ 'Final Report to the President and Prime Minister', 24 August 1943, Quadrant, CCS 319/5, pp.252-253; 'Rankin', 20 August 1943, Quadrant, CCS 320, pp.266-275

¹⁴ For example, 'Defeat of the Axis Powers in Europe (Elimination of Italy First)', Memorandum by British Joint Planning Staff, 17 May 1943, Trident, CCS 234, pp.82-94. It argued that the size of a cross-Channel assault was limited by landing craft availability; 'Defeat of Axis Powers in Europe (Concentration of Largest Possible Force in UK)', Memorandum by US Joint Staff Planners, 18 May 1943, Trident, CCS 235, pp.104-120. It argued against Britain's proposal for further Mediterranean operations after Husky, concluding that they 'might seriously interfere with Roundup (plans for the cross-Channel invasion) because of their potential shipping needs (p.113). For manning: 'Implementation of Assumed Basic Undertakings and Specific Operations for the Conduct of the War, 1943-1944, Availability of Resources to Meet the Requirements of Critical Strategy', 26 August 1943, Quadrant, CCS 329/2, p.340

At Quadrant it was clear that Operation Overlord (Normandy) must take priority,¹⁵ with a target date of 1 May 1944.¹⁶ Resources for the Mediterranean theatre would be limited to ensure the success of Overlord, while the 'reorientation of forces...to the PACIFIC and FAR EAST' would be undertaken only when the situation in Germany allowed.¹⁷ Following Quadrant, the invasion of mainland Italy took place across the Messina Straits in early September 1943, shortly followed by Operation Avalanche, an amphibious landing at Salerno (9 September) with the deployment of British escort carriers in an assault role.¹⁸

In early December 1943, the Allies at the Sextant and Eureka Conferences¹⁹ settled plans to invade Southern France (Operation Anvil), possibly simultaneously with Overlord, with these two being deemed 'the supreme operations for 1944', which 'must' be executed in May 1944, and with nothing to be undertaken anywhere which 'hazards the success of these two operations'.²⁰ The South East Asian theatre was identified as a source of landing craft where a series of amphibious operations were cancelled,²¹ with the RN having to contemplate withdrawing many vessels, including three assault escort carriers and one spare hull, from potential deployment to the Eastern Fleet. These vessels were needed to support Operation Anvil (now renamed Dragoon), postponed from May to 15 August 1944 following Eisenhower's review of Overlord, which required additional men and resources, particularly landing ship/craft capacity. Furthermore, seven British escort carriers might be withdrawn from the Atlantic to support Overlord.²² RN reinforcements released by the defeat of Italy

¹⁵ 'Implementation of Assumed Basic Undertakings and Specific Operations for the Conduct of the War, 1943-1944, Availability of Resources to Meet the Requirements of Critical Strategy', 26 August 1943, Quadrant, CCS 329/2, p.352. See also Howard (1972a), pp.502-511, 520-524

¹⁶ 'Final Report to the President and Prime Minister', 24 August 1943, Quadrant, CCS 319/5, p.252

¹⁷ *Ibid.*, pp.254-255. Capitals in original

¹⁸ 'Note of a meeting held at the Admiralty on 20th October, 1943, to consider the lessons learnt from the Naval Air operations in AVALANCHE' ('Lessons from Avalanche'), ADM 1/12640; Roskill (1960b), pp.157-165

¹⁹ Held in Cairo and Tehran, 22 November-7 December 1943. Eureka was held in Tehran (28 November-1 December) between the two Sextant conferences in Cairo

²⁰ 'Draft Agreement by the CCS', 5 December 1943, Sextant, CCS 423/2, p.282. See also Ehrman (1956a), pp.203-267: Operation Shingle (Anzio) proceeded on schedule (22 January 1944)

²¹ 'Draft Agreement by the CCS', 5 December 1943, Sextant, CCS 423/2, p.283, noted the political and military implications of postponing Operation Buccaneer (the capture of the Andaman Islands in spring 1944)

²² 'Relation of Available Resources to Agreed Operations', 15 December 1943, Sextant, CCS 428 (Revised), p.330. See also Howard (1972a), pp.563-574. To support amphibious landings in the absence of assault carriers, Admiral Lord Louis Mountbatten had studied Habbakuks (2,000 feet long 'unsinkable' aircraft carriers made of Pykrete, a synthetic substance). See "'HABBAKUKS'", Memorandum by the British COS(s), 18 August 1943, Quadrant, CCS 315, pp.186-198. The CCS concluded: the 'diversion of manpower and critical materials involved in their construction is not warranted' (29 August 1943, CCS 315/2, p.199)

and clearance of the Mediterranean would be required to achieve the strategic goal of regaining control of the Bay of Bengal.²³

5.3 Procurement

5.3.1 Introduction

Manpower shortages in shipyards²⁴ and crews of vessels,²⁵ lay at the heart of many Admiralty procurement difficulties, compounded as new weapons increased pressure on the support 'tail' of Allied forces.²⁶ The Admiralty had warned of these shortages as early as 1942.²⁷ By July 1943 some 50% of the working population of 22.3m were employed in Britain's armed forces or essential war industries.²⁸ Manpower rationing meant tighter resource allocation, Churchill noting on 6 July 1943 that while offensive operations against the U-boat remained the top naval priority, future naval programmes would have to be reassessed.²⁹

The decision to favour manpower allocation to MAP rather than the Navy 'made it impossible to man the various craft required for combined operations both in Europe and the East without paying off ships',³⁰ the Admiralty arguing that it needed very substantial increases in manpower if it were not to review the tasks given it by the Cabinet.³¹

²³ White House 2nd Meeting, 14 May 1943, Trident, CCS Minutes (Revised), p.269; White House 6th Meeting (Annex), 25 May 1943, Trident, CCS Minutes, p.314

²⁴ Response to Prime Minister from First Lord, 12 January 1943, ADM 205/27; 'Absenteeism in Admiralty shipyards, 20 October 1942-20 September 1945', CAB 141/131. See also Johnman and Murphy (2002a), pp.60-93

²⁵ Note to Prime Minister from First Lord, 18 July 1943, ADM 205/27; Hobbs (2003), p.160: *Thane* (Ruler class) waited five months in Seattle (November 1943-April 1944) for sufficient crew to arrive from Britain

²⁶ Ehrman (1956a), pp.49-50

²⁷ For example, 'Naval Construction Programme', Memorandum by Minister of Production, War Cabinet, 15 September 1942, PREM 3/322/3-4; 'The Needs of the Navy', Memorandum by First Lord, War Cabinet Defence Committee (Supply), 5 October 1942, CAB 70/5, pp.1-8

²⁸ Howard (1972a), p.289. 5.1m and 5.2m respectively

²⁹ *Ibid.*, p.290; Roskill (1960b), p.9. The prewar RN: 10,000 officers and 109,000 men; by 30 June 1943: 57,682 officers and 604,248 men. While there were to be cutbacks in the future manpower allocation of all supply departments, Churchill insisted that the exception was MAP, following the advice of Cherwell who had based calculations of the efficacy of strategic bombing on MAP's production targets, which had been missed repeatedly. MAP had requested 212,000 additional manpower, but this would have starved the other services of essential tradesmen. Following debate, MAP received 115,000, achieved by stripping 185,000 army munition workers from the Ministry of Supply

³⁰ Message from Admiralty to BAD, 23 October 1943, ADM 116/4877, p.813

³¹ War Cabinet, Manpower, Record of a Conference of Ministers, 5 November 1943, CAB 121/323. The 'Vote A' men on the Admiralty's books were: 1 November 1943, 722,000; 1 January 1944, 771,000 estimated; 1 January 1945, 934,000 estimated. Churchill challenged the need for more men and the meeting concluded with the proposal that the services met with, amongst others, the Ministry of Labour and National Services, to determine needs in the light of alternative dates for the cessation of war with Germany

Cunningham, First Sea Lord (appointed October 1943), argued that the war against Japan 'would be very largely an amphibious war', needing more manpower, and that Britain must have sufficient resources or be over-reliant on America.

The Admiralty's warnings about resources were well judged, illustrated by how seriously this threatened the supply of US-built escort carriers. The Navy's inability to provide sufficient ferry-carrier capacity for USAAF's long-range fighters to be shipped to Britain, coupled with the threat of the escort carrier *Empress* (*Ruler* class) being reduced to care and maintenance because it could not be manned 'immediately', meant that the USN was reported to be 'very loathe to assign any material to us from which they cannot see a quick operational dividend, which their own CVEs have most certainly paid'.³² Concern was expressed by Commander Jackson (BAD) that America would begin to 'ask us for an accounting, on which our future assignments may well rest'.³³

An important report in August 1943 by Rear Admirals Kauffman, USN, and Mansfield, RN, of the AASSB³⁴ to King as a member of the CCS encapsulated criticisms made against the Admiralty over delays in escort carriers becoming operational, and concluded that 'at the present stage of the war these delays are not considered acceptable'.³⁵ The report noted that seven US-built CVEs were allocated to Britain for delivery in the next three months, but Admiralty modifications and working-up time allegedly involved delays of 24 to 30 weeks between delivery in the US shipyard to becoming operational – itemising modifications of gasoline installations, bomb stowage, and fighter-direction equipment. Interestingly, no mention was made of lengthening the flight deck to compensate for the incompatibility of British aircraft and American catapults.

³² Message from Jackson, Joint Planning Staff, Washington to Joint Planning Staff, London, 3 August 1943. See also reply, 7 August 1943. Both CAB 122/220. *Empress* was commissioned in Vancouver, BC, on 12 August 1943, but did not sail for New York for over six months (Hobbs (2003), p.68)

³³ Message from Jackson, Joint Planning Staff, Washington to Joint Planning Staff, London, 3 August 1943. See also reply, 7 August 1943. Both CAB 122/220

³⁴ 'Employment of C.V.E.s in offensive action against U-boats' ('AASSB Report'), 27 August 1943, ADM 234/384, pp.322-324, sent to King (USN) and copied to First Sea Lord (RN) and CNS Ottawa (RCN); Roskill (1960b), pp.35-36. The AASSB had no executive authority (Roskill (1962b), p.360)

³⁵ 'AASSB Report', 27 August 1943, ADM 234/384, p.323

The report also noted that with large crews the USN 'have proved that they can operate these ships most successfully without these very lengthy modifications'.³⁶ Subsequent analysis showed they did perform better,³⁷ but this was aided by larger crews and modern aircraft. Furthermore, US CVEs were built to a higher specification, and did not require modification; they were also built in greater numbers, allowing some specialisation in usage.³⁸

The report recommended that as many of these seven vessels as the USN could equip and man be reallocated to the USN so that 'an adequate proportion be employed on A/S operations immediately', estimating that all seven should be operational by the end of January 1944, saving at least three months. A subsequent alteration to the British allocation should be initiated.³⁹ The dispute rumbled on throughout September, with DOP even suggesting returning five unmodified CVEs as the RN could not assign them because of operational restrictions, 'nor does the manning situation permit any acceleration of our commissioning programme', the proviso being that 'the carriers should either be returned to Vancouver for modification when the programme permits' or substitutes made available during 1944.⁴⁰ On 3 September 1943, King accepted the AASSB recommendation, but with the condition that CVEs already assigned or delivered to the RN were not recalled, suggesting the latter 'advance the date of operational readiness'.⁴¹ Roskill claims King was politically aware in proposing delays were reduced rather than the allocation, thus avoiding the 'confusion' which would result from such a cancellation,⁴² or he may have better understood the dilemmas facing the Admiralty.⁴³

³⁶ Ibid., pp.322-324; Hobbs (2003). Average time for *Attacker*-class modifications was 33 weeks; modifications were essential for safety and operational flexibility

³⁷ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, pp.1-5; Brown (1983a), p.22: US vessels were built to provide A/S and fighter/assault capability, the latter to support amphibious landings in the Pacific

³⁸ Terzibaschitsch (1981), pp.194-200. 77 CVEs (including USS *Charger* from the RN) were commissioned into the USN by the end of the war, with over 100 additional aviation support ships (many being ferry carriers)

³⁹ 'AASSB Report', 27 August 1943, ADM 234/384, pp.322-324

⁴⁰ Minute by DOP, 1 September 1943, ADM 1/12857, pp.27-29. See also Minute from Captain Clarke, Director Anti-U-boat Division (DAUD), 9 September 1943, ADM 1/12730: he concurred with the proposal to return seven CVEs because they would be operational more quickly with maximum effect against U-boats

⁴¹ Memorandum from Admiral King to Secretariat, CCS, 3 September 1943, ADM 1/12730

⁴² Roskill (1960b), p.35

⁴³ King & Whitehill (1953), pp.11-29, 72. King had direct experience of carrier warfare, having commanded the USS *Lexington* and been promoted to Vice-Admiral on 29 January 1938, with command of all USN aircraft carriers

On 7 September 1943, the Admiralty replied robustly via BAD, defending its ‘fully justified’ policy of modifications to enable its escort carriers to be general purpose, noting:

...the main cause of delay in getting our carriers into service is our endeavour not only to improve the petrol system, but to get all these carriers capable of full fighter operation and not merely fit for A/S work.

[2.] It must be remembered that we differ from the United States Navy since we have not in sight so large a force of Fleet and Light Fleet types. For this reason we shall in future have to depend more than the Americans upon fighters operated from Escort Carriers in support of amphibious operations. We have also to consider the anti-aircraft protection of trade (e.g. in the Bay and possibly North Russian routes).⁴⁴

The letter also noted that some of the delays occurred in America⁴⁵ and concluded that reviewing the manning programme for 1944 might cause the Admiralty to reduce procurement of US-built vessels in the future, attaching a history of each carrier.

Relationships were strained during this period, Rear Admiral Dorling noting that the USN was increasingly refusing to co-operate in furnishing naval stores under Lend-Lease.⁴⁶ The situation was resolved somewhat when, as recorded at the end of September, BAD (at the Admiralty’s suggestion)⁴⁷ made the USN an offer of five RN escort carriers, which was declined on the basis that the USN also had manpower shortages.⁴⁸ Whilst DOP said that the latter was a ‘new aspect, hitherto only suspected’,⁴⁹ it was also perhaps another example of King’s political astuteness and pragmatism, as the USN could probably have found 5,000 men over a three-month period, but would not want more *Bogue*-class vessels, the USN having opted for the newer and better-equipped *Casablanca* class.⁵⁰

⁴⁴ AL to BAD, 7 September 1943, ADM 1/12857, p.20. This capability required modifications. For example, see Response to Controller by C.S. Lillicrap, Deputy DNC, 28 June 1943, ADM 229/30, p.292, noting the decision to round down the aft end of the flight deck after *Avenger* ‘had crashed 18 Hurricanes in about a month’ during 1942

⁴⁵ Hobbs (2003). The CVEs of the *Attacker* class were commissioned in US dockyards (in the case of *Attacker*, before completion), before sea trials, defect rectification and movement to Britain, with typically 20 weeks between commissioning and arrival in Britain

⁴⁶ Minute from Rear Admiral Dorling, 22 September 1943, ADM 1/12508. Dorling was British Admiralty Supply Representative (BASR) in America, a direct representative of the Controller, and a member of the shadow Board in Washington under the primacy of Admiral Noble (note, 13 October 1943, ADM 1/12508)

⁴⁷ ADM 234/384, p.132

⁴⁸ Note by DOP, 30 September 1943, ADM 1/12730

⁴⁹ Note by DOP, 13 September 1943, ADM 1/12857, p.33

⁵⁰ Friedman (1988), pp.183-184, details these classes

Whilst the language in the 'AASSB Report' appears severe, as discussed above, the Admiralty's robust response and clear explanations for the delays, detailing its inadequate resources, particularly manpower, about which it had warned and which were beyond its control, and dependence on the necessary modifications to CVEs to perform the role of CVLs, coupled with King's intervention, defused the dispute. Indeed, as is shown below, the US supply of CVEs subsequently accelerated with the pressure on British shipyards eased by modification work being carried out on the west coast of Canada and pressure on naval manpower being eased by many CVEs initially being deployed as ferry carriers.

5.3.2 British-built escort carriers

Skilled labour shortages, varying efficiencies in different shipyards, and having to accept the MT's allocation of hulls and engines, formed the background to delays,⁵¹ but nevertheless the Admiralty brought into operation four British-built escort carriers and 17 of the remaining 18 MAC ships within the period of this chapter, and made advances in aircraft direction management systems. All 19 MAC ships entered service between April 1943 and May 1944, with *Empire MacAlpine*, a grain conversion, the first.⁵² MAC ships flew the Red Ensign, being manned by the Merchant Navy (under T124X articles), with the RN flying and maintaining the aircraft.⁵³

The first escort carrier conversion in this period was of *Pretoria Castle*. She was the largest (23,450 tons deep displacement), with the greatest petrol stowage (74,000 gallons). She was allocated in August 1943 to WAC as a trials carrier, evaluating new types of FAA aircraft; her only operational voyage was with a convoy to Iceland in October 1943, returning in November. Like other British escort carriers, *Pretoria Castle* flew the White Ensign and had an RN and Merchant Navy crew, totalling 666 (86 officers and 580 men), compared with 210

⁵¹ Note to Prime Minister from First Sea Lord, 4 January 1943, ADM 205/27, shows estimated delivery dates in 1943 of British-built escort carriers; they were three to seven months late (Hobbs (2003) for actual delivery dates). See also Note by DOD(H), 7 August 1943, ADM 1/14826: *Activity* had to wait two months for a yard to undergo a short essential refit

⁵² ADM 234/384, p.317 (note p.111 states the last entered service at the end of June 1944)

⁵³ Admiralty meetings on MAC ships, January-July 1943, ADM 1/13087, pp.37-43: air fitters and air mechanics totalled 17 on grain carriers and 19 on oil tankers when the latter had four aircraft. See also Lenaghan (1983), pp.45-62; Hobbs (2013), pp.123-130: grain carriers' total complement was 107, while oil tankers was 118. Lenaghan (1983) states 122 for the oil tankers (possibly a reference to the handling of four aircraft). The split in personnel was stated in the case of two ships as 64 RN and 54 Merchant Navy. Two, *Gadilla* and *Macoma*, were operated by the Royal Netherlands Navy

in *Audacity*, 375 in *Activity*, and 639 (85 officers and 554 men) in the later *Nairana*, *Vindex*, and *Campania*.⁵⁴

She was joined by sisters, *Nairana* and *Vindex*. *Nairana* took 25 months to build (including seven months conversion), at John Brown, Clydebank. Worked up in December 1943 and allocated to WAC, she became operational on 25 January 1944, sailing with the 2nd Escort Group on 29 January. *Vindex* took 17 months to build (conversion again took seven months) at Swan Hunter & Wigham Richardson at Wallsend-on-Tyne. Worked up in January-February 1944, she became operational on 2 March 1944 with 2nd Support Group. Both were slipway conversions, had top speeds of 16 knots, deep displacements of 17,200 tons, and petrol stowage of 52,000 gallons. One unfortunate design detail was the lift, which was positioned at the aft end of the hangar, making it harder to range or strike down aircraft, so that only 20 could be carried operationally in each ship.⁵⁵

The final British-built escort carrier was *Campania*, a half-sister of *Nairana* and *Vindex*, again converted on the slipway, taking 31 months to build (including a lengthy 19 months conversion), at Harland & Wolff, Belfast.⁵⁶ Worked up in March-May 1944 and allocated to WAC as a TPC with 813 (Swordfish/Fulmar Night Fighter/Wildcat) NAS embarked, she became operational on 3 June 1944. She had a top speed of 18 knots and a deep displacement of 15,970 tons, and again only capable of operating 20 aircraft because of the single lift position and deck park.⁵⁷ However, *Campania* had the most advanced operations room of any escort carrier, capable of controlling fighters in the air defence role and

⁵⁴ 'Requirements and Availability of Aircraft Carriers', September 1942, PREM 3/322/3-4, p.26; Brown (1983a) pp.21-22; Brown (1995), pp.85-87; Hobbs (2003) pp.196-199; Hobbs (2013), pp.116-123. *Pretoria Castle* was capable of 18 knots, had a steel flight deck, and could handle 21 aircraft (15 in the hangar, with a lift at the forward end). A useful attribute was a cordite-operated catapult (type CII, usually found on battleships and cruisers) which could launch any aircraft in service up to the end of hostilities. Hobbs (2003, 2013), states the total complement of *Activity* at 700

⁵⁵ 'Requirements and Availability of Aircraft Carriers', September 1942, PREM 3/322/3-4, p.26, shows planning for *Nairana* embarking 21 aircraft; see also Brown (1995), pp.87-89, Hobbs (1996). Both *Nairana* and *Vindex* had steel flight decks and a hangar extending the full width of the vessel and capable of accommodating 15 aircraft. The narrow flight deck limited the size of the deck park and the single barrier was sited by the small island only 150 feet from the bow, limiting the size of an air group to 20

⁵⁶ Brown (1983a), p.22. *Campania* had been on the stocks for almost a year and some structure required dismantling, but the time taken indicates poor productivity

⁵⁷ Brown (1995), pp.88-89; Hobbs (1996). Her petrol stowage capacity and complement were identical to *Nairana* and *Vindex*. *Campania's* steel flight deck was slightly larger, but the shorter hangar also accommodated 15 aircraft, limiting her total air group to 20

directing strikes against submarines plotted by radar, ASDIC, and HF/DF.⁵⁸ These three vessels were fitted for night flying operations and for fighter direction, and used extensively escorting Arctic convoys.⁵⁹ *Campania* was even fitted with flight deck floodlighting to aid recovery of aircraft at night.⁶⁰

5.3.3 US-built escort carriers

The barriers the Admiralty faced in procuring escort carriers in Britain propelled it towards US procurement,⁶¹ despite competition with the USN for these badly-needed vessels. Whilst British modifications for 'future commitments in amphibious operations' and fighters to protect trade routes, coupled with difficulties in securing sufficient crews,⁶² caused problems with the USN, the procurement programme achieved considerable success. Indeed, the majority of escort carriers procured by the RN during the war were the 38 vessels in four classes provided by America: the earlier *Archer* and *Avenger* classes (four vessels), together with the *Attacker* and the *Ruler* classes.⁶³ This compares with six escort carriers and 19 MAC ships from British yards.⁶⁴

All 11 of the *Attacker* class were commissioned into the RN between 30 September 1942 and 14 June 1943,⁶⁵ following which they underwent sea trials, defect rectification and working-up in American waters. When ready, West Coast-built vessels had to transit the

⁵⁸ Friedman (1988), p.186. She was the first British CVE with an Action Information Organisation (AIO; CIC in US parlance)

⁵⁹ Brown (1983a), p.22. Riveted hulls of these ships were perceived as safer in the Arctic theatre than the all-welded hulls of US-built vessels

⁶⁰ Hobbs (2003), pp.57, 198-199: *Campania*, *Nairana*, and *Vindex* lacked catapults. This was overcome in time by RATOG to ensure aircraft could carry a full weapons-load in calm weather conditions; RATOG's introduction for Swordfish II aircraft was delayed, which was unfortunate as heavier ASV Mark XI radar equipment was now carried (ADM 234/384, pp.151, 154). Friedman (1988), pp.186-187, states these vessels possessed cordite-type catapults (CII), as found on *Pretoria Castle*; Thomlinson (1975) in his recollections of the Royal Aircraft Establishment stated that the CII system was used only on *Pretoria Castle*

⁶¹ For American industry's transformation from consumer to military needs: Ellis (1990); Klein (2013); Koistinen (2004); Nash (1985); Overy (1995). See also War Production Board (1969)

⁶² Admiralty Message (AM) to BAD, 10 September 1943, ADM 1/12857, p.44

⁶³ Terzibaschitsch (1981), pp. 36, 61, 68, 128, 193-197. The *Ruler*-class vessels were the last CVEs to be received from America, taking the total to 38 (*Archer* class one, *Avenger* three, *Attacker* 11, and *Ruler* 23). *Charger* (*Avenger* class) lies outside these figures. The sequence of US CVEs was as follows, with totals launched in brackets, date of first vessel of each class being commissioned, and number and class of RN vessels procured: *Long Island* (6), June 1941, one *Archer* and three *Avengers*; *Bogue I* (21), June 1942, 11 *Attackers* (including *Tracker*); *Sangamon* (4), August 1942, no RN vessels; *Bogue II/Prince William* class (24), April 1943, 23 *Rulers*; *Casablanca* (50), July 1943, no RN vessels; *Commencement Bay* (19), September 1943, no RN vessels

⁶⁴ Hobbs (2003)

⁶⁵ *Ibid.*; Terzibaschitsch (1981), pp.36, 193-194. US *Bogue I* class includes *Tracker* (originally an *Avenger* class but modified as the prototype of the *Attacker* class) and ten other vessels

Panama Canal and reach the Norfolk Navy Yard, Virginia, taking some five to six weeks. Here they joined those vessels built in the Gulf of Mexico yard, both undergoing any further defect rectification, before embarking aircraft for the Allies in Britain or the USAAF in Casablanca. Ships bound for Britain sailed to New York before joining a convoy, taking some two weeks to cross the Atlantic.⁶⁶ They arrived in Britain between 10 January 1943 and 12 August 1943, directly or via Casablanca, for modifications to RN standards in British shipyards, followed by working-up both ship and its NAS; five became operational by the end of August 1943, three more by the end October, with the remaining three by the end of February 1944.⁶⁷

The Admiralty's procurement efforts were further complicated by increasing calls on escort carriers to fulfil a variety of operational roles,⁶⁸ which changed over time and required yet further modifications during 1943 and 1944 in British shipyards. Initially five of the eleven *Attacker* class were modified as TPCs, five as fighter/assault carriers for air defence and support of amphibious landings, and one as a DLT carrier.⁶⁹ Later, within the period of the chapter, of the five for trade protection, three were subsequently given fighter/assault carrier roles, involving additional modification in British shipyards.⁷⁰ The initial delay in getting the *Attacker* class operational was at the heart of the dispute between the USN and RN regarding the deployment of escort carriers in the Atlantic.⁷¹

The *Ruler* class, also known as *Ameer* or *Smiter*, consisted of 23 vessels, was commissioned between August 1943 and February 1944,⁷² and became operational between November

⁶⁶ AL to BAD, 7 September 1943, ADM 1/12857, pp.20-24; ADM 234/384, p.111; Hobbs (2003). MAC tanker ships were also used as ferry carriers in the run up to D-Day, March-April 1944. Hobbs (2003): *Attacker*-class orders were awarded to one shipyard in the Gulf of Mexico (Pascagoula) and two on the West Coast (San Francisco and Seattle). The time from being laid down to commissioning (averaging 17.5 months for the class) reflected relative efficiencies and is covered in Friedman (1988), pp.177-201; Nailer (1980a), pp.4-5; Nailer (1980b), pp.31-32; Woodman (1987), pp.8-43

⁶⁷ AL to BAD, 7 September 1943, ADM 1/12857, pp.20-24

⁶⁸ AL to BAD, 7 September 1943, ADM 1/12857, pp.20-24; Message to ACNS (UT) from DAUD, 8 September 1943, ADM 1/12857, p.42, asks for clarification as the order of priority to be applied to the introduction of escort carriers seemed now to place 'Fighter Carriers for amphibian assaults' (assault carriers) in first place and trade protection in fourth

⁶⁹ AL to BAD, 7 September 1943, ADM 1/12857, pp.23-24; Hobbs (2003). TPCs: *Biter*, *Chaser*, *Searcher*, *Striker*, and *Tracker*; fighter/assault: *Attacker*, *Fencer*, *Hunter Pursuer*, and *Stalker*; DLT: *Ravager*

⁷⁰ AL to BAD, 7 September 1943, ADM 1/12857, pp.23-24; Hobbs (2003): Of the TPCs *Biter*, *Searcher* and *Striker* became fighter/assault carriers and *Chaser* became a ferry carrier. Two of the fighter/assault carriers became TPCs (*Fencer* and *Pursuer*); *Ravager* was subsequently fitted out as a ferry carrier but remained a DLT carrier

⁷¹ 'AASSB Report', 27 August 1943, ADM 234/384

⁷² Terzibaschitsch (1981), pp.36, 193-194. US *Bogue II* or *Prince William* class

1943 and January 1945.⁷³ It had a deep load displacement of 15,390 tons, and a speed of some 18 knots.⁷⁴ Most of the vessels were built by the Seattle-Tacoma shipyard,⁷⁵ the bulk of the *Ruler* class being modified to RN standards by Burrard Dry Dock in Vancouver, BC, in an effort to streamline and shorten the time taken in getting the vessels operational, with the Admiralty settling the role of the shipyard in May 1943.⁷⁶ Burrard concentrated the work at LaPointe pier on Burrard Inlet (leased from the National Harbours Board), with initially two berths.⁷⁷ The majority of workers were unskilled, but quality and productivity improved, reducing modification times from *Empress* (189 days) to *Smiter* (44 days).⁷⁸ The average time for modification of the *Ruler* class in Vancouver, BC, was 11 weeks, compared to that in British shipyards of nearly 15 weeks, partially explained by Vancouver, BC, only modifying to RN-standards for a TPC, whereas British shipyards simultaneously undertook the time-consuming modification of the early vessels in this class to fighter or assault carrier.⁷⁹ Significant additional savings were achieved because previously many US-built escort carriers had to wait days or even weeks on arrival in Britain to obtain a berth in British yards for modification.⁸⁰ There were similar delays in commencing modifications in Vancouver, BC, in the earlier part of the programme as productivity of the Seattle-Tacoma shipyard improved faster than that of Vancouver;⁸¹ Burrard responded by expanding capacity, and reconfiguration of the yard allowed up to four vessels to be berthed simultaneously,

⁷³ Hobbs (2003), pp.48-174

⁷⁴ Nailer (1980a), pp.1-5, states 18.5 knots; Hobbs (2003), p.197 and Terzibaschitsch (1981), p.201, state 18 knots

⁷⁵ Foster (1985); Friedman (1983), pp.415-416; Lindberg and Todd (2004), pp.154-156, 172, 185; Terzibaschitsch (1981), pp.36, 68, 128, 193-196. In 1939 the old Todd Dry Dock and Construction Company Shipyard at Commencement Bay in Tacoma was revived as the Seattle-Tacoma Shipbuilding Corporation by Todd and Henry Kaiser with partners, utilising US\$15m in capital from the USN. This shipyard and Kaiser's in Vancouver, Washington State, demonstrated the benefits of mass production, utilising extensive use of welding and assembly of prefabricated units

⁷⁶ Poolman (1972), p.89. Funded by the Canadian government. These modifications excluded the adaptation of TPCs to assault carriers, carried out in Britain

⁷⁷ Mansbridge (2002), p.90

⁷⁸ Hobbs (2003), pp.68, 146; Mansbridge (2002), pp.89-91

⁷⁹ Hobbs (2003), pp.48-174. Political pressure from America for ferry carriers meant many *Ruler*-class vessels initially becoming ferry carriers either on arrival in Britain or immediately upon completion in Vancouver, BC, deploying to the Pacific on loan to the USN. A number of these were subsequently converted to assault carriers when British yards had capacity

⁸⁰ Ibid. In August 1944, *Trouncer*, on arrival in Liverpool from the US via Casablanca, found shipyard capacity was not available to bring her up to operational readiness. She operated as a ferry carrier for six months before a refit in Belfast to achieve full operational status (pp.168-169)

⁸¹ BAD Message to Admiralty, 31 August 1943, ADM 1/12857, p.41. BAD predicted delays in commencing modification in Vancouver, BC, would rise from three weeks to three and a half months by the end of the programme because of increased productivity at Seattle-Tacoma

accelerating modifications.⁸² The result was faster procurement, with the average for the *Ruler* class from laying down to becoming fully operational only half the time taken by *Archer* and the *Avenger* class,⁸³ although RN manpower issues led to further problems.⁸⁴

As the VCNS wrote in September 1943:

Our manpower resources govern rate at which C.V.E. could be commissioned. To accept unmodified Carriers now would result in accelerated commissioning programme, which manning situation would not repeat not permit.⁸⁵

The RN's manning shortage was so severe that the USN even offered to crew three *Ruler*-class escort carriers from the Seattle-Tacoma shipyard to await modification at Burrard Dry Dock, and steam a fourth to New York to be turned over to the British for passage to a British shipyard for modifications.⁸⁶ Manning difficulties continued to present problems in moving ships out of the Seattle-Tacoma shipyard and maintaining a 'uniform flow of work at Vancouver', with BAD suggesting that operating as ferry carriers the vessels could be operational sooner with reduced crews.⁸⁷ However, whilst accepting three of the escort carriers could perform ferrying duties for a period, the Admiralty's need to maintain operational flexibility is reflected in its refusal to reduce manning levels because full complements 'should shorten subsequent working-up of crews'.⁸⁸

In total, 20 of the 23 *Ruler*-class vessels were allocated as ferry carriers for a period during their service.⁸⁹ While ferry capacity requirements reflected demand for replenishment of front-line aircraft, shortages of British shipyard capacity for further modifications and an increase in crew size would have delayed other uses, such as that of assault carriers. Their

⁸² Mansbridge (2002), p.90. There were four berths eventually, and apparently at one stage six vessels were being modified simultaneously. 19 vessels of the *Ruler* class were modified in Vancouver, BC

⁸³ Brown (1983a), p.24; Friedman (1988), p.183; Hobbs (1996); Hobbs (2003); Hobbs (2013), pp.152-171. *Ruler*-class vessels featured an enclosed aircraft hangar, which was connected by two aircraft lifts to the wooden flight deck. Steam turbines were again specified. Many of the *Ruler* vessels had not been launched when modifications began, and considerable time was saved in conversion, giving a total of 16 months on average from being laid down to becoming operational. This compares with 33 months for *Archer*, an average of 33 months for the *Avenger* class, and 24 months for the *Attacker* class

⁸⁴ AM to BAD, 10 September 1943, ADM 1/12857, p.44

⁸⁵ Ibid. DOP reinforced this in his note, 30 September 1943, ADM 1/12730

⁸⁶ 'BAD Reports', 1st to 30th June 1943, report date 19 July 1943, ADM 199/1469, p.172. From 15 July 1943 the USN officially designated ACVs as CVEs and referred to them as 'escort carriers'

⁸⁷ BAD Message to Admiralty, 14 September 1943, ADM 1/12857, p.53

⁸⁸ AM to BAD, 27 September 1943, ADM 1/12857, p.58

⁸⁹ Hobbs (2003). Six were lent to the USN for periods from six months to a year during 1944-1945

widespread use as ferry carriers almost certainly reflected an unwillingness to incur political aggravation over delays in getting escort carriers operational, an interpretation supported by the wording in a signal from BAD four days after the 'AASSB Report'.⁹⁰

5.3.4 Naval aircraft

The Admiralty faced further problems in procuring modern naval aircraft, complicated by a succession of unsuitable British models and competition with the USN for American aircraft. Its requests for additional aircraft to address forecast deficiencies were objected to by Churchill, who saw a threat to MAP's output of Halifax bombers and hence the bomber offensive, and who used Cherwell's analysis to challenge Admiralty assumptions.⁹¹ The problem was raised by Alexander at a Cabinet meeting in April 1943, at which it was indicated that the FAA would, in 1945, 'still be relying on obsolescent aircraft for a proportion of the initial equipment of carriers'.⁹² This prediction proved correct, particularly for TBR aircraft.⁹³ The Fairey Swordfish, already outdated,⁹⁴ would outlive its replacement, the Albacore, and continue as a front-line aircraft for the FAA throughout the war; the Albacore's replacement, the Fairey Barracuda, was introduced in early 1943 as a naval torpedo/dive bomber, but lacked 'power, self defence and a weapon bay'.⁹⁵

Lacking a new generation of British high-performance TBR aircraft, the Admiralty focused in Britain on major A/S equipment improvements to the Swordfish, achieved with enhanced versions of ASV radar, the air-deployed acoustic torpedo (Mark 24 mine, code named Fido),

⁹⁰ BAD Message to Admiralty, 31 August 1943, ADM 1/12857, p.41, proposes the use of five escort carriers to ferry aircraft to various front-line theatres to prevent a potential bottleneck in Vancouver, BC. BAD argues it would be 'impolitic to give the Americans an extra lever to get in on our programme'

⁹¹ Note by Cherwell to Prime Minister, 29 March 1943, which challenges the Admiralty's request for part of MAP's Halifax bomber output to be changed to Barracudas; War Cabinet Defence Committee (Supply), 30 March 1943, Minutes, which record a discussion on the Admiralty's estimates of TBR shortages for 1944-1946 and request for Barracudas, with Churchill quoting 'certain figures worked out by Lord Cherwell' to challenge the level of reserves required, and arguing that 'auxiliary carriers' needed lower levels of reserves; Note by Cherwell to Prime Minister, 7 April 1943, which again challenges the need for the additional TBRs requested by the Admiralty. All PREM 3/171/9

⁹² 'Aircraft for the Fleet Air Arm, Forecasts for 1944 and 1945', 5 April 1943, Memorandum by First Lord, War Cabinet Defence Committee (Supply), PREM 3/171/9, pp.11-12. This included the Swordfish

⁹³ Minute by Director of Naval Air Organisation (DNAO), 23 November 1943, ADM 1/12865, pp.12-14, shows the expected composition of 11 escort carriers' NAS in February 1944

⁹⁴ Notes by Director of Air Equipment (DAE), 25 November 1943 and DAWT, 17 December 1943, ADM 1/12865, pp.14, 16; Gunston (1978), p.99: Swordfish were first flown in 1934

⁹⁵ ADM 234/383, p.239; Gunston (1978), pp.96. Swordfish front-line strength peaked at 201 (September 1944)

more effective depth charges and use of R/P technology,⁹⁶ and continued to turn to America for more advanced aircraft,⁹⁷ both TBRs and fighters, as new types able to operate off escort carriers were introduced during 1943. Procurement of US aircraft transformed the effectiveness of British escort carriers. Firstly, the majority of carriers, being US-built, featured catapults compatible with US aircraft⁹⁸ but incompatible with British aircraft;⁹⁹ and secondly, US aircraft had superior performance, robust landing gear more suited to deck landings,¹⁰⁰ and folding wings unlike many of their British counterparts, whose long fixed wings restricted the number accommodated in a hangar or on a lift.¹⁰¹ The Admiralty's success is illustrated by its procurement of the US Grumman Avenger, a three-seater TBR: 575 were delivered during 1943, representing 30% of US aircraft deliveries to the RN that year.¹⁰² The Avenger's performance was superior to the Swordfish, with an enclosed cockpit,¹⁰³ vitally important on Arctic convoys, heavier weapon-load capacity¹⁰⁴ with forward machine guns, nearly double the operational range with a full weapon load and, most importantly, greater speed.¹⁰⁵ Operational deployment in escort carriers was initially

⁹⁶ DAWT's response to DAUD's note of 18 November 1943, 17 December 1943, ADM 1/12865, p.16; Gunston (1978), p.99

⁹⁷ 'Naval Stores', ADM 116/5813, pp.138-139, 161. During the war the FAA obtained 6,630 US aircraft (35 marks of 17 basic types). See also Bell (2012): Wildcat; Sullivan (2013): Corsair; Tillman (1979): Avenger; Tillman (1988): Hellcat. Total FAA deliveries of 1,919 US-built aircraft in 1943 included 575 Avengers, 314 Corsairs, 200 Hellcats, and 310 Wildcats, representing some 73% of deliveries, all capable of operating off CVEs

⁹⁸ AL to C-in-C WAC, 22 January 1944, ADM 1/12865, pp.31-32: although initially the *Tracker/Attacker* class catapult was deemed incompatible with US Avenger aircraft, this was resolved by March 1944 for North Russia convoys (ADM 234/384, pp.211, 214)

⁹⁹ 'Employment of British and American Escort Carriers in Anti-U-Boat Warfare', Memorandum to Admiralty from C-in-C WAC, 7 November 1943, ADM 1/12865, p.5; Minute by DNAO, 23 November 1943, ADM 1/12865, pp.12-14. DNAO also noted shortages of aircraft and air staff on carriers, the need for overbearing of NAS, and that it would be unsatisfactory to transfer aircraft and crews, 'willy-nilly', between ships, while squadrons must be 'teamed' with ships for efficiency. See also Friedman (1988), p.187

¹⁰⁰ 'Naval Stores', ADM 116/5813, p.161; ADM 234/384, pp.142, 230. See also Roskill (1960b), pp.173-174

¹⁰¹ 'Naval Representation in the Ministry and Progress in Development and Production of Naval Types', Memorandum to Aircraft Supply Council, by Chief Naval Representative at MAP (CNR) Slattery, 3 August 1943, AVIA 46/136, note 17. See Friedman (1988), pp.202-217 for constraints on designers

¹⁰² 'Naval Stores', ADM 116/5813, p.161. Avenger deliveries to FAA front line units declined to 186 in 1944, recovering partially to 220 in 1945

¹⁰³ Gunston (1978), p.99. Gunston states the later Swordfish Mark IV had an enclosed cockpit

¹⁰⁴ ADM 234/384, pp.151, 154. When sonabuys were introduced, the additional weight proved too much for the outdated Swordfish

¹⁰⁵ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, p.3; ADM 234/384, pp.209-210. Avenger's higher speed (about 230 versus 120 knots) transformed attacks on surfaced U-boats or enemy aircraft shadowing a convoy. See Gunston (1978), pp.99, 224

restricted to the *Ruler* class, due to shortages and early incompatibility with *Attacker*-class catapults.¹⁰⁶

Similarly, the Admiralty worked to improve carrier-borne fighters. The Seafire, the naval derivative of the British Spitfire, introduced in the second half of 1942, provided a steady stream of replacement aircraft. Its poor endurance was partially compensated for by detachable fuel tanks, although the top speed compared to the latest German aircraft attacking North Russia convoys remained an operational handicap.¹⁰⁷ In the Mediterranean it was reported as 'not a satisfactory fleet fighter in light winds, in bad weather with motion on the ship, and above all, unless the pilots have been properly trained before embarking...'¹⁰⁸

The need for carrier-borne night-fighters had been recognised for some time,¹⁰⁹ and the FAA investigated fitting air-to-air radar in a range of fighters including the Hellcat and Corsair, but concluded that an observer was required to operate the radar set effectively.¹¹⁰ Accordingly, when the British Fairey Firefly (a two-seater fighter)¹¹¹ was introduced, the Admiralty took the opportunity to modify an obsolete day-fighter into an effective night-fighter. This, the Mark II, fitted with air-to-air radar, was introduced in late 1943, and proved a great improvement on the Fairey Fulmar (phased out in early 1944).¹¹²

The first US naval fighter flown by the FAA was the Grumman Wildcat,¹¹³ which was operational in Britain from its introduction in 1940 to VJ Day.¹¹⁴ Introduced in 1944, the Mark VI was specifically designed to operate off escort carriers, being lighter, possessing a more powerful engine, and with full span flaps to improve take-off.¹¹⁵ As late as January 1944, the Admiralty was forced by 'over-riding operational requirements' to allocate

¹⁰⁶ AL to C-in-C WAC, 22 January 1944, ADM 1/12865, pp.31-32

¹⁰⁷ 'Naval Representation in the Ministry and Progress in Development and Production of Naval Types', Memorandum to Aircraft Supply Council, by CNR Slattery, 3 August 1943, AVIA 46/136, note 14. A new variant, planned for March 1944, was delivered much later (ADM 234/384, p.230)

¹⁰⁸ 'Operation "Husky" – Experience Gained in Force "H"', Report by Vice Admiral Willis, 13 August 1943, ADM 199/2514, p.2

¹⁰⁹ ADM 234/384, p.213

¹¹⁰ Ibid., p.230

¹¹¹ Ibid.

¹¹² Ibid.

¹¹³ Hobbs (2003), p.195. On 1 January 1944 the Admiralty adopted USN aircraft names, including Wildcat (previously Martlet), Hellcat (previously Gannet), and Avenger (previously Tarpon)

¹¹⁴ 'Naval Stores', ADM 116/5813, p.161; Gunston (1978), p.223. Deliveries peaked at 310 aircraft (1943)

¹¹⁵ ADM 234/384, p.230. Deliveries to the FAA totalled 240 in 1944 (ADM 116/5813, p.161)

Wildcats to assault carriers, rather than TPCs.¹¹⁶ Deliveries of Wildcats were overtaken in the latter half of 1943 by more modern US naval fighters: the Grumman F6F Hellcat (single-seat naval fighter)¹¹⁷ and Vought F4U Corsair (gull-winged single-seat naval fighter-bomber).¹¹⁸ The Admiralty was successful in increasing the procurement of Hellcats and Corsairs, causing overall US deliveries of naval aircraft to expand from 1,919 in 1943 to 3,169 in 1944, the latter representing 46% of naval aircraft deliveries to FAA front-line units in that year.¹¹⁹ Both these modern naval aircraft were to be used on CVEs in their different capacities, helping the Navy to compensate for the late delivery of CVLs, although the Corsair's later arrival on CVEs forestalled its contribution.

Following the Radford Report,¹²⁰ the USN introduced new principles of aircraft maintenance which stated that labour and materials were better employed in building new aircraft, rather than in repairing old ones, even after a relatively short life. Accordingly, from spring 1944 shipments focused on complete aircraft rather than spares,¹²¹ placing increased ferrying demands on Allied CVEs.

5.4 Deployment

5.4.1 Introduction

Britain's deployment of escort carriers in multiple roles, supported by the stop-gap MAC ships, proved pivotal in key theatres during the period covered in this chapter.

Notwithstanding problems associated with inadequate manning levels,¹²² the Navy continued to suppress U-boats on the North Atlantic trade routes, while accelerating supplies to Russia. As Lambert notes:

¹¹⁶ AL to C-in-C WAC, 22 January 1944, ADM 1/12865, pp.31-32

¹¹⁷ Gunston (1978), pp.230-232. Some Hellcats were later modified to carry bombs, or operate as night fighters. Hellcats arrived in the first half of 1943 (ADM 234/384, p.230). Hobbs (2003), pp.188-194: after DLT on *Ravager* (October 1943), Hellcats operated off six CVEs (December 1943-VJ Day) in fighter carrier and assault carrier roles

¹¹⁸ Gunston (1978), p.252. Hobbs (2003), pp.188-194: after DLT on *Premier* (July 1945), Corsairs were apparently ready to commence operations on other CVEs but this was forestalled by the end of hostilities

¹¹⁹ 'Naval Stores', ADM 116/5813, p.161. Hellcat deliveries rose from 200 (1943) to 666 (1944); Corsair deliveries rose from 314 (1943) to 1,423 (1944)

¹²⁰ Buchanan (1946), pp.354-355; Furer (1959), pp.394-398. Rear Admiral A.W. Radford, USN, Assistant to DCNO (Air) was appointed to lead a board to establish a policy regarding the retirement of naval aircraft (12 April 1944). The average age of USN aircraft in the Pacific fell by 50% during the 12 months ending June 1945

¹²¹ 'Naval Stores', ADM 116/5813, pp.140-141

¹²² 'Most Secret Office Memorandum B, Naval Manpower, 1944', 19 January 1944, ADM 1/13050

Aircraft added a crucial element to convoy defence. They could follow DF fixes and force submarines down more quickly and economically than destroyers, with no risk from Gnat and without compromising the outer screen that kept the enemy away from the merchant ships.¹²³

The introduction of MAC ships released CVEs from trade protection for other operational roles, including air defence and assault carrier, and in other theatres, where lack of CVLs had, as the Admiralty predicted, made CVEs essential.¹²⁴ Having noted at the start of this period that the 'support of amphibious operations from Escort Carriers is a complicated matter of which we are ignorant',¹²⁵ the Admiralty used them successfully three months later at *Avalanche*,¹²⁶ learning further valuable lessons which informed subsequent assault carrier operations in support of amphibious landings.

As escort carriers repeatedly demonstrated their versatility, demand continued to outstrip availability, with the pressures faced by the Admiralty illustrated by several key documents of the period, including the politically-charged 'AASSB Report' of August 1943.¹²⁷ This report argued that 'in certain quarters' (it meant British) attention had wandered from the Battle of the Atlantic because of sharp reductions in losses of merchant ships.¹²⁸ It warned that 150 U-boats 'could suddenly appear in the Atlantic'.¹²⁹ The conclusion drawn was that if they returned, they might not repeat the discredited 'pack tactics' but operate widely dispersed, and if 100 submarines each sank only one vessel a month, mercantile tonnage losses would 'return to the unacceptable figure of previous months'.¹³⁰ The report stressed

¹²³ Lambert (1996), p.154. Gnat: Allied code name for a German acoustic torpedo (*T5* or *Zaunkönig*) introduced to attack escort vessels (Showell (1989), p.111)

¹²⁴ AL to BAD, 7 September 1943, ADM 1/12857

¹²⁵ Note from DOP, 13 June 1943, ADM 1/14806, paragraph 6. The note implies that the earlier use of assault carriers (during *Torch* in November 1942) indicated capabilities but also limitations. See Tomblin (2004), p.471: aircraft from escort carriers struggled to operate in light winds, with USS *Sangamon* noting 'complete dependency upon its catapult'

¹²⁶ 'Lessons from *Avalanche*', 20 October 1943, ADM 1/12640

¹²⁷ 'AASSB Report', 27 August 1943, ADM 234/384, pp.322-324. See also Memorandum for C-in-C US Fleet, Proposed Itinerary, 25 May 1943, ADM 1/13756: the AASSB visited operational stations around the Atlantic during summer 1943, leading to recommendations in the report. The AASSB was dissolved on 28 September 1943 (Memorandum, 26 September 1943, ADM 1/13756)

¹²⁸ 'AASSB Report', 27 August 1943, ADM 234/384, p.322; ADM 234/384, p.127. Following the withdrawal of U-boat wolf packs from the North Atlantic routes (May 1943), Doenitz focused on other areas key to Allied shipping: the Brazilian coast, south of the Azores, off the West Coast of Africa, the Cape Town area, the Mozambique Channel, the Indian Ocean, and Mediterranean. See also Roskill (1960b), p.389; Roskill (1962b), p.486

¹²⁹ 'AASSB Report', 27 August 1943, ADM 234/384, p.322

¹³⁰ *Ibid.*

the significant success of US CVEs, in collaboration with Support Groups¹³¹ in sinking U-boats in the Atlantic.¹³² It noted that despite a CCS directive¹³³ for 31 Allied CVEs to be operational in the Atlantic, at the time of the report only five were engaged in A/S operations there and all were American. The report stated that Britain nominally had 13 escort carriers in commission for the Atlantic, but allegedly none engaged in A/S duties. It concluded it was essential to maintain pressure on the morale of U-boats' crews and even recommended how many British escort carriers should be assigned to specific theatres and their operational roles, focusing on A/S duties.¹³⁴

However, firstly the report ignored the CCS's developing strategic priorities, which subsequent to the April directive had resulted in the Admiralty deploying four escort carriers as assault carriers to the Mediterranean to support *Avalanche*,¹³⁵ and in an Allied decision to mount Operation Alacrity, to occupy airfields in the Portuguese Azores, with a British escort carrier designated to lead the escort to the task force.¹³⁶ These necessary strategic decisions depleted the British vessels available for Atlantic TPC deployment. Secondly, contrary to the impression given in the report, eight RN US-built escort carriers, together with *Unicorn* and CV *Argus*, were operating periodically in support of Atlantic convoys from January-August 1943 – although not at the precise date of the report (27 August).¹³⁷ It also ignored the

¹³¹ *Ibid.*, p.323; ADM 234/384, p.129. Support Groups became known as Air Support Groups if accompanied by a CVE. A Hunter-Killer Group was a CVE with attendant destroyers assigned exclusively to hunt down U-boats rather than support convoys, although this was achieved indirectly. The Hunter-Killer role was first developed by the USN which actively targeted U-boats, often by use of HF/DF, or as a result of ULTRA intelligence giving coordinates for a U-boat refuelling rendezvous with a U-tanker or surface tanker. The success of this USN initiative was evident between 5 June-31 July 1943, when eight U-boats south west of the Azores were sunk by aircraft from CVEs (USS *Bogue*, *Santee*, and *Core*) rather than their surface screen, in line with USN policy

¹³² 'Success' was based on the number of U-boats sunk, rather than Britain's previous emphasis on the safe and timely arrival of convoys: Milner (2017), p.57

¹³³ 'CCS Directive 203', 24 April 1943, cited in ADM 234/384, p.321

¹³⁴ 'AASSB Report', 27 August 1943, ADM 234/384, p.324. Two CVEs on southern approaches to the Bay of Biscay, one off West Africa, one to the Northern passage, and one to the Cape-Mozambique Channel trade route

¹³⁵ Hobbs (2003); Hobbs (1996), p.189. *Attacker*, *Battler*, *Hunter*, and *Stalker*, were joined by *Unicorn* (an aircraft repair ship operating as an assault carrier) for *Avalanche*

¹³⁶ 'Development of Facilities in the Azores', Memorandum by the British COS(s), 6 December 1943, Sextant, CCS 270/14, pp.3-4; Poolman (1972), p.99; Roskill (1960b), pp.46-47. *Fencer* led Alacrity's escort group. For Portuguese political reasons, Britain, not America, had to be seen as leading the operation. The Azores airfields on Fayal and Terceira Islands (facilities granted on 8 October 1943) would help close the mid-Atlantic air gap

¹³⁷ ADM 234/384, p.329. *Archer*, *Attacker*, *Battler*, *Biter*, *Chaser* (not fully operational until February 1944 but operating aircraft *en route* to Britain), *Hunter*, *Stalker*, and *Ravager*. For 1943: one vessel in January, February, April, August, and September; two in July; three in March, May, June, November, and December; six in October. Some supported multiple convoys in a month

tactical emphasis of British overstretched escort forces which had until recently necessarily focused on the 'safe and timely' arrival of the convoy, with the inadequately-armed CVE aircraft often only able to force the U-boat to submerge. When U-boats were located by RN CVE aircraft, sinkings were often attributed to the British surface escort vessels summoned by the aircraft.¹³⁸

One of the eight, *Ravager* (Attacker class) was allocated to WAC in July 1943 as a DLT carrier, as was the British-built *Pretoria Castle* in August 1943 as a trials carrier.¹³⁹

Additionally, one of the eight and three new escort carriers were undergoing modification to TPCs,¹⁴⁰ one of the eight was undergoing urgent repairs,¹⁴¹ and two new escort carriers were working-up.¹⁴² Moreover, it ignored the very effective MAC ships, all deployed exclusively as TPCs between North America and Britain, three of which were operating by the date of the report; furthermore, with much smaller crews, they reduced the extreme pressure on manpower.¹⁴³ While no U-boats were sunk by aircraft from MAC ships, their effectiveness can be gauged by the fact that of 217 convoys accompanied by one or more MAC ships, only one convoy was successfully attacked.¹⁴⁴

Additionally, little account was taken of another key use of escort carriers, namely ferrying US-manufactured aircraft to forward areas across the Atlantic and Pacific, as the tempo of combat increased. As noted above, almost all escort carriers carried US aircraft on their initial Atlantic crossing to Britain, sometimes via North Africa.¹⁴⁵

¹³⁸ Roskill (1961b), p.472 for U-boat kills by type of Allied aircraft and ships

¹³⁹ Hobbs (2003), p.124 (*Ravager*); p.99 (*Pretoria Castle*)

¹⁴⁰ AL to BAD, 7 September 1943, ADM 1/12857, pp.20-24; Hobbs (2003). *Searcher, Striker, and Chaser* (*Chaser*, having supported HX.245 *en route*, arrived in Britain July 1943), becoming operational as TPCs for WAC in October and December 1943, and February 1944, respectively. *Pursuer*, arriving in Britain (August 1943) became operational as a TPC for WAC (February 1944), prior to becoming an assault carrier for the Home Fleet (March 1944)

¹⁴¹ AL to BAD, 7 September 1943, ADM 1/12857, pp.20-24; Hobbs (2003), p.27. *Archer* underwent defect rectifications in Devonport Dockyard (July 1943), followed by engine repairs in a Clyde shipyard which proved so major she was paid off into care and maintenance

¹⁴² Hobbs (2003), pp.70, 163. *Fencer*, as an assault carrier, was working-up 824 NAS for Alacrity (October 1943), before reverting to a TPC (November). *Tracker* was working-up 816 NAS, before becoming a DLT carrier (2 September), and joining 4th Escort Group in the North Atlantic as a TPC in the latter half of September 1943

¹⁴³ ADM 234/384, p.317; Hague (2000), pp.87; Hobbs (1996), pp.231-247; Mably (2004). MAC ship operational numbers increased to 19 by May 1944. For MAC ship complements (107-122 compared to British CVEs of 375-666): Hobbs (2013), pp.123-130; Lenaghan (1983), pp.47, 52

¹⁴⁴ ADM 234/384, pp.111-112

¹⁴⁵ Hobbs (2003), p.12. Vessels were typically non-operational with up to 90 aircraft in the hangar and on deck

As a series of exchanges in the Admiralty files show, shortages of ferrying capacity was a major problem, threatening to divert CVEs from other critical uses such as trade protection¹⁴⁶ and assault, with DOP arguing there could be no question of allowing the idea to become established that CVEs were the first line of aircraft ferry capacity.¹⁴⁷ As DOP observed, US aircraft manufacturers had substantially increased output with large surpluses awaiting shipment to FAA operational theatres, noting ‘we have come off second best to the RAF in competition for shipping space’; meanwhile, demand for FAA aircraft in many theatres had increased (a predicted 250% in Ceylon by February 1944). DOP warned of shortages in operational areas and that Britain’s inability to handle existing stocks risked America withholding future allocations. These shortages were exacerbated by the inability to lay down strategic reserves, which DOP argued was opposed by the Air Ministry, supported by Churchill, as it would impact on RAF-dedicated MAP output. In the short term it was necessary to examine any available ferry capacity including the two specialist aircraft transporters, (*Athene* and *Engadine*), the fleet carrier *Formidable*, and CVEs, prompting a discussion about using CVEs as quasi-MAC ships/ferries.¹⁴⁸ Despite the suggestion that a committee be formed to address the issue,¹⁴⁹ the files indicate the First Sea Lord made final determinations on escort carrier allocations as part of overall Admiralty efforts to anticipate fluctuating future operational requirements.¹⁵⁰

Analysis of the ‘AASSB Report’ and these exchanges illustrate the interlocking and conflicting demands made on deployment of CVEs, as well as uncertainty surrounding future operations during the period of this chapter. These issues were fundamental to the Admiralty’s deployment choices in the theatres discussed below.

¹⁴⁶ Note by DTD, 1 October 1943, ADM 1/13752. He noted severe shortages of CVEs in TPC roles, with currently only *Tracker* operating in the North Atlantic and *Battler* proceeding to the Indian Ocean

¹⁴⁷ Note by DOP, 3 October 1943, ADM 1/13752

¹⁴⁸ Note on behalf of DNAO, 7 October 1943, ADM 1/13752

¹⁴⁹ Note by DAUD, 15 October 1943, ADM 1/13752

¹⁵⁰ For example: Admiralty plans in ‘Provision of aircraft carriers for named operations in 1943’, 4 June 1943, ADM 1/14806; the First Sea Lord’s approval on 24 June of VCNS’s recommendations of 21 June 1943, ADM 1/14806

5.4.2 Atlantic

Whilst the destruction of Allied convoys remained critical to Hitler's strategy of tying down Allied resources and delaying the Second Front,¹⁵¹ the Allies continued their success against the U-boats, both during the 'lull' from May to September 1943 and when this ended on 19 September,¹⁵² with the Admiralty adopting increasingly offensive tactics. 27 German U-boats were sunk in the North Atlantic, including off Iceland and the Faeroe Islands, between June and August 1943, while British, Allied and neutral merchant vessels sunk fell to only 24, from 155 in the preceding three months,¹⁵³ and this trend continued. As noted, a new aspect of Allied success was the Admiralty's introduction of MAC ships for A/S trade protection in this theatre, with 14 ships (five grain and nine oil), operational by the end of 1943.¹⁵⁴

Trade protection (A/S and AA)

In September 1943 Doenitz resurrected his campaign against North Atlantic convoys, introducing innovative technology.¹⁵⁵ This was matched by further developments in the Allies' own A/S technology, including the Mark 24 mine and the highly effective R/P carried on escort carrier-borne aircraft such as the Swordfish.¹⁵⁶ Admiralty technological advances, including ULTRA, proved superior, and with increasing deployment of escort vessels, escort carriers, MAC ships and VLR maritime aircraft,¹⁵⁷ the Allies subdued the U-boats. The RN

¹⁵¹ Raeder and Dönitz (1990), pp.334-337. 'The Atlantic is my first line of defence in the West' (31 May 1943). Doenitz, now C-in-C *Kriegsmarine*, as well as *BdU*, had persuaded Hitler to expand U-boat production to 40 per month, overseen by Albert Speer

¹⁵² 'Progress Report on the U-boat War - September-October 1943', Memorandum by British COS(s), 7 November 1943, circulated 23 November 1943, Sextant, CCS 399/1, pp.85-92

¹⁵³ Roskill (1960b), pp.365-367, 389; Roskill (1962b), pp.469-471, 486. This compares to January-May 1943 North Atlantic sinkings: 59 U-boats; 228 British, Allied and neutral merchant ships

¹⁵⁴ ADM 234/384. 14 vessels are shown as operational on p.317, but p.146 shows *Empire MacKendrick* and *Alexia* as working-up

¹⁵⁵ 'Progress Report on the U-boat War - September-October 1943', Memorandum by British COS(s), 7 November 1943, circulated 23 November 1943, Sextant, CCS 399/1, pp.85-92; 'Report on Recent and Prospective Developments in Anti-Submarine Operations since "QUADRANT"', Memorandum by C-in-C US Fleet and CNO, 8 November 1943, circulated 18 November 1943, Sextant, CCS 399, pp.79-84. The Allies noted the introduction of German acoustic torpedoes (*Zaunkönig*), improved flak, and better radar-search equipment: see Milner (1989b), pp.62-63; Milner (2017), pp.55-59; Roskill (1960b), pp.37, 365-367, 388-389

¹⁵⁶ 'Report on Recent and Prospective Developments in Anti-Submarine Operations since "QUADRANT"', Memorandum by C-in-C US Fleet and CNO, 8 November 1943, circulated 18 November 1943, Sextant, CCS 399, pp.79-84. See also 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, p.3; Poolman (1988), pp.56-62; Roskill (1960b), p.24

¹⁵⁷ ADM 234/384, pp.133, 329. See also Hague (2000), pp.128, 135, 159. For example, in October 1943 *Biter* joined 7th Escort Group, and with *Tracker* (in 2nd Escort Group), covered convoys between North America and Liverpool

escort carriers on convoy duty were predominantly *Attacker* class,¹⁵⁸ escorting 29 Atlantic convoys between June and December 1943, either as part of the close escort or within Air Support Groups focusing on the North Atlantic and West Coast of Africa.¹⁵⁹ Doenitz's offensive in the North Atlantic continued until the end of May 1944, but became increasingly ineffective.¹⁶⁰

Between January and May 1944, 29 voyages by escort carriers protected 53 North Atlantic convoys and various other convoys in the vicinity of the Greenland air gap.¹⁶¹ This period also saw the first voyages of the British-built escort carriers *Nairana* (February 1944) and *Vindex* (March); *Campania* followed in June.¹⁶² These vessels, together with the British-built *Activity*,¹⁶³ covered convoys in the North Atlantic, Arctic, and off the West Coast of Africa.¹⁶⁴ *Vindex* was the first British escort carrier to operate exclusively as part of an RN Hunter-Killer Group along USN lines, free of responsibility for convoy protection. She carried Sea Hurricanes and night-flying Swordfish with the latest ASV Mark XI radar.¹⁶⁵

Reports during the first half of 1943 had noted the relative lack of success of British CVEs in sinking U-boats compared to their American counterparts.¹⁶⁶ However, it was not until May 1943 that WAC moved from the 'safe and timely' arrival of convoys as its priority to a more aggressive approach 'and intensified the offensive'.¹⁶⁷ Furthermore, documents show the Admiralty was hampered in the implementation of key policy recommendations by a lack of resources.¹⁶⁸ For example, despite recommendations from Admiralty conferences that

¹⁵⁸ ADM 234/384, p.329. *Attacker, Battler, Chaser, Fencer, Hunter, Ravager, Stalker, Striker, and Tracker*. The exceptions were the *Avenger*-class *Biter*, the aircraft repair ship *Unicorn* and, for one voyage, the CV *Argus* (ferrying aircraft to Gibraltar, with three Swordfish for A/S protection)

¹⁵⁹ *Ibid.*, p.329. This included *Fencer's* support of the military convoy to occupy Lagens airfield in the Azores

¹⁶⁰ Roskill (1960b), pp.388-389

¹⁶¹ ADM 234/384, page following p.329

¹⁶² *Ibid.*

¹⁶³ Hobbs (1996), p.32. *Activity*, previously a DLT carrier, became operational as an A/S escort carrier (January-August 1944)

¹⁶⁴ ADM 234/384, pp.139-141

¹⁶⁵ *Ibid.*, p.152

¹⁶⁶ 'Letter of Proceedings by Captain MacWilliam of Hunter', 14 April 1943, ADM 199/1039; 'Report of Proceedings by Captain Abel-Smith of Biter', 3 May 1943, ADM 237/112; 'Report of Proceedings by Macintyre, Commander, Escort Group B.2.', 30 April 1943, ADM 237/112

¹⁶⁷ Milner (2017), p.57

¹⁶⁸ ADM 234/384, pp.124-126. For example, recommendations regarding escort carriers with Support Groups followed the North Atlantic voyages of *Archer* and *Biter* during April and May 1943. As stated above, Captain Abel-Smith of *Biter* reported on 5th Escort Group's voyage (April 1943), which resulted in U-203's destruction; his recommendations included that five destroyers was the ideal number of surface vessels for Air Support Groups, three to protect the CVE and two to follow up ASDIC or air contacts

aircrews in trade protection escort carriers should be 'overborne' by up to fifty percent as soon as possible,¹⁶⁹ manpower shortages meant this was never achieved. US CVEs regularly held overbearing of pilots, and their fighter pilots were qualified for the Avenger TBR, thus being able to act as relief pilots.¹⁷⁰ US squadrons were disembarked between cruises and replaced after three or four A/S operations, allowing new squadrons to gain operational experience amongst experienced CVE crews.¹⁷¹ Wastage of British air crew on *Vindex* due to stress was so high that after three months of operations only about 35% of the original Swordfish crews remained.¹⁷²

RN shortages of manpower¹⁷³ contrasted with higher numbers of maintenance, repair and flight-deck crews on US CVEs, enabling the latter to carry more aircraft,¹⁷⁴ allowing a faster turnaround of combat aircraft, thus impacting on operational efficiency.¹⁷⁵ The RN was further handicapped by its shortage of US-built carrier aircraft, which could be accelerated off US-built British escort carriers; British aircraft could not, requiring reduced weapons load of such aircraft as the Swordfish in light winds.¹⁷⁶ Furthermore, even when the RN had US aircraft, their US-built escort carriers possessed only one accelerator/catapult, while three of the US *Bogue I* series (USS *Bogue*, *Card*, and *Core*) featured two accelerators,¹⁷⁷ greatly assisting strike forces becoming airborne quickly on sighting of a U-boat or enemy

¹⁶⁹ Ibid., p.124

¹⁷⁰ Ibid., p.143. USS *Core* carried 24 pilots for 18 aircraft on her first operational cruise

¹⁷¹ Ibid.

¹⁷² 'Report by CO of *Vindex*', 15 May 1944, ADM 234/384, p.156

¹⁷³ 'The Needs of the Navy', Memorandum by First Lord, 5 October 1942, War Cabinet Defence Committee (Supply), CAB 70/5, pp.1-8

¹⁷⁴ Hobbs (2003), pp.188-194; Hobbs (2013), pp.133-153; Terzibaschitsch (1981), p.202. 21 aircraft could be carried in the US *Long Island* class; 10-15 in the comparable British *Archer* and *Avenger* classes; 28 in the US *Bogue I* class; 18-24 in the comparable British *Attacker* class; 28 in the US *Bogue II/Prince William* class; and up to 26 in its British counterpart (the *Ruler* class). Both navies often operated with fewer aircraft. This was particularly true of British escort carriers, reflecting shortages of aircraft and aircrew, as well as flight deck and air maintenance crews

¹⁷⁵ Morison (1956), p.39. British flight-deck crews numbered 20 versus 80 on a comparable US CVE

¹⁷⁶ ADM 234/384, p.121. Lack of wind forced the Swordfish to fly sorties with only two 40-pound anti-personnel bombs, rather than the standard two 250-pound depth charges

¹⁷⁷ Terzibaschitsch (1981), pp.36, 61, 128, 202. The US *Sangamon* class (four vessels) had a second accelerator fitted in late autumn 1944; the US *Casablanca* class possessed one. The US *Commencement Bay* class possessed two accelerators; ten such vessels were commissioned before VJ Day

aircraft.¹⁷⁸ Interestingly, these three *Bogue* / series vessels led many of the US Hunter-Killer Groups in the Atlantic during 1943.¹⁷⁹

The maintenance of aircraft radar and radio sets similarly suffered because of a shortage of maintenance technicians on British escort carriers,¹⁸⁰ contributing to the latter spending more time in dockyards between operations, where labour shortages exacerbated delays in returning ships to sea.¹⁸¹ Both aircraft and vessels suffered: a report on five *Attacker*-class CVEs noted a consensus that shortages of qualified engineering staff on board, together with inadequate engines and shortages of parts, caused an above-average time under repair.¹⁸² Manning issues also impacted on the training of ships' crews.¹⁸³

The quality of US naval aircraft was a further telling factor. Avenger torpedo bombers could return from sorties and land on the flight deck carrying their four 350-pounds A/S Torpex bombs, while in rough weather Swordfish aircrew found it was much safer to jettison their depth charges,¹⁸⁴ which risked exploding if the undercarriage gave way. Slower air speeds was an additional major problem, with the recommendation that the speed of a Swordfish's attack on a sighted U-boat be increased from 100 to 130 knots to reach the U-boat sooner and reduce its vulnerability to the latter's AA fire,¹⁸⁵ a higher speed potentially being a pragmatic compromise. A better combat proposition would have been the greater employment of Avengers with their forward machine guns and maximum air speed of about 230 knots.¹⁸⁶ However, no additional Avenger aircraft were available to the FAA during 1943

¹⁷⁸ ADM 234/384, p.142. The average time to get an aircraft aloft on US carriers was one minute; with up to six aircraft kept on deck, this permitted fast responses to sighting reports

¹⁷⁹ *Ibid.*, p.141

¹⁸⁰ *Ibid.*, p.145

¹⁸¹ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, Summary Page; Hobbs (2003)

¹⁸² 'An investigation into the employment of C.V.E.s', Directorate of Naval Operational Studies, Report 28/44, 31 March 1944, ADM 219/114, which examined five *Attacker*-class CVEs operating during August 1943-January 1944

¹⁸³ 'Note by Director of Gunnery and Anti-Aircraft Warfare', 3 November 1943, ADM 1/13077. Manpower shortages on escort carriers prevented adequate pre-commissioning training, and was held responsible for an accident on the escort carrier *Searcher*

¹⁸⁴ ADM 234/384, p.142

¹⁸⁵ *Ibid.*, p.125. Unfortunately, this exceeded the maximum speed of a Swordfish (ADM 219/95, p.3; Gunston (1978), p.99: both state 120 knots; ADM 234/384, p.125 states 124 knots)

¹⁸⁶ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, p.3

beyond the 575 delivered, while deliveries fell to only 186 in 1944,¹⁸⁷ a reflection of strong USN demand for this aircraft.

Archer's CO also recommended fitting R/P to Wildcat fighters, making a powerful combination with their 0.5-inch machine guns.¹⁸⁸ This was already being studied, the difficulty being finding production capacity to tackle large-scale modification of these US aircraft,¹⁸⁹ a by-product of the US procurement policy of uninterrupted mass production.

Nevertheless, other important initiatives were successfully introduced including a homing beacon, a Type 257 Blind Approach Beam System, increased stowage of depth charges, settings of IFF to indicate the tactical position of a U-boat, and endorsement of a single aircraft not attacking a surfaced U-boat until reinforced by a second aircraft.¹⁹⁰

Tactically, the Admiralty can also be given credit for the effective development of direction control exercised by escort carriers using fighter-direction techniques, long foreseen by naval aviators but first put into practice by *Archer* and *Biter* in 1943. It introduced:

...the Air Plot in which HF/DF bearings of U-boat transmissions, the positions of patrolling aircraft obtained by radar fixes, and the convoy position kept by the automatic plot were all used to give action information on the immediate U-boat situation from which air A/S counter measures could be quickly launched.¹⁹¹

Guidance regarding the conduct of escort carriers in convoys and the operation of Air Support Groups was inserted into the Atlantic Convoy Instructions on 12 August 1943 and, whilst allowing flexibility, underpinned much tactical conduct of escort carriers in trade protection.¹⁹² Feedback from experience was sought and disseminated, illustrated by C-in-C WAC issuing guidance on two CVEs operating in company and tactical bulletins in response to U-boat tactics, which changed from day to day.¹⁹³ Escort carrier deployment policy was

¹⁸⁷ 'Naval Stores', ADM 116/5813, p.161

¹⁸⁸ ADM 234/384, p.125

¹⁸⁹ *Ibid.*

¹⁹⁰ *Ibid.*, pp.124-125

¹⁹¹ *Ibid.*, p.124

¹⁹² *Ibid.*, p.125, Article 145

¹⁹³ Minutes of Conference on Operation of Aircraft from Escort Carriers, held at Derby House, 26 November 1943, ADM 1/13781

reviewed in September 1943 as more escort carriers and surface escorts became available, the most urgent deployments decided on according to the latest U-boat dispositions.¹⁹⁴

An important paper in November 1943 from Admiral Horton shows deep understanding of the tactical and strategic problems facing the Navy, centred on lack of manpower and modern aircraft.¹⁹⁵ The responses this paper received illustrate the severe political and operational constraints within which the Admiralty operated during this period. For example, Horton noted the superior operational characteristics of US naval aircraft¹⁹⁶ and the much larger reserves of aircrews on US carriers (50%) as to British (10%), while the US squadron commander was 'free of all organising, clerical and maintenance duties and can devote his whole time to the supervision and training of his crews in operational requirements' and the CO and Executive Officer of the US carrier were experienced naval aviators,¹⁹⁷ with an impact on weapons training.¹⁹⁸ This contrasted with the RN, where manpower shortages included senior naval aviators,¹⁹⁹ the seeds of which stretched back to 1918 when the RNAS passed to the RAF.

Horton attributed the delays in getting the Mark 24 mine into operation some 10 weeks behind the US to the delays in British carriers reaching Britain; he noted further delays because of the 'varied operational purposes for which our carriers are required', causing a refit he suggested of nine weeks on arrival in Britain (although this was rarely achieved). Horton deemed flight-deck lengthening and the installation of fighter-direction equipment 'essential before employment as Assault Carriers', with the lengthened flight deck necessary

¹⁹⁴ 'Anti-U-Boat Escort Carrier Requirements', Appreciation by DAUD, 23 September 1943, ADM 1/12731

¹⁹⁵ 'Employment of British and American Escort Carriers in Anti-U-Boat Warfare', Paper from C-in-C WAC to Secretary of the Admiralty, 7 November 1943, ADM 1/12865, pp.5-7

¹⁹⁶ Ibid. He noted the above-mentioned incompatibility of US-built British CVEs' catapults with British aircraft, thus making the latter dependent on wind speed for take-off with full weapon loads, which contributed to a 'marked loss of fighting efficiency', and the relatively weak undercarriage of British aircraft. Furthermore, Martlets (Wildcats) were fitted with 'droppable' tanks ensuring similar endurance to Avengers, enabling the two aircraft to 'patrol continuously in company'; this was unlike British aircraft, where fighters had to be flown off after a reported sighting, thus reducing the effectiveness of anti-U-boat attacks. Mention was also made of the Wildcats' folding wings, allowing more aircraft to be carried

¹⁹⁷ Ibid., p.6

¹⁹⁸ ADM 234/384, p.145: unsurprisingly, it was reported that the 'US carriers' air crews' standard of weapon training was, in 1943 at least, superior to ours'

¹⁹⁹ Morison (1956), p.39. British escort carriers were not commanded by naval air officers, since 'none of sufficient seniority were available'

until Martlets could replace 'other types of fighter aircraft'²⁰⁰ (presumably a reference to the British Sea Hurricanes' and Seafires' incompatibility with US catapults). Regarding the relative success of US escort carriers, he noted that the U-boats had moved from the northern Atlantic convoy routes, where the RN was operating, to an area off the Azores, where they had not 'previously been subjected to air attack and therefore may have relaxed full precautions'. It was here that *BdU* arranged for many U-boats to rendezvous with U-tankers, making this the 'best possible hunting ground' as both types of U-boat were vulnerable to attack, accentuated by America's extensive use of ULTRA.²⁰¹

Horton's key recommendation was to raise the manning levels of British escort carriers, even if it meant fewer being operational, thereby enabling British carriers, currently at sea for 16 or 18 days, to match American carriers continuously operating for 33 to 40 days and thus having longer periods in contact with the enemy. He also suggested that some carriers be designated exclusively for trade protection, so presumably ensuring a greater degree of specialisation in both carrier and aircrew. He recommended British fighters were replaced by Martlets (Wildcats) equipped with droppable tanks, and that Swordfish were replaced by Tarpon (Avenger) aircraft 'at the first opportunity'.²⁰² Additionally, Horton recommended British carriers' complement of aircraft match that of American carriers at 12 Avengers and eight or nine Wildcats.²⁰³

Whilst Horton's analysis was excellent,²⁰⁴ his key recommendations were unrealistic given the Admiralty's constraints, evident in comments on his paper. Rear Admiral Reginald Portal,²⁰⁵ ACNS (Air), referred to the 'lavish scale' of US CVEs and their equipment, which Britain could not match; that there was 'little prospect of meeting the requirement for more Martlets in view of our fighter commitments in the Far East'; and warned of 'severe repercussions in USA' of reducing British escort carrier numbers to increase manning,

²⁰⁰ 'Employment of British and American Escort Carriers in Anti-U-Boat Warfare', Paper from C-in-C WAC to Secretary of Admiralty, 7 November 1943, ADM 1/12865, p.6

²⁰¹ Ibid. For ULTRA and signals intelligence: Erskine (1995, 2004); Ferris (2020); Gardner (1999); Hinsley (1991); Soybel (2005); Winton (1988)

²⁰² 'Employment of British and American Escort Carriers in Anti-U-Boat Warfare', Paper from C-in-C WAC to Secretary of Admiralty, 7 November 1943, ADM 1/12865, p.6

²⁰³ Ibid., p.7

²⁰⁴ ADM 234/384, pp.142-145. Explanations of the comparative performance is confirmed in the *Naval Staff History* (published 1956)

²⁰⁵ Richards (1977), p.12; Roskill (1960b), p.362. Appointed 1 January 1943, Reginald was brother to Charles Portal, CAS

instead suggesting operating the carriers in pairs, which was being investigated ‘from the tactical point of view’.²⁰⁶ Comments recorded in the files show a lively debate on multiple escort carriers operating in company, the need for modern US aircraft, and concern regarding the political risks of reducing the number of operational escort carriers in order to raise manning levels.²⁰⁷

Whilst clearly many of the recommendations could not be implemented, the Admiralty floated the idea of two CVEs operating together in support of one convoy in a reply to Horton, noting the severe strain on flyers and maintenance crews of one carrier operating by both day and night. He was asked to compare the use of one and two carriers, taking into account the problems associated with smaller complements of aircraft (and by implication men) currently available in RN escort carriers.²⁰⁸ Such arrangements were expected to reduce stress for night flyers, leading to an increase of over 100% in ‘thoroughness and continuity of search’ activity, improvements in maintenance, economy in surface escorts to the carriers while the ‘refuelling of close escorts and hunting groups would be expedited’.²⁰⁹ This idea of two carriers working together would be implemented in early spring 1944 as more escort carriers became available and its success proven on the Atlantic, Arctic, and Gibraltar-UK trade routes, with aircraft suitable to counter the different threats posed in these theatres.²¹⁰ 1 April 1944 saw C-in-C WAC deploy five CVEs for trade protection and by mid-April the use of CVEs in Air Support Groups.²¹¹ Similar tactics had been seen in 1943 when the USN’s Tenth Fleet deployed multiple CVEs acting in concert if the number of U-boats justified the allocation; witness the use of USS *Bogue*, *Core*, *Santee*, and *Card* during

²⁰⁶ Handwritten response to Horton’s paper by ACNS (Air), 12 November 1943, ADM 1/12865, p.3. ACNS (Air) refers to an AU meeting (11 November 1943) at which the main points in this paper were discussed. The minutes refer to a full discussion (ADM 205/30, pp.87-89)

²⁰⁷ Response to Horton’s paper by DAWT, November 1943, ADM 1/12865, p.10; Minute by DAUD, 18 November 1943, ADM 1/12865, pp.11-12; Comments by DNAO, 23 November 1943, ADM 1/12865, pp.12-14; Comments by DAE, 25 November 1943, ADM 1/12865, p.14; Minute by DOP, 3 December 1943, ADM 1/12865, p.15; Minute by DAWT, 17 December 1943, ADM 1/12865, p.16

²⁰⁸ AL from FW Mottershead to C-in-C WAC, 16 November 1943, ADM 1/12731

²⁰⁹ ADM 234/384, p.156

²¹⁰ For example, ‘Battle Summary No. 51’, ADM 234/370, pp.64-71: *Nairana* and *Activity* worked with the 2nd Support Group by which six U-boats were sunk (January-February 1944). *Striker* and *Fencer* supported convoys as part of 16 Escort Group; a Swordfish from *Fencer* sank U-666 on 10 February 1944 (Hobbs (2003), p.71)

²¹¹ ADM 234/384, pp.157-158. *Activity*, *Biter*, *Nairana*, *Striker*, and *Vindex*. The Admiralty had learnt that Air Support Group operations near convoys were ‘far more profitable than the systematic search of an area but with the important proviso that current enemy tactics must include the concentration of U-boats on the convoy routes’

July 1943, aggregating almost 100 Wildcat, Avenger, and Dauntless aircraft, all screened by 12 destroyers.²¹²

Horton's paper and the responses illustrate the Admiralty's keen awareness of the issues overshadowing deployment of escort carriers in the Atlantic. However, the improvements proposed were largely beyond the Admiralty's control. They would have required a considerable increase in resources, only available from the Cabinet and clearly not forthcoming, and the proposed mitigations were operationally or politically unacceptable. For example, at this stage, given the MAC ships' success, it might have been possible to operate with fewer, better manned, escort carriers, designated to only one application. However, this would have undermined the Admiralty's need for flexible redeployment of individual escort carriers able to meet its unpredictable future obligations, while clearly political considerations regarding American sensibilities forestalled reducing the number of escort carriers in use.

The Admiralty's constraints were also apparent in a detailed analysis by the Directorate of Naval Operations in February 1944, which examined the efficiency of British and US CVEs in anti-U-boat operations.²¹³ It showed more sightings of U-boats by US vessels, attributed to more time at sea, apparently explained by labour shortages in British yards; while British Air Support Groups focused on convoy protection,²¹⁴ US CVEs often operated as Hunter-Killer Groups in the Atlantic.²¹⁵ Further, US CVEs enjoyed higher productivity with more hours flown per day at sea, flying on more days and flying longer sorties,²¹⁶ with lower wastage rates - the weaker undercarriage on British aircraft being the primary reason for the disparity.²¹⁷ Additionally, US Avenger aircraft were much faster than Swordfish and so more able to catch the U-boat on the surface, while attacks were followed up with greater use of

²¹² Farago (1962), p.199

²¹³ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95

²¹⁴ ADM 234/384, pp.140-142, 329. British CVEs were more tightly controlled by C-in-C WAC

²¹⁵ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, p.1. See also Buell (1980), pp.111-310; King (1946), pp.12-16, 31-37, 77-88, 146-150, 168-170, 196, 234-235; King and Whitehill (1953), pp.120-269; Turnbull and Lord (1949), pp.303, 311-323

²¹⁶ 'Achievements of British and US Escort Carriers', Directorate of Naval Operational Studies, Report 9/44, 12 February 1944, ADM 219/95, p.2. USN aircraft flew 3.5-hour sorties compared to RN 2.25, explained by greater endurance of US aircraft, 'exaggerated' by use of catapults, permitting aircraft with heavier fuel loads to be flown-off

²¹⁷ *Ibid.*, pp.2-3. The USN suffered one aircraft lost/damaged in 100 sorties, the RN seven

multiple aircraft and the Mark 24 Mine.²¹⁸ Consequently, the number of U-boats sunk/probably sunk was seven times higher from US than British CVEs.²¹⁹ The report clearly shows the Admiralty's understanding of the limitations of their escort carriers, which were largely due to factors beyond their control. Furthermore, another key recommendation that the Swordfish be replaced by the Avenger was unachievable given shortages of the US-built aircraft.²²⁰ Indeed, the Admiralty had noted in November 1943 that it could not even increase the complement of Swordfish in escort carriers without stripping them from MAC ships.²²¹

Clearly, comparison of RN and USN performance of US-built escort carriers can be invidious. The USN's vessels were built from inception to higher specifications²²² to allow deployment as assault carriers, supporting amphibious landings, primarily in the Pacific, as well as TPCs. As discussed above, 'the US ships were bigger and faster with more aircraft and much better aviation equipment'²²³ and, critically, supported by much larger crews,²²⁴ underlining the RN's manpower shortages. The disparity between British and American CVE performance was clearly seen in 1943, when US CVEs' aircraft sank 24 U-boats in the Atlantic, compared with three by their British counterparts, the latter often in conjunction with surface warships; the comparable figure for 1944 was 17 U-boats sunk by both nations.²²⁵ Later, individual RN Hunter-Killer Groups with escort carriers gained comparable levels of success

²¹⁸ *Ibid.*, p.3. While A/S attack techniques were similar in both navies, with initial strafing of the U-boat by the fighter, followed immediately by bombing from the second aircraft (usually an Avenger), the latter's pilot controlling the synchronisation of the attack by R/T, the RN suffered from a shortage of aircraft and manpower

²¹⁹ *Ibid.*, pp.3-4

²²⁰ Note by DNAO, 23 November 1943, ADM 1/12865, pp.12-14; AL to C-in-C WAC, 22 January 1944, ADM 1/12865, pp.31-32

²²¹ Note by DNAO, 23 November 1943, ADM 1/12865, pp.12-14, reports the expected status of escort carriers and their aircraft up to mid-February 1944. The shortages were further enumerated in AL to C-in-C WAC, 22 January 1944, ADM 1/12865, pp.31-32

²²² Terzibaschitsch (1981), pp.200-202. See also Brown (1983a), pp.21-22; Central Statistical Office (1995), p.225 (the exchange rate was fixed in 1940 at £1: US\$4.03): costs differed widely: *Activity* cost £850,000, *Campania* £1.52m; the *Commencement Bay* class of the USN cost US\$11m (£2.72m) each

²²³ Brown (1983a), p.22. See also Hobbs (2013), pp.117, 119; Terzibaschitsch (1981), pp.200-202. The British *Nairana*, *Vindex*, *Campania*, and *Pretoria Castle* had twin screws like *Activity*, giving superior manoeuvrability over earlier US-built carriers (*Long Island* and *Bogue* classes) operated by the RN; but all the later US classes (*Sangamon*, *Casablanca*, and *Commencement Bay*) enjoyed better propulsion systems, heavier armaments, more aircraft, and more personnel

²²⁴ Terzibaschitsch (1981), p.202; Hobbs (2013), pp.133, 139, 153. The US *Long Island* class carried 970 men; the British *Archer/Avenger* comparable classes 555 men. The US *Bogue* classes carried 890 men; the British *Attacker* and *Ruler* classes 646

²²⁵ ADM 234/384, pp.333-338

against U-boats,²²⁶ as the aircrews gained similar skills in spotting U-boats and leading the highly-experienced crews of the surface escorts to their quarry.

5.4.3 Arctic and Norway

Trade protection (A/S and AA)

Russia convoys remained strategically important throughout the period of this chapter,²²⁷ but the combination of unsustainable losses during the longer Arctic days of summer and the pressing, competing needs in the North Atlantic for convoy escorts, forced their suspension in March 1943 until November,²²⁸ while Operation Neptune (the naval component of Overlord) forced a further suspension from May 1944 until August.²²⁹ The resumption in November 1943 was followed by the Admiralty's successful development of new tactics, enabled by the greater availability of escort carriers, modified for Arctic usage.²³⁰

Following the sinking of *Scharnhorst* (26 December 1943), which had attempted to intercept convoy JW.55B,²³¹ and the damage to *Tirpitz* following an attack by RN midget submarines (22 September 1943),²³² the Admiralty increased convoy sizes significantly, with JW.57 (February 1944) comprised of 42 merchantmen and a tanker.²³³ This also saw a new concept in escort tactics, with a strong surface escort group of 17 destroyers supplemented by a light

²²⁶ ADM 234/384, pp.147-149; Milner (1989b), p.63. For example, Captain Johnny Walker's 2nd Escort Group sank 16 U-boats between June 1943-May 1944, six on a single cruise in January-February 1944 when the group was joined for a period by *Activity* and *Nairana*; although their aircraft did not achieve any kills on this occasion, the Admiralty files record that they assisted in keeping the U-boats down with no merchant ships lost, while driving off enemy reconnaissance aircraft. The increased availability of two CVEs in a Support Group allowed the employment of Avenger aircraft for day A/S patrols from one carrier while Swordfish, fitted with the new ASV Mark X or XI sets, carried out night patrols from the other

²²⁷ 'Conduct of the War in 1943', Memorandum by the CCS, 19 January 1943, Casablanca, CCS 155/1, p.18; 'Implementation of Assumed Basic Undertakings and Specific Operations for the Conduct of the War, 1943-1944', Report by the Combined Staff Planners, 26 August 1943, Quadrant, CCS 329/2, p.332

²²⁸ Ruegg and Hague (1993), p.55. See also Mawdsley (2019), pp.316-321; Roskill (1960a), pp.303-324, 351-364. Whilst, as Motter (1952) notes, the importance of the 'Persian Corridor' is often overlooked by historians, supplying Russia via Persia was slower and required more shipping; however, 70% of aid to Russia went via this route (Hague (2000), p.187)

²²⁹ Ruegg and Hague (1993), p.65

²³⁰ ADM 234/384, p.206. The RN undertook the 'Arcticization' of escort carriers, with particular emphasis on British-built vessels. See Poolman (1988), p.105: Arcticization included steam heating at all gun mountings, flying stations, catapult and barrier machinery, as well as arrester wire sheaves

²³¹ 'Battle Summary No. 22', ADM 234/369, pp.111-114; Ruegg and Hague (1993), pp.57-58

²³² Langenberg (1981), pp.87-88. *Tirpitz* was non-operational for six months in Norway's fjords, but the extent of her damage was unknown to the Admiralty and she maintained her strategic importance as a 'fleet in being' (see Benbow (2017), p.278)

²³³ Ruegg and Hague (1993), p.61

cruiser, *Black Prince*, specifically tasked to control aircraft operations from the escort carrier *Chaser* (Attacker class), which had embarked 816 (Swordfish/Wildcat) NAS and was operating from within the convoy.²³⁴ *Chaser's* Wildcats drove off air shadowers. The only Allied loss was the destroyer *Mahratta* to U-990, while the enemy lost two U-boats.²³⁵

On 4 March 1944, as part of the return convoy (RA.57), a Swordfish from *Chaser*, with three-inch R/P missiles, badly damaged U-472 which the escort destroyer *Onslaught* then sank. The next day another of *Chaser's* Swordfish sank U-366, and on 6 March U-973 was sunk by a third Swordfish, both with R/P missiles, while two other U-boats were damaged.²³⁶

The winning formula of air cover and strong close escort was further enhanced following a meeting in London regarding the next convoy (JW.58, which left Loch Ewe on 27 March 1944 with 50 merchantmen)²³⁷ when the strong close escort was reinforced by two Western Approaches' Escort Groups together with the cruiser *Diadem* and two escort carriers, *Tracker* (Attacker class) and the British-built *Activity*.²³⁸ Air activity was intense, fighters destroying six long-range shadowers²³⁹ while *Tracker's* Avenger aircraft of 846 (Avenger/Wildcat) NAS shared with a surface escort the sinking of U-355, and shared with *Activity's* 819 (Swordfish/Wildcat) NAS the sinking of U-288. Three further U-boats (U-362, U-673, and U-990) were damaged, without loss of escorts or merchantmen,²⁴⁰ although four aircraft were lost.²⁴¹

The return convoy (RA.58) on 7 April 1944 passed uneventfully, unsighted by U-boats, the threat of *Tirpitz* temporarily removed by Operation Tungsten carried out by the FAA on 3 April.²⁴² The neutralisation of this major surface vessel for a period enabled CVEs escorting Russia convoys to focus on their anti-submarine and air defence roles.

²³⁴ Hobbs (2003), p.58; Roskill (1960b), p.270; Ruegg and Hague (1993), pp.61-62

²³⁵ Ruegg and Hague (1993), p.62

²³⁶ Hobbs (2003), p.59; Roskill (1960b), p.271

²³⁷ Hague (2000), p.189. Hobbs (2003), pp.18, 165, states 48 ships

²³⁸ ADM 234/384, pp.204, 210-211; Ruegg and Hague (1993), p.63. As one escort carrier was insufficient to deter enemy air and submarine attacks on Arctic convoys, from March 1944 the availability of CVEs allowed the Admiralty typically to deploy at least two

²³⁹ Hobbs (2003), p.165; Roskill (1960b), pp.272-273. Wildcats shot down three FW 200s, two Ju88s, and one Bv 138

²⁴⁰ Hobbs (2003), pp.165, 194; Ruegg and Hague (1993), p.63

²⁴¹ ADM 234/384, pp.212-213

²⁴² *Ibid.*, pp.215-222

The next convoy (RA.59) with 43 merchantmen left Kola Inlet on 28 April 1944 with the now standard strong surface escort (well over 20 ships), cruiser *Diadem* and two escort carriers, *Activity* and the *Attacker*-class *Fencer* sailing in column six of the convoy.²⁴³ *Fencer's* Swordfish from 842 NAS sank three U-boats (U-277, U-674, and U-959),²⁴⁴ all with depth charges, and although one merchant ship was lost, the escort carriers underlined their tactical superiority over U-boats, and RA.59 reached Loch Ewe on 6 May 1944 without further loss from a wolf pack of twelve U-boats.²⁴⁵

The Admiralty's deployment of escort carriers on this trade route demonstrated the benefit in tactical efficiency from operating two escort carriers simultaneously in trade protection, together with a strong close surface escort,²⁴⁶ further laying to rest the long-held myth that an 'offensive' posture of hunting groups dashing across the oceans improved on the 'defensive' one with U-boats drawn to the convoy and their destruction.²⁴⁷

Assault (anti-shipping)

During this period, this theatre increasingly required CVEs operating as assault carriers, often deployed with fleet carriers, in Allied attacks on Norwegian ports and shipping lanes. These raids were designed to disrupt German convoys running between northern Norway and Germany, and heighten German fears of an invasion of Norway (Operation Fortitude North).²⁴⁸

In a further example of their versatility, in early April 1944, four escort carriers (*Emperor*, *Fencer*, *Pursuer*, and *Searcher*) assisted the fleet carriers *Victorious* and *Furious* in another attack on *Tirpitz*, which crippled the battleship,²⁴⁹ thus reducing pressure on the Admiralty

²⁴³ Ruegg and Hague (1993), pp.64-65 state 43 merchantmen; Roskill (1960b), p.280 states 45

²⁴⁴ 'Report from CO *Fencer* to Secretary of Admiralty', 5 May 1944, ADM 217/103; Roskill (1960b), p.280. Roskill notes that *Activity's* experienced aircrew had been transferred in preparation for Neptune, their replacements lacking the experience of *Fencer's* aircrew

²⁴⁵ Hague (2000), p.189; Roskill (1960b), p.280; Ruegg and Hague (1993), pp.64-65

²⁴⁶ AL to C-in-C WAC, 16 November 1943, ADM 1/12731, which followed a series of Admiralty papers based on USN experience in the Pacific operating carriers in groups (ADM 1/15576, February 1943 and subsequent dates)

²⁴⁷ Roskill (1960b), p.265

²⁴⁸ Hinsley (1993), p.400. See also Hesketh (1999) and Maps 2 and 3 below

²⁴⁹ 'Operation Tungsten, HMS *Victorious* Report', 5 April 1944, ADM 1/15806. A letter from CO of HMS *Victorious* to Vice Admiral Second in Command Home Fleet, refers to the 'magnificent performance' of the escort carriers' fighter aircraft; see also ADM 234/384, pp.215-222

and allowing reinforcement of the Eastern Fleet to proceed,²⁵⁰ and removing a major threat to Neptune.

Later in April, Operation Ridge Able saw an attack on enemy shipping near Bodo by aircraft from *Victorious* and *Furious*, supported by escort carriers (*Emperor*, *Pursuer*, *Searcher*, and *Striker*), resulting in three ships sunk and a fourth damaged. Similar attacks took place with three escort carriers (*Emperor*, *Searcher*, and *Striker*) striking at various shore establishments in early May,²⁵¹ followed by an anti-shipping strike (by *Emperor* and *Striker*) at Rorvik.²⁵²

5.4.4 Mediterranean

The pressure to deploy escort carriers beyond trade protection increased as the Allies went on the offensive, with carriers from the Atlantic needing to be redeployed to the Mediterranean.²⁵³

In August-September 1943 four *Attacker*-class escort carriers (*Attacker*, *Battler*, *Hunter*, and *Stalker*), sailed for the Mediterranean, having undergone modifications to become fighter and assault carriers.²⁵⁴ These vessels joined *Unicorn* as part of *Avalanche*, providing fighter cover for Allied landings in Italy on 9 September 1943.²⁵⁵ They formed part of Force V²⁵⁶ controlled by the cruiser flagship *Euryalus*, and operated *Seafire* air groups flying 713 sorties during 42 daylight hours, over half of Allied air effort over the beach.²⁵⁷ This operation illustrated the value of escort carriers in combined operations²⁵⁸ but also some of the difficulties inherent in being under-resourced: besides ten combat losses, 32 *Seafires* were

²⁵⁰ Roskill (1960b), p.267

²⁵¹ Hobbs (2003), p.63. Operation Hoops involved an anti-shipping strike between Gossen and Kristiansand North, oil tanks at Kjejn, and a fish-oil factory at Fossevagg. See Map 3 below

²⁵² *Ibid.*, p.64

²⁵³ 'Symbol - Final Report to the President and Prime Minister', 23 January 1943, Casablanca, CCS 170/2, p.118; 'Strategic Concept for the Defeat of the Axis in Europe', Note by the Secretaries, 17 August 1943, Quadrant, CCS 303/3, pp.87-88. This campaign is covered by Cunningham (2006), pp.19-138, 269-296; Mawdsley (2019), pp. 328-349; Roberts (2018), pp.762-822; Roskill (1960a), pp.279-302, 325-338

²⁵⁴ Hobbs (2003)

²⁵⁵ ADM 234/384, p.130; Hobbs (2003), p.44; Roskill (1960b), p.3

²⁵⁶ 'Lessons from *Avalanche*', 20 October 1943, ADM 1/12640; Roskill (1960b), p.165: the CVs *Illustrious* and *Formidable* (part of Force H) were 'to provide fighter cover over an escort carrier force which in turn was providing cover over the assault beaches and shipping'. *Avalanche* illustrated how CVs and CVEs worked increasingly well together

²⁵⁷ 'Report by Staff Officer (Air) to C-in-C Eastern Fleet', Appendix A, 30 October 1943, AIR 23/2512; Hobbs (2003), p.44

²⁵⁸ AM to C-in-C Eastern Fleet, 23 October 1943, ADM 1/12640

damaged beyond repair mostly through deck-landing crashes, due to the slow speed of the escort carriers, insufficient pilot training in deck landing, and the aircrafts' weak undercarriage.²⁵⁹ Following review, the Admiralty recommended exercises in manoeuvring a formation of escort carriers and more pilot training, with one suggestion for a new type of vessel, a carrier task-force flagship.²⁶⁰

Whilst 14 U-boats were reported in the Mediterranean in November 1943, with German efforts at reinforcements continuing,²⁶¹ there was no further deployment of escort carriers here until summer 1944, a measure of the trade-offs necessary given the urgent need for these versatile vessels in the Atlantic, Arctic, Norwegian Sea, and Indian Ocean. It was, as ever, a matter of priorities.

5.4.5 Indian Ocean

Trade protection (A/S and anti-raider)

In its deployment of escort carriers in the Indian Ocean the Admiralty faced familiar problems. Firstly, the agreed strategy of 'Germany First' meant the timing of a build-up of forces in this theatre was both uncertain and subject to priorities elsewhere.²⁶² Secondly, although 'all focal areas' in the Indian Ocean 'can be considered as "soft spots"' for German U-boats, it was recognised by DAUD that compromises between 'defensive close protection' and 'offensive means of destroying U-boats' were required, given 'the heavy German threat in the Atlantic'.²⁶³ The proposed policy was that Air Support Groups with escort carriers should be established, preferably using vessels or crew with WAC training and experience of A/SW.²⁶⁴ Meanwhile, to 'economise its overstretched anti-submarine resources', the Admiralty used ULTRA intelligence to assist in the assessment of convoy routes and protection required.²⁶⁵

²⁵⁹ Roskill (1960b), pp.173-174

²⁶⁰ 'Lessons from Avalanche', 20 October 1943, ADM 1/12640. The need for a flagship was accepted, with the flag officer flying his flag on a cruiser at Dragoon, and subsequently embarking on one of the carriers, as seen during later Arctic convoys (see Woodman (1994), p.409)

²⁶¹ 'CCS Progress Report on the U-boat War – September-October 1943', Memorandum by British COS(s), 7 November, circulated 23 November 1943, Sextant, CCS 399/1, p.86

²⁶² AM to C-in-C Eastern Fleet, 16 July 1943, ADM 1/13050

²⁶³ 'U-boat threat in the Indian Ocean', Appreciation by DAUD, 19 August 1943, ADM 1/12590, paragraphs 18, 30

²⁶⁴ 'U-boat threat in the Indian Ocean', Appreciation by DAUD, 4 September 1943, ADM 1/12590, paragraphs 38, 41

²⁶⁵ Hinsley (1984), p.219. For details of the Operational Intelligence Centre (OIC) see Beesly (2000)

Somerville's fleet was able to move back from Kilindini to Colombo in September 1943, but was weak and 'unbalanced in composition', having no aircraft carriers until *Battler*, released after *Avalanche*, was deployed to Bombay²⁶⁶ to address an outbreak of sinkings.²⁶⁷ *Battler* escorted convoys on the Aden to Bombay route between November 1943 and January 1944 with Swordfish/Seafire/Wildcat aircraft of 834 NAS, before conducting A/S sweeps off East Africa and Madagascar.²⁶⁸

As the RN went on the offensive, strategic demands in the Indian Ocean saw the arrival of a British battle squadron of three battleships and the CV *Illustrious*, together with attendant escort vessels at Trincomalee at the end of January 1944,²⁶⁹ while CVEs began playing greater roles in both offence and defence. However, manpower shortages were again in evidence.²⁷⁰

Battler was deployed offensively following the sinking of six independently-routed merchant ships at the end of January 1944, mostly by German U-boats operating in the Gulf of Aden and north of the Maldives, with losses continuing to rise.²⁷¹ The decision was taken to focus on the U-boat supply surface tankers, *Charlotte Schlemann* and *Brake*, with the former sunk on 12 February 1944.²⁷² March saw *Battler* with cruisers *Newcastle* and *Suffolk*, and destroyers *Roebuck* and *Quadrant*, hunting *Brake*, which was sighted (with two U-boats refuelling) by a Swordfish aircraft from *Battler* on the 12 March 1944. One U-boat was later damaged by a R/P attack from *Battler's* aircraft.²⁷³ *Roebuck* sank *Brake*,²⁷⁴ curtailing U-boat operations, and the Admiralty was able to reinforce trade protection capacity in May 1944

²⁶⁶ 'U-boat threat in the Indian Ocean', Appreciation by DAUD, 4 September 1943, ADM 1/12590, p.8; Roskill (1960b), p.221. See Map 6 below

²⁶⁷ 'CCS Progress Report on the U-boat War – September–October 1943', Memorandum by British COS(s), 7 November, Sextant, circulated 23 November 1943, CCS 399/1, p.92. U-boats sank 12 ships in September–October 1943, greater than any other British theatre at this time

²⁶⁸ Hague (2000), p.109; Hobbs (2003), p.44

²⁶⁹ Roskill (1960b), pp.242–243, 335, 347–351. In March 1944 the main Japanese fleet (including five battleships, three fleet carriers and 18 cruisers) moved to Singapore

²⁷⁰ 'Statement on Employment and Reinforcement of A/S Escorts on the East Indies Station', from C-in-C Eastern Fleet to Admiralty, 6 November 1943; Response to DOP's minute of 14 January 1944, by Director of A/SW Division and DAUD, 28 January 1944, which stressed 'the importance of providing adequate bases, both for maintenance and training' of A/S escort forces. Both ADM 1/13050

²⁷¹ Roskill (1960b), pp.349–351. January–March 1944 saw 29 Allied ships lost (188,040 tons) in widely dispersed attacks, with only four German and Japanese U-boats sunk

²⁷² Hinsley (1984), pp.230–231. ULTRA was the source of the refuelling rendezvous intelligence

²⁷³ Hobbs (2003), pp.44–45; Lenton & Colledge (1964), pp.36, 44, 115; Roskill (1960b), pp.349–350

²⁷⁴ Hinsley (1984), pp.230–231; Hinsley (1993), p.387

with two new *Ruler*-class vessels, *Begum* and *Shah*, preparing to undertake A/S sweeps off Colombo and Trincomalee.²⁷⁵

Assault (anti-shipping and combined operations)

At the end of the period covered in this chapter, the Admiralty began to address the need for assault carriers to carry out air strikes on shipping and harbour installations in this theatre as well as support amphibious landings in combined operations now envisaged by the CCS and Mountbatten, the new Supreme Allied Commander, South East Asia.²⁷⁶

Atheling (*Ruler* class)²⁷⁷ spent April 1944 escorting convoys in the northern Indian Ocean, embarking 899 (Seafire) NAS and 890 (Wildcat) NAS to work up as an operational fighter carrier. She was joined by *Ameer*, another new *Ruler*-class vessel, which was converted to an assault carrier in a Clyde shipyard before sailing to join the Eastern Fleet in May 1944, arriving in Trincomalee on 27 June.²⁷⁸

5.5 Conclusion

This chapter examined a period which saw the demand for escort carriers intensify, and manpower shortages overshadow both procurement and deployment. A study of the major conferences showed the necessity for the Admiralty to respond to changing strategic objectives and uncertain timescales, with demand for these vessels in many theatres, in a variety of roles stretching from A/S, A/A and anti-raider convoy protection in mid-ocean to providing air support for amphibious landings, whilst also enhancing aircraft-ferrying capacity to meet the greater demand for offensive operations. Meanwhile, the 'Germany First' policy determined priorities and prevented early deployment to the Indian Ocean and Far East.

The analysis of official documents showed the Admiralty's dependence on the USN for an essential flow of CVEs, resulting from shortages of British labour and shipyard capacity. Those shortages caused delays in essential modifications of US-built carriers in British

²⁷⁵ Hobbs (2003), pp.48, 138-140, 189, 193: *Begum* with 832 (Avenger/Wildcat) NAS, and *Shah* with 851 (Avenger/Wildcat) NAS; Roskill (1960b), p.354

²⁷⁶ Roskill (1960b), p.214; Smith (2010), p.3

²⁷⁷ Hobbs (2003), p.29, newly arrived in Britain from Vancouver in January 1944 and immediately modified as a fighter carrier in a Clyde shipyard before sailing in early March 1944 ferrying aircraft *en route* to join the Eastern Fleet

²⁷⁸ *Ibid.*, p.21

shipyards, prompting a damning report by the AASSB in August 1943 threatening this vital supply line and challenging the Admiralty's policy of procuring multi-role escort carriers. As the analysis of this report and the Admiralty's response showed, the issue was one of resource allocation beyond the Admiralty's control or it required potential solutions that were operationally and politically unacceptable. However, the stop-gap measure of the MAC ships once again showed innovation in the procurement process delivering badly needed, if inferior, capacity.

Similarly, the FAA was shown to be increasingly dependent on US aircraft manufacturing, both in quantity and quality, although the Admiralty successfully developed a number of A/S weapons to optimise the use of the Swordfish. During this period the Admiralty once again suffered from Churchill favouring the RAF's expansion of Bomber Command, with the crisis over manpower shortages exacerbated by the decision to favour MAP and the RAF in the allocation of this essential resource. This impacted not only on shipyard labour but on the manning of British warships and the newly-arrived CVEs.

The analysis of deployment showed how, by the end of the period, the Admiralty's use of escort vessels, escort carriers and MAC ships, combined with VLR maritime aircraft and enhanced technology, contributed to the defeat of the U-boats in the North Atlantic. While the number of U-boat kills by ship-borne aircraft was relatively small, compared to those ascribed solely to escort vessels and to shore-based aircraft, this understates their value. Compared to shore-based aircraft, carrier-based aircraft could dominate the air space over and around the convoy, rearming and refuelling on the carrier to make repeated sorties, identifying and attacking U-boats beyond the range of surface radar. If forced to submerge, the U-boat was slower and vulnerable to attack by surface escorts, while the convoy was free to proceed.

Admiral Horton's study of deployment effectiveness comparing British and US CVEs showed how British effectiveness in the North Atlantic was overshadowed by a lack of manpower and modern US aircraft, whilst the replies to his proposals illustrated both the political and severe resource constraints under which the Admiralty operated. An analysis of two later studies by the Directorate of Naval Operational Studies in the Spring of 1944 confirmed Horton's analysis and the importance of manpower shortages, which contributed to the

frequency of repairs and delays in shipyards, together reducing time at sea and hence contact with the enemy. These studies also showed how shortages of modern US aircraft for much of this period left the Admiralty operating British aircraft which were less effective in both the A/S and A/A role and were incompatible with US-built carrier catapults, further impacting on operational effectiveness.

Finally, during the period under review the Admiralty moved from self-confessed ignorance of operating escort carriers in an assault role, to their second application at Salerno in September 1943, and a subsequent study of this application which confirmed the weaknesses of British naval aircraft.

This chapter highlighted one of the key dilemmas facing the Admiralty regarding escort carriers. The Admiralty could respond to a fluid and dynamic situation regarding strategic priorities and tactical needs by operating effectively, but inefficiently, with vessels being constantly reassigned to new roles with the inevitable interruption to operational capabilities; or it could efficiently allocate ships and shipyard capacity in a fixed and inflexible programme minimising time spent in shipyards but failing to be fully effective as a fighting force in a global alliance. The Admiralty correctly chose the former, but was unable to address fully the urgent need to increase manning levels of escort carriers, despite it being pressed for by Horton and others.

6. Chapter 6: Home Run: D-Day June 1944–September 1945

6.1 Introduction

This chapter examines the Admiralty's procurement and deployment of escort carriers from June 1944 to September 1945, when Japan unconditionally surrendered. It first considers strategic issues as the Admiralty pivoted from Europe to the Far East. It then examines procurement policies as manpower shortages and shipyard capacity continued to impact escort carrier conversion and maintenance, while vital modern aircraft supplies failed to meet even significantly reduced procurement targets.

Finally, the chapter assesses CVE deployment in this context of ongoing resource shortages in the final phases of the war, with the RN exploiting their flexibility to help meet new demands. CVEs were redeployed from the Atlantic to the Arctic, Norwegian Sea, Mediterranean, and Indian Ocean, achieving new successes in offensive roles. As resources shifted to the Pacific Ocean, CVEs then played multiple roles as the Navy became ever more dependent on ship-borne aircraft and an under-resourced Fleet Train to deliver the key political goal of participation in the final campaign against Japan, whilst learning a new type of warfare pioneered by the USN.

6.2 Strategic Overview

The Navy's role between June 1944 and August 1945 largely reflected the outcome of Sextant and Eureka at the end of 1943,¹ updated by agreements at the Octagon (12-16 September 1944)² and Argonaut (20 January-11 February 1945) conferences.³ The Normandy and southern France amphibious landings planned at Sextant enabled most German forces to be expelled from France by autumn 1944,⁴ coinciding with significant Soviet advances on the Eastern Front.⁵ Convoys to north Russia remained critical for supplying matériel to Russia,⁶ noted by Germany which reinforced its forces in northern

¹ 'Report to the President and Prime Minister', 6 December 1943, Sextant, CCS 426/1

² 'Report to the President and Prime Minister', 16 September 1944, Octagon, CCS 680/2

³ 'Report to the President and Prime Minister', 9 February 1945, Argonaut, CCS 776/3

⁴ 'Progress of Operations Report, Supreme Commander Allied Expeditionary Force', 9 September 1944, Octagon, SCAF 78, pp.3-5; Ehrman (1956b), pp.1-28

⁵ Beevor (2012), pp.586-616; Roberts (2012), pp.199-212

⁶ 'Resumption of Northern Convoys to Russia', US COS(s), 27 May 1944, CCS 580, and 17 August 1944, CCS 580/1. Both CAB 88/27

Norway with *Luftwaffe* torpedo bombers.⁷ This forced RN reinforcement of fighter carriers to improve A/A defences,⁸ whilst operations continued off Norway to destroy *Tirpitz* and maintain the threat of an Allied invasion.⁹ This threat resulted in some 400,000 German troops remaining in Norway until the European war ended,¹⁰ with fears of a 'large-scale landing' even featuring in the *Kriegsmarine* debate over releasing six *Schnorkel* U-boats for the Atlantic campaign in October 1944.¹¹ While RN capital ships redeployed to the Far East after the sinking of *Tirpitz*, CVEs remained key to trade protection in the Atlantic and Home Waters and helped in the fighter/assault carrier role to maintain perceived threats to Norway.

At Octagon it was agreed that US and British naval forces would initiate plans to transfer naval assets to the Far East following Germany's defeat,¹² while, to meet British political aims, the British Pacific Fleet (BPF) would participate in the final campaign against Japan.¹³ This latter decision and the failure to provide the resources previously requested by the Navy, including manpower and an adequate Fleet Train, required the extensive use of CVEs in many roles, illustrating the impact of government decisions on specific deployment of CVEs. At this stage, CVEs had again proved their versatility in Dragoon and were shortly to be deployed in the Aegean Sea where they assisted in freeing Greece from occupation and a short civil war.¹⁴ Meanwhile, the Allies' land campaign in Italy remained a secondary theatre.¹⁵

Argonaut convened at Malta and Yalta. A Combined Intelligence Committee report concluded that 'Germany's fundamental situation is relatively weak and deteriorating', but

⁷ Air Ministry (1948), p.383; Paterson (2020), pp.342-357

⁸ Ruegg and Hague (1993), pp.63-69

⁹ '*Tirpitz*', ADM 234/350; Hesketh (1999). See Maps 2 and 3 below

¹⁰ Beevor (2012), p.759

¹¹ 'War Diary of FO U-boats for 1 October 1944', cited in ADM 234/68, p.89

¹² 'Redeployment of Forces after the end of the War in Europe', 14 September 1944, Octagon, CCS 679

¹³ 'British Participation in the War Against Japan', British COS(s), 11 September 1944, Octagon, CCS 452/26 and 'British Participation in the War Against Japan', US COS(s), 13 September 1944, Octagon, CCS 452/27; 'Man-Power one year after the Defeat of Germany', COS(s) Committee, 7 July 1944, CAB 121/323; 'British Participation in Far Eastern Strategy', British COS(s), 15 August 1944, CCS 452/18, CAB 88/22; King and Whitehill (1953), p.360

¹⁴ AIR 41/76, pp.70-74, 106-115, 135-138, and Admiralty file M/01027/45 in Appendix 43

¹⁵ CCS 172nd Meeting, 12 September 1944, Octagon, CCS Minutes

that predicting the timing of its collapse was difficult,¹⁶ further complicating resource allocation¹⁷ when RN manpower constraints were so severe.¹⁸ Liberating Burma was the first objective in South East Asia, thereby supporting China,¹⁹ followed by liberating Malaya and opening the Straits of Malacca.²⁰ The strategic goal in the Pacific was to destroy Japanese air and naval forces, enabling a blockade of the Japanese islands, leading to an invasion.²¹

6.3 Procurement

6.3.1 Introduction

RN CVEs in June 1944 totalled 40, consistent with earlier forecast requirements for convoy protection.²² The procurement of 19 MAC ships for the TPC role between North America and Britain, combined with the reduced U-boat threat,²³ released some trade protection CVEs for conversion to fighter/assault carriers,²⁴ in turn freeing fleet carriers for other activities. However, CVE conversion and repairs were constrained by shipyard capacity and skilled labour availability.²⁵

As previous chapters have shown, the Admiralty repeatedly warned about these shortages. For example, in December 1943 Admiralty forecasts predicted reinforcements of CVEs to

¹⁶ 'Estimate of the Enemy's Situation – Europe (as at 23 January 1945)', 24 January 1945, Argonaut, CCS 660/3, pp.29-30

¹⁷ Memorandum to the President from Admiral Land, War Shipping Administration, 9 December 1944, psfa0091. Land challenged King's request to eliminate US assistance to UK imports and cut other Lend-Lease programmes, noting that Britain faced the same difficulties from the evolving timeframes of the war

¹⁸ 'Man-Power Allocations for the Navy, 1 January-30 June 1945', First Lord, 12 December 1944, CAB 121/323

¹⁹ Feber (1975) and Willmott (1996), p.134 offer different accounts of Roosevelt's strategy regarding post-war Indochina, and China's role in replacing France and Britain as a stabilising force alongside America in South East Asia; Ehrman (1956a), pp.479-504; Ehrman (1956b), pp.165-273

²⁰ 'Report to the President and Prime Minister', 9 February 1945, Appendix C: Directive to Supreme Allied Commander, South East Asia, Argonaut, CCS 776/3, p.170. See Map 7 below

²¹ 'Report to the President and Prime Minister', 9 February 1945, Appendix B: Operations for the Defeat of Japan, Argonaut, CCS 776/3, p.168

²² Memorandum by DOP and DNAD, 17 January 1942, ADM 1/11971, pp.78-79

²³ Roskill (1961b), pp.173-185

²⁴ 'Summary of Naval Operations, First Lord': 1st May to 1st August 1944, 21 August 1944, CAB 66/54, and 1st November, 1944, to 1st February, 1945, 19 February 1945, CAB 66/62. For example, see Hobbs (2003), pp.148-149: in the summer of 1944 conversion of *Speaker* to assault carrier included modern 'Type 277 radar, a 100-line operational telephone system, a new Briefing Room and "Army Plot" Room, extra W/T and R/T sets. She also received 140 additional bunks, better heads and bathrooms, an improved bridge, and twin 20 mm power-operated A/A guns'

²⁵ 'Man-Power Allocations for the Navy, 1st January-30 June 1945', First Lord, 12 December 1944, CAB 121/323. See Hobbs (2003): defect rectifications averaged three months; the time taken to complete repairs and defect rectification in some individual cases is disturbing: *Chaser* took 11 months, *Empress* and *Slinger* nine months (pp.59, 68, 143-144)

the Far East during the second half of 1944 would be compromised by the inability to man them fully until the defeat of Germany and only if the necessary fleet auxiliaries and base facilities were provided.²⁶ By July 1944 predicted shortfalls in manning proved even more severe. The COS(s) Committee identified naval manpower requirements of 820,000 one year after the defeat of Germany with 518,300 deployed against Japan.²⁷ However, these would only provide 'one strong cover or striking force in addition to those required to support a major amphibious operation'. Further savings would require 'abandoning all idea of British amphibious operations against the Japanese, outside the range of shore-based air support', considered by the COS(s) Committee as 'unacceptable'.

On 3 August 1944 a draft directive by Churchill demanded cuts of 700,000 from the armed services and 600,000 from their support 'tails'. Of these, the Navy would have to cut 200,000 with 'some reduction in the FAA'.²⁸ The Admiralty responded,²⁹ accepting cuts of 155,000 personnel to 665,000, through reducing the Fleet's main operation against Japan and FAA front-line aircraft.³⁰ The shortages of manpower dictated the reduction in Fleet size, meaning that the fewer aircraft now proposed would be adequate for the reduced carrier force envisaged which, because of completion delays, would contain fewer CVs and CVLs.³¹ The Admiralty even discussed reducing 'uniformed personnel' shortages by transferring one and possibly other CVEs to commercial management, appointed by the MT, and flying the Blue Ensign as 'Merchant Fleet auxiliary' ferry carriers.³² Indeed, *Biter* had been transferred to the Merchant Navy for ferry duties on 21 August 1944, only to be

²⁶ 'Relation of Available Resources to Agreed Operations', Report by the Combined Administrative Committee and shipping and logistics experts, 15 December 1943, Sextant, CCS 428 (revised), pp.330-332

²⁷ 'Man-Power One Year After the Defeat of Germany', Memorandum to War Cabinet, 7 July 1944, CAB 121/323. Of 820,000 required, some 29.6% were for FAA aircraft carriers, air maintenance ships, and air stations. At June 1944, total RN manpower approximated 851,000 (HMSO (1995), p.39)

²⁸ 'Man-Power One Year After the Defeat of Germany', Draft Directive by the Prime Minister, 3 August 1944, CAB 121/323

²⁹ 'Man-Power Allocations for the Navy 1 January-30 June, 1945', First Lord, 12 December 1944, CAB 121/323. Extensive ship repairs meant the Admiralty requested its industrial workforce remain at 850,000

³⁰ 'Man-Power One Year After the Defeat of Germany: Reduction of Service Requirements Report', COS(s) Committee, January 1945, CAB 121/323

³¹ *Ibid.*

³² AMs to MT, 29 November 1944, and to BAD, 29 and 30 November 1944. All ADM 1/16166

guttled by fire whilst alongside in Greenock three days later. Dockyard capacity was unavailable for repairs and she was returned to the USN as 'lying' in the Clyde.³³

Far East RN commitments required Indian Ocean assault forces capable of 'lifting three divisions with the necessary supporting naval forces' and a 'self-supporting' BPF.³⁴ As the Admiralty warned, requirements of a large fleet train for operations in the Far East impacted on available manpower and accordingly on vessel availability. Forecast CVEs for this theatre were reduced from 25 to 19: 13 to the East Indies Fleet (EIF); six to the BPF.³⁵ This would free CVs for transfer from the EIF to the BPF. At Octagon Britain had agreed to a balanced and self-supporting fleet³⁶ with auxiliary support vessels (the Fleet Train) operating in the Western Pacific, all under American command. King insisted that the BPF be self-supporting and not one 'he could not employ or support'.³⁷ While the British accepted King's condition and Churchill assured all of the RN's capability,³⁸ in truth the RN was logistically exhausted and recognised as such in Washington, D.C., if not in London. Churchill, returning on the liner *Queen Mary*, told Cunningham and Leathers that the Fleet Train should be properly equipped 'if we need thirty or even forty ships we must have them'. Unsurprisingly, Cunningham noted that Leathers became somewhat pensive:³⁹ the appropriate Fleet Train size was not now feasible in the time required,⁴⁰ the opportunity to procure the appropriate

³³ Hobbs (2003), pp.27-28, 53. The role was taken by the former *Archer*, transferred from care and maintenance to the MT as the aircraft ferry *Empire Lagan*

³⁴ 'Man-Power One Year After the Defeat of Germany: Reduction of Service Requirements Report', by COS(s) Committee, January 1945, CAB 121/323, p.3

³⁵ Ibid. Forecasts showed 560 naval aircraft for the EIF's CVEs and 1,050 for the BPF's CVEs, six CVs and 10 CVLs. As newly built carriers of the 1941 and 1942 programmes were completed, CVEs would be paid off or 'relegated to ferry duties'. This January 1945 report shows a total of 19 CVEs for the reduced Fleet in 1945, all deployed in the Far East plus three in training with special crews and eight in reserve with reduced crews (presumably in Home Waters). This compares with the July 1944 report, which showed total CVEs of 26 fully manned and operational with 13 partially crewed for 31 December 1945 (including ships completing in early 1946); in July 1944, 25 are shown for January 1946 in the Far East, of which only six were allocated to the EIF and 19 to the BPF ('Man-Power One Year After the Defeat of Germany', COS(s) Committee, 7 July 1944, CAB 121/323)

³⁶ 'Report to the President and Prime Minister', 16 September 1944, Octagon, CCS 680/2, p.137. A balanced force was defined by Cunningham as four battleships, 5-6 large carriers, 20 CVLs/CVEs and an appropriate number of cruisers and destroyers (174th CCS Meeting, 14 September 1944, Octagon, CCS Minutes, p.209). Coles (2001) provides an analysis of the political, military and logistical issues

³⁷ 174th CCS Meeting, 14 September 1944, Octagon, CCS Minutes, pp.210-211

³⁸ First Plenary Meeting, 13 September 1944, Octagon, CCS Minutes, pp.238-241

³⁹ Cunningham (1952), p.613

⁴⁰ 'Admiralty Requirements for Shipping for the Fleet Train', Alexander to Prime Minister, 20 January 1945, CAB 66/61; 'History of the Fleet Train, Volume I (November 1944-May 1945)', 7 June 1945, ADM 199/1766; ADM 234/379 (*Naval Staff History, War with Japan, Volume VI*), pp.13-19; Hobbs (2012); Jones (2007); Smith (1994b); Willmott (1996), pp.97-156

tonnage having been missed and deemed as excessive by Churchill on Cherwell's advice in early 1944.⁴¹

6.3.2 British-built escort carriers

The last British-built escort carrier, *Campania*, became operational on 3 June 1944 and was assigned to WAC, embarking a composite NAS (813)⁴² offering trade protection from air and submarine threats. She had advanced fighter direction facilities (AIO), and flight deck floodlighting to assist night flying. However, lacking a second lift forward and parking space forward of the single barrier limited the air group size to 20.⁴³

RN manpower shortages prevented further procurement of CVEs beyond the US *Ruler*-class ships previously ordered,⁴⁴ although the favourable outcome of the Battle of the Atlantic resulted in returning four MAC ships to trade in July 1944,⁴⁵ thereby releasing badly-needed air, flight deck, and maintenance crews for British carriers and other MAC ships.

6.3.3 US-built escort carriers

Initial inability to convert many of the *Ruler*-class vessels⁴⁶ to more advanced types such as fighter or assault carrier meant that many were initially allocated as ferry carriers, either for the RN or on loan to the USN, both requiring fewer crew.⁴⁷ Of the total 23 *Ruler*-class vessels procured and operational (November 1943 to October 1944), eight were received in the

⁴¹ Minute from Air Ministry to BRITMAN, Washington, 23 December 1943; Memoranda by First Lord, 1944: 8 February, 16 March; Memoranda to War Cabinet from Minister of War Transport, 1944: 18 February, 3 April; Memoranda from Cherwell to Prime Minister, 1944: 3 March, 7 March, 31 March, 6 April; Minutes from Prime Minister to First Lord and First Sea Lord, 1944: 10 March, 9 April; Responses from First Lord to Prime Minister, 1943: 19 January, 16 March and 1944: 20 February, 25 March. All PREM 3/164/5

⁴² Hobbs (2003), pp.54, 190. 12 Swordfish, four Wildcats, and three Fulmars

⁴³ Hobbs (1996), pp.68-69; Hobbs (2013), p.122

⁴⁴ 'Man-Power One Year After the Defeat of Germany: Reduction of Service Requirements Report', by COS(s) Committee, January 1945, CAB 121/323; ADM 234/384, p.111-112

⁴⁵ Hobbs (2013), pp.124, 126. As noted, MAC ships acted as ferry carriers in the run up to D-Day; in June and July 1944 aircrews had to be reduced by one in each MAC ship in order to 'provide additional aircraft for other naval squadrons involved in Overlord'

⁴⁶ *Ibid.*, pp.152-171

⁴⁷ 'Most Secret Office Memorandum B, Naval Manpower 1944', First Lord, 19 January 1944, ADM 1/13050. Amongst other manpower-saving measures it was noted that six battleships, 14 cruisers, 20 destroyers, the outdated CV *Furious*, and catapult-trainer *Pegasus*, were to be paid off without replacement to release key personnel for newer fleet vessels. Some new vessels would be manned only on a care and maintenance basis, although personnel allocations would favour FAA carriers. Admiralty files show the risks in the formal acceptance of newly-built escort carriers/NAS from manpower shortages and the need for training, to minimise air and flight-deck crew casualties (ADM 234/384, pp.232-233)

period of this chapter: six initially allocated as ferry carriers;⁴⁸ one as a DLT carrier;⁴⁹ and one as an assault carrier.⁵⁰

Whilst demand for aircraft ferrying capacity reflected the need for more front-line aircraft globally, the abrupt shift from escort carriers modified for different roles to an almost total focus on ferry carriers reflected shortages of naval manpower as well as British skilled labour and shipyard conversion capacity discussed above. Indeed, this period also saw the RN rely on US dockyards for the repair of many CVEs as operational intensity increased.⁵¹ The political need remained to ensure that US-supplied CVEs were seen to be operational as soon as possible.⁵² However, following the earlier dispute over the length of time taken to modify CVEs,⁵³ the emphasis in BAD reports now shifted to warnings about the impact of the forthcoming US presidential election on RN procurement with specific reference to associated pressure for all US Navy Department Lend-Lease equipment to be in 'genuine short supply and needed in the 'common war effort', with details for the timing of its use.⁵⁴ Towards the middle of 1945, the requirement was tightened for any request for such equipment 'to be essential to support operations in the war against Japan'.⁵⁵ The impact of this changing political environment was particularly significant on naval aircraft procurement and is discussed in the next section.

At the conclusion of war with Japan, extensive discussions settled the return of American-built CVEs and naval aircraft supplied under Lend-Lease⁵⁶ which, with the end of the war, had to be returned, paid for, or destroyed.⁵⁷

⁴⁸ Hobbs (2003). *Arbiter, Puncher, Reaper, Smiter, Thane, and Trouncer*

⁴⁹ *Ibid.*, pp.116-119. *Rajah* was a DLT carrier (July-August 1944), before ferrying aircraft to the Eastern Fleet

⁵⁰ *Ibid.*, p.17. *Ameer* was converted to an assault carrier for the Eastern Fleet where she was a ferry carrier for a month followed by five months as a TPC, before becoming an assault carrier

⁵¹ 'BAD Reports', January-February 1944, ADM 199/1470, and January-August, 1945, ADM 199/1471

⁵² Letter from ACM Courtney to Sir Robert Sinclair, MAP, 19 October 1944; Letter from Captain Abel-Smith to Vice Admiral Boyd, 8 November 1944, with Supplement – Aircraft Produced under USN Cognizance. Both BT 87/161

⁵³ See chapter 5

⁵⁴ 'BAD Reports', 1st-31st July 1944, 19 August 1944, ADM 199/1470, p.182

⁵⁵ 'BAD Reports', 1st-31st May 1945, 19 June 1945, ADM 199/1471, p.153 and attached Letter from Admiral J.M. Reeves, USN to Rear Admiral J. Waller, RN, BAD, 30 May 1945, p.186

⁵⁶ 'Arrangements for the Return of CVEs to the USA', DOP, 2 September 1945 and following exchanges, ADM 1/18682

⁵⁷ 'Disposal of Surplus Lend Lease Aircraft & Associated Equipment', attached to Memorandum, F.W. Musson, BAC, 11 July 1945, AVIA 38/1259; Brown (1974), p.139; Hobbs (2003), p.178; Scammell (2001), p.40. Many aircraft were ditched into the ocean; also seen off the East Coast of America, witnessed by the author's father

6.3.4 Naval aircraft

The quality and numbers of naval aircraft for CVEs remained a major issue throughout the period of this chapter. Forecasts of August 1943 had predicted FAA requirements would rise from 1,962 on 1 October 1944 to 2,364 front-line aircraft on 1 October 1945.⁵⁸ The Cabinet-imposed cutbacks in late 1944 reduced front-line aircraft forecasts to 1,600.⁵⁹ In fact, front-line strength peaked at 1,336 in April 1945.⁶⁰

Official papers show the Admiralty continuing to press for suitable British-built aircraft for CVEs specifically to support amphibious operations against the Japanese. In early 1944, the COS(s) instructed the Joint Technical Warfare Committee to study if CVEs, operating on their own (i.e., without CV or CVL support) in the assault role could secure air superiority in the face of land-based fighters and report back on the experience of the USN in the Pacific, comparing the performance of Japanese, US, and British aircraft.⁶¹ The committee's documents show how the study evolved, with requests for naval versions of the RAF Tempest and Hornet for RN carriers effectively thwarted by Air Ministry and MAP concerns about production capacity shortages.

The Admiralty also pressed in 1944 for more advanced US aircraft for CVEs for 1945 but this was resisted by the USN, which was itself facing temporary constraints, reflecting shortages of Avengers with a new variant being awaited, and Corsair production cut-backs which coincided with more being sought by the US Marine Corps.⁶² Abel-Smith of BAD reported that the US assignments were 'coloured by' USN views on RN reserves and aircraft backlogs

⁵⁸ 'Munitions for the War Against Japan: Total I.E. Strength of Naval Aircraft to be Maintained after Defeat of Germany', 14 August 1943, COS(s) Committee, CAB 121/323. Estimates for October 1945 showed 70 carriers (five CVs, 13 CVLs, and 52 CVEs) would require 2,364 front line aircraft (3,910 including training and ancillary aircraft)

⁵⁹ 'Man-Power One Year After the Defeat of Germany: Reduction of Service Requirements Report', COS(s) Committee, January 1945, CAB 121/323; HMSO (1951), p.152. British aircraft production peaked at 26,461 in 1944

⁶⁰ 'Numbers of Aircraft on the Strength of Front Line Units, 1939-1945', ADM 234/383, p.239

⁶¹ 'Fighter and Tactical Air Support from Escort Carriers', Report by Joint Technical Warfare Committee (later revised), 25 April 1944; 8th Meeting of the Sub-Committee, 28 June 1944 and following papers; related discussions. All CAB 137/9. See also AIR 20/3677: Portal, ACNS (Air), chaired the Committee (the final report was signed off on 3 August 1944)

⁶² Admiralty to BAD, Washington, 30 October 1944; Letter from Captain Abel-Smith to Vice Admiral Boyd, 8 November 1944, with attached Supplement – Aircraft Produced under USN Cognizance. All BT 87/161. The USN stated that its own shortages of Avengers had forced it 'to extend the "Radford Report eight months" in the combat area' (referring to the policy of deploying new aircraft to replace those over eight months old in combat: 'The Integrated Aeronautic Program', March 1945, Office of the CNO, USN, ADM 1/17446)

in Britain; his report included a USN analysis noting the RN target for 'spare aircraft' was 150-200% of front line aircraft versus the USN practice of 67%.⁶³ Another US concern was that reserves of US aircraft in Britain would not be deployed in the 'Japanese Theatre' and that 13 CVEs were 'not committed' to the Eastern Theatre, and that British CVLs would be unavailable until late 1946.⁶⁴

By May 1945, the USN and RN discussions were much more positive, reflecting the deployment of the majority of CVEs to the Far East, and the introduction of the BPF to the Pacific conflict. Furthermore, analysis showed that the RN's higher levels of spare aircraft largely reflected its longer pipeline from manufacturer to front-line carrier, the necessity to use 'casual shipping' (commercial vessels) for ferrying aircraft, and the use of new aircraft for training (reflecting the absence of a 'back pipe' of reconditioned aircraft used for USN training).⁶⁵ This contrasted with the USN's Integrated Aeronautic Program, recommended by the Radford Report and enabled by America's greater resources.⁶⁶

The Admiralty finally succeeded in negotiating significant quantities of new variants for 1945, albeit numbers substantially below the previous year.⁶⁷ These deliveries of new and improved variants of US-built Corsairs, Hellcats and Wildcats,⁶⁸ brought catapult compatibility with US-built CVEs, enhanced combat capabilities and stronger undercarriage,⁶⁹ and were far superior to British-built aircraft.⁷⁰ Nevertheless, the impact of ongoing shortages can be seen in the analysis of deployment below.

⁶³ Letter from Captain Abel-Smith to Vice Admiral Boyd, 8 November 1944, with attached Supplement – Aircraft Produced under USN Cognizance, BT 87/161

⁶⁴ Letter from ACM Courtney to Sir Robert Sinclair, MAP, 19 October 1944; Letter from Captain Abel-Smith to Vice Admiral Boyd, 8 November 1944, with attached Supplement – Aircraft Produced under USN Cognizance. All BT 87/161

⁶⁵ Letter from Rear Admiral Cassady, Assistant Deputy Chief of Naval Operations (Air), USN to Captain Abel-Smith, BAD, 24 May 1945; 'Report on Visit to Washington – May 1945', by Mr R Beard, Admiralty, 5 June 1945. Both ADM 1/17446

⁶⁶ 'The Integrated Aeronautic Program', March 1945, Office of the CNO, USN, ADM 1/17446. For the Radford Report see chapter 5 above

⁶⁷ 'Naval Stores', ADM 116/5813, p.161. 1945 deliveries totalled 923 including Avengers 220; Corsairs 230; Hellcats 316; Wildcats 100. 1944 deliveries had totalled 3,169 including: Corsairs 1,423; Hellcats 666; Wildcats 240

⁶⁸ ADM 234/384, p.230

⁶⁹ *Ibid.*, p.207. *Chaser's* CO stated on deck landing (4 March 1944): 'The Wildcats continued to take the most almighty clouts and come up smiling. You apparently cannot ask too much of an American undercarriage beneath a good pilot

⁷⁰ 'Operation "Husky" – Experience Gained in Force "H"', Report by Vice Admiral Willis, 13 August 1943, ADM 199/2514, p.2; Gunston (1978). Friedman (1988), pp.202-217 details war-time development of naval aircraft

Furthermore, the FAA's shortages of new aircraft, together with a far greater variety of models, increased and complicated the requirements for spares, which was a particular issue in the Pacific. This was exacerbated from January 1945 as a new policy meant no new aircraft supplied by the US to the FAA would 'automatically' be provided with spares and accessories; '...demands...must be based on estimated expenditure of individual items involved'.⁷¹

6.4 Deployment

6.4.1 Introduction

Following the Allies' success in suppressing the U-boat threat in the North Atlantic,⁷² a striking feature of deployment in the period of this chapter is how the Admiralty exploited CVEs' versatility. They were deployed in amphibious and other offensive roles, while maintaining trade protection of Allied convoys,⁷³ ferrying aircraft for the RN and USN,⁷⁴ providing DLT, and acting as a trials carrier.⁷⁵ Their deployment culminated in the Far East, where in the Indian Ocean they released CVs for deployment with the BPF and as part of the BPF's Fleet Train they helped the RN to deliver Britain's key political aim of participating in the final defeat of Japan, and gain experience of 'everlasting benefit to the Royal Navy'.⁷⁶

6.4.2 Atlantic

From June 1944 to May 1945 22 RN CVEs⁷⁷ were deployed for varying periods in the Atlantic in a range of activities, especially convoy escort,⁷⁸ many redeployed as the U-boat threat

⁷¹ 'BAD Reports', 1st – 28th February 1945, 19 March 1945, ADM 199/1471. See also 'The Integrated Aeronautic Program', March 1945, Office of the CNO, USN, ADM 1/17446: the Radford Board of 1944 recommended the US policy that no more than two models of an aircraft, both under eight months old, should be deployed in combat, with one of the key benefits being the need to carry fewer spares

⁷² Roskill (1961b), pp.173-185. See Map 1 below

⁷³ 'Summary of Naval Air Operations', First Lord: 1st May to 1st August 1944, 21 August 1944, CAB 66/54; 1st August to 1st November 1944, 7 December 1944, CAB 66/59; 1st November 1944 to 1st February 1945, 19 February 1945, CAB 66/62; 1st February to 1st May 1945, 1 June 1945, CAB 66/66; and 1st May to 15 August 1945, covered by 'Weekly Résumés of the Naval, Military and Air Situation', CAB 66/67 and CAB 129/1; Hobbs (2003); Roskill (1961b), pp.12-207

⁷⁴ 'BAD Reports', January 1945-August 1945, ADM 199/1471; Hobbs (2003)

⁷⁵ 'Summary of Air Naval Operations', 1st November 1944 to 1st February 1945, First Lord, 19 February 1945, CAB 66/62. During this period, five CVEs acted as DLT carriers for varying periods, while *Pretoria Castle* acted as a trials carrier

⁷⁶ 'Report of Experience of the British Pacific Fleet from January to August 1945', 15 March 1946, ADM 199/1457, p.8

⁷⁷ Hobbs (2003). *Activity, Biter, Campania, Fencer, Nairana, Patroller, Pretoria Castle, Pursuer, Queen, Rajah, Ranee, Ravager, Reaper, Ruler, Searcher, Smiter, Striker, Thane, Tracker, Trouncer, Trumpeter, and Vindex*

⁷⁸ ADM 234/384, pp.330-331. Success in the Battle of the Atlantic ensured US forces and equipment could participate in D-Day, an essential prerequisite for success. See Benbow (2017b), pp.281-282 for the

receded.⁷⁹ From 6 June 1944, D-Day, the RN provided A/S support as part of Neptune, consisting of 10 escort/support groups totalling 54 A/S ships. Three escort carriers (*Emperor*, *Pursuer* and *Tracker*) were deployed about 130 miles west of Land's End providing air cover to Coastal Command aircraft and to six of the escort/support groups involved in A/S screening of the western English Channel.⁸⁰ This support is often overlooked because the vessels were not, for practical reasons, deployed off the beaches, and the *Luftwaffe* and U-boats failed to seriously disrupt the invasion.⁸¹ However, their effectiveness is illustrated by one of *Pursuer's* aircraft shooting down a Ju88 when it was about to attack a Coastal Command Sunderland on A/S patrol.⁸² Furthermore, British naval aviation supported the landings directly from Lee-on-Solent Naval Air Station and other locations in southern England⁸³ and, whilst being criticised for this approach,⁸⁴ as Benbow notes it would have been impractical to have escort carriers crossing the north-south flow of the invasion fleet in the Channel as they launched and recovered aircraft on an east-west axis.⁸⁵

During June to August 1944 the Allies lost very few ships in the North Atlantic to U-boats, which were largely confined to British coastal waters and the South West Approaches,⁸⁶ where sufficient British escort carriers were deployed providing air cover on the critical Gibraltar-South West Approaches trade route.⁸⁷

contribution of CVEs in 'establishing the necessary conditions for the preparation and conduct of Operation Overlord'

⁷⁹ 'Prospects of a German Collapse or Surrender (as of 8 September 1944)', Report by the Combined Intelligence Committee, 9 September 1944, Octagon, CCS 660/1, pp.86-87

⁸⁰ 'Summary of Naval Air Operations', 1st May to 1st August 1944, First Lord, 21 August 1944, CAB 66/54; Meeting at Coastal Command on 24 March 1944, AIR 15/497; Grove (1997), pp.125-127; Roskill (1961b), map 23 opposite p.25. Escort/Support Groups (terminology varied) were deployed throughout the South West Approaches and English Channel. However, enemy air activity was so light that the CVEs were withdrawn by 11 June. Two further CVEs provided bogus W/T traffic off Norway to attract U-boats away from Overlord. See Benbow (2017b), pp.282-283 for the role of all CVEs on D-Day

⁸¹ 'U-boat threat during 1945', British COS(s), 31 January 1945, Argonaut, CCS 774/1, p.146; Paterson (2020), pp.318-327

⁸² 'Summary of Naval Air Operations', 1st May 1944-1st August 1944, First Lord, 21 August 1944, CAB 66/54

⁸³ Ibid.; Benbow (2017b), pp.274-277. As Benbow shows, about one-third of the FAA's fighters and 40% of its TBRs operated from shore bases in support of the Normandy landings (the RAF had initially asked for 21% of the FAA's fighters and 100% of its TBRs)

⁸⁴ Morison (1957), pp.104-105, criticised this approach, citing the tactical advantages of operating from aircraft carriers stationed off the beaches

⁸⁵ Benbow (2017b), pp.271-272

⁸⁶ Grove (1997), pp.126-127; Roskill (1961b), pp.173-175

⁸⁷ Hobbs (2003). *Activity, Biter, Campania, Nairana*, and *Searcher*, provided Gibraltar-UK convoy trade protection between June-September 1944, complementing MAC ship North Atlantic close escort operations,

Whilst the Admiralty deployed escort carriers more effectively in this period as a result of their greater availability, and also operated more offensively in the face of changing U-boat tactics,⁸⁸ it was still remedying technological defects even in *Campania*.⁸⁹ Despite many innovations, in June 1944 the captain noted severe difficulties of operating without ‘an accelerator or any means [sic] of aiding take-off’,⁹⁰ this longstanding problem only being overcome with RATOG on *Campania*’s second deployment.⁹¹ Ongoing manning shortages meant that half the ship’s company had not sailed operationally before.⁹²

The Admiralty also developed an effective system of interlocking convoy aircover in the Eastern Atlantic. For example, *Campania* was at first allocated to WAC as a TPC and embarked 813 NAS. She escorted OS.79/KMS.53, which incorporated convoys from Britain to Freetown and to North Africa, with the convoys splitting west of Gibraltar, where the OS section continued south to Freetown, escorted by a Freetown Escort Group. The WAC escort, including *Campania*, took the Mediterranean portion to Gibraltar, where a Mediterranean Fleet Escort Group escorted the KMS section to its destination, usually Port Said. The return convoy, in this case SL.160 (Freetown-Liverpool) rendezvoused with MKS.51 (North Africa to UK) off the Portuguese coast with its Escort Group and CVE air cover (*Campania*) on 10 June 1944, reaching Liverpool on 21 June with 44 vessels.⁹³ *Campania* repeated this process on 2 July 1944 (covering convoys OS.82, KMS.56, SL.163, and MKS.54) and 3 August (covering convoys OS.85, KMS.59, SL.166, and MKS.57), before being attached to the Home Fleet at Scapa Flow on 14 September, prior to deployment on Arctic convoy routes. This deployment of escorts and CVEs was further refined when the pattern of U-boat operations changed during the last four months of 1944,⁹⁴ when U-boats sank only 14 ships

while *Vindex* made A/S sweeps in the Western Approaches during the period June-August before being lent to the Home Fleet for Arctic convoy duty

⁸⁸ Signal from C-in-C WAC, March 1944, ADM 217/528. Also referenced in June (‘HMS *Campania*, Report of Proceedings’, 3-20 June 1944, 22 June 1944, ADM 217/528)

⁸⁹ ‘HMS *Campania*, Report of Proceedings’, 2-18 August 1944, 23 August 1944, ADM 217/530. The aircraft derrick, described as ‘a “Heath Robinson” contraption’, broke down and ‘jammed in the upright position’, making the carrier inoperable as it prepared to deploy in support of convoy OS.85/KMS.59

⁹⁰ ‘HMS *Campania*, Report of Proceedings’, 3-20 June 1944, 22 June 1944, ADM 217/528, p.3

⁹¹ ‘HMS *Campania*, Report of Proceedings’, 2-18 August 1944, 23 August 1944, ADM 217/530. The captain declared the introduction of RATOG to his Swordfish aircraft (all Mark IIIs fitted with the heavier ASV Mark XI radar) ‘a godsend’ and looked forward to his fighters being ‘similarly fitted at an early date’

⁹² ‘HMS *Campania*, Report of Proceedings’, 3-20 June 1944, 22 June 1944, ADM 217/528, p.5

⁹³ Hague (2000), pp.143-144, 166-169; Hobbs (2003), p.54

⁹⁴ ‘List of British Escort Carriers with the Convoys Escorted or Supported by them in the Atlantic’, 1944, ADM 234/384, pp.330-331

in British coastal waters and two in the Atlantic with 12,168 merchantmen safely convoyed to port; during this time 55 U-boats were sunk, 37 in the North Atlantic, Arctic, and Home Waters.⁹⁵

However, the Admiralty faced a potentially significant German development in the Atlantic with the introduction of the *Schnorkel*.⁹⁶ Admiral Stark reported to King (22 October 1944 and 3 January 1945) the concerns of Admirals Cunningham, Edelsten, and Horton regarding the ‘inability to locate or pick up submarines due to their use of “Schnorkel”’, and potentialities of the Types XXI and XXIII.⁹⁷ U-boat threats were reassessed in the light of these developments, with evidence that *BdU* intended a major offensive by mid-March 1945.⁹⁸ This failed to materialise because of delays in getting these new types operational,⁹⁹ but illustrates the continuing uncertainties faced by the Admiralty.

6.4.3 Arctic and Norway

Additional CVEs enabled the Admiralty to implement some recommendations made following Admiral Horton’s November 1943 analysis,¹⁰⁰ proving their worth to the Home Fleet. This fleet deployed 13 CVEs in the Arctic Ocean and Norwegian Sea, with typically four to six ships operational simultaneously, although commitments to D-Day more than halved their availability in June to August 1944.¹⁰¹

The Admiralty was under pressure to resume regular convoys to North Russia,¹⁰² initiated when JW.59 sailed from Loch Ewe on 15 August 1944 with the cruiser *Jamaica*, and escort

⁹⁵ Grove (1997), pp.126-130; Roskill (1961b), p.185

⁹⁶ ‘U-boat threat during 1945’, British COS(s), 31 January 1945, Argonaut, CCS 774/1. For the German perspective: ADM 234/68, pp.57-58

⁹⁷ Simpson (2021), p.157-158

⁹⁸ ‘Estimate of the Enemy’s Situation – Europe (as at 23 January 1945)’, 24 January 1945, Argonaut, CCS 660/3, pp.38-39; CCS 182nd Meeting, 30 January 1945, CAB 88/4, p.352; Rössler (2001), pp.198-234

⁹⁹ ADM 234/68, pp.88-99; Roskill (1961b), p.477 (for details of German U-boats sunk between 1 June 1944-8 May 1945, pp.463-469)

¹⁰⁰ ‘Employment of British and American Escort Carriers in Anti-U-Boat Warfare’, C-in-C WAC to Secretary of the Admiralty, 7 November 1943, ADM 1/12865, pp.5-7. See chapter 5 above

¹⁰¹ ADM 234/384, pp.226-245; Hobbs (2003): *Campania, Fencer, Nabob, Nairana, Premier, Puncher, Pursuer, Queen, Searcher, Striker, Tracker, Trumpeter, and Vindex*. See Maps 2 and 3 below

¹⁰² ‘Resumption of Northern Convoys to Russia’, Memoranda by US COS(s), 27 May 1944, CCS 580, and 17 August 1944, CCS 580/1. Both CAB 88/27, pp.344-346. America also pressed for a shorter cycle with fewer ships but this was only partially accepted because of the requirement for ‘all available escort vessels’ to counter a renewed U-boat threat in UK waters (CCS 580/3, 27 December 1944, pp.348-350; CCS 580/4, 23 January 1945, p.351. Both CAB 88/27)

carriers *Striker* and *Vindex* in the convoy's 'central box' with 'freedom of movement', a position which became standard on Arctic convoys.¹⁰³

Trade protection was provided for 18 convoys in the Arctic Ocean, with both A/S and A/A capabilities,¹⁰⁴ necessitating two CVEs for most convoys, and sometimes three to allow a CVE to specialise in night flying.¹⁰⁵ The RN was increasingly on the offensive, actively hunting down U-boats attacking convoys¹⁰⁶ and, as documents show, achieved considerable success.¹⁰⁷ Between 15 August 1944 and 8 May 1945, 469 merchant ships were convoyed to and from North Russia, with only seven merchantmen lost alongside six warships, costing *BdU* nine U-boats.¹⁰⁸ Three CVEs allowed each to work a watch of eight hours: Duty Carrier, Stand-By Carrier, and Available Carrier. This last CVE enabled rests for aircrews, command personnel and flight deck parties, with the ship taking station in one of the convoy columns instead of the usual 'box'. Night flying was restricted to *Nairana* and *Vindex*, each on duty for half the night.¹⁰⁹

Inferior British aircraft and incompatibility with US-built CVEs continued to undermine effectiveness, forcing compensatory trade-offs such as balancing low-endurance fighters to A/S aircraft embarked based on the most likely threat, selection of armament carried by A/S aircraft (depth charges and/or R/Ps) and how to lighten the load before introduction of RATOG, and whether to send two aircraft (a fighter and A/S aircraft) patrolling in pairs or hold back A/S strike aircraft in reserve.¹¹⁰ However, introducing Type 277 radar in

¹⁰³ ADM 234/384, p.234. The 'central box' was left vacant in the 'rear and astern' of the four centre columns (two ships each) in the convoy. See also Ruegg and Hague (1993), pp.65-66

¹⁰⁴ Admiralty (1954), pp.117-134; Hobbs (2003), pp.190-194. Fighters, in most cases Wildcats which had replaced the few remaining Sea Hurricanes by November 1944, successfully working alongside Swordfish and later Avenger TBRs. Besides their A/S function the Avengers were capable of dive-bombing and minelaying (Roskill (1961b), p.251)

¹⁰⁵ Ruegg and Hague (1993), pp.65-71. *Nairana*, *Tracker*, and *Vindex* in October/November with JW.61 and RA.61 were joined by two Support Groups to supplement the convoy Escort Group

¹⁰⁶ See Lambert (1996), pp.151-161. The Admiralty's policy was to bring U-boats to battle and destroy them, achievable by exploiting Germany's unavoidable defensive commitment to the Arctic campaign in support of the Eastern Front, which forced U-boats to attack North Russia convoys and thereby make themselves vulnerable. An essential side effect was the elimination of the experienced U-boat commanders and crews who otherwise would be available to man the anticipated new and more effective Type XXI U-boats

¹⁰⁷ 'Summary of Naval Air Operations', First Lord: 1st August to 1st November 1944, 7 December 1944, CAB 66/59; 1st November 1944 to 1st February 1945, 19 February 1945, CAB 66/62; 1st February to 1st May 1945, 1 June 1945, CAB 66/66

¹⁰⁸ Ruegg & Hague (1993), pp.65-79

¹⁰⁹ ADM 234/384, pp.231-232. Flying was largely restricted to Swordfish at night and Avengers by day

¹¹⁰ *Ibid.*, pp.224, 243

Campania at the end of 1944 to detect low-flying shadowers was transformative, allowing A/S patrol aircraft to be directed like night fighters with the observer able to concentrate on his ASV radar set. Meanwhile, effective communications between flagship, escorts, convoy, and aircraft were finally achieved with TBS VHF radio-telephones in 1944.¹¹¹

A further innovation was the Flag Officer escorting the convoy now flew his flag from a CVE. Thus, Rear Admiral Dalrymple-Hamilton in *Vindex*, accompanied by *Nairana* and *Tracker*, sailed with JW.61 on 20 October 1944.¹¹² Similarly, on 30 December 1944, convoy JW.63, with 35 ships, sailed with Dalrymple-Hamilton, flying his flag in *Vindex*, accompanied by the light cruiser *Diadem* and 19 escort vessels.¹¹³

British-built CVEs (one-eighth of the RN CVE fleet) were overrepresented in the Arctic campaign, deployed 24 times in the 36 voyages of CVEs in this period.¹¹⁴ This is attributed to widespread belief in the fragility of US-built CVEs' hulls in extremely cold weather,¹¹⁵ and positive experience of *Campania's* advanced fighter-direction room. This room's team was simultaneously able to direct her fighters, supply her partner CVE with information to direct her own fighters, keep the Flag Officer and all ships informed regarding air threats, while warning A/S patrols of hostile aircraft activity. Thus the Flag Officer could 'keep in touch with the carriers, direct general policy and co-ordinate destroyer and air activity' using the AIO, aided by the appointment of an additional Fighter Direction Officer (FDO) on the flagship.¹¹⁶

Reports illustrate CVEs' success in the Arctic, both in deterring attacks and offensive action. For example, on a Russia-Britain convoy, RA.62 departing 10 December 1944, U-boats and nine Ju88 (LT) torpedo bombers attacked, strongly resisted by CVE aircraft (destroying U-365 and a reconnaissance BV.138) and naval gunfire (accounting for two Ju88s); further Ju88

¹¹¹ Ibid., p.242. The VHF radio telephone, produced for the BuS (USN), was known as 'Talk Between Ships' (Proc (2022))

¹¹² Woodman (1994), p.409

¹¹³ Roskill (1961b), pp.252-253

¹¹⁴ Ruegg and Hague (1993), pp.65-92. British-built: *Campania*, 10 times; *Vindex*, eight; and *Nairana*, six. US-built: *Striker*, four times; with *Premier*, *Queen*, *Tracker*, and *Trumpeter*, two each. Only British-built CVEs operated from December 1944 to February 1945. The 12 voyages by US-built CVEs were from August to November 1944 and from March to May 1945

¹¹⁵ Brown (1983a), p.22

¹¹⁶ ADM 234/384, pp.225, 240-241. FDOs directed their carrier's aircraft with communication between FDOs by an inter-FDO VHF R/T

attacks were rebutted.¹¹⁷ Similarly, attacks against outbound convoy JW.64, departing 5 February 1945, with upwards of 20 Ju88s (LT) involved in one attack,¹¹⁸ were countered with help by aircraft from *Campania* and *Nairana* resulting in heavy German losses.¹¹⁹ The final months saw *BdU* concentrate U-boats near the entrance to Kola Inlet, utilising the *Schnorkel*.¹²⁰

Concurrently, fighter/assault carriers successfully supported 26 operations off Norway, ranging from anti-shipping strikes, including those on *Tirpitz* and U-boat depot vessels, to attacks on shore installations such as airfields, harbours, oil tanks, and radar and W/T stations.¹²¹ The tempo of anti-shipping strikes increased over the period, largely based on CVEs as more were released from the Battle of the Atlantic.¹²² Aerial minelaying in the Norwegian Leads and A/S sweeps in the Norwegian Sea favoured deployment of US-built CVEs and Avenger TBRs which could carry a large mine,¹²³ illustrating the impact on deployment of constraints forced on the Navy.

During the second half of 1944 the fighter/assault carriers operating off Norway sometimes accompanied fleet carriers,¹²⁴ but the destruction of *Tirpitz*¹²⁵ released British fleet carriers for redeployment to the Far East.¹²⁶ 1 January 1945 would see Admiral Moore without a

¹¹⁷ 'Summary of Naval Air Operations', First Lord: 1st November 1944 to 1st February 1945, 19 February 1945, CAB 66/62/24; Ruegg and Hague (1993), p.70

¹¹⁸ 'Summary of Naval Air Operations', First Lord: 1st February to 1st May 1945, 1 June 1945, CAB 66/66/17; Ruegg and Hague (1993), p.73 state 48 Ju88s were noted in one attack

¹¹⁹ Admiralty (1954), pp.120-121; ADM 234/384, p.236; 'Summary of Naval Air Operations', First Lord: 1st February to 1st May 1945, 1 June 1945, CAB 66/66/17

¹²⁰ ADM 234/384, p.233. See Map 2 below

¹²¹ *Ibid.*, pp.305-312

¹²² *Ibid.*, p.228. See Maps 2 and 3 below

¹²³ *Ibid.*, pp.305-312. Less than 10% of CVE deployments off Norway involved British-built CVEs in this period. See also 'Summary of Naval Air Operations', First Lord: 1st August to 1st November 1944, 7 December 1944, CAB 66/59/14; 1st November 1944 to 1st February 1945, 19 February 1945, CAB 66/62/24; 1st February to 1st May 1945, 1 June 1945, CAB 66/66/17

¹²⁴ ADM 234/384, pp.305-312. From 1 June 1944-8 May 1945 CVEs were deployed 50 times in 26 operations off Norway out of 35 (nine being CVs alone). One to two CVEs accompanied CVs on five operations until 8 December 1944, prior to the latter being transferred to the Far East. Thereafter, the number of CVEs in each operation increased, peaking at four

¹²⁵ '*Tirpitz*', ADM 234/350, p.74, sunk in Tromsø by the RAF (12 November 1944)

¹²⁶ 'Attack on the *Tirpitz*', Report by the Joint Planning Staff, War Cabinet, 23 August 1944, CAB 79/80, pp.26-27

fleet carrier,¹²⁷ with 11 escort carriers effectively replacing CVs in Norwegian Sea operations, operating offensively with considerable success.¹²⁸

6.4.4 Mediterranean

Following Overlord, CVEs were required in the Mediterranean for a range of services aiding the Allied armies closing the ring around the Third Reich.¹²⁹ Operation Anvil (delayed from June and renamed Dragoon) required tactical naval air cover¹³⁰ and, learning from past operations,¹³¹ the Admiralty insisted on extensive pilot training in both deck landing and close co-operation with Allied ground forces.¹³² For example, three RN CVEs sent to Gibraltar in May 1944 lent 30% of their Seafires to the Tactical Air Force in Italy during June and July to gain operational experience, while the vessels and remaining aircraft provided trade protection between Gibraltar and Malta.¹³³

For Dragoon, nine Allied US-built CVEs (seven RN, assembled from a variety of previous missions,¹³⁴ and two USN) were deployed with 214 fighters in Allied Carrier Task Force (TF) 88¹³⁵ to provide air observation for Allied bombardment vessels and 'close fighter support for the Army until such time as the Tactical Air Force was established in southern France'.¹³⁶ On D-Day of Dragoon, 15 August 1944, Allied pilots found little *Luftwaffe* opposition and concentrated on strafing and bombing enemy positions; the CVEs withdrew each night to the south to avoid the threat of *Kriegsmarine* torpedo-carrying 'small battle units' and

¹²⁷ Roskill (1961b), pp.251-252

¹²⁸ 'Summary of Naval Air Operations', First Lord: 1st February to 1st May 1945, 1 June 1945, CAB 66/66; ADM 234/384, pp.305-312; Hobbs (2003). The 11: *Campania, Fencer, Nabob, Nairana, Premier, Puncher, Pursuer, Queen, Searcher, Striker, and Trumpeter*

¹²⁹ Tucker-Jones (2009), provides political background to Dragoon, which was subject to a fierce debate between Eisenhower and Churchill (Roskill (1961b), pp.76-77)

¹³⁰ Brown (1974), pp.89-91. *Avalanche* had further vindicated the provision of fighter/assault carrier air support

¹³¹ 'Lessons from *Avalanche*', 20 October 1943, ADM 1/12640

¹³² Brown (1974), p.90. All pilots received training in CAP, ground attack, interdiction and bombardment spotting. The pilots of *Attacker* and *Stalker* received specialist training in tactical reconnaissance, and those of the American CVE USS *Tulagi* in fighter-observation for spotting

¹³³ 'Summary of Naval Operations', 1st May to 1st August 1944, First Lord, 21 August 1944, CAB 66/54; Brown (1974), p.89: Gibraltar-Malta convoys had suffered from *Luftwaffe* air attacks earlier in 1944

¹³⁴ 'Summary of Naval Air Operations', 1st May to 1st August 1944, First Lord, 21 August 1944, CAB 66/54: *Attacker, Emperor, Hunter, Khedive, Pursuer, Searcher, and Stalker*. See Map 4 below

¹³⁵ 'Summary of Naval Air Operations', 1st August to 1st November 1944, First Lord, 7 December 1944, CAB 66/59; Brown (1974), pp.84-88, who reports 226 aircraft in total; Roskill (1961b), pp.86-99. The A/A cruiser *Royalist* was specially fitted out as a carrier force flagship (Brown (1994), p.90), as recommended by an Admiralty review, 'Lessons from *Avalanche*', 20 October 1943 (ADM 1/12640)

¹³⁶ Roskill (1961b), pp.87-88. Aircraft in Dragoon came under the orders of the Air Task Force Commander (Brigadier-General G.P. Saville, USAAF of XII Tactical Air Command) once they had flown off the flight deck

Luftwaffe torpedo bombers, returning at daybreak.¹³⁷ By 19 August the Tactical Air Force's fighters were established on land and the carriers' sorties largely consisted of fighter-bombing of enemy columns retreating up the Rhone valley.¹³⁸ It was reported of the nine CVEs that 'their manifold activities eventually ensured the complete success of the landing'.¹³⁹

At the end of August the seven RN CVEs, having carried out 1,673 operational sorties, were ordered to Alexandria. The two US CVEs stayed a further two days; their US Hellcats' endurance allowing fighter sweeps to reach within ten miles of Lyons – well beyond the British Seafires' range,¹⁴⁰ and a further example of how the basic capabilities of CVEs could be enhanced by operating the modern aircraft sought by the Admiralty. At Dragoon, after a significant increase in US-manufactured aircraft in FAA front-line service on CVEs, they represented 54% of total deployed aircraft (226) on the nine Allied CVEs, and 42% of all carrier-borne aircraft on the seven British CVEs, where Seafires represented most of the balance.¹⁴¹ This trend to US-manufactured aircraft would continue and raise effectiveness of RN CVEs.¹⁴²

A key Admiralty document shows the tactical flexibility of the escort carrier task force when Troubridge, asked to form a naval strike force (Force 120) built around his seven British CVEs, carried out operations in the Aegean Sea between 9 September and 20 November.¹⁴³ These offensive operations were a response to Germany's reduction of garrisons in Greece, Crete, and the Aegean Islands and were designed to stop their orderly evacuation, while filling the political vacuum in Greece which the communists might exploit.¹⁴⁴ Troubridge,

¹³⁷ *Ibid.*, pp.89, 99, Appendix W. See Map 4 below

¹³⁸ *Ibid.*, p.99

¹³⁹ 'Summary of Naval Air Operations', 1st August to 1st November 1944, First Lord, 7 December 1944, CAB 66/59

¹⁴⁰ Brown (1974), pp.90-91; Roskill (1961b), p.99

¹⁴¹ Brown (1974), pp.84-91. At Avalanche no US-manufactured aircraft had been on the four RN CVEs. The Seafires' improvement in performance at Dragoon was attributed to a higher standard of DLT, and helped to compensate for lower levels of reserve aircraft held by the RN in this operation: 17% on their seven CVEs compared with the USN's 75%

¹⁴² Roskill (1961b), p.99. Rear Admiral Troubridge, Commander of TF 88, noted the superiority of US aircraft, which he ascribed to longer endurance and more robust undercarriage

¹⁴³ 'Escort Carrier Force, Operations in the Aegean, September and October 1944', Admiralty file M/01027/45, precis included as Appendix 43 in AIR 41/76. See also AIR 41/76, pp.70-74, 106-115, 135-138; Brown (1974), pp.91-93; Hobbs (2003); Roskill (1961b), pp.113-114

¹⁴⁴ Roskill (1961b), p.113. Hitler authorised a gradual withdrawal from southern Greece to the central Balkans (27 August 1944). See Map 5 below

with three light cruisers and seven destroyers, deployed various combinations of CVEs and escorts into the Aegean, moving north, initially isolating Crete, then the Dodecanese with the key island of Rhodes, before occupying Athens in early October, which isolated the Cyclades Islands (Melos, Naxos and Paros).¹⁴⁵

Operations involved widespread anti-shipping strikes (including E-boats, landing craft, ferries, and coastal craft), attacks on airfields, and radar and W/T stations, together with straffing of motor transport and garrison infrastructure (such as dive bombing the railway on Kos). Aircover was provided to support amphibious landings (Mitylene and Piskopi) and spotting for bombardment vessels, while TarCAP sorties flew over minesweeping operations near Milos. Fighters flew some 1,500 sorties with negligible losses.¹⁴⁶ Despite the successful deployment of CVEs, as the Admiralty reported regarding the first operation, a suitable blend of aircraft and weapons system remained problematic:

The Hellcats and Wildcats with their extra range again proved their superiority over British types, though the need for rocket projectiles in the Hellcats was much felt. Had they been so equipped, a great deal more damage might have been done to shipping.¹⁴⁷

Furthermore, as the report notes, while the Hellcats of NAS 800 in *Emperor* were 'very impressive' in terms of range and hitting power, the pilots were 'thoroughly tired after five months of sustained operations'.

The squadron of CVEs was steadily reduced as ships were recalled for refit and preparation for transfer, in most cases to the Eastern Fleet,¹⁴⁸ at the end of October only *Emperor* remained, to provide a CAP for her Swordfish which was spotting for the battleship *King George V's* bombardment of Milos and Piskopi.¹⁴⁹ The Seafire squadrons embarked on *Attacker*, *Hunter*, *Khedive*, and *Stalker*, constituted No. 4 Naval Fighter Wing and, following

¹⁴⁵ 'Escort Carrier Force, Operations in the Aegean, September and October 1944', Admiralty file M/01027/45, precis included as Appendix 43 in AIR 41/76. See also Brown (1974), pp.91-93; Hobbs (2003); Roskill (1961b), pp.114-119

¹⁴⁶ Ibid.

¹⁴⁷ 'Escort Carrier Force, Operations in the Aegean, September and October 1944', Admiralty file M/01027/45, p.4, precis included as Appendix 43 in AIR 41/76

¹⁴⁸ Hobbs (2003). *Attacker* refitted at Taranto, *Emperor* at Newport, *Hunter* at Malta, *Khedive* at London, *Pursuer* and *Searcher* at the Clyde (for redeployment with the Home Fleet), and *Stalker* at Gibraltar

¹⁴⁹ Roskill (1961b), p.116. *King George V* was transiting the Mediterranean to join the Eastern Fleet

leave in the UK, returned to Egypt to work up for operations in the Indian Ocean, with *Khedive* replacing her 26 Seafires of 899 NAS with 24 Hellcats of 808 NAS.¹⁵⁰

As these accounts illustrate, as the Allies moved increasingly on to the offensive and demands on the RN intensified, CVE deployment evolved from delivering trade protection to attacking land targets. Once again, the RN exploited their flexibility and value, particularly when armed with modern naval aircraft.

6.4.5 Indian and Pacific Oceans

Whilst Admiralty warnings about the scale of resources required in these theatres were well founded, official documents shed light on how it once again successfully exploited the versatility of CVEs to compensate for some of the shortages. For example, in addition to the review of *Avalanche* and guide to tactics,¹⁵¹ the C-in-C Eastern Fleet commissioned research into 'the handling and equipment of escort carriers which were to be sent out to join the Eastern Fleet';¹⁵² as noted above the Joint Technical Warfare Committee examined 'the problem inherent in providing tactical air support from escort carriers under conditions to be expected in the Pacific war';¹⁵³ and the inter-service Lethbridge Report examined logistics for the war against Japan.¹⁵⁴ Whilst the literature emphasises how successfully the BPF learnt from experience in these theatres and from the USN,¹⁵⁵ analysis in these reports also informed Admiralty thinking on deployment of escort carriers, with important recommendations on pilot training, exercises, aircraft types, and communications, and the use of a spare deck on operations, which 'came to the rescue' on at least one occasion.¹⁵⁶

¹⁵⁰ Brown (1974), pp.91-93; Hobbs (2003), pp.190-193

¹⁵¹ 'Lessons from *Avalanche*', 20 October 1943, ADM 1/12640; 'Escort Carrier Force Instructions', Memorandum, 25 December 1943, Rear Admiral A.W. La T. Bisset to Commanding Officers of Eastern Fleet Escort Carriers, ADM 1/16463

¹⁵² 'Report by Staff Officer (Air) to C-in-C Eastern Fleet', 30 October 1943, and covering note, 13 November 1943. Both AIR 23/2512

¹⁵³ Joint Technical Warfare Committee papers, 25 April 1944, CAB 137/9, p.32

¹⁵⁴ 'Lethbridge Report', 25 March 1944, WO 203/5250; see also ADM 116/4906 for naval papers prepared for this report. Jones (2007) and Madsen (2008) provide further analysis of the logistics involved

¹⁵⁵ Hobbs (2012); Robb-Webb (2011, 2013, 2016)

¹⁵⁶ AIR 41/77, *The RAF in Maritime War, Volume VII*, p.520. The benefits were evident in Operation Inmate (14-15 June 1945), an attack on Japanese facilities on the Truk Islands: bad weather, and other aircraft ranged on *Implacable's* deck, forced six Seafires from *Implacable* to land on the spare deck provided by *Ruler*

Deployment accelerated in the second half of 1944 and early 1945 as CVEs were released from the Atlantic and Mediterranean.¹⁵⁷ The Eastern Fleet was dissolved on 19 November 1944 and two separate commands formed, the EIF on 19 November and the BPF on 22 November.¹⁵⁸ 18 CVEs were allocated to the EIF between November 1944 and September 1945 and 11 to the BPF, while six RN-manned CVEs were lent to the USN during 1944-1945 as ferry carriers in the Pacific for some six months each, the majority of the assignments commencing in January 1945.¹⁵⁹

More CVEs deployed to the Indian Ocean allowed the Admiralty to transfer all fleet carriers from there to the BPF, enabling the RN to meet the requirement for a credible strike force in the Western Pacific. The role of CVEs was expanded in the Indian Ocean from the still essential one of trade protection and in the Pacific CVEs performed new roles in the BPF's Fleet Train. As the Air Staff noted, the tasks performed by escort carriers in these theatres:

...increased as time proceeded and the carrier therein showed itself one of the most versatile of crafts and the employment of its aircraft increased the diversity of air tactics and widened the field of air strategy.¹⁶⁰

Indian Ocean

June 1944 saw German U-boats commence a campaign against merchant shipping, mostly sailing alone, which lasted until August and claimed 17 Allied ships of 107,227 tons.¹⁶¹

Somerville focused his few CVEs on TPC roles,¹⁶² and launched one A/S sweep employing *Begum* and *Shah* in a Hunter-Killer Group (Force 66) resulting in the sinking of U-198, north west of the Seychelles on 12 August.¹⁶³ Meanwhile, the RN's Eastern Fleet began gaining

¹⁵⁷ Ibid., p.409

¹⁵⁸ Faulkner (2012a), p.221; Willmott (1996), p.177

¹⁵⁹ 'Summary of Naval Air Operations', 1st November 1944 to 1st February 1945, 19 February 1945, CAB 66/62; Hobbs (2003). The six lent to America: *Atheling*, *Rajah*, *Reaper*, and *Tracker* (once); *Patroller* and *Ranee* (twice)

¹⁶⁰ AIR 41/77, pp.201, 409. An *RAF Narrative* of the Eastern Fleet in 1944 analysed the offensive operations of RN carriers, noting the shift from trade protection to 'denial of the Indian Ocean to the Japanese', highlighting the performance of escort carriers

¹⁶¹ Ibid., pp.203, 554. Doenitz had decided to reinforce the Indian Ocean theatre. Allied losses for 1944 exceeded all other theatres at 50 ships (486,324 tons), most in January-August; see also Roskill (1961b), p.204

¹⁶² Hobbs (2003). Convoy trade protection and A/S sweeps were carried out between June-October 1944 by *Ameer*, *Battler*, *Begum*, and *Shah*

¹⁶³ ADM 234/377 (*Naval Staff History, War with Japan, Volume IV*), pp.196-199; ADM 234/68, p.91 for a German perspective. Force 66 was the only successful Hunter-Killer Group operation in the Indian Ocean, as these had been discouraged by the Admiralty in the light of scarce escort vessels and CVEs in the theatre. The mining of Penang Harbour (October 1944) by the RAF obliged the Axis submarines to abandon their bases and move to Batavia (Java), while *BdU* began to recall its U-boats to Germany

supremacy in the Bay of Bengal, with eight carrier air strikes between March and October 1944 as capital ships and fleet carriers were deployed off Ceylon.¹⁶⁴ When the EIF lost its fleet carriers to the BPF it gained more CVEs which, besides trade protection, proved their flexibility and value in air operations - as previously in the Mediterranean and off Norway - providing strike capability along the Burmese and Malayan coasts as the British 14th Army moved south towards Mandalay and Rangoon, while monitoring IJN cruisers based in Singapore.¹⁶⁵

The five CVEs with the EIF in November 1944¹⁶⁶ were augmented with seven CVEs by April 1945 and a further six subsequently,¹⁶⁷ albeit subject to recall to Britain, loans to the USN, and transfers to the BPF, which impacted on the EIF's effective use in early 1945. Most were fighter/assault carriers, allocated to the 21st Aircraft Carrier Squadron (ACS) of the EIF.¹⁶⁸ The total number of operational aircraft flying off the CVEs in the Indian Ocean grew from 58 in late 1944 to approximately 256 by August 1945; this reflected the increased availability of CVEs.¹⁶⁹

The tempo of CVE operations in the Indian Ocean accelerated over the period of the chapter, with fighter/assault carriers covering successful combined operations and air strikes against enemy airfields and installations.¹⁷⁰ These successes were despite ongoing unreliability of machinery on some CVEs, such as *Shah's* catapult during Operation Dukedom and *Emperor's* catapult in Operation Sunfish.¹⁷¹ Furthermore, they lacked a Fleet Train as BPF enjoyed 'absolute priority in this respect'; this restricted long-range operations and

¹⁶⁴ AIR 41/77, pp.406-413; Barnett (1992), pp.871-872; Willmott (1966), pp.158-177. See Map 6 below

¹⁶⁵ AIR 41/77, pp.408-413. See also Roskill (1961b), pp.236-237, 316-319. See Map 7 below

¹⁶⁶ 'Summary of Naval Air Operations', 1st August to 1st November 1944, First Lord, 7 December 1944, CAB 66/59: *Ameer, Atheling, Battler, Begum, and Shah*

¹⁶⁷ Brown (1974), pp.112-120; Hobbs (2003); Willmott (1996), pp.187-188, 199-200. *Activity, Empress, and Khedive* in February 1945; *Emperor, Hunter and Stalker* in March; and *Attacker* in April. A further six CVEs would arrive later (approximate dates): *Pursuer, Smiter and Trumpeter* (July); *Fencer and Searcher* (August). Assault carrier flagship *Trouncer* arrived in October 1945

¹⁶⁸ 'Withdrawal of Escort Carriers from E.I. Station', 15 August 1945, Memorandum by DOP, ADM 1/18682; Hobbs (2003). Of the 18, 10 were fighter/assault carriers, three general purpose/TPC, four were ferry carriers, and one was a DLT carrier (two arrived in theatre too late to participate in combat)

¹⁶⁹ 'Withdrawal of Escort Carriers from E.I. Station', 15 August 1945, Memorandum by DOP, ADM 1/18682; Hobbs (2003), pp.188-194

¹⁷⁰ 'Summary of Naval Air Operations', 1st February to 1st May 1945, First Lord, 1 June 1945, CAB 66/66; AIR 41/77, p.413

¹⁷¹ AIR 41/77, pp.469-476, 486-492, 548-550; Hobbs (2003); Willmott (1996), pp.169-174. These sources detail individual CVE's deployment in the different operations

thereby made CVEs an extension of land-based air power.¹⁷² Nevertheless, estimates suggest a third of serviceable Japanese aircraft in Burma, Malaya, and Sumatra were destroyed by 21st ACS aircraft during the last six months of the war, together with Japanese coastal shipping, railway stock, and motor transport, which effectively 'strangled' sea-borne supplies to their troops in Burma.¹⁷³

Pacific Ocean

In November 1944, at the BPF inception, the Strike Fleet component totalled 51 warships, including the 1st ACS¹⁷⁴ and the Fleet Train escorts, and the Fleet Train contained 43 vessels, including four classified as replenishment escort carriers.¹⁷⁵ The BPF operated strike aircraft off four fleet carriers against oil refineries in Sumatra during three phases of Operation Outflank,¹⁷⁶ and then sailed to Sydney, Australia, which became its main rear base.¹⁷⁷ Here it faced general shortages of repair and supply needs,¹⁷⁸ and trained staff, especially air crew, with no replacement air crews available in Australia when it arrived.¹⁷⁹ From Sydney the BPF joined Admiral Nimitz's US Naval forces as one¹⁸⁰ of several separate task forces. The BPF then deployed against targets on Sakishima Gunto and Formosa as part of the invasion of Okinawa (Operation Iceberg),¹⁸¹ and later operations against the Japanese Home Island of Honshu.¹⁸²

¹⁷² Brown (1974), p.120

¹⁷³ Ibid. See Map 8 below

¹⁷⁴ Hobbs (2012), p.61. *Indomitable, Illustrious, Indefatigable, and Victorious*

¹⁷⁵ Ibid., p.62. *Fencer, Slinger, Speaker, and Striker*

¹⁷⁶ 'Report of Experience of the British Pacific Fleet from January to August 1945', 15 March 1946, ADM 199/1457, p.9. Operations Robson (20 December 1944), Lentil (4 January 1945), and Meridian (22 January 1945). See Map 7 below

¹⁷⁷ AIR 41/77, pp.504, 552. See also Hobbs (2007), p.13

¹⁷⁸ 'Man-Power One Year After the Defeat of Germany: Reduction of Service Requirements Report', Memorandum by COS(s) Committee, January 1945, CAB 121/323. The Admiralty noted: 'Australian facilities are barely sufficient for meeting repair and supply needs of the Australian Navy' (paragraph 9)

¹⁷⁹ 'Commander-in-Chief's Despatches – November 1944 to July 1945', dated 23 November 1945, ADM 199/118, provides Fraser's comments on the establishment and operation of the BPF. See paragraphs 26-31 for the resources and political background in Australia; paragraphs 32-48 for distances involved, requiring Intermediate and Advanced bases

¹⁸⁰ Robb-Webb (2016), pp.64-65. TF 57/TF 37 in the Fifth and Third US Fleets respectively

¹⁸¹ 'Battle Summary No. 47, Naval Operations Okinawa, Operation "Iceberg" March-June, 1945', ADM 234/368, pp.17-19, 99-117, in the East China Sea, under Admiral Spruance, USN, of the Fifth Fleet

¹⁸² ADM 234/379, pp.210-231. Third Fleet Operations (July–August 1945) under Admiral Halsey. See Map 9 below

The Fleet Train and its CVEs grew over time,¹⁸³ but never to the level required.¹⁸⁴ Ships in Task Force 112 (including the Fleet Train and its escorts) on VJ Day numbered 125 against the anticipated number of 309 operational by 1 January 1946.¹⁸⁵ Despite the shortcomings of the Fleet Train, RN CVEs were successfully deployed in a number of roles and 'largely met' the needs of the BPF fleet carriers,¹⁸⁶ although America continued to provide support, particularly to help overcome a lack of fast oil tankers.¹⁸⁷

RN CVEs supported the BPF in a number of ways. Firstly, they provided aircrew for the newly formed BPF and a reserve pool of pilots.¹⁸⁸ CVEs joining then included fighter/assault carriers and two squadrons were disbanded to help alleviate the critical pilot shortages on the fleet carriers while another fighter squadron, in *Speaker*, was retained for CAP sorties over the replenishment at sea (RAS) area, allowing CV air groups to rest.¹⁸⁹ The importance of the CAP role is illustrated by the transfer of four Hellcats with experienced pilots, intended for *Indomitable*, to *Ruler* from the replenishment CVE *Chaser*, despite *Indomitable's* shortages.¹⁹⁰

Secondly, a shortage of aircraft transport ships was addressed by using CVEs as ferry and replenishment carriers for the BPF, with two other squadrons landed to form the heart of

¹⁸³ Smith (1994b), pp.195-196. The CVE component grew from four replenishment and two ferry CVEs in May 1945 to six replenishment and three ferry CVEs by VJ Day

¹⁸⁴ 'Man-Power One Year After the Defeat of Germany: Reduction of Service Requirements Report', Memorandum by COS(s) Committee, January 1945, CAB 121/323, Appendices A-C; see also AIR 41/47, pp.515-519, which includes an account of the Air Train's formation and how the BPF had to return to Leyte (23 April 1945) after its first major operations with the USN in the Pacific: 'Its tankers had been too few and too slow and the Fleet Train had proved inadequate. To retard a return to operations still further, three fighter wings, at the end of their operational tour, had now to be relieved.' Jones (2007), pp.230-251 provides an analysis of the Fleet Train's operations, both of the distances covered and variety of aircraft and spares required as well as the perennial shortages of skilled maintenance personnel

¹⁸⁵ 'History of the Fleet Train, Volume II (1 June 1945-20 August 1945)', 8 September 1945, ADM 199/1766, p.76

¹⁸⁶ Brown (1974), pp.124, 130-132

¹⁸⁷ 'History of the Fleet Train, Volume I (November 1944-May 1945)', 7 June 1945, ADM 199/1766, pp.3-66; 'Report of USN Liaison Officer', 12 July 1945, ADM 199/1766, pp.142-150. See 'Commander-in-Chief's Despatches – November 1944 to July 1945', dated 23 November 1945, ADM 199/118, paragraphs 24, 61-65A for Fraser's observations on generous local USN logistical support in contrast to the 'rule of self sufficiency', invoked when requests had to be referred 'upwards'

¹⁸⁸ 'Report of Experience of the British Pacific Fleet from January to August 1945', 15 March 1946, ADM 199/1457, p.13

¹⁸⁹ Hobbs (2012), pp.116-159; Hobbs (2003), pp.130-131, 192, 194. When *Speaker* changed roles in April 1945 from a CAP carrier to a replenishment carrier, *Ruler* was used carrying 24 Hellcats (December 1944-September 1945). Of *Speaker's* two disbanded squadrons, their maintenance ratings remained on the CVE to assist in the maintenance role of a replenishment carrier

¹⁹⁰ Hobbs (2012), p.192. 23 May 1945

the replacement carrier groups.¹⁹¹ The ferry carriers took aircraft from Sydney to intermediate facilities and on to advanced bases,¹⁹² where they were transported by lighter to replenishment carriers, which then sailed to the RAS¹⁹³ where the aircraft flew to the fleet carriers and the CVEs received damaged but 'flyable duds' aircraft in return.¹⁹⁴ The importance of CVEs acting as replenishment carriers is clearly illustrated in Operation Iceberg, where *Speaker* replenished *Formidable* after she lost 18 aircraft (leaving only four Avengers and 11 Corsairs serviceable), with *Ruler* performing CAP and A/S patrols.¹⁹⁵ Subsequent reports showed the replenishment carriers in Iceberg met 67% of the BPF's requirements; to increase this figure, during July and August two replenishment carriers joined the BPF at the start of the first refuelling period, and one at the start of subsequent refuelling.¹⁹⁶

Thirdly, CVEs were crucial to maintenance of replacement aircraft, with maintenance crews handicapped by the diversity of aircraft on BPF fleet carriers.¹⁹⁷ This diversity was exacerbated by the US aircraft (Avengers, Corsairs, Hellcats, and Wildcats), over 75% of the air groups, having been so modified to RN specifications that relying on pooling resources for spares with the USN was impossible. Accordingly, the spares carried were 'entirely disproportionate to the number of squadrons employed'; furthermore, lack of

¹⁹¹ 'Summary of Naval Air Operations', 1st February to 1st May 1945, First Lord, 1 June 1945, CAB 66/66. The extra ferrying requirements of the BPF had necessitated the withdrawal from the USN of *Reaper* and *Patroller* - two of six CVEs lent during 1945; Hobbs (2012), p.118

¹⁹² Smith (1994b), p.109. Intermediate facilities were established at Manus (in the Admiralty Islands) and Advanced Bases at Ulithi (in the Western Carolines) and Leyte (in the Philippines). See Maps 10 and 11 below

¹⁹³ Brown (1974), p.131. A replenishment carrier's standard load for Iceberg 2 was 10 Corsairs, seven Hellcats, three Seafires, one Avenger, and one Firefly

¹⁹⁴ Smith (1994b), p.107. Task Force replenishment usually took two full days. Hobbs (2007), pp.97-99, describes how replenishment carriers operated. By July-August 1945, the total aircraft embarked on the four British fleet carriers is stated as 255: 'The British Pacific Fleet in Operations Against Japan', 15 October 1945, ADM 199/118, table following p.31. In the eight strike days of operations in the period 17 July-10 August, 141 aircraft replacements were needed (101 write-offs and 40 flyable duds/aircraft damaged beyond repair on board); of the 141, 50 were deck-landing casualties: 'Analysis of Aircraft Wastage', 1 October 1945, ADM 199/118, table 3

¹⁹⁵ Hobbs (2012), p.187

¹⁹⁶ 'Report of Experience of the British Pacific Fleet from January to August 1945', 15 March 1946, ADM 199/1457, p.24. 67% was 'adequate for predictable losses', but failed to cover 'hangar fires and suicide attacks'

¹⁹⁷ AIR 41/77, pp.506-507. For example, operating as TF 57 (Operation Iceberg), in the period 26 March-20 April 1945 and 4 May-25 May 1945, the BPF had 218 aircraft of six different types (including 40 Seafires, described as 'relics of a bygone age'); see also Roskill (1961b), p.344

standardisation, with British and US aircraft on the same carrier, created difficulties in operating aircraft efficiently and reduced the fleet's mean speed.¹⁹⁸

Fourthly, a key problem for the BPF, widely covered in the literature, was the shortage of oil tankers. Less emphasised is the role CVEs played as tankers at crucial points. For example, replenishment carriers *Arbiter* and *Chaser* were fitted at Manus with equipment to supplement tankers, and in August 1945 acted as auxiliary tankers 'to make up the shortfall' at a key moment after the BPF had to disengage early in order to refuel.¹⁹⁹ Another serious problem identified was a 'low' standard of A.A. gunnery training in RN ships. Following USN practice, the RN again exploited CVE versatility when *Ruler*, on fighter cover and A/S patrol duties, acted as an A.A. training carrier with aircraft capable of towing targets for A.A. gunnery training.²⁰⁰

Cessation of hostilities on 15 August saw CVEs involved in the occupation of key ports and the local surrender of Japanese troops.²⁰¹ The period ended with running down FAA facilities in the Pacific and Indian Oceans, Repatriation of Allied POWs and Internees (RAPWI), and troop transportations around the theatre, involving British CVEs and other carriers extensively.²⁰²

During nine months of wartime service, the BPF launched 7,958 operational sorties, destroying or damaging 730 enemy aircraft and sinking over 400,000 tons of shipping, and disrupting Japanese industry and transport systems on the Home Islands.²⁰³ It enabled the RN to participate in the final offensive of the USN against Japan and to gain experience in a new type of warfare 'operating a fleet in ocean warfare',²⁰⁴ which is still relevant today. As the Admiralty noted, the Fleet Train 'by rendering the striking forces independent of shore bases, formed an indispensable part of the Fleet'.²⁰⁵ Without the CVEs, the Fleet Train could not have fulfilled its role. Indeed, as the Director of Naval Air Warfare noted with regard to,

¹⁹⁸ AIR 41/77, pp.506-507

¹⁹⁹ Hobbs (2012), p.260, 279

²⁰⁰ 'Report of Experience of the British Pacific Fleet from January to August 1945', 15 March 1946, ADM 199/1457, p.15

²⁰¹ Willmott (1996), p.175-177

²⁰² Hobbs (2012), pp.322-346

²⁰³ Brown (1974), p.140

²⁰⁴ 'Report of Experience of the British Pacific Fleet from January to August 1945', 15 March 1946, ADM 199/1457, p.8. See also 'The British Pacific Fleet in Operations against Japan', 15 October 1945, ADM 199/118

²⁰⁵ 'Battle Summary No. 47', ADM 234/368, p.100

‘...a large number of ferry and replenishment Carriers in the Fleet train...Without them, this form of warfare is impossible’.²⁰⁶

6.5 Conclusion

This chapter examined the final phase of the war in the various theatres, when the Admiralty’s earlier determination to maintain operational flexibility of its escort carriers was further vindicated. As the chapter shows, this flexibility enabled deployment in all theatres and in multiple roles, meeting a wide variety of operational requirements despite ongoing resource constraints.

A study of key documents illustrated the severe impact of manpower shortages on procurement, justifying repeated Admiralty warnings. These shortages impacted conversion of the US-built *Ruler*-class vessels in particular and the maintenance and upgrading of the CVE fleet in general. During this period supplies to the RN of vital modern US naval aircraft slowed, despite the huge output of US industry, with reports of continued competition with the USN exacerbated by US concerns over RN utilisation of aircraft held in reserve in Britain and initial doubts over British commitment to deploy adequate numbers of CVEs in the Far East.

Effectiveness of deployment was similarly overshadowed by a shortage of experienced manpower, impacting on CVE availability for deployment and the need to utilise inexperienced aircrew and seamen. Furthermore, the RN was operating with unreliable equipment, a significant proportion of inferior aircraft, and a Fleet Train which was inadequate in the Pacific and non-existent in the Indian Ocean. Despite suffering from ‘too little, too late’,²⁰⁷ it nevertheless achieved remarkable success in deploying increasing numbers of CVEs in a succession of theatres and in a variety of increasingly offensive roles. The Admiralty used its early experience of CVEs to inform future tactics and, as more CVEs became available, exploit them in multiple units. During the period covered by this chapter, the RN also exploited the development of modern communications and aircraft direction

²⁰⁶ ‘Reference Sheet by Director of Naval Air Warfare’, 13 February 1946, ADM 199/118

²⁰⁷ Jones (2007), p.28. Jones addresses the importance of a well-funded efficient supply chain operating in an economy able to sustain multiple operations over great distances. Jones quotes Ballantine (1947), p.8: ‘The logistic process in total war must operate in an economy saturated by demand, in which the ordinary laws of the marketplace are in suspension, in which the factor of time supersedes price and the greatest evil is to have “too little, too late”’

systems. Successful operations included support of amphibious landings, airstrikes against land-based targets, spotting for naval bombardments, aircraft ferrying, as well as traditional roles in trade protection against U-boats, surface vessels, and aircraft. The deployment of CVEs for these varied roles enabled the Admiralty to offset major gaps in naval resources, particularly CVs, CVLs, and aircraft transporters, meeting the increasingly important needs for air power in naval warfare. Finally, the Admiralty's deployment of CVEs as a vital component of the Fleet Train enabled the RN to deliver Britain's political goal in the Far East and acquire valuable skills in a new form of naval warfare.

7. Chapter 7: Conclusion

7.1 Introduction

The first escort carrier became operational in September 1941, two years after hostilities began and 23 years after specifications for such a vessel were the subject of an Admiralty report. The integrated nature of this thesis has underpinned the identification of complex reasons for the initial delay in procurement and the analysis showing that the Navy deployed these modest vessels effectively in key roles and at pivotal moments during the course of the war, exploiting their versatility and demonstrating a better understanding of an aircraft's potential against a range of threats than is sometimes argued by critics.¹

Whilst supporting the more recent trend in scholarship on the RN, which suggests to varying degrees that the Admiralty was less conservative than once thought, this thesis argues that there was indeed a focus on the battleship in the interwar years, which might be characterised as conservative but which was necessary. Furthermore, whilst there was a lack of sufficient resources to exploit nascent airmindedness in trade protection in the early period of the war this was largely overcome as the war progressed, predominately by innovation in auxiliary carriers and the help of US CVEs and modern naval aircraft. Moreover, the thesis shows how the Admiralty developed its use of air power with modified CVEs to meet new operational needs for these vessels exposed by the absence of light fleet carriers.

The research results have been presented chronologically in the previous chapters. This final chapter shows how this research answers the six secondary questions identified in the first chapter and how the findings collectively address the central question of the thesis. This chapter then looks at the key interconnecting themes emerging from the research: the impact of policy and strategy; lack of resources; inadequate naval aircraft; and the need for a versatile vessel which could be modified and deployed in a variety of roles. The chapter concludes with wider observations drawn from the research.

¹ For example, Barnett (1992) and Marder (1974) examine policy in parts of this period, emphasising Admiralty conservatism and being critical of the Navy and RAF for their approach to naval and maritime air power; and Roskill (1976), pp.226-228, who accuses the Admiralty of an obsession with 'the battle fleet concept'

7.2 Thesis Questions

Question One: *What foundations were set during the interwar period – in terms of doctrine, leadership, organisational structure, and priority for resources – for trade defence, in the context of the Navy as a whole, and the development of the escort carrier in the Second World War?*

The organisational structure imposed by the government for trade defence at the end of the First World War placed the FAA under dual control, leading to a lack of strategic clarity, with poor co-operation and little co-ordination between the Navy and RAF, particularly regarding A/S bombs, arrester gear and catapults. Lessons evident in the 1918 Hope Report were forgotten, the most important of which was the need for good co-ordination between aircraft and warships hunting submarines. Dependence on the RAF, a sister service competing for resources and focused on strategic bombing, for shore-based trade protection and the development of suitable maritime and carrier-based aircraft, further undermined the foundations of trade defence in the interwar period. Indeed, the RAF's rebuttal of the Navy's case for carrier-borne aircraft in trade defence was based on its arguments in favour of strategic attacks against enemy air bases, submarine pens, and shipyards, rather than close aerial support of the convoy. In this context, it is unsurprising that the Navy lost its leadership among the world's navies in naval aviation.

Caught between government cutbacks in defence expenditure and the roles required of it, the Navy was forced to prioritise the rebuilding of the battlefleet as the most flexible response to evolving and competing threats, tactically and strategically. Battleships and fleet carriers, which required longer lead times than escort vessels, were key to trade protection and necessary to match modern Japanese, Italian, and German capital ships and carriers.

The Admiralty's consideration of a range of potential escort carriers in 1935 and 1936, even considering the conversion of merchant vessels into a basic variant, illustrates the evolution of trade protection doctrine and the Admiralty's increasing stress on the importance of mobile sea-based platforms far from land. However, earlier cutbacks in designers, sharply rising demand associated with British rearmament, and budgetary constraints, prevented work proceeding. This cast a long shadow over later decisions.

The Holland Report of 1938 further illustrates the Admiralty's awareness that the battlefleet, even with evasive routing of convoys, could not fully address the issue of trade defence. It argued strongly in favour of air cover from trade protection carriers but recognised the limitations imposed by financial constraints and the need to prioritise expenditure on the more flexible fleet carrier.

Question Two: *Why were stop-gap solutions required for trade protection in the opening phase of the Second World War? Which ones were adopted and why? Why was the escort carrier given the roles it was?*

Stop-gap solutions are an example of the Admiralty's innovative and pragmatic response to increasing convoy losses, combined with evolving threats from surface warships, aircraft, and submarines, an uncertain strategic situation, and pressure on resources. Convoys, as the Admiralty had predicted, required surface and aerial protection. However, convoys lacked TPCs on the oceanic trade routes and support for aerial trade protection from the RAF was limited in range and capability. The Admiralty therefore pursued a dual approach: it sought alternative interim solutions for aerial trade protection, while also allowing the prioritisation of essential, longer lead-time vessels, thus optimising the use of scarce resources.

In an illustration of Admiralty pragmatism, to tackle the problem of enemy AMRs and reconnaissance aircraft, AMCs with catapult aircraft were deployed despite the acknowledged limitations of the vessel and the associated Walrus aircraft. However, illustrating the varied nature of the different bottlenecks, procurement was hampered by severe shortages of catapult-manufacturing capacity. The possibility of auxiliary seaplane carriers was examined, but again thwarted by resource constraints. However, perseverance with alternative approaches to catapult technology yielded FCSs, operational from December 1940 to June 1942, and CAM ships, operational from May 1941 to July 1943. They both operated single-use aircraft to combat enemy reconnaissance aircraft, an example of a relatively effective if inefficient stop-gap measure.

As U-boats became an increasing threat and the RAF's maritime aircover remained completely inadequate, the Admiralty continued to seek a solution which would provide uninterrupted air cover over convoys. In line with previous Admiralty studies, the solution

would require low-cost vessels which could be relatively quickly procured, with flight decks able to launch and recover currently-available British aircraft. These aircraft would be deployed to spot and attack U-boats threatening convoys, forcing U-boats to dive and hence lose their tactical advantage, as well as deterring enemy reconnaissance aircraft. The eventual outcome was the auxiliary, or escort, carrier. However, despite the Admiralty's efforts the first of these did not become operational until September 1941, illustrating the importance of persisting with stop-gap measures in the early war years. In a further example of the Admiralty's innovative use of stop-gap measures, CVEs were ultimately required to act as critical stop-gap measures in their own right to address the absence of CVLs and cover fleet tasks such as assault carriers aiding amphibious landings.

Question Three: *How did the Navy adapt its approach to escort carrier procurement and use as strategic threats multiplied from June 1940 to December 1941?*

Despite the U-boat threat increasing with the fall of France in June 1940, the Admiralty was still unable to secure the support it sought for aerial trade protection. A series of meetings illustrate the complex inter-service rivalry and political issues involved. The critical issue for escort carrier procurement was the continued resistance of the War Cabinet to the conversion of British merchant hulls, as well as the inherent difficulty in judging the potential of some of the initiatives to address their absence.

However, the Navy's determination to replace inadequate stop-gap solutions with fully operational escort carriers to combat increasing convoy losses culminated in two major developments. First, a British-government supported approach to America resulted in four US-built auxiliary aircraft carrier hulls being acquired by the USN for the RN between March and November 1941 (which would still need to be completed in US yards and then modified in British yards), and a fifth which was returned to the USN for joint DLT. Simultaneously, the Admiralty finally secured government approval for the conversion of the first British escort carrier, *Audacity*, from an existing merchant ship. *Audacity* was operational as a fighter carrier by September 1941 but was sunk by a U-boat in December. However, in the short time she was operational on the Gibraltar-UK trade route she had proved her worth, her aircraft shooting down enemy reconnaissance aircraft, sighting and suppressing

numerous U-boats, and aiding in the sinking of a U-boat. Significantly, she showed her superior effectiveness compared with the FCS and CAM ships.

Two key achievements illustrate the Admiralty's proactive approach to organisational changes necessary to address the threats to convoys. Firstly, the Admiralty moved WAC from Plymouth to Liverpool in February 1941, and secondly it finally succeeded in gaining operational control of Coastal Command in April. However, the Admiralty was unable to overcome the RAF's and Churchill's bias towards the bomber offensive, resulting in insufficient support to address Coastal Command's need for adequate numbers of suitable aircraft being available for mid-Atlantic work, creating an even greater need for escort carriers and their aircraft.

Question Four: *How did the Navy respond between December 1941 and May 1943 to the heavy naval and mercantile losses and the competing demands over escort carrier usage in many theatres?*

The Navy's responses to losses initially lacked further British government support, but Pearl Harbor acted as a catalyst for Roosevelt to accelerate supplies of escort carriers to the Royal Navy in the form of 11 *Attacker*-class vessels, 10 of which the RN was allocated as part of a USN order in December 1941, and one which was acquired by the USN for the RN in May 1942. In Britain, the MT and the Air Ministry again prevailed in the competition for resources, despite particularly stark warnings from the Admiralty about losses and the urgent need for air cover. However, the Admiralty again illustrated its pragmatism by including a simple variant in proposed British escort carrier designs and, under continued Admiralty pressure, the War Cabinet approved the construction of a second vessel in Britain – *Activity*, ordered in January 1942. Between March and October 1942, the Admiralty only succeeded in securing approval for what would be the final four British-built escort carriers (*Pretoria Castle*, *Vindex*, *Campania*, and *Nairana*).

In the same period, with insufficient escort carriers and VLR maritime aircraft to counter the success of the U-boat campaign in the North Atlantic and with few available to counter increasing threats to convoys in the Arctic, South Atlantic, and Indian Ocean, the Admiralty again turned to the US, assisted by the close working relationship it had established and a

positive political environment. Between January 1942 and the end of May 1943 it ordered 23 more US escort carriers (of the *Ruler* class).

In a further example of pragmatism, the Admiralty, facing continued opposition in Britain to the procurement of sufficient escort carriers, proposed a clever compromise as a new stop-gap measure. In June 1942 it agreed the conversion of the first of 19 British-built merchant vessels into MAC ships which, importantly, were still able to carry the majority of their cargo.

The Navy's response to heavy losses and increased demand for escort carriers was hampered by the poor quality of its naval aircraft, reflecting its dependence on MAP and illustrating how long shadows cast by earlier decisions continued to impact operational effectiveness. The Navy therefore turned increasingly to the US for high-performance naval aircraft, both fighters and TBRs. The effectiveness of the RN's escort carriers was markedly enhanced by these superior American aircraft and their catapult compatibility with the US-built vessels.

The limited number of escort carriers available during this period required the Navy to ration deployment, particularly illustrated by its response to heavy losses on the strategically-important Arctic convoys to north Russia. These convoys required aerial trade protection which, after the initial use of CAM ships, was provided by the deployment of the CVE *Avenger* sailing with PQ.18 in September 1942. However, within two months of this first successful Arctic deployment, escort carriers were required in a new role as assault carriers in support of the Torch amphibious landings in North Africa, necessitating further modifications and the suspension of Arctic convoys because of shortages of CVEs and surface escort vessels. These deployments show the RN's successful exploitation of the CVE's versatility, and the trade-offs required in transfers between theatres and uses – in this case, the political and military importance of Torch warranted the temporary suspension of Arctic convoys. The integrated approach of this thesis, which considers escort carrier use across different settings, reveals the frequent need for the Admiralty to make such choices, balancing the competing requirements of operations, theatres, and different roles in its deployment of CVEs.

The Admiralty took further steps to address the worsening U-boat crisis. A meeting in January 1943 to discuss forthcoming escort carrier and MAC ship deployment led to amendments of the Western Approaches Instructions, enhanced use of operational research, and expansion of Support Groups, illustrating the Admiralty's growing confidence in both better equipment and tactics, as well as the greater number of escort vessels available.

The deployment of MAC ships in the North Atlantic from May 1943 coincided with WAC's change in policy from the 'safe and timely' arrival of convoys as its priority to a more aggressive approach, enabled by greater resources in that theatre, aiming to eliminate U-boats as a threat to existing and future convoys. Furthermore, MAC ships released newly-arrived escort carriers desperately needed for trade protection in other theatres and for other roles as the Navy struggled to maintain operational flexibility in the face of increasing demands on its limited resources.

Question Five: *Why did Britain continue to face capacity constraints in the period from June 1943 to June 1944, and what impact did this have on the deployment of escort carriers?*

Government interwar cutbacks had severely reduced shipyard capacity and British yards were overburdened by shipbuilding, repairs, and conversion work. This delayed the basic modification of US-built escort carriers to RN standards in British shipyards, while their commissioning and manning suffered from manpower shortages. Additional modifications to fulfil a variety of roles, such as air assault in support of amphibious operations as the Allies went on the offensive, exacerbated the capacity constraints. It is fair to say that the Navy, lacking CVLs and with too few CVs, showed both pragmatism and considerable prescience regarding the potential value of the versatile escort carrier. As US historians note, the RN and USN worked closely in the early development of these vessels, but with a different emphasis on operational needs.² The RN's need for a vessel to address a variety of operational requirements contrasted with the USN, whose greater numbers of the three basic operational types of carrier allowed a degree of specialisation, illustrating the limitations of comparisons between the decisions of the two navies. The RN, correctly insisting on operational flexibility for its CVEs, resisted US pressure for immediate

² Friedman (1983), pp.159-177; Friedman (1988), pp.177-201; Terzibaschitsch (1981), pp.24-28

deployment as TPCs, with less modification, in the North Atlantic, despite criticism from the USN culminating in the very negative report on the RN by the AASSB in August 1943.

The Navy's ability to address the procurement capacity constraints was limited but one bottleneck was overcome by modifying the bulk of the 23 *Ruler*-class vessels in Vancouver, BC. Overall, productivity improved markedly over time: the time to build, convert, and make a CVE operational fell from 33 to only 16 months, aided by many *Ruler*-class vessels being allocated as ferry carriers, requiring little modification and smaller crews, with some deployed straight from the US West Coast to the Pacific theatre. Nevertheless, this was no small achievement by the shipyards and a credit to the Admiralty and the three governments concerned.

However, British government strategic objectives combined with capacity constraints still forced trade-offs between the theatres needing escort carriers. For example, the strategically-important Arctic convoys had to be suspended again between March and November 1943 to allow four assault carriers to be deployed to Operation Avalanche in the Mediterranean, and again between May and August 1944 to release escort carriers for D-Day and subsequent operations in the Mediterranean, all trade-offs required to meet important strategic objectives. Capacity constraints also limited responses to immediate crises, such as an outbreak of sinkings in the Indian Ocean in autumn 1943, to which only one escort carrier could initially be diverted. The Admiralty was forced to deploy effectively, but inefficiently, with vessels regularly reassigned to new roles, with the inevitable interruption to operational capability as modifications were carried out.

Capacity constraints also affected deployment by reducing operational effectiveness, an example of an issue closely studied by the Admiralty but about which it could do little. The British *Attacker*- and *Ruler*-class vessels were significantly undermanned compared to USN CVEs of the same class, with shortages of air, maintenance and flight deck crews, and a smaller number of aircraft embarked on British A/S escort carriers, itself a reflection of the manpower constraints imposed across the British war effort. The difference was particularly apparent in the comparatively slower response time of A/S aircraft to U-boat sightings, when the two navies' CVEs operated in Hunter-Killer Groups.

Question Six: *How effectively did the Navy respond to the need to pivot its limited resources to the Far East during the last phase of the war?*

Despite the planning difficulties inherent in the uncertain timing of the pivot to the Far East, the Navy successfully accelerated the process during the autumn of 1944, enabling a significant presence to be established in the Indian Ocean. Whilst resource shortages, particularly manpower, remained beyond its control, the Navy's response was characteristically resourceful. The RN exploited experience gained in prior operations and from research it commissioned into the handling and equipment of CVEs and the problems associated with providing tactical air support from escort carriers, with training specific to the forthcoming Far East campaign. It also benefited from the re-equipment of various naval air squadrons with the latest US aircraft, which proved particularly important as the Air Ministry had thwarted the Navy's attempt to secure specific aircraft for the Pacific theatre.

In the Indian Ocean, the Navy deployed escort carrier reinforcements to provide DLT, A/S air cover to both convoys and combined operations, and air assault strikes against enemy installations in Burma and Malaya. In this early stage of the pivot to the Far East, escort carriers were used effectively to release the recently-arrived fleet carriers to redeploy to the newly-formed BPF. However, the Navy had been denied the resources it sought in 1944 to build a fully operational Fleet Train for the Pacific to support the BPF, despite the clear need shown in a major examination of the logistics of deploying a fleet far from its base. Furthermore, not only had the delivery of the RN's CVLs been delayed, but Churchill's required manpower cutbacks in 1945 resulted in fewer escort carriers available for deployment to the Far East.

The Admiralty's impressive response was to exploit the versatility of the escort carrier again, in this case to become a vital component of the BPF. They were deployed as ferry carriers and replenishment carriers for the transportation of replacement aircraft to maintain a force of some 255 aircraft on the four BPF fleet carriers, and in other key roles. Whilst US aircraft comprised some 75% of the FAA in the Pacific, US political pressure meant there were never enough US-built aircraft and a shortage of spares, requiring the RN to continue flying British-built aircraft, incompatible with the catapults of US-built escort carriers. This led to a duplication in spares and logistics, exacerbated by frequent model changes in naval

aircraft. This inevitably impacted on both procurement and maintenance efficiency, further challenges the Admiralty worked to overcome.

The effectiveness of CVE deployment in the Pacific was critical to the functioning of the BPF, facilitating and supporting a major national strategic priority to work alongside the USN in this new type of naval warfare.

7.3 Themes

7.3.1 Policy and strategy

A key theme emerging from the thesis is the extent to which government policy and strategy constrained the Admiralty as the latter's priorities changed over time between the 1930s and 1940s. Furthermore, as the Admiralty drove to develop effective aerial trade protection, evolving strategy meant it was faced by competing demands for naval air power which could only be met at that stage by a modified basic trade protection carrier.

The consequences of some government decisions cast long shadows and emerged much later. For example, inter-service disputes over priorities, if unresolved by bilateral department committees, typically found themselves under the purview of committees chaired by Churchill. The impact of this is illustrated by the COS(s) Committee, which failed to function effectively in prioritising resources for the Battle of the Atlantic, stymied by partisan views of its members and Churchill's failure to act as an impartial referee. The Admiralty repeatedly pressed Churchill for more escort carriers and also for additional appropriate shore-based aircraft, a poor substitute for carrier-borne aircraft but no less a good stop-gap measure. For a critical period Churchill declined to support the Admiralty in both cases, refusing the release of more British-built hulls for escort carrier conversion on the advice of Leathers and prioritising the bomber offensive on the advice of Cherwell.

Despite the promising establishment of the AU Committee in August 1942, policy and strategy, dominated by Churchill, continued to constrain the Admiralty.³ Even after the first meeting, delayed until November, the Committee's minutes show a desperate state of affairs, with Admiralty concerns over escort carriers, shipyard capacity, and manpower shortages throughout the Navy and its supply chain, still largely ignored. The need for escort

³ AU Committee Minutes, November-December 1942, CAB 86/2

carriers to meet strategic objectives was clearly demonstrated, but only met by further reviews, spurious concerns about the viability of escort carriers and MAC ships, and unrealistic expectations of the US as supplier of last resort.

The constraints on RN escort carrier procurement and deployment continued throughout the war. In Britain, Churchill's policy continued to favour the Air Ministry and MT. In the US, the Admiralty faced disputes with the USN in 1943 over the latter's demand that more escort carriers be deployed in the Atlantic. In 1944 it faced the competing needs of the USN for naval aircraft and political concerns that Britain might not wholeheartedly join in the Pacific war against Japan, illustrating the impact of high-level grand strategic concerns on procurement. The result of the latter concerns was familiar: delays in the procurement of suitable aircraft and spares. Furthermore, the Admiralty's response to having inadequate vessels, aircraft, and manpower for the strategically important campaign in the Pacific, shows again the pressures which forced it to adopt less than ideal solutions, and also its innovative approach to overcoming those pressures. In this case, using CVEs in the Indian Ocean in key offensive roles, so releasing CVs for the BPF, and in the Pacific as part of the Fleet Train, in both cases to compensate for the shortage of other key vessels.

7.3.2 Impact of resource constraints

The second key theme is the extent to which a shortage of resources, particularly manpower, forced the Admiralty into repeated trade-offs in procurement and deployment. For example, the Admiralty would have developed escort carriers sooner if resources had allowed. As early as December 1918 the need for such a vessel had been identified by Vice Admiral Hope, but the proposal fell victim to interwar defence cuts and the need to prioritise battleships and the more flexible fleet carriers as the strategic cover for convoys. These cuts also reduced the capacity of British shipyards and the pool of skilled labour, accentuated by a severe economic recession which impacted British shipbuilding during the interwar years.

This theme is also evident as the war progressed, when British shipyard capacity constraints and hull allocations forced the Admiralty to develop stop-gap measures for aerial trade protection and turn to the US for escort carriers. The outcome is illustrated by the Navy procuring only six British escort carriers and 19 MAC ships from British yards, compared with

38 US-built escort carriers. Whilst the US procurement programme was an undoubted success, manpower shortages in British yards delayed necessary modifications, with the vast majority of the vessels only becoming operational between 1943 and 1944. Furthermore, manpower shortages in the RN impacted on the ability to provide crews for new vessels and prevented optimum levels of manning on CVEs.

The shortage in naval manpower remained a theme to the end of the war, with further manpower cutbacks required by Churchill in January 1945 resulting in fewer escort carriers available for deployment in the Far East, placing a major national strategic priority in jeopardy.

7.3.3 Naval aircraft

The 'Battle of the Air' has received widespread analysis, but the equally important battle over carrier aircraft - often involving the same actors - has received less attention. The integrated approach underpinning this thesis led to a third theme emerging, namely how the type of aircraft available to the RN impacted on the effectiveness of its deployment of escort carriers in widespread theatres and multiple roles.

In the interwar period dual control of the FAA led to a lack of constructive co-operation, which is well covered in the literature, but the crucial impact on the Admiralty's ability to deploy escort carriers efficiently has been largely ignored. The impact is illustrated by MAP prioritising the RAF's much larger orders, and its provision of modified RAF aircraft initially designed for use from airfields in response to the Admiralty's requests for naval fighters. Similarly, the lack of an effective replacement for the Swordfish TBR meant the FAA relied throughout the whole of the war on this aircraft, designed in the early 1930s and still the best British-built TBR for the escort carrier role in A/SW, but lacking the speed, endurance, weapons load, forward armament and enclosed cockpit of its American counterpart, the Avenger TBR. Dependence on the Swordfish inevitably reduced the effectiveness of British escort carriers in A/SW compared with their counterparts flying Avengers.

A key element of this theme is how the Admiralty turned to the US for high-performance naval aircraft, replicating its success with procuring US-built escort carriers. Deliveries of US aircraft expanded rapidly in 1943 and early 1944, although the US authorities cut back deliveries in late 1944 and early 1945 – by which time US naval aircraft represented over

50% of the FAA globally. Indeed, there were never enough US-built aircraft and always a shortage of spares. This inevitably impacted on both procurement and maintenance efficiency.

7.3.4 Multiple-role escort carriers

The fourth theme emerging from this research is the Admiralty's combination of pragmatism and prescience regarding the potential value of maintaining the versatility of escort carriers, vessels which ultimately undertook a multitude of crucial roles until the appearance of the British-built CVL in mid-1945.

The value of the Admiralty's insistence on multi-role capability is illustrated following the innovative introduction of MAC ships in the North Atlantic in mid-1943, which allowed the Navy to expand Support Groups. This saw escort carriers in A/SW deployed, with a dedicated flotilla of escort vessels, as Air Support Groups going to the aid of endangered convoys. Subsequently, with the advent of additional escort carriers and surface escorts, the RN was able to replicate the USN's Hunter-Killer Groups in tracking down and destroying U-boats, aided by the introduction of novel technology. The Admiralty was further vindicated in 1944 when the variation of roles and theatres multiplied over a matter of months: fighter and A/S patrols guarding the D-Day landings in June; air assault in support of Operation Dragoon in August; and anti-shipping and air assault strikes against land targets during operations in the Aegean in September to November, and Norway in 1944 and 1945. In all these deployments the CVE proved highly effective despite the aforementioned constraints. This multi-role capability also proved essential in the Far East during 1944-1945, where CVE use varied from A/S, DLT, and air assault in the Indian Ocean, to being a vital component of the Fleet Train of the BPF, where its core roles were as a ferry carrier and a replenishment carrier. Indeed, in many theatres, the role of CVE ferry carrier became critical for both RN and USN aircraft deliveries, while also performing an important role in the Navy 'lending the strategic mobility of sea power to land-based aircraft'.⁴

7.4 Wider Observations

This thesis has examined why, and how effectively, the Royal Navy procured, and then used, escort carriers in the Second World War. The broader factors to emerge explain that the RN

⁴ Benbow (2017b), pp.282-283

required a cost-effective platform from which to launch and recover aircraft to counter attacks on convoys in mid-ocean, and that this became increasingly urgent as attacks intensified and the stop-gap measure of maritime aircraft proved both an inefficient use of resources and difficult to secure in the face of the RAF's focus on strategic bombing. Subsequent strategic demands and the absence of alternatives explain the RN's development of the escort carrier to fulfil a variety of crucial roles.

It is clear from the research that government and Air Ministry decisions had a major impact on both procurement and deployment. Procurement choices were severely limited by government cutbacks and subsequent allocation of resources, which were influenced by the Air Ministry both directly through its success in persuading Churchill to support strategic bombing at the expense of maritime trade defence, and indirectly through its dominance of the output of MAP, which failed to produce high-performance naval aircraft. Deployment decisions reflected strategic objectives laid down by government, with efficient use of resources sacrificed to meet those objectives. Further, dependence on an unwilling Air Ministry for sufficient effective VLR maritime aircraft to support aerial trade defence resulted in additional pressure for the early deployment of escort carriers in the mid-Atlantic. The adverse impact of the poor relationship between the Admiralty and the Air Ministry was clear, and illustrates the wider point of the importance of strong co-operation between the services as a vital aid to help government make better choices.

By rooting its assessment in the context of developing naval and national strategy and resources, this thesis has identified complex and interwoven reasons for the delays and compromises in procurement and deployment for which the Admiralty is often criticised. The Navy faced headwinds from policy, strategy, and resource allocation, which inevitably forced trade-offs and impacted both procurement and deployment. The RN was also adversely affected by its dependence on too few and inferior British naval aircraft, whilst its success in securing US aircraft presented new problems relating to incompatibility with British-built carriers and shortages of spares, illustrating some of the wider issues related to dependency on allies and encapsulated by Admiral Fraser's strong warning in November 1945: '...if we are to fight alongside the Americans again our aircraft should be

interchangeable with the Americans'.⁵ Deployment was further affected by the absence of CVLs, resulting in a competing need for an air assault platform. However, despite all of the challenges identified above, the Navy responded to the prevailing headwinds in a creative and determined way, successfully developing stop-gap solutions and novel applications to overcome resource deficits, as well as successfully turning to the US for essential vessels and aircraft.

The integrated approach of this thesis has revealed the significance of the escort carrier as a component of many naval operations in a wide spread of theatres, in which it often played an essential facilitating, but unglamorous, role, perhaps explaining why the escort carrier's role is often marginalised in the traditional silo approach of many naval historians.

For example, the delay in introducing escort carriers in any significant number meant convoy losses at sea were unnecessarily high until 1943, when the tide turned for a variety of reasons, including the greater supply of escort vessels, escort carriers, MAC ships, better aircraft and depth charges, combined with technological breakthroughs in many aspects of warfare including radar and radio interception. Even here, historians credit the majority of kills to the surface escort vessels, just as the modern football striker receives the credit for goals yet both rely on the 'assist' from other team players for setting up the kill/goal. While the USN Hunter-Killer Group was designed for naval aircraft to kill the U-boat, it was only from May 1943 for sound tactical reasons that RN philosophy moved from 'getting the convoy through' by suppressing U-boats, to one of killing U-boats, and this by the means of surface escort vessels, by which time attention was soon to be focused on the European land battles in the final stages of the war. Similarly, the British CVEs' role in supporting numerous amphibious landings by Allied armies, such as at Torch and Avalanche, and air strikes on enemy assets both on land and at sea is often overlooked in favour of the major vessels of the Fleet and the larger strategic picture. At D-Day their role was important, but is often overlooked because of the dominant coverage of the amphibious landings involving the RN, combined with the CVEs' unusual deployment at a great distance from the beaches and thus their particularly low visibility. Even the modern fleet carriers of the British Pacific Fleet became dependent on the escort carrier for logistical support, but it is the BPF's fleet

⁵ 'Commander-in-Chief's Despatches – November 1944 to July 1945', dated 23 November 1945, ADM 199/118, p.15

carriers and battleships which attract greater attention. Deployed in such a wide variety of supporting roles and across so many theatres, often overstretched by having to operate singly, poorly equipped, inadequately manned, and as a substitute for more suitable vessels, it is perhaps unsurprising that the significance of escort carriers has been largely overlooked by many historians. However, the nature of the CVEs' contribution to the success of the RN illustrates the wider point of the importance of government devoting enough resources to the provision of apparently modest but nonetheless vital components of the Fleet.

Further research could take these findings forward, for example in terms of policy, by exploring the important role of special advisers to Churchill in the context of his bias towards both the MT and the RAF in resource allocation. In addition, regarding operations, further analysis of how the development of catapults impacted on the operational capability of escort carriers is warranted.

In conclusion, it is worth reflecting that the historical challenges revealed in this thesis remain relevant today and illustrate the wisdom of Mahan, who observed:

Whether a democratic government will have the foresight, the keen sensitiveness to national position and credit, the willingness to ensure its prosperity by adequate outpouring of money in times of peace, all which are necessary for military preparation, is yet an open question.⁶

Roskill notes that warnings had been ignored post 1918, and since 1945 failure to build enough modern ships, aircraft, and weapons, might lead to history repeating itself with a heavy loss of life:

Where ships and weapons have been inadequate or obsolete, British seamen have again and again shown that tradition and training can hold the line till better weapons and more ships are forthcoming; and the first two years of the recent war at sea once more proved that to be abundantly true.⁷

The integrated approach of this thesis has revealed an invaluable asset, procured and modified with difficulty and then skilfully deployed to enable an under-resourced Fleet to meet urgent and diverse needs. Whilst this thesis has shown the impressive role of the Royal Navy in developing escort carriers during the Second World War and the significance

⁶ Mahan (1889), p.67

⁷ Roskill (1961b), pp.415-416

of these vessels in this period, it has also shown the risk of relying on tradition and training to 'hold the line'. Shortages of escort carriers and their aircraft resulted in a fine line between success and failure for the RN in a number of campaigns in the Second World War.

Appendix: Maps

Map 1. Battle of the Atlantic, May 1943

Map 2. Arctic convoy routes, 1941-1942

Map 3. Southern Norway

Map 4. Operation Dragoon, August 1944

Map 5. The Aegean Sea, 1944-1945

Map 6. Indian Ocean

Map 7. South East Asia

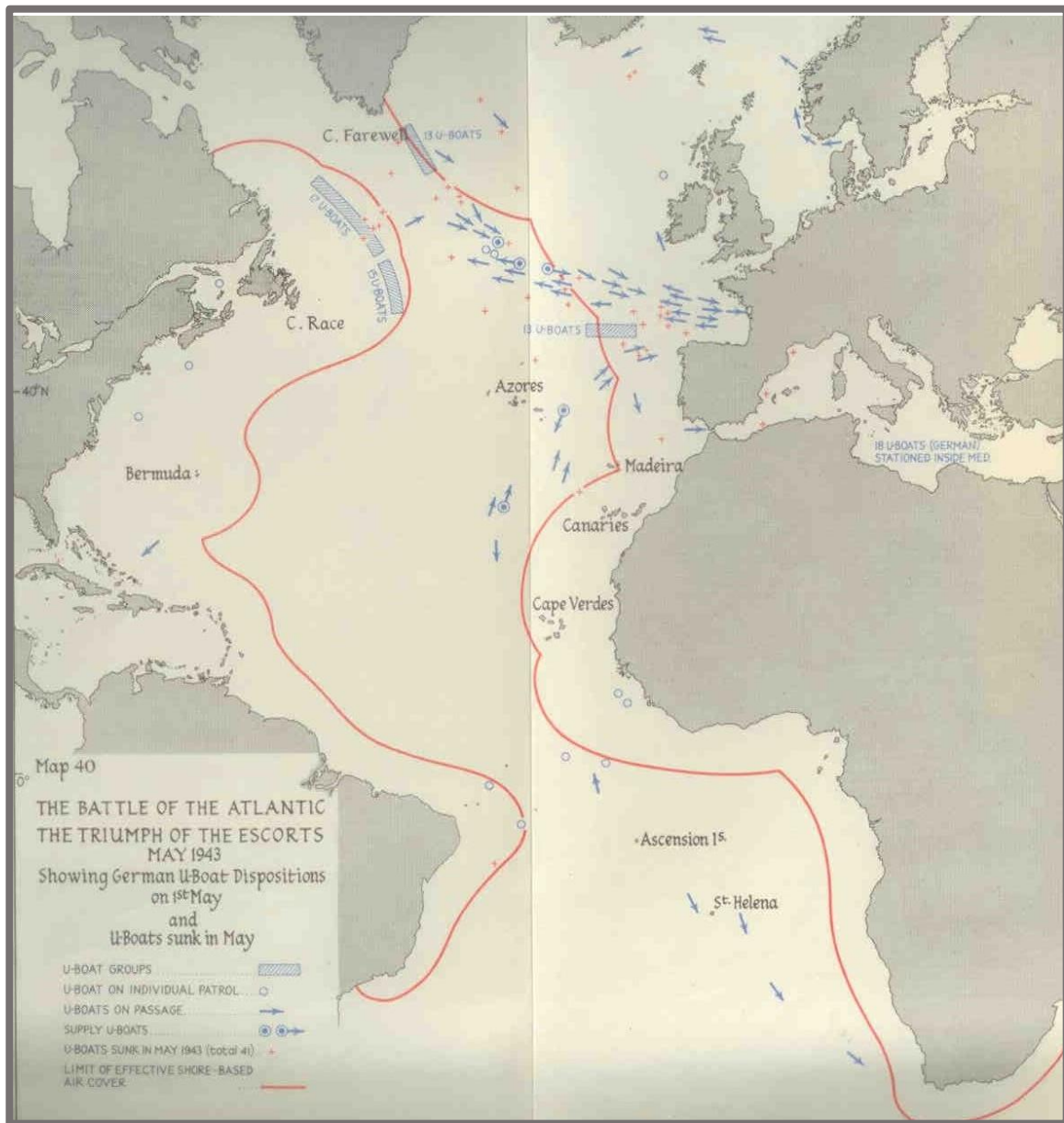
Map 8. The Burma Coast, 1945

Map 9. Western Pacific and Approaches to Japan

Map 10. Admiralty Islands, showing Manus

Map 11. The Philippines, showing Leyte Gulf and Ulithi (Western Caroline Islands)

Map 1. Battle of the Atlantic, May 1943



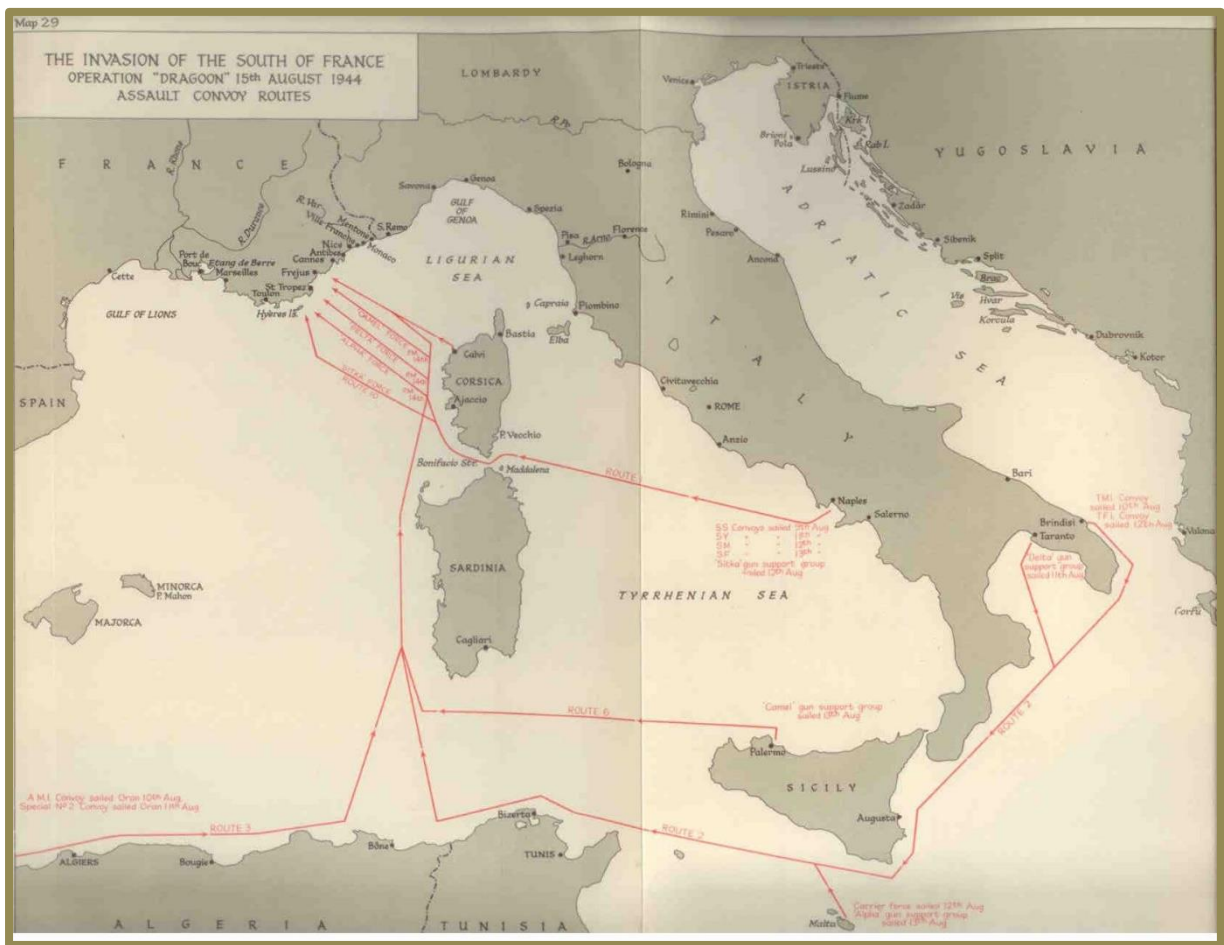
Source: Roskill (1962b), p.373

Map 3. Southern Norway



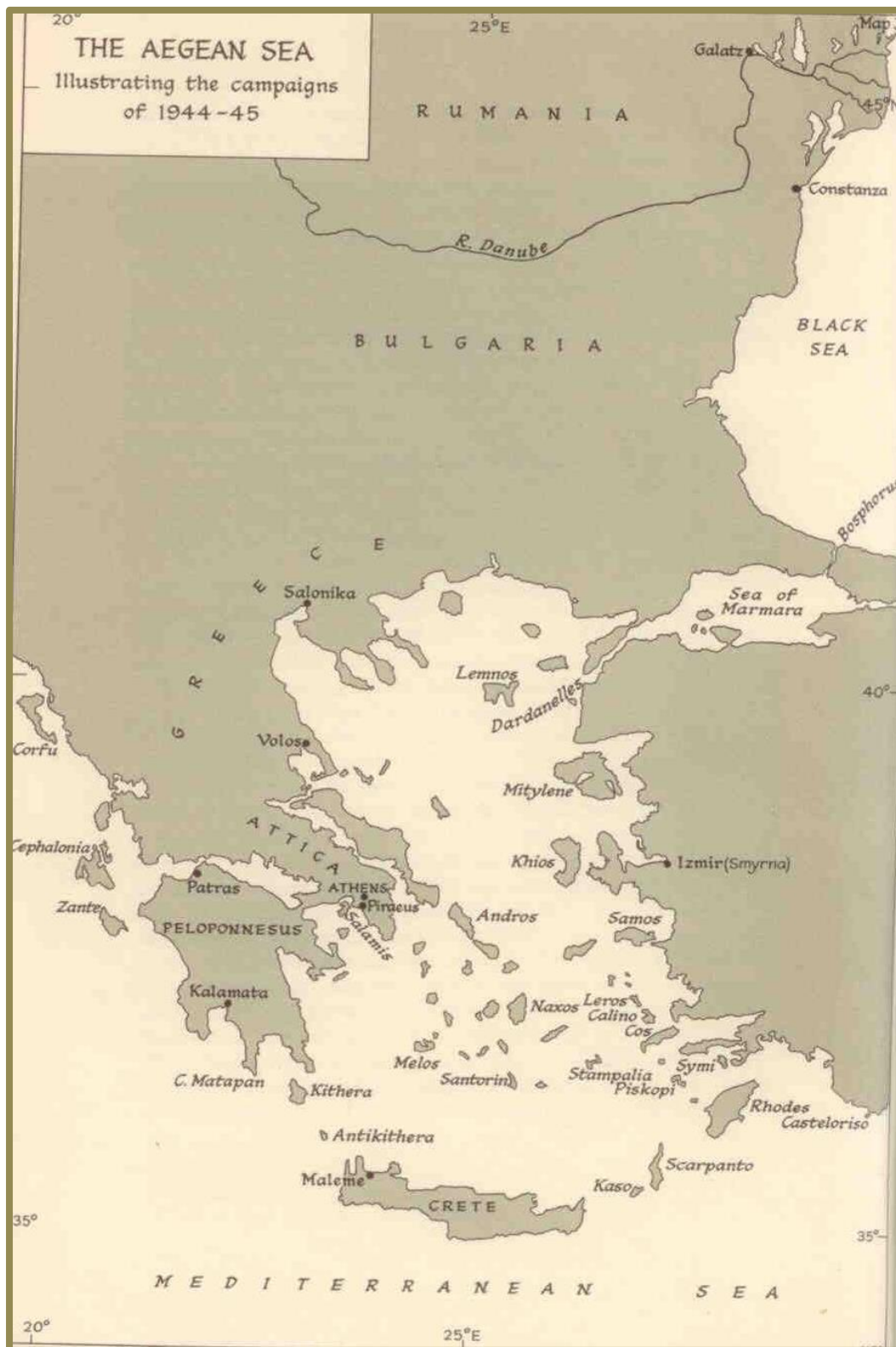
Source: Roskill (1961b), p.259

Map 4. Operation Dragoon, August 1944



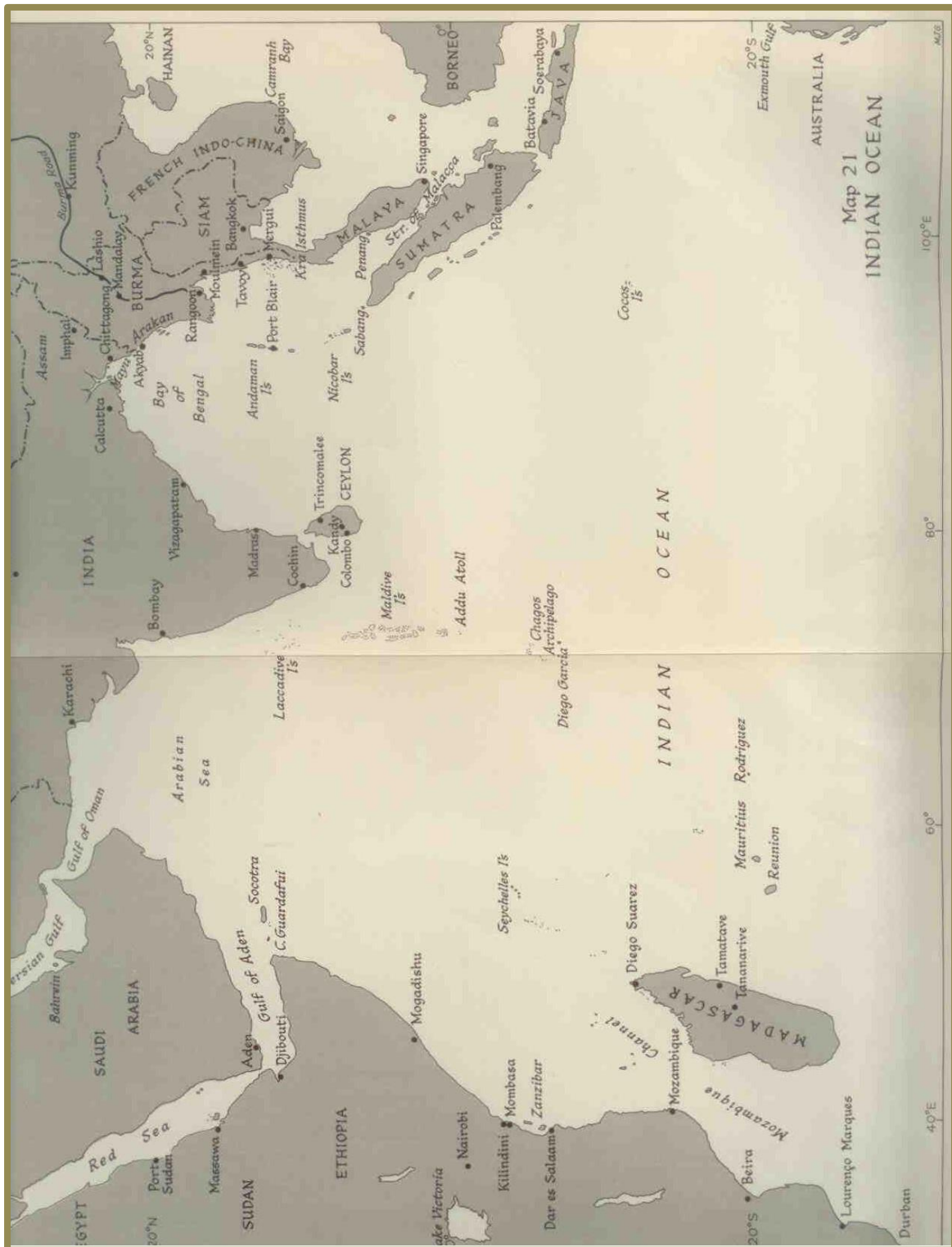
Source: Roskill (1961b), p.93

Map 5. The Aegean Sea, 1944-1945



Source: Roskill (1961b), p.115

Map 6. Indian Ocean



Source: Roskill (1960b), p.345

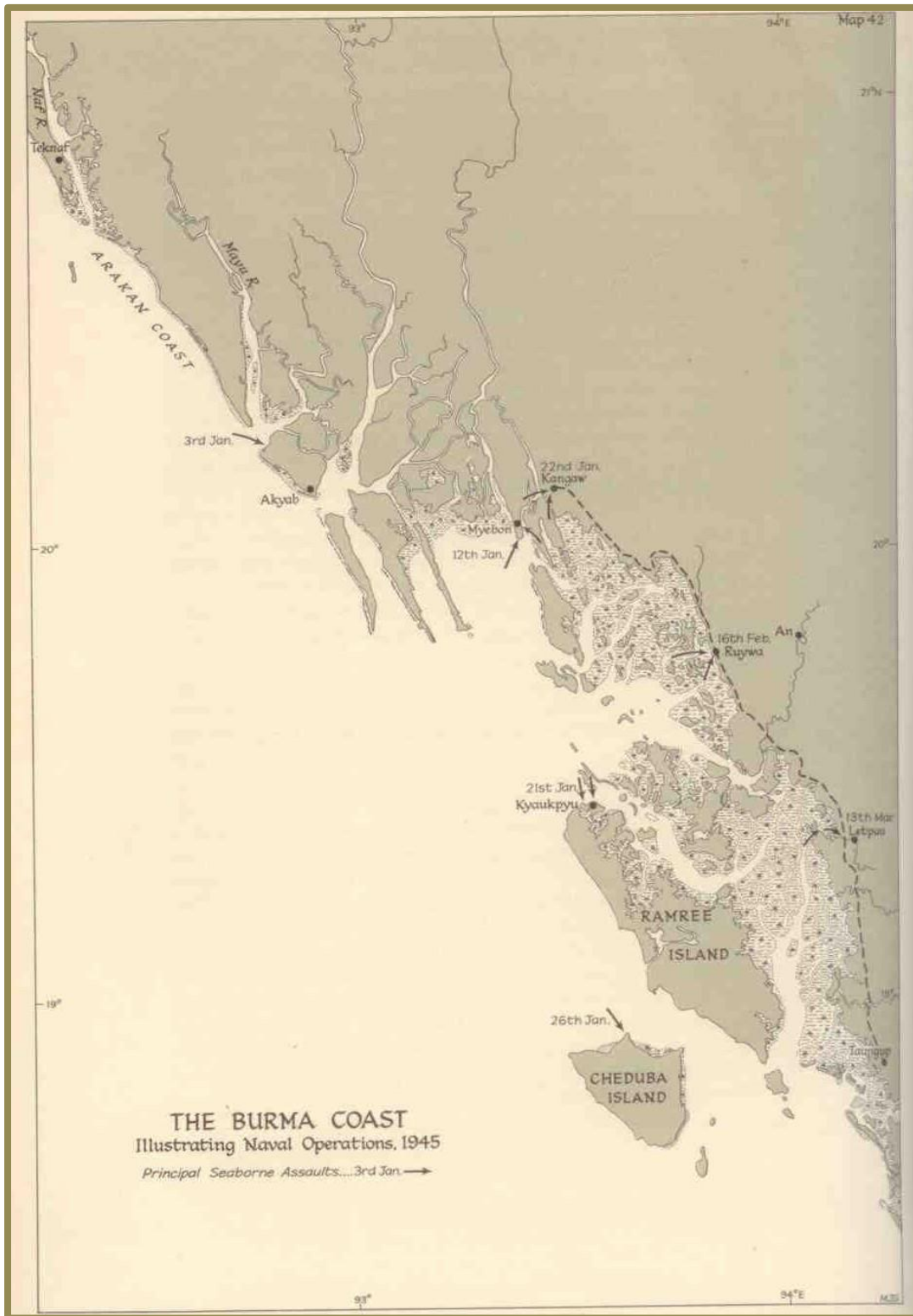
Distances (nautical miles, approximate): Aden-Perth: 4,900; Durban-Mumbai (Bombay): 3,800

Map 7. South East Asia



Source: Roskill (1961b), p.199

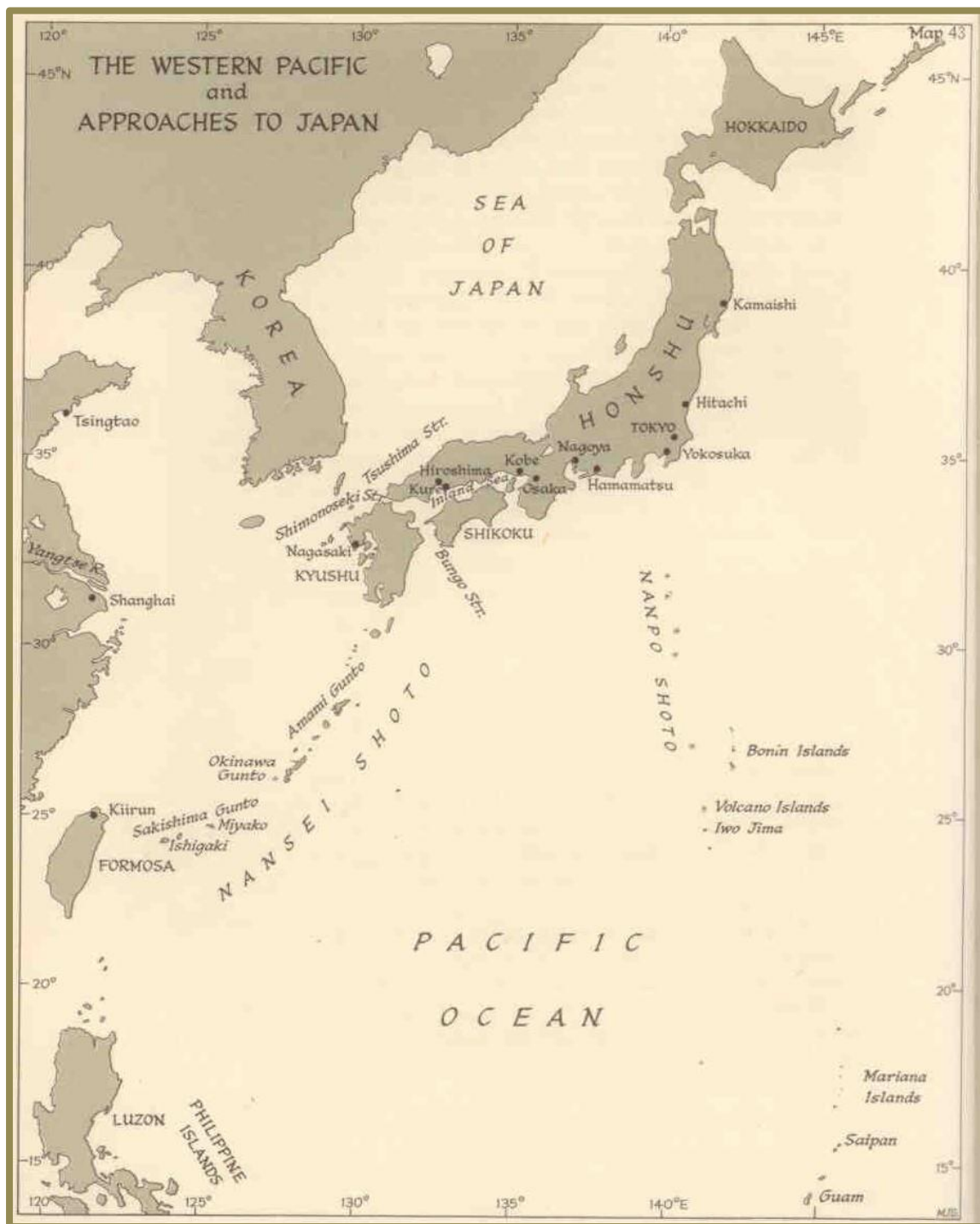
Map 8. The Burma Coast, 1945



Source: Roskill (1961b), p.311

Map 9. Western Pacific and Approaches to Japan

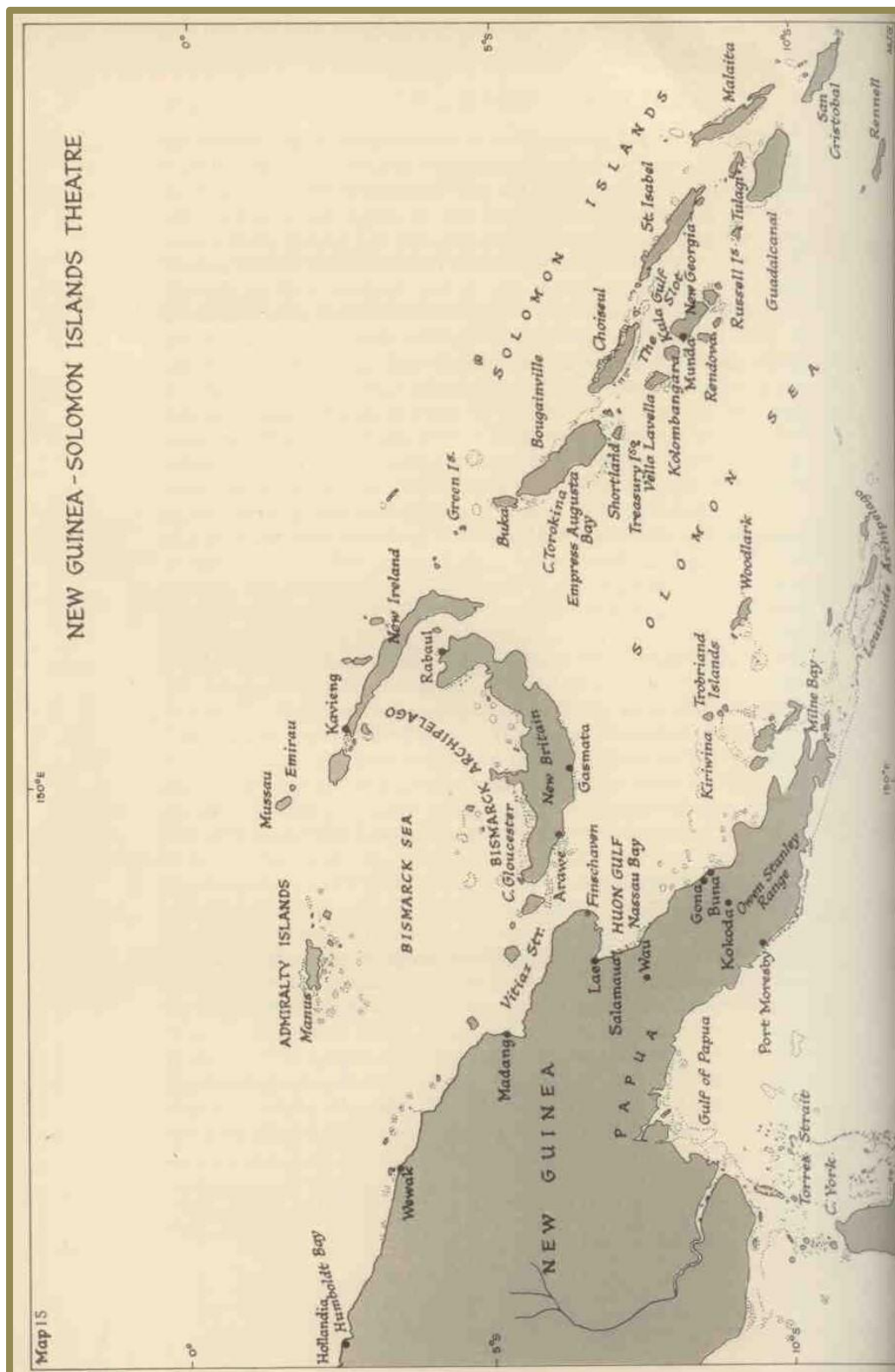
Map shows Honshu in Japanese Home Islands and Sakishima Gunto, both targets of the BPF



Source: Roskill (1961b), p.323

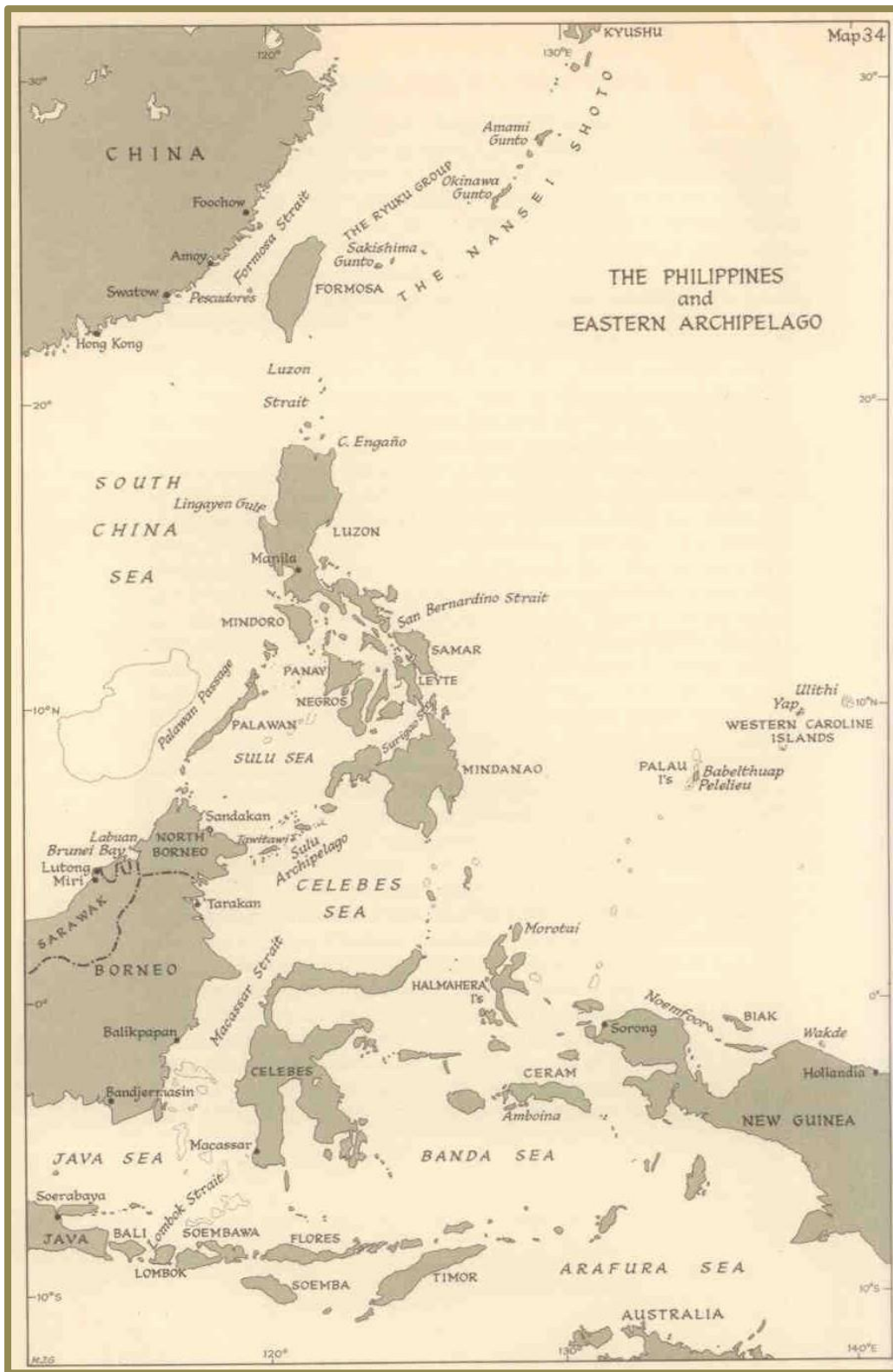
Distances (nautical miles, approximate): Sydney-Tokyo: 4,300; Sydney-Manus: 1,900; Sydney-Leyte: 3,100; Leyte-RAS off Sakishima Gunto: 780

Map 10. Admiralty Islands, showing Manus



Source: Roskill (1960b), p.225

Map 11. The Philippines, showing Leyte Gulf and Ulithi (Western Caroline Islands)



Source: Roskill (1961b), p.191

Thesis Bibliography

Primary Sources

Admiralty (1947), *Ships of the Royal Navy: Statement of Losses during the Second World War and British Merchant Vessels Lost or Damaged by Enemy Action during Second World War*. Reprinted in 1980 as *British Vessels Lost at Sea 1939-45* (Cambridge: Patrick Stephens)

Admiralty (1950) *Convoys to North Russia, 1942*, Supplement to The London Gazette of Friday, No. 39041, 13 October, 1950 (London: HMSO)

Admiralty (1954), *The Royal Navy and the Arctic Convoys, A Naval Staff History*. First issued by the Historical Section of the Admiralty as a confidential study. Reprinted in 2014 with preface by series editor, Llewellyn-Jones, Malcolm. (Whitehall History Publishing in association with Routledge (London and New York)). Page references refer to 2014 edition

Admiralty (1957), *The Royal Navy and the Mediterranean Convoys, A Naval Staff History*. First issued by the Historical Section of the Admiralty as a confidential study. Reprinted in 2007 with preface by series editor, Llewellyn-Jones, Malcolm (Whitehall History Publishing in association with Routledge (London and New York)).

- ADM 1 Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers, 1660-1976, TNA
- ADM 12 Admiralty: Digests and Indexes, 1660-1974, TNA
- ADM 116 Admiralty: Record Office: Cases, 1852-1965, TNA
- ADM 167 Board of Admiralty: Minutes and Memoranda, 1869-1976, TNA
- ADM 182 Admiralty: Admiralty Fleet Orders, 1909-1964, TNA
- ADM 186 Admiralty: Publications, 1827-1970, TNA
- ADM 187 Admiralty: Naval Staff, Operations Divisions: Lists showing stations and movement of Allied and Royal Naval Ships (Pink Lists), 1939-1976, TNA
- ADM 199 Admiralty: War History Cases and Papers, Second World War, 1922-1968, TNA
- ADM 205 Admiralty: Office of the First Sea Lord, later First Sea Lord and Chief of the Naval Staff: Correspondence and Papers, 1937-1968, TNA
- ADM 207 Admiralty: Fleet Air Arm: Squadron Diaries and Standing Orders, 1939-1957, TNA

- ADM 209 Admiralty: Naval Staff Operations Division: Lists of Ships Built (Blue Lists), 1940-1946, TNA
- ADM 217 Admiralty: Western Approaches, Station Records, 1942-1945, TNA
- ADM 219 Admiralty: Directorate of Operational Research and predecessors: Reports, 1917-1980, TNA
- ADM 223 Admiralty: Naval Intelligence Division and Operational Intelligence Centre: Intelligence Reports and Papers, 1914-1978, TNA
- ADM 229 Admiralty: Department of the Director of Naval Construction (DNC): Directors' Papers, 1893-1957, TNA
- ADM 234 Admiralty, and Ministry of Defence, Navy Department: Reference Books (BR Series), 1856-1984 (including Battle Summaries), TNA
- ADM 237 Admiralty: Naval Staff: Operations Division: Convoy Records, Second World War, 1940-1945, TNA
- ADM 239 Admiralty, and Ministry of Defence, Navy Department: Confidential Reference Books, CB Series, 1910-1985, TNA
- ADM 264 Admiralty, and Ministry of Defence, Navy Department: Air Publications (Naval), 1941-1976, TNA
- ADM 334 Admiralty: Commander W B Luard: Papers, 1940-1953 (Liaison Officer to Coastal Command), TNA
- ADM 335 Admiralty: Fleet Air Arm: Fixed-Wing Flying Review Collection, 1936-1971, Fleet Air Arm Museum
- ADM 343 Admiralty: Directorate of Merchant Shipbuilding and Ministry of Transport: Statistics Division: Shipbuilding Returns, 1946-1975 (including Merchant Shipbuilding Returns: statements of construction, February 1940 to December 1954), TNA

Air Ministry (1948), *The Rise and Fall of the German Air Force: 1933-1945*. First published for in-house use. Reprinted in 1987 (Poole, Dorset: Arms and Armour Press, by permission of HMSO). Page references refer to 1987 edition

- AIR 1 Air Ministry: Air Historical Branch Records: Papers (Series 1), 1794-1974 (mostly 1914-1918), TNA
- AIR 2 Air Ministry and Ministry of Defence: Registered Files, 1887-1995, TNA
- AIR 5 Air Ministry: Air Historical Branch: Papers (Series II), 1914-1959, TNA

- AIR 6 Air Board, and Air Ministry, Air Council: Minutes and Memoranda, 1916-1984, TNA
- AIR 8 Air Ministry and Ministry of Defence: Department of the Chief of the Air Staff, Registered Files, 1916-1998, TNA
- AIR 9 Air Ministry: Directorate of Operations and Intelligence and Directorate of Plans: Registered Files, 1914-1947, TNA
- AIR 10 Ministry of Defence and predecessors: Air Publications and Reports, 1913-1987, TNA
- AIR 15 Air Ministry and Admiralty: Coastal Command: Registered Files, 1930-1974 (including Battle Summary, Operation Torch), TNA
- AIR 19 Air Ministry, and Ministry of Defence, Air Department: Private Office Papers, 1917-1983, TNA
- AIR 20 Air Ministry, and Ministry of Defence: Papers accumulated by the Air Historical Branch, 1874-1998, TNA
- AIR 22 Air Ministry: Periodical Returns, Intelligence Summaries and Bulletins, 1936-1963, TNA
- AIR 23 Air Ministry and Ministry of Defence: RAF Overseas Commands: Reports and Correspondence, 1916-1984, TNA
- AIR 24 Air Ministry and Ministry of Defence: Operations Record Books, Commands, 1920-1996 (including Coastal Command), TNA
- AIR 34 Air Ministry: Central Interpretation Unit, predecessors and related bodies: Reports and Photographs, 1916-1952, TNA
- AIR 41 Air Ministry and Ministry of Defence: Air Historical Branch: Narratives and Monographs, 1942-1991, TNA
- AIR 50 Air Ministry: Combat Reports, Second World War, 1939-1945 (including FAA), TNA
- AIR 51 Mediterranean Allied Air Forces: Microfilmed Files, 1941-1945, TNA
- AIR 75 Marshal of the RAF, Sir John Slessor: Papers, 1914-1980, TNA
- AVIA 2 Air Ministry and predecessor and successors: Civil Aviation, Registered Files, 1909-1958 (including establishment of RNVR Air Branch, 1939), Ministry of Aircraft Production (MAP) Papers, TNA

- AVIA 7 Ministry of Aviation, predecessor and successors: Royal Radar Establishment and predecessors: Registered Files, 1917-1969, MAP Papers, TNA
- AVIA 8 Air Ministry and successors: Inventions, and Research and Development, Registered Files, 1915-1960, MAP Papers, TNA
- AVIA 9 Ministry of Aircraft Production (MAP) and Ministry of Supply: Private Office Papers, 1940-1947, MAP Papers, TNA
- AVIA 10 Air Ministry and MAP: Miscellaneous Unregistered Papers, 1931-1966, MAP Papers, TNA
- AVIA 12 Ministry of Supply and Ministry of Aviation: Second World War and Miscellaneous Unregistered Papers, 1928-1970, MAP Papers, TNA
- AVIA 13 Air Ministry and successors: Royal Aircraft Establishment (from 1988, Royal Aerospace Establishment): Registered Files, 1914-1991, MAP Papers, TNA
- AVIA 15 MAP and predecessor and successors: Registered Files, 1924-1990, MAP Papers, TNA
- AVIA 22 Ministry of Supply: Registered Files, 1933-1962, MAP Papers, TNA
- AVIA 26 Ministry of Aviation, predecessors and successors: Royal Radar Establishment (later Royal Signals and Radar Establishment) and predecessors: Reports and Memoranda, 1921-1991, MAP Papers, TNA
- AVIA 38 Ministry of Supply and MAP: North American Supply Missions, Second World War, Files, 1933-1947
- AVIA 46 Ministry of Supply: Establishment, Registered Files (Series 1), 1832-1956, MAP Papers, TNA
- BL MS 52570. See ff. 148r-149v in Add MS 52570 (Volume XIV of the Cunningham Papers), British Library
- BT 28 Ministry of Production: Correspondence and Papers, 1936-46, Board of Trade Papers, TNA
- BT 56 Board of Trade: Office of the Chief Industrial Adviser, 1929-1932, Board of Trade Papers, TNA
- BT 61 Board of Trade: Department of Overseas Trade: Establishment Files, 1912-1946, Board of Trade Papers, TNA
- BT 87 Ministry of Production: Ministers' and Officials' Papers, 1939-1945, Board of Trade Papers, TNA

- BT 96 Board of Trade: Industrial Supplies Department: Files, 1937-1948, Board of Trade Papers, TNA
- BT 291 Admiralty and successors: Shipbuilding and Repair: Registered Files (SBR Series), 1940-1971, Board of Trade Papers, TNA
- CAB 2 Committee of Imperial Defence (CID) and Standing Defence Sub-committee: Minutes, 1902-1939, Cabinet Papers, TNA
- CAB 4 CID: Miscellaneous Memoranda (B Series), 1903-1939, Cabinet Papers, TNA
- CAB 16 CID: Ad Hoc Sub-Committees: Minutes, Memoranda and Reports, 1905-1939, Cabinet Papers, TNA
- CAB 21 Cabinet Office and predecessors: Registered Files (1916-1965), Cabinet Papers, TNA
- CAB 23 War Cabinet and Cabinet: Minutes, 1916-1939, Cabinet Papers, TNA
- CAB 29 Cabinet Office: International Conferences: Minutes and Papers, 1916-1939 (including the London Naval Conferences 1930 and 1934-1935, Lausanne Conference, 1932 and the Anglo-French Staff Conversations, 1939), TNA
- CAB 45 Committee of Imperial Defence, Historical Branch and Cabinet Office, Historical Section: Official War Histories Correspondence and Papers, 1904-1957, TNA
- CAB 50 CID: Oil Board: Minutes and Memoranda, 1925-1939, Cabinet Papers, TNA
- CAB 53 CID: Chiefs of Staff Committee: Minutes and Memoranda, 1923-1939, Cabinet Papers, TNA
- CAB 56 Committee of Imperial Defence: Joint Intelligence Sub-Committee: Minutes and Memoranda (JIC, JIC(S), JIC(A)), 1936-1939, TNA
- CAB 64 Minister for the Co-ordination of Defence: Registered Files (CD Series), 1924-1939, TNA
- CAB 65 War Cabinet and Cabinet: Minutes (WM and CM Series), 1939-1945, Cabinet Papers, TNA
- CAB 66 War Cabinet and Cabinet: Memoranda (WP and CP Series), 1939-1945, Cabinet Papers, TNA
- CAB 69 War Cabinet and Cabinet: Defence Committee (Operations): Minutes and Papers (DO Series), 1940-1945, Cabinet Papers, TNA

- CAB 70 War Cabinet and Cabinet: Defence Committee (Supply): Minutes and Papers (DC(S) and SAA Series), 1940-1946, Cabinet Papers, TNA
- CAB 79 War Cabinet and Cabinet: Chiefs of Staff Committee: Minutes, 1939-1946, Cabinet Papers, TNA
- CAB 80 War Cabinet and Cabinet: Chiefs of Staff Committee: Memoranda, 1939-1946, TNA
- CAB 81 War Cabinet and Cabinet: Committees and Sub-committees of the Chiefs of Staff Committee: Minutes and Papers, 1939-1947, TNA
- CAB 84 War Cabinet and Cabinet: Joint Planning Committee, later Joint Planning Staff, and Sub-committees: Minutes and Memoranda (JP, JAP and other Series), 1939-1947, TNA
- CAB 86 War Cabinet: Battle of the Atlantic and Anti-U-Boat Warfare Committees: Minutes and Papers (BA and AU Series), 1941-45, Cabinet Papers, TNA
- CAB 88 War Cabinet and Cabinet: Combined Chiefs of Staff Committee and Sub-committees: Minutes and Memoranda (CCS and other Series), 1942-1949, Cabinet Papers, TNA
- CAB 92 War Cabinet and Cabinet: Committees on Supply, Production, Priority and Manpower: Minutes and Papers, 1939-1946, Cabinet Papers, TNA
- CAB 97 War Cabinet and Cabinet: Shipping Committee: Minutes and Papers (SC, SS and SEP Series), 1940-1945, Cabinet Papers, TNA
- CAB 110 War Cabinet and Cabinet Office: Joint American Secretariat: Correspondence and Papers, 1942-1947, Cabinet Papers, TNA
- CAB 115 War Cabinet: Central Office for North American Supplies: Minutes and Papers, 1939-1944, Cabinet Papers, TNA
- CAB 120 Cabinet Office: Minister of Defence Secretariat: Records, 1938-1947, Cabinet Papers, TNA
- CAB 121 Cabinet Office: Special Secret Information Centre: Files, 1939-1955, Cabinet Papers, TNA
- CAB 122 War Cabinet and Cabinet Office: British Joint Staff Mission and British Joint Services Mission: Washington Office Records, 1940-1958, Cabinet Papers, TNA
- CAB 137 War Cabinet and Cabinet: Joint Technical Warfare Committee: Correspondence and Papers, 1943-1948, Cabinet Papers, TNA

- CAB 138 War Cabinet and Cabinet Office: British Joint Staff Mission and British Joint Services Mission: Minutes and Memoranda, 1942-1952 (from Washington Office), Cabinet Papers, TNA
- CAB 139 War Cabinet and Cabinet Office: Central Statistical Office: Correspondence and Papers, 1939-1994, Cabinet Papers, TNA
- CAB 141 War Cabinet and Cabinet Office: Central Statistical Office: Working Papers, 1934-1968, Cabinet Papers, TNA
- CCS CCS Papers and Minutes from the Argonaut, Casablanca, Quadrant, Sextant and Eureka, and Trident Conferences: Joint History and Research Office, Joint Chiefs of Staff, Washington, DC www.jcs.mil/About/Joint-Staff-History/
- CHUR Churchill, W.S., papers, Churchill Archive Centre, Churchill College Cambridge
- Cmd 1938 Balfour Report, 1923, House of Commons Command Papers, <http://parlipapers.proquest.com>
- Cmd 2029 Salisbury Committee Report, 1924, House of Commons Command Papers, <http://parlipapers.proquest.com>
- Cmd 2476 Navy. Programme of New Construction, 1925, House of Commons Command Papers, <http://parlipapers.proquest.com>
- Cmd 5385 Statement. Navy Estimates, 1937, House of Commons Command Papers, <http://parlipapers.proquest.com>
- CNM Papers of Admiral Viscount Cunningham, National Maritime Museum, Archives, Greenwich
- CRES Creswell, Captain John, papers, Churchill Archive Centre, Churchill College Cambridge
- DEFE 3 Admiralty: Operational Intelligence Centre: Intelligence from Intercepted German, Italian and Japanese Radio Communications, WWII, 1941-1945, Ministry of Defence (MOD) Papers, TNA
- DEFE 10 Ministry of Defence: Major Committees and Working Parties: Minutes and Papers, 1942-1986, MOD Papers, TNA
- DEFE 69 Ministry of Defence (Navy): Registered Files and Branch Folders, 1869-1992 (including History of SDAC, 1937-1976), MOD Papers, TNA
- DEN Papers of Admiral Sir Norman Denning, National Maritime Museum, Archives, Greenwich

- DHH Directorate of History and Heritage, Ottawa, 99/36, Box 69, File 10, 9-6-87, 11-12. Syrett, David and Douglas, W.A.B (1986), 'The North Atlantic Triangle in Disarray, Closing the Greenland Air Gap, 1942-1943' (English version of article published as 'Die Wende in der Schlacht im Atlantik: Die Schliessung des "Grönland-Luftlochs" 1942-3', *Marine-Rundschau* 83, pp.1-3, October 1985)
- FDR-39 Letter, FDR to Winston S. Churchill, March 18, 1942, Series 1, Box 1, Significant Documents Collection, Franklin D. Roosevelt Presidential Library & Museum

http://www.fdrlibrary.marist.edu/_resources/images/sign/fdr_39.pdf
- FO 93 Foreign Office and Foreign and Commonwealth Office: Protocols of Treaties, 1695-2003, Foreign Office Papers, TNA
- FO 94 Foreign Office and Foreign and Commonwealth Office: Ratifications of Treaties, 1782-2005, Foreign Office Papers, TNA
- FO 115 Foreign Office: Embassy and Consulates, United States of America: General Correspondence, 1791-1967, Foreign Office Papers, TNA
- GB0099 KCLMA Brooke AF: Alanbrooke, Field Marshal Viscount, papers, Liddell Hart Centre for Military Archives, King's College London
- GB0099 KCLMA Misc 33: Beaverbrook, Lord, papers, Liddell Hart Centre for Military Archives, King's College London
- GB0099 KCLMA Dill: Dill, Field Marshal Sir John, papers, Liddell Hart Centre for Military Archives, King's College London
- GB0099 KCLMA Lethbridge, Lethbridge, Major General John Sydney, papers, Box 1 File, Lethbridge 220, Lethbridge Mission, 1943-44, Liddell Hart Centre for Military Archives, King's College London
- GB0099 KCLMA Slessor: Slessor MRAF Sir John Cotesworth, papers, Liddell Hart Centre for Military Archives, King's College London
- HMC 3 Royal Commission on Historical Manuscripts: Evershed Papers, 1937-1960 (including papers relating to his report on the Internal Organisation of Naval Aviation, 1944 to 1945), TNA
- HW 1 Government Code and Cypher School (GC&CS): Signals Intelligence Passed to the Prime Minister, Messages and Correspondence, 1940-1945, GCHQ Papers, TNA

- HW 3 GC&CS and predecessors: Personal Papers, Unofficial Histories, Foreign Office X Files and Miscellaneous Records, 1914-1945, GCHQ Papers, TNA
- HW 5 GC&CS: German Section: Reports of German Army and Air Force High Grade Machine Decrypts (CX/FJ, CX, JQ and CX/MSS Reports), 1940-1945, GCHQ Papers, TNA
- HW 8 GC&CS: Naval Section: Reports, Working Aids and Correspondence, 1914-1946, GCHQ Papers, TNA
- HW 11 GC&CS: World War II Official Histories, 1938-1945, GCHQ Papers, TNA
- HW 13 Government Code and Cypher School: Second World War Intelligence Summaries Based on Sigint, 1939-1945, TNA
- HW 18 Government Code and Cypher School: Naval Section: Reports of German, Italian, French, Spanish and Portuguese Naval Decrypts, 1938-1945 (including teleprinted translations of decrypted Second World War German U-boat (or U-boat command) radio messages), TNA
- HW 73 Government Code and Cypher School: German Signals Intelligence in the Second World War: Studies, 1934-1945 (including operations against British cyphers before and during the Second World War), TNA
- JOD/185/1 Diary of Vice-Admiral James Wilfred Sussex Dorling, National Maritime Museum, Greenwich. MS1983/134
- LAB 6 Ministry of Labour and National Service and Ministry of Labour: Military Recruitment: Registered Files, 1937-1976 (including Naval Recruitment, 1937-1976), Ministry of Labour Papers, TNA
- LAB 10 Department of Employment and predecessors: Industrial Relations, Registered Files, 1895-1986, Ministry of Labour Papers, TNA
- LAB 25 Ministry of Labour and Ministry of Labour and National Service: Private Office Papers: War Emergency Measures, 1935-1955, Ministry of Labour Papers, TNA
- MT 9 Board of Trade and Ministry of Transport and successors: Marine, Harbours and Wrecks (M, H and W Series) Files, 1854-1969 (including SDAC), Ministry of War Transport Papers, TNA
- MT 40 Sea Transport: Correspondence and Papers, 1903-2003 (including war planning and operations: Far East; Japan; fleet train for Far East, additional shipping, schedules etc, 1943-1945), TNA

- MT 59 Shipping Control and Operations: Correspondence and Papers, 1919-1993, Ministry of War Transport Papers, TNA
- MT 62 Private Office Papers, 1928-1953 (including papers of Lord Leathers, Minister of War Transport, 1941 to 1945; and Sir Arthur Salter, Parliamentary Secretary to the Ministries of Shipping and War Transport, 1939 to 1941, and Head of the British Merchant Shipping Mission, Washington, 1941 to 1943), TNA
- MT 63 Ministry of Transport and successors, Port and Transit: Correspondence and Papers, 1915-1957 (including turn round of ships, Admiralty meetings, 1941), Ministry of War Transport Papers, TNA
- MT 65 Ministry of Transport and successors: Statistics Files, 1935-1974, Ministry of War Transport Papers, TNA
- PREM 1 Prime Minister's Office: Correspondence and Papers, 1916-1940, Prime Minister's Office Papers, TNA
- PREM 3 Prime Minister's Office: Operational Correspondence and Papers, 1937-1946, Prime Minister's Office Papers, Minister of Defence, TNA
- PSF Box 1 Arcadia Conference, psfa0005, President's Secretary's File (PSF), Franklin D. Roosevelt Presidential Library & Museum
http://www.fdrlibrary.marist.edu/_resources/images/psf/psfa0005.pdf
- PSFA0091 Memorandum to the President from Admiral Land, War Shipping Administration, 9 December 1944, President's Secretary's File (PSF), Franklin D. Roosevelt Presidential Library & Museum
http://www.fdrlibrary.marist.edu/_resources/images/psf/psfa0091.pdf
- RG 19 Records of the Bureau of Ships, National Archives and Records Administration, US (NARA)
- RG 38 Records of the office of the Chief of Naval Operations (OCNO), National Archives and Records Administration, US (NARA)
- RG 72 Records of the Bureau of Aeronautics, National Archives and Records Administration, US (NARA)
- RG 80 General Records of the Department of the Navy, National Archives and Records Administration, US (NARA)
- RG 179 Records of the War Production Board (WPB), National Archives and Records Administration, US (NARA). *Industrial Mobilization for War, History of the*

War Production Board and Predecessor Agencies, 1940-1945, Volume II, Materials and Products (unpublished)

- RG 225 Joint Army and Navy Boards Committees, National Archives and Records Administration, US (NARA)
- RG 428 General Records of the Department of the Navy, National Archives and Records Administration, US (NARA)
- ROSK Roskill, Captain Stephen Wentworth, papers, Churchill Archive Centre, Churchill College Cambridge
- SCAF 78 Progress of Operations Report, Supreme Commander Allied Expeditionary Force, 9 September 1944, Octagon Conference, Joint History Office of the Joint Chiefs of Staff,
<https://www.jcs.mil/Portals/36/Documents/History/WWII/Octagon3.pdf>
- SUPP 9 Aircraft Data Sheets and Photographs, 1941-1945 (including naval aircraft), Ministry of Supply Papers, TNA
- T 160 Treasury: Registered Files: Finance Files (F Series), 1887-1948, Treasury Papers, TNA
- T 161 Treasury: Supply Department: Registered Files (S Series), 1905-1975, Treasury Papers, TNA
- T 225 Treasury: Defence Policy and Materiel Division: Registered Files (DM and 2DM Series), 1911-1976, Treasury Papers, TNA
- T 246 Ministry of Supply and successors: Central Priority Department: Correspondence, Papers and Minutes, 1934-1946, Treasury Papers, TNA
- WO 193 War Office: Directorate of Military Operations and Plans, later Directorate of Military Operations: Files concerning Military Planning, Intelligence and Statistics (Collation Files), 1934-1958 (including FAA/aircraft carriers in British Pacific Fleet, 1939-1944), War Office Papers, TNA
- WO 203 War Office: South East Asia Command: Military Headquarters Papers, Second World War (1932-1952), TNA
- WO 208 War Office: Directorate of Military Operations and Intelligence, and Directorate of Military Intelligence; Ministry of Defence, Defence Intelligence Staff: Files, 1917-1990 (including reports from 30 Military Mission, Moscow and Senior British Naval Officer, Archangel, 1944 June-1945 Feb), TNA

- WO 214 War Office: Earl Alexander of Tunis, Supreme Allied Commander Mediterranean Theatre: Papers, 1941-1946, War Office Papers, TNA
- WO 229 War Office: Supreme Headquarters Allied Expeditionary Force and 21 Army Group: Microfilms, 1943-1945, War Office Papers, TNA
- WO 282 War Office: Field Marshal Sir John Greer Dill: Papers, 1936-1941, War Office Papers, TNA

Secondary Sources

- Abbatiello, John J. (2004), *British Naval Aviation and the Anti-Submarine Campaign, 1917-18*. PhD Thesis, King's College London
- Abbatiello, John J. (2011), *Anti-Submarine Warfare in World War I, British naval aviation and the defeat of the U-Boats* (London and New York: Routledge)
- Abbazia, Patrick (1975), *Mr. Roosevelt's Navy: The Private War of the U.S. Atlantic Fleet, 1939-1942* (Annapolis, Maryland: Naval Institute Press)
- Adams, Thomas A. (1994), 'The Control of British Merchant Shipping', in Howarth, Stephen, and Law, Derek (eds.), *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference* (London: Greenhill Books and Annapolis, Maryland: Naval Institute Press)
- Adcock, Al (1996), *Escort Carriers in Action*. Warships Number 9 (Carrollton, Texas: Squadron/Signal Publications)
- Alanbrooke, Field Marshal Lord (2001), *War Diaries: 1939-1945*, Danchev, Alex and Todman, Daniel (eds.) (London: Weidenfeld & Nicolson)
- Anonymous (1946), *History of H.M.S. Speaker* (Sydney: The Pinnacle Press)
- Ashworth, Chris (1992), *RAF Coastal Command 1936-1969* (Yeovil: Patrick Stephens)
- Ashworth, William (1953), *Contracts and Finance* (London: HMSO and Longmans, Green and Co.), in Hancock, W.K. (ed.) *History of the Second World War, United Kingdom Civil Series*
- Ayre, Sir Amos (1945), *Merchant Shipbuilding During the War*, The Institution of Naval Architects, Transactions (London), pp.1-28
- Baer, George W. (1993), 'Conference Summary: Corbett and Richmond...and Mahan and US', in Goldrick, James, and Hattendorf, John B. (eds.), *Mahan is not Enough, The Proceedings of a Conference on the Works of Sir Julian Corbett and Admiral Sir Herbert Richmond* (Newport, Rhode Island: Naval War College Press)
- Bailey, Thomas A. and Ryan, Paul B. (1979), *Hitler vs. Roosevelt: The Undeclared Naval War* (New York and London: Macmillan)
- Baker, R., Holt, W.J., Lenaghan, J., Sims, A.J., and Watson, A.W. (1983), *Selected Papers on British Warship Design in World War II: From the Transactions of the Royal Institution of Naval Architects* (London: Conway Maritime Press Ltd)
- Ballantine, Duncan S (1947), *U.S. Naval Logistics in the Second World War* (Princeton: Princeton University Press)

- Barker, Ralph (2000), *The Hurricats: The fighters that could not return* (Stroud: Tempus)
- Barlow, Jeffrey G. (2013), 'The Navy's Escort Carrier Offensive', *Naval History Magazine*, Vol. 27, No. 6, December 2013
- Barnett, Correlli (1972), *The Collapse of British Power* (London: Eyre Methuen)
- Barnett, Correlli (1986), *The Audit of War: The Illusion & Reality of Britain as a Great Nation* (London and Basingstoke: Macmillan)
- Barnett, Correlli (1992), *Engage the Enemy More Closely: The Royal Navy in the Second World War* (London, Sydney, Auckland and Toronto: Hodder and Stoughton)
- Barros, Andrew (2009), 'Strategic Bombing and Restraint in "Total War", 1915-1918', in *The Historical Journal*, Volume 52, 2 (2009), pp.413-431
- Bassett, G.A. (1946), 'The Repair and Upkeep of H.M. Ships and Vessels in War', in *Transactions of the Institution of Naval Architects*, Volume 88, pp. 21-43. Duckworth, Captain (S) A.D., R.N. (ret.) (ed.) (London: Institution of Naval Architects)
- Bath, Alan Harris (1998), *Tracking the Axis Enemy: The Triumph of Anglo-American Naval Intelligence* (Kansas: University of Kansas)
- Baugh, Daniel A. (1993), 'Admiral Sir Herbert Richmond and the Objects of Sea Power', in Goldrick, James, and Hattendorf, John B. (eds.) (1993), *Mahan is not Enough, The Proceedings of a Conference on the Works of Sir Julian Corbett and Admiral Sir Herbert Richmond* (Newport, Rhode Island: Naval War College Press)
- Baugh, Daniel A. (1996), 'Confusion and Constraints: The Navy and British Defence Planning, 1919-1939', in Rodger, N.A.M. (ed.) (1996), *Naval Power in the Twentieth Century*, pp.101-119 (Basingstoke and London: Macmillan Press)
- Beesly, Patrick (1990), 'Convoy PQ17: A study of intelligence and decision-making', *Intelligence and National Security*, Vol. 5, No. 2, pp.292-322, <http://dx.doi.org/10.1080/02684529008432054> (accessed 12 March 2014)
- Beesly, Patrick (2000), *Very Special Intelligence: The Story of the Admiralty's Operational Intelligence Centre 1939-1945* (London: Greenhill Books and Pennsylvania: Stackpole Books). Later edition of 1977 book with introduction by Gardner, W.J.R.
- Beesly, Patrick; Stafford, David; and Montague, Ewen (1983), 'What You Don't Know by What You Do', Review of *British Intelligence in the Second World War: Its Influence on Strategy and Operations, Vol. II, by F. H. Hinsley*, *The International History Review*, Vol. 5, No. 2, pp.279-290, <http://www.jstor.org/stable/40105296> (accessed 12 March 2014)
- Beevor, Anthony (2009), *D-Day: The Battle for Normandy* (London: Viking)

- Beevor, Anthony (2012), *The Second World War* (London: Weidenfeld & Nicolson)
- Behrens, C.B.A. (1955), *Merchant Shipping and the Demands of War* (London: HMSO and Longmans, Green and Co)
- Bekker, Cajus (1974), *Hitler's Naval War*, Ziegler, Frank (trans. and ed.) (London: Macdonald)
- Bell, Christopher M. (2000), *The Royal Navy, Seapower and Strategy between the Wars* (Stanford, California: Stanford University Press)
- Bell, Christopher M. (2010), 'Winston Churchill and the Ten Year Rule', *Journal of Military History*, October 2010, Vol. 74, Issue 4
- Bell, Christopher M. (2013), *Churchill and Sea Power* (Oxford: Oxford University Press)
- Bell, Christopher M. (2015), 'Air Power and the Battle of the Atlantic: Very Long Range Aircraft and the Delay in Closing the Atlantic "Air Gap"', *Journal of Military History*, July 2015, Vol. 79, Issue 3
- Bell, Christopher M. (2016), 'Did Churchill Prolong the Battle of the Atlantic?' (Hillsdale College, MI), <https://winstonchurchill.hillsdale.edu/churchill-prolong-battle-atlantic/>
- Bell, Christopher (2019), 'The View from the Top: Winston Churchill, British Grand Strategy, and the Battle of the Atlantic', in Faulkner, Marcus and Bell, Christopher M., (eds.), in *Decision in the Atlantic, The Allies and the Longest Campaign of the Second World War* (Lexington, Kentucky: Andarta Books, The University Press of Kentucky)
- Bell, Dana (2012), *Aircraft Pictorial 4: F4F Wildcat* (Tucson, Arizona: Classic Warships Publishing)
- Benbow, Tim (ed.) (2011), *British Naval Aviation: The First 100 Years*, Corbett Centre for Maritime Policy Studies Series (Farnham, Surrey: Ashgate)
- Benbow, Tim (2014), 'Brothers in Arms: The Admiralty, the Air Ministry and the Battle of the Atlantic, 1940-1943', *Global War Studies*, Vol. 11, No. 1, pp.41-88, <http://dx.doi.org/10.5893/19498489.11.01.02> (accessed 30 November 2017)
- Benbow, Tim (2017a), 'Absent Friends? British naval aviation and D-Day', *Defence-in-Depth*, King's College London. <https://defenceindepth.co/2017/09/29/absent-friends-british-naval-aviation-and-d-day/> (accessed 25 November 2017)
- Benbow, Tim (2017b), 'The contribution of the Royal Navy aircraft carriers and the Fleet Air Arm to Operation "Overlord", 1944', *War in History* 2019, Vol. 26(2), 265-286. DOI: 10.1177/0968344517702417
- Berger, Stefan (2022), *History and Identity: How Historical Theory Shapes Historical Practice* (Cambridge: Cambridge University Press)

Berger, Stefan; Feldner, Heiko; & Passmore, Kevin (eds.) (2020), *Writing History: Theory and Practice* (London: Bloomsbury Academic)

Beyerchen, Alan (2009), 'From radio to radar: Interwar military adaptation to technological change in Germany, the United Kingdom, and the United States', in Murray, Williamson and Millett, Allan R., (eds.), *Military Innovation in the Interwar Period*, pp. 265-299 (New York: Cambridge University Press)

Birkenhead, The Earl of (1961), *The Prof in Two Worlds: The official life of Professor F.A. Lindemann, Viscount Cherwell* (London: Collins)

Black, Jeremy (2004), *Rethinking Military History* (London and New York: Routledge, Taylor & Francis Group)

Black, Nicholas Duncan (2005), *The Admiralty War Staff and its influence on the conduct of the naval war between 1914 and 1918*, PhD Thesis, University College London

Blackett, P.M.S. (1962), *Studies of War: Nuclear and Conventional* (Edinburgh and London: Oliver & Boyd)

Blair, Clay (1997), *Hitler's U-Boat War: The Hunters, 1939-1942* (London: Weidenfeld & Nicolson)

Blair, Clay (1999), *Hitler's U-Boat War: The Hunted, 1942-1945* (London: Weidenfeld & Nicolson)

Boog, Horst (1994), 'Luftwaffe Support of the German Navy', in Howarth, Stephen, and Law, Derek (eds.), *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference* (London: Greenhill Books and Annapolis, Maryland: Naval Institute Press)

Bowman, Martin W. (1998), *Consolidated B-24 Liberator* (Marlborough, Wiltshire: The Crowood Press Ltd)

Boyd, Andrew (2017), *The Royal Navy in Eastern Waters: Linchpin of Victory, 1935-1942* (Barnsley: Seaforth Publishing)

Boyd, Andrew (2020), *British Naval Intelligence Through the Twentieth Century* (Barnsley: Seaforth Publishing)

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

Bragadin, Marc'A. (1957), *The Italian Navy in World War II* (Annapolis, Maryland: US Naval Institute)

Breyer, Siegfried and Skiot, Mirosław (2012), *German Capital Ships of the Second World War*, trans. Jaroslaw Glodek (Barnsley: Seaforth Publishing)

- Brodhurst, Robin (2000), *Churchill's Anchor: Admiral of the Fleet Sir Dudley Pound OM, GCB, GCVO* (Barnsley: Leo Cooper)
- Brown, David (1974), *Carrier Operations in World War II, Volume I: The Royal Navy* (London: Ian Allan). Second edition
- Brown, David (1975), *Carrier Fighters: 1939-1945* (London: Macdonald and Jane's)
- Brown, David (1977), *Aircraft Carriers: WW2 Fact Files* (London: Macdonald and Jane's)
- Brown, D.K., RCNC (1983a), *The Development of the British Escort Carrier*, Warship 25, pp.18-24, January 1983
- Brown, D.K. (1983b), *A Century of Naval Construction: The History of the Royal Corps of Naval Constructors, 1883-1983* (London: Conway Maritime Press)
- Brown, D.K. (ed.) (1995), *The Design and Construction of British Warships 1939-1945: The Official Record, Major Surface Warships* (London: Conway Maritime Press)
- Brown, D.K. (2000), *Nelson to Vanguard: Warship Design and Development 1923-1945* (London: Chatham Publishing)
- Brown, Eric (1980), *Wings of the Navy: Flying Allied Carrier Aircraft of World War Two* (London: Macdonald & Jane's Publishing Group Ltd)
- Brown, Eric M. (1989), *Duels in the Sky: World War II Naval Aircraft in Combat* (Annapolis, Maryland: Naval Institute Press)
- Buchanan, A.R. (ed.) (1946), *The Navy's Air War: A Mission Completed*. By the Aviation History Unit, OP-519B, DCNO (Air). (New York and London: Harper & Brothers Publishers)
- Buchanan, A. Russell (ed.) (1972), *The United States and World War II Military and Diplomatic Documents* (Columbia, South Carolina: University of South Carolina Press)
- Buckley, John (1993), 'Air Power and the Battle of the Atlantic, 1939-45', *Journal of Contemporary History*, Vol. 28, No. 1, pp.143-161
- Buckley, John (1994), 'Contradictions in British Defence Policy 1937-1939, The RAF and the Defence of Trade', *Twentieth Century British History*, Vol. 5, No. 1, pp.100-113
- Buckley, John (1995a), 'Atlantic Airpower Co-operation, 1941-1943' in Gooch, John (ed.) (1995), *Airpower Theory and Practice*, pp.175-197 (London: Frank Cass)
- Buckley, John (1995b), *The RAF and Trade Defence 1919-1945: Constant Endeavour* (Keele, Staffordshire: Ryburn Publishing, an imprint of Keele University Press)
- Buckley, John (1995c), 'Atlantic airpower co-operation, 1941-1943', *Journal of Strategic Studies*, 18:1, pp.175-197, <http://dx.doi.org/10.1080/01402399508437583>

- Buckley, John (2018), 'Coastal Command in the Second World War', *Air Power Review*, Volume 21, Number 1, Spring 2018, chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.raf.mod.uk/what-we-do/centre-for-air-and-space-power-studies/documents1/vol-21-no-1-raf100-special-edition/
- Buell, Thomas B. (1980), *Master of Sea Power: A Biography of Fleet Admiral Ernest J. King* (Boston and Toronto: Little, Brown and Company)
- Burton, Anthony (1994), *The Rise & Fall of British Shipbuilding* (London: Constable)
- Butler, J.R.M. (1957), *Grand Strategy, Volume II, September 1939-June 1941* (London: HMSO). Butler, J.R.M. (ed.) *History of the Second World War, United Kingdom Military Series*
- Butler, J.R.M. (1964), *Grand Strategy, Volume III, Part II, June 1941-August 1942* (London: HMSO). Butler, J.R.M. (ed.) *History of the Second World War, United Kingdom Military Series*
- Butler, Phil with Hagedorn, Dan (2004), *Air Arsenal North America: Aircraft for the Allies 1938-1945, Purchases and Lend-Lease* (Hinckley, England: Midland Publishing)
- Cafferky, Shawn (2010), 'Battle Honours Won HMS Nabob, 1944', *Canadian Military History*, Vol. 19, Issue 3, Article 2. <http://scholars.wlu.ca/cmh/vol19/iss3/2>
- Canaday, Lt Commander John L, USN (1990), *The Small Aircraft Carrier: A Re-Evaluation of the Sea Control Ship*, MA Thesis, Fort Leavenworth, Kansas, U.S. Army Command and General Staff College
- Central Statistical Office (1995), *Fighting with Figures* (London: CSO)
- Chalmers, Rear Admiral W.S. (1954), *Max Horton and the Western Approaches: A Biography of Admiral Sir Max Kennedy Horton, G.C.B., D.S.O.* (2nd imp.) (London: Hodder and Stoughton)
- Chance, David (undated), *The Wartime Russian Convoys 1941-1945: A personal view* (unpublished)
- Chapman, J.H.B. (1960), 'The Development of the Aircraft Carrier', *Royal Institution of Naval Architects, Quarterly Transactions*, October 1960, Volume 102, No. 4, pp.495-533
- Chatfield, Lord (1947), *The Navy and Defence, Volume II: It might happen again* (London and Toronto: William Heinemann). Written in 1940 but first published 1947
- Cheska, John C. Jr. (1962), *Submarine Warfare, Fiction or Reality?* MA thesis, University of Massachusetts, Amherst

- Chesneau, Roger (1988), *Aircraft Carriers of the World, 1914 to the Present: An Illustrated Encyclopedia* (Annapolis, Maryland: Naval Institute Press)
- Churchill & Roosevelt (1984a), *Churchill & Roosevelt: The Complete Correspondence, I, Alliance Emerging, October 1933-November 1942*. Kimball, Warren F. (ed.). (London: Collins)
- Churchill & Roosevelt (1984b), *Churchill & Roosevelt: The Complete Correspondence, II, Alliance Forged, November 1942-February 1944*. Kimball, Warren F. (ed.). (London: Collins)
- Churchill & Roosevelt (1984c), *Churchill & Roosevelt: The Complete Correspondence, III, Alliance Declining, February 1944-April 1945*. Kimball, Warren F. (ed.). (London: Collins)
- Churchill, Winston S. (2015a), *The Second World War: Vol. I, The Gathering Storm* (London: Weidenfeld & Nicolson). First published 1948
- Churchill, Winston S. (2015b), *The Second World War: Vol. II, Their Finest Hour* (London: Weidenfeld & Nicolson). First published 1949
- Churchill, Winston S. (2015c), *The Second World War: Vol. III, The Grand Alliance* (London: Weidenfeld & Nicolson). First published 1950
- Churchill, Winston S. (2015d), *The Second World War: Vol. IV, The Hinge of Fate* (London: Weidenfeld & Nicolson). First published 1950
- Churchill, Winston S. (2015e), *The Second World War: Vol. V, Closing the Ring* (London: Weidenfeld & Nicolson). First published 1951
- Churchill, Winston S. (2015f), *The Second World War: Vol. VI, Triumph and Tragedy* (London: Weidenfeld & Nicolson). First published 1953
- Claasen, Adam R.A. (2001), *Hitler's Northern War: The Luftwaffe's Ill-Fated Campaign, 1940-1945* (Kansas: University Press of Kansas)
- Clark, Ronald W. (1965), *Tizard* (London: Methuen & Co Ltd)
- Clayton, Aileen (1980), *The Enemy is Listening* (London, Melbourne, Sydney, Auckland and Johannesburg: Hutchinson)
- Cocker, Maurice (2008), *Aircraft-Carrying Ships of the Royal Navy* (Stroud: The History Press)
- Coles, Michael (2001), 'Ernest King and the British Pacific Fleet: The Conference at Quebec, 1944 ("Octagon")', *The Journal of Military History*, January 2001, Volume 65: 1, pp.105-129, <https://www.jstor.org/stable/2677432> (accessed 6 May 2020)
- Collier, Basil (1957), *The Defence of the United Kingdom* (London: HMSO). History of the Second World War, United Kingdom Military Series

Colomb, Vice Admiral P.H., Royal Navy (1990a), *Naval Warfare, Its Ruling Principles and Practice Historically Treated, Volume 1* (Annapolis, Maryland: Naval Institute Press, Classics of Sea Power series). First published 1891 (London: W.H. Allen & Co.)

Colomb, Vice Admiral P.H., Royal Navy (1990b), *Naval Warfare, Its Ruling Principles and Practice Historically Treated, Volume 2* (Annapolis, Maryland: Naval Institute Press, Classics of Sea Power series). First published 1891 (London: W.H. Allen & Co.)

Colville, John (1985), *The Fringes of Power: Downing Street Diaries 1939-1955* (London, Sydney, Auckland, and Toronto: Hodder and Stoughton)

Conway's (1980), *All the World's Fighting Ships* (Greenwich, London: Conway Maritime Press)

Cook, James F. (2004), *Carl Vinson: Patriarch of the Armed Forces* (Macon, Georgia: Mercer University Press)

Corbett, Julian S. (1988), *Some Principles of Maritime Strategy* (Annapolis, Maryland: Naval Institute Press, Classics of Sea Power series). Introduction and notes by Eric J. Grove. Originally published 1911 (London: Longman, Green and Co.)

Costello, John and Hughes, Terry (1977), *The Battle of the Atlantic* (Collins)

Cote, Stephen R. (2001), *Operation Husky: A Critical Analysis*. Paper submitted to the Faculty of the Naval War College, Newport, Rhode Island

Creswell, J. (1938), *Naval War Manual (Draft)* (Cambridge: Churchill Archives Centre, Churchill College)

Creveld, Martin Van (2004), *Supplying War: Logistics from Wallenstein to Patton* (Cambridge: Cambridge University Press). Second edition

Crosley, R 'Mike', Commander DSC RN (2014), *They Gave Me a Seafire* (Barnsley, South Yorkshire: Pen and Sword Aviation)

Cunningham, Admiral of the Fleet Viscount Cunningham of Hyndhope K.T., G.C.B., O.M., D.S.O. (1952), *A Sailor's Odyssey* (London: Hutchinson & Co.)

Cunningham, Admiral Sir Andrew (1999), *The Cunningham Papers: Vol I, The Mediterranean Fleet 1939-1942*. Simpson, Michael (ed.) (Aldershot, Hants: Ashgate for the Naval Records Society)

Cunningham, Admiral Sir Andrew (2006), *The Cunningham Papers: Vol. II, The Triumph of Allied Sea Power 1942-1946*. Simpson, Michael (ed.) (Aldershot, Hants: Ashgate for the Naval Records Society)

Danchev, Alex (1986), *Very Special Relationship: Field Marshal Sir John Dill and the Anglo-American Alliance 1941-44* (London: Brassey's Defence Publishers)

Datson, Neil (2023), *The British Air Power Delusion, 1906-1941* (Oxford: Oxfordfolio)

Dewar, Kenneth G.B., RN (1913), 'What is the influence of oversea commerce on the operations of war? How did it affect our naval policy in the past, and how does it in the present day?', Gold Medal (Naval) Prize Essay for 1912, Royal United Services Institution. Journal, Vol. 57, No. 422, April 1913, pp.449-500.

<http://dx.doi.org/10.1080/03071841309420085> (accessed 19 July 2017)

Dewar, Kenneth G.B., RN (1959), 'War on Shipping (1914-1918)', *The Naval Review*, Vol. XLVII, No. 1, January 1959, pp.3-13, <http://www.naval-review.com/issues/1950s/1959-1.pdf#Page%D5&View%3DFit> (accessed 16 September 2017)

Dewaters, Diane K. (2008), *The World War II Conferences in Washington DC and Quebec City: Franklin D. Roosevelt and Winston S. Churchill*, Doctor of Philosophy thesis, University of Texas at Arlington

Dickerson, Bryan J. (2020), *USS Charger (CVE-30)*, (published by author)

Dimbleby, Jonathan (2015), *The Battle of the Atlantic – How the Allies Won the War* (London: Viking, Penguin Random House)

Dobson, Alan P. (1986), *US Wartime Aid to Britain 1940-1946* (New York: St. Martin's Press)

Doenitz, Admiral Karl (1946), *The Conduct of the War at Sea* (Washington DC: Office of the Chief of Naval Operations, Navy Department)

Doenitz, Grand Admiral Karl (1990), *Memoirs: Ten Years and Twenty Days* (London: Greenhill Books). First published in German 1958 (Bonn) and translated into English 1959. This edition new material by Dr Jürgen Rohwer

Doherty, Richard (2015), *Churchill's Greatest Fear – The Battle of the Atlantic 3rd September 1939 to 7th May 1945* (Barnsley, South Yorkshire: Pen & Sword Military)

Doughty, Martin (1982), *Merchant Shipping and War: A Study in Defence Planning in Twentieth-Century Britain* (London: Royal Historical Society, and New Jersey: Humanities Press Inc.)

Douglas, W.A.B. (1986), *The Creation of a National Air Force: The Official History of the Royal Canadian Air Force, Volume II* (University of Toronto Press in co-operation with the Department of National Defence and the Canadian Government Publishing Centre, Supply and Services Canada)

Douglas, W.A.B. (ed.) (1988), *The RCN in Transition, 1910-1985* (Vancouver: The University of British Columbia Press)

Douglas, W.A.B.; Sarty, Roger; Whitby, Michael; with Caldwell, Robert H.; Johnston, William; and Rawling, William G.P. (2002), *No Higher Purpose: The Official Operational History of the Royal Canadian Navy in the Second World War, 1939-1943, Volume II, Part 1* (St Catharines, Ontario: Vanwell Publishing Limited)

Douglas, W.A.B.; Sarty, Roger; Whitby, Michael; with Caldwell, Robert H.; Johnston, William; and Rawling, William G.P. (2007), *A Blue Water Navy: The Official Operational History of the Royal Canadian Navy in the Second World War, 1943-1945, Volume II, Part 2* (St Catharines, Ontario: Vanwell Publishing Limited)

Duckworth, Captain (S) A.D., R.N. (ret.) (ed.), (1946), *Transactions of the Institution of Naval Architects: Volume 88* (London: Institution of Naval Architects)

Dunn, Patrick T. (1991), *The Advent of Carrier Warfare*, MA Thesis, Southern Connecticut State University

DuVon, Lieutenant Jay, USNR, and King, Lieutenant John F., USNR (1945), *Air Task Organization in the Atlantic Ocean Area* (reprinted in Delhi, India: Facsimile Publisher, 2016)

Edgerton, David (1996), *Science, technology and the British industrial 'decline', 1870-1970* (Cambridge: Cambridge University Press)

Edgerton, David (2006), *Warfare State: Britain, 1920-1970* (Cambridge: Cambridge University Press)

Edgerton, David (2011), *Britain's War Machine: Weapons, Resources and Experts in the Second World War* (London: Allen Lane)

Edwards, Peter J. (2010), *The Rise and Fall of the Japanese Imperial Naval Air Service* (Barnsley, South Yorkshire: Pen & Sword Aviation)

Ehrman, John (1956a), *Grand Strategy: Volume V, August 1943-September 1944* (London: HMSO). Butler, J.R.M. (ed.) *History of the Second World War, United Kingdom Military Series*

Ehrman, John (1956b), *Grand Strategy: Volume VI, October 1944-August 1945* (London: HMSO). Butler, J.R.M. (ed.) *History of the Second World War, United Kingdom Military Series*

Ellis, John (1990), *Brute Force: Allied Strategy and Tactics in the Second World War* (London: Andre Deutsch)

Ellis, John (1993), *The World War II Databook: The Essential Facts and Figures for All the Combatants* (London, New York, Sydney and Toronto: BCA)

Ellwood, Tobias, M.P. (2013), 'Leveraging UK Carrier Capability, A Study into the Preparation for and Use of the Queen Elizabeth-class Carrier', RUSI Occasional Paper, September 2013

Elphick, Peter (2001), *Liberty: The Ships That Won the War* (London: Chatham Publishing)

Erskine, Ralph (1987), 'U-boats, homing signals and HFDF', *Intelligence and National Security*, Vol. 2, No. 2, pp.324-330, <http://dx.doi.org/10.1080/02684528708431894> (accessed 12 March 2014)

Erskine, Ralph (1995), 'ULTRA and some U.S. Navy Carrier Operations', *Cryptologia*, 19:1, pp.81-96, <http://dx.doi.org/10.1080/0161-119591883782>

Erskine, Ralph (2002), 'The Admiralty and Scipher Machines During the Second World War: Not So Stupid After All', *Journal of Intelligence History*, Vol. 2, No. 2, pp.49-68, <http://dx.doi.org/10.1080/16161262.2002.10555069> (accessed 3 March 2014)

Erskine, Ralph (2004), 'Shore High-Frequency Direction-Finding in the Battle of the Atlantic: An Undervalued Intelligence Asset', *Journal of Intelligence History*, Vol. 4, No. 2, pp.1-32, <http://dx.doi.org/10.1080/16161262.2004.10555098> (accessed 3 March 2014)

Erskine, Ralph (2008), 'Captured Kriegsmarine Enigma Documents and Bletchley Park', *Cryptologia*, Vol. 32, No. 3, pp.199-219, <http://dx.doi.org/10.1080/01611190802088318> (accessed 3 March 2014)

Erskine, Ralph (2010), 'Ultra Reveals a Late B-Dienst Success in the Atlantic', *Cryptologia*, Vol. 34, No. 4, pp.340-358, <http://dx.doi.org/10.1080/01611194.2010.485412> (accessed 3 March 2014)

Erskine, Ralph (2013), 'Tunny Reveals B-Dienst Successes Against the "Convoy Code"', *Intelligence and National Security*, Vol. 28, No. 6, pp.868-889, <http://dx.doi.org/10.1080/02684527.2012.746414> (accessed 3 March 2014)

Evans, David (ed.) (2017), *The Japanese Navy in World War II in the Words of Former Japanese Naval Officers* (Annapolis: Naval Institute Press)

Evans, Mark Llewellyn (1990), *Great World War II Battles in the Arctic* (Westport, Connecticut and London: Greenwood Press)

Evans-Lombe, Captain E.M. (1947), 'The Royal Navy in the Pacific', *RUSI Journal*, Volume 92, pp.333-343

Farago, Ladislav (1962), *The Tenth Fleet* (New York: Ivan Obolensky, Inc.)

- Farrell, Brian (2014), *Grand Strategy and Imperial Defence: Reflections from a Historian* (National University of Singapore)
- Faulkner, Marcus (2012a), *War at Sea: A Naval Atlas 1939-1945*, cart. Peter Wilkinson (Barnsley: Seaforth Publishing)
- Faulkner, Marcus (2012b), 'The Kriegsmarine and the Aircraft Carrier: The Design and Operational Purpose of the Graf Zeppelin, 1933-1940', *War in History*, 19(4), pp.492-516, DOI: 10.1177/0968344512455974
- Faulkner, Marcus (2019), "'A Most Disagreeable Problem'", *British Perceptions of the Kriegsmarine's Aircraft Carrier Capability*, in Faulkner, Marcus and Bell, Christopher M. (eds.) (2019), *Decision in the Atlantic, The Allies and the Longest Campaign of the Second World War* (Lexington, Kentucky: Andarta Books, The University Press of Kentucky)
- Faulkner, Marcus and Bell, Christopher M. (eds.) (2019), *Decision in the Atlantic: The Allies and the Longest Campaign of the Second World War* (Lexington, Kentucky: Andarta Books, The University Press of Kentucky)
- Feber, Walter La (1975), 'Roosevelt, Churchill and Indochina: 1942-45', *The American Historical Review* (published by Oxford University Press), December 1975, Volume 80, No. 5, pp.1277-1295
- Felker, Craig C. (2007), *Testing American Sea Power: U.S. Navy Strategic Exercises, 1923-1940* (Texas: Texas A&M University Press)
- Ferris, John Robert (1989), *Men, Money and Diplomacy: The Evolution of British Strategic Policy, 1919-26* (Ithaca, New York: Cornell University Press)
- Ferris, J.R. (1997), 'The Last Decade of British Maritime Supremacy, 1919-1929', in Kennedy, Greg and Neilson, Keith (eds.), *Far Flung Lines, Essays on Imperial Defence in Honour of Donald Mackenzie Schurman* (London: Frank Cass)
- Ferris, John (2002), 'The road to Bletchley Park: the British Experience with Signals Intelligence, 1892-1945', *Intelligence and National Security*, Vol. 17, No. 1, pp.53-84, <http://dx.doi.org/10.1080/02684520412331306410> (accessed 3 March 2014)
- Ferris, John (2020), *Behind the Enigma: The Authorised History of GCHQ, Britain's Secret Cyber-Intelligence Agency* (London, Oxford, New York, New Delhi, and Sydney: Bloomsbury)
- Field, Alexander J. (2008), 'Impact of the Second World War on US Productivity Growth', published by Wiley on behalf of the Economic History Society, *Economic History Review*, New Series, Vol. 61, No. 3 (August 2008), pp. 672-694, <http://www.jstor.org/stable/40057606>

- Foot, M.R.D. (1987), 'Uses and abuses of intelligence', *Intelligence and National Security*, Vol. 2. No. 1, pp. 184-190, <http://dx.doi.org/10.1080/02684528708431882> (accessed 3 March 2014)
- Fort, Adrian (2003), *Prof: The Life of Frederick Lindemann* (London: Jonathan Cape)
- Foster, Mark S. (1985), 'Giant of the West: Henry J. Kaiser and Regional Industrialization, 1930-1950', *Harvard Business History Review* 59, Spring 1985
- Foster, Mark S. (1989), *Henry J Kaiser – Builder in the Modern American West* (Austin, Texas: University of Texas Press)
- Franklin, G.D. (2004), 'The Origins of the Royal Navy's Vulnerability to Surface Night U-Boat Attack 1939-40', *The Mariner's Mirror*, Vol. 90. No. 1, pp.73-84, <http://dx.doi.org/10.1080/00253359.2004.10656886> (accessed 3 March 2014)
- Franklin, George (2015), *Britain's Anti-Submarine Capability 1919-1939* (London and New York: Routledge, an imprint of Taylor & Francis Group)
- Franks, Norman L.R. (1990), *Search Find and Kill: Coastal Command U-boat Successes* (Bourne End, Buckinghamshire: Aston Publications)
- Fraser, David (1982), *Alanbrooke* (London: Collins)
- Frere-Cook, Gervis (1973), *The Attacks on the Tirpitz* (Shepperton: Ian Allan Ltd.)
- Friedman, Norman (1981a), *Carrier Air Power* (Greenwich, London: Conway Maritime Press)
- Friedman, Norman (1981b), *Naval Radar* (Greenwich, London: Conway Maritime Press)
- Friedman, Norman (1983), *US Aircraft Carriers: An Illustrated Design History* (Annapolis, Maryland: Naval Institute Press)
- Friedman, Norman (1988), *British Carrier Aviation: The Evolution of the Ships and their Aircraft* (Annapolis, Maryland: Naval Institute Press)
- Friedman, Norman (2016), *Fighters over the Fleet: Naval Air Defence from Biplanes to the Cold War* (Barnsley, South Yorkshire: Seaforth Publishing)
- Fry, M.G. (1965), 'The Imperial War Cabinet, The United States, and the Freedom of the Seas', *RUSI Journal*, 110:640, pp. 353-362, <https://doi.org/10.1080/03071846509419791>
- Furer, Rear Admiral Julius Augustus, USN (retired) (1959), *Administration of the Navy Department in World War II* (Washington, D.C.: Department of the Navy)
- Gannon, Michael (1990), *Operation Drumbeat: The Dramatic True Story of Germany's First U-Boat Attacks Along the American Coast in World War II* (New York: Harper & Row Publishers)

- Gardner, Jock (1994), 'The battle of the Atlantic, 1941 – the first turning point?', *Journal of Strategic Studies*, Vol. 17, No. 1, pp.109-123, <http://dx.doi.org/10.1080/01402399408437542> (accessed 16 March 2014)
- Gardner, W.J.R. (1999), *Decoding History: the Battle of the Atlantic and Ultra* (Annapolis, Maryland: Naval Institute Press)
- Gates, David and Jones, Ben (2016), *Air Power in the Maritime Environment: The World Wars* (London and New York: Routledge)
- Gelb, Norman (1992), *Desperate Venture: The Story of Operation Torch, The Allied Invasion of North Africa* (London, Sydney and Auckland: A John Curtis Book, Hodder & Stoughton)
- German, Commander Tony (1990), *The Sea is at our Gates: The History of the Canadian Navy* (Toronto: McClelland & Stewart)
- Gibbs, N.H. (1976), *Grand Strategy: Volume I, Rearmament Policy* (London: HMSO). Butler, J.R.M. (ed.) *History of the Second World War, United Kingdom Military Series*
- Gilbert, Martin (1983), *Finest Hour: Winston S. Churchill, 1939-1941* (London: Heinemann)
- Gilbert, Martin (1986), *Winston S. Churchill: Vol VII, Road to Victory, 1941-1945* (London: Heinemann)
- Gilbert, Martin (1993), *The Churchill War Papers, Volume I: At the Admiralty, September 1939-May 1940* (New York and London: W.W. Norton & Company)
- Gilbert, Martin (1995), *The Churchill War Papers, Volume II: Never Surrender, May 1940-December 1940* (New York and London: W.W. Norton & Company)
- Gilbert, Martin (2001), *The Churchill War Papers, Volume III: The Ever-Widening War, 1941* (New York and London: W.W. Norton & Company)
- Gilbert, Price Jr. and Durgin, C.T. (1946), *The Escort Carriers in Action* (Atlanta, Georgia: Ruralist Press)
- Goette, Richard (2005), 'Britain and the Delay in Closing the Mid-Atlantic "Air Gap" During the Battle of the Atlantic', *The Northern Mariner*, Vol. XV, No. 4, pp.19-41, http://www.cnrs-scrn.org/northern_mariner/indices/index_vol_15_e.html (accessed 7 November 2015)
- Goldrick, James (1995), 'The Problems of Modern Naval History', in Hattendorf, John B. (ed.) *Doing Naval History, Essays Towards Improvement*, pp. 11-23 (Newport, Rhode Island: Naval War College Press)
- Goldrick, James, and Hattendorf, John B. (eds.) (1993), *Mahan is not Enough, The Proceedings of a Conference on the Works of Sir Julian Corbett and Admiral Sir Herbert Richmond* (Newport, Rhode Island: Naval War College Press)

- Gooch, John (ed.) (1990), *Decisive Campaigns of the Second World War* (London: Frank Cass)
- Gooch, John (ed.) (1995), *Airpower Theory and Practice* (London: Frank Cass)
- Goodchild, James Martinson (2013), *R.V. Jones and the Birth of Scientific Intelligence*, PhD Thesis, University of Exeter
- Gordon, Gilbert Andrew Hugh (1983), *British Naval Policy and Procurement Between the Wars*, PhD Thesis, King's College London
- Gordon, G.A.H. (1988), *British Seapower and Procurement between the Wars: A Reappraisal of Rearmament* (Annapolis, Maryland: Naval Institute Press)
- Gordon, Andrew (1994), 'The Admiralty and Imperial Overstretch, 1902-1941', *Journal of Strategic Studies*, Vol. 17, No. 1, pp.63-85, <http://dx.doi.org/10.1080/01402399408437540> (accessed 16 March 2014)
- Goulter, Christina (1990), 'The role of intelligence in coastal command's anti-shipping campaign, 1940-1945', *Intelligence and National Security*, Vol. 5, No. 1, pp.84-109, <http://dx.doi.org/10.1080/02684529008432036> (accessed 1 March 2014)
- Goulter, Christina J.M. (1995), *A Forgotten Offensive: Royal Air Force Coastal Command's Anti-Shipping Campaign, 1940-1945* (London: Frank Cass)
- Grafton, Anthony (1994), 'The Footnote from de Thou to Ranke', *History and Theory*, December 1994, Vol. 33, No. 4, pp.53-76
- Gray, Colin S. (1992), *The Leverage of Sea Power: The Strategic Advantage of Navies in War* (New York: Macmillan)
- Gray, Colin S. (1994), 'History for strategists: British Seapower as a relevant past', *Journal of Strategic Studies*, Vol. 17, No. 1, pp. 7-32, <http://dx.doi.org/10.1080/01402399408437538> (accessed 16 March 2014)
- Greene, Jack and Massignani, Alessandro (2011), *The Naval War in the Mediterranean 1940-1943* (London: Frontline Books, and Annapolis, Maryland: Naval Institute Press)
- Greenfield, Kent Roberts (ed.) (1987), *Command Decisions* (Washington D.C.: Center of Military History, United States Army)
- Gretton, Vice-Admiral Sir Peter (1964), *Convoy Escort Commander: A Memoir of the Battle of the Atlantic* (Leeds: Sapere Books). First published by Cassell
- Gretton, Vice-Admiral Sir Peter (1965), *Maritime Strategy: A Study of British Defence Problems* (London: Cassell)

- Gretton, Vice-Admiral Sir Peter (1968), *Former Naval Person: Winston Churchill and the Royal Navy* (London: Cassell)
- Gretton, Vice-Admiral Sir Peter (1974), *Crisis Convoy: The Story of HX231* (London: Peter Davies)
- Gröner, Erich (1991), *German Warships 1815-1945, Volume Two: U-Boats and Mine Warfare*, revised and expanded by Dieter Jung and Martin Maass (Annapolis, Maryland: Naval Institute Press). First published in West Germany under the title *Die Deutschen Kriegsschiffe 1815-1945*
- Grove, Eric J. (ed.) (1997), *The Defeat of the Enemy Attack on Shipping, 1939-1945*. First published 1957. A Revised Edition of the Naval Staff History Volume 1A (Text and Appendices) and 1B (Plans and Tables). (Aldershot: Ashgate Publishing for The Navy Records Society)
- Grove, Eric (2019), "'The Battle of the Atlantic": a legend deconstructed', *The Mariner's Mirror*, 105:3, pp.336-339, <http://dx.doi.org/10.1080/00253359.2019.1589123>, published online 19 July 2019
- Gunn, Simon, and Faire, Lucy (eds.) (2016), *Research Methods for History* (Edinburgh: Edinburgh University Press)
- Gunston, Bill (1978), *The Illustrated Encyclopedia of Combat Aircraft of World War II* (New York: Bookthrift Publications)
- Gwyer, J.M.A. (1964), *Grand Strategy: Volume III, Part I, June 1941-August 1942* (London: HMSO). Butler, J.R.M. (ed.) *History of the Second World War, United Kingdom Military Series*
- Hackmann, Willem (1984), *Seek & Strike: Sonar, anti-submarine warfare and the Royal Navy, 1918-1954* (London: HMSO)
- Hague, Arnold (1983a), 'Armed Merchant Cruisers', in *Conversion for War*, Monograph No. 6. Osborne, Dr Richard (ed.), (Kendal, Cumbria: World Ship Society)
- Hague, Arnold (1983b), 'Ocean Boarding Vessels', in *Conversion for War*, Monograph No. 6. Osborne, Dr Richard (ed.), (Kendal, Cumbria: World Ship Society)
- Hague, Arnold (1990), 'Fighter Catapult Ships', in *Warships Supplement* (a supplement to *Marine News*, Journal of the World Ship Society), A World Ship Society publication, Vol. 100, Spring 1990
- Hague, Arnold (2000), *The Allied Convoy System 1939-1945: Its Organization, Defence and Operation* (London: Chatham Publishing)

- Hall, H. Duncan (1955), *North American Supply* (London: HMSO and Longmans, Green and Co.). History of the Second World War, United Kingdom Civil Series
- Halpern, Paul G. (1995), 'Comparative Naval History', in Hattendorf, John B. (ed.), *Doing Naval History, Essays Towards Improvement*, pp.75-92. (Newport, Rhode Island: Naval War College Press)
- Hamilton, C.I. (2000), 'The Character and Organization of the Admiralty Operational Intelligence Centre During the Second World War', *War in History*, Vol. 7, No. 3, pp.295-324, <http://wih.sagepub.com/content/7/3/295> (accessed 1 March 2014)
- Hammond, Richard (2020), *Strangling the Axis: The Fight for Control of the Mediterranean during the Second World War* (Cambridge: Cambridge University Press)
- Hanable, William S. (1998), 'Case Studies in the Use of Land-Based Aerial Forces in Maritime Operations, 1939-1990' (Washington, D.C.: Air Force History & Museums Program)
- Hancock, W.K. and Gowing, M.M. (1949), *British War Economy* (London: HMSO and Longmans, Green and Co.). History of the Second World War, United Kingdom Civil Series
- Handel, Michael I. (1990), 'Intelligence and military operations', *Intelligence and National Security*, Vol. 5, No. 2, pp.1-95, <http://dx.doi.org/10.1080/02684529008432047> (accessed 3 March 2014)
- Harding, Richard (ed.) (2012), *The Royal Navy, 1930-2000: Innovation and Defence* (Abingdon, Oxon, and New York: Routledge)
- Harding, Richard (2016), *Modern Naval History: Debates and Prospects* (London and New York: Bloomsbury Academic)
- Hargreaves, Reginald (1959), *The Narrow Seas* (London: Sidgwick and Jackson Ltd)
- Harris, Sir Arthur, Marshal of the RAF (1990), *Bomber Offensive* (London: Greenhill Books and California: Presidio Press)
- Harrison, William (1992), *Fairey Firefly: The Operational Record* (Shrewsbury: Airlife Publishing Ltd)
- Harrison, E.D.R. (2009), 'British Radio Security and Intelligence, 1939-43', *English Historical Review*, Vol. CXXIV, No. 506, <http://ehr.oxfordjournals.org> (accessed 1 March 2014)
- Haslop, Dennis (2013), *Britain, Germany and the Battle of the Atlantic: A Comparative Study* (London: Bloomsbury)
- Hastings. D.J. (ed.) (1986), *Bombay Buccaneers', Memories and Reminiscences of the Royal Indian Navy* (London: BACSA)

Hattendorf, John B. and Jordan, Robert S. (eds.) (1989), *Maritime Strategy and the Balance of Power: Britain and America in the Twentieth Century* (New York: St. Martin's Press)

Hattendorf, John B. (ed.) (1995), *Doing Naval History: Essays Towards Improvement* (Newport, Rhode Island: Naval War College Press)

Hearn, Chester G. (2005), *Carriers in Combat: The Air War at Sea* (Westport, Connecticut and London: Praeger Security International)

Heiner, Albert P. (1991), *Henry J Kaiser, Western Colossus: An Insider's View* (San Francisco, California: Halo Books)

Heinrich, Thomas (2012), "We Can Build Anything at Navy Yards:" Warship Construction in Government Yards and the Political Economy of American Naval Shipbuilding, 1928-1945', *International Journal of Maritime History*, XXIV, No. 2 (December 2012), pp.155-180. <http://journals.sagepub.com/doi/pdf/10.1177/084387141202400207> (accessed 14 August 2016)

Herwig, Holger H. (2009), 'Innovation ignored: The submarine problem – Germany, Britain, and the United States, 1919-1939', in Murray, Williamson and Millett, Allan R. (eds.), *Military Innovation in the Interwar Period*, pp.227-264 (New York: Cambridge University Press)

Hesketh, Roger (1999), *Fortitude: the D-Day Deception Campaign* (London: St. Ermine's Press in association with Little, Brown and Company, UK)

Hessler, Fregattenkapitän Günter (1992), *The U-Boat War in the Atlantic 1939-1945 (Volume I 1939-1941, Volume II January 1942-May 1943, and Volume III June 1943-May 1945, and Diagrams Volumes I-III, German Naval History Series)*, (London: HMSO; originally written at the Admiralty's request)

Hezlet, Vice Admiral Sir Arthur (1970), *Aircraft & Sea Power* (London: Peter Davies)

Hicks, Ursula K. (1938), *The Finance of British Government, 1920-1936* (London: Oxford University Press and Humphrey Milford, publisher to the University)

Hiley, Nicholas (1987), 'The strategic origins of room 40', *Intelligence and National Security*, Vol. 2, No. 2, pp.245-273, <http://dx.doi.org/10.1080/02684528708431889> (accessed 3 March 2014)

Hinsley, F.H. (1950), *Command of the Sea: the Naval Side of British History from 1918 to the end of the Second World War* (London: Christophers)

Hinsley, F.H., with Thomas, E.E., Ransom, C.F.G., and Knight, R.C. (1979), *British Intelligence in the Second World War: Its Influence on Strategy and Operations: Volume One* (London: HMSO)

Hinsley, F.H., with Simkins, C.A.G., Ransom, C.F.G., and Knight, R.C. (1984), *British Intelligence in the Second World War: Its Influence on Strategy and Operations: Volume Three, Part I* (London: HMSO)

Hinsley, F.H., with Thomas, E.E., Simkins, C.A.G., and Ransom, C.F.G. (1988), *British Intelligence in the Second World War: Its Influence on Strategy and Operations: Volume Three, Part II* (London: HMSO)

Hinsley, F.H., with Thomas, E.E., Ransom, C.F.G., and Knight, R. (1991), *British Intelligence in the Second World War: Its Influence on Strategy and Operations: Volume Two* (London: HMSO)

Hinsley, F.H. (1993), *British Intelligence in the Second World War* (Abridged Edition) (London: HMSO)

HMSO (1951), *Statistical Digest of the War Prepared by the Central Statistical Office*. W.K. Hancock (ed.), *History of the Second World War, United Kingdom Civil Series* (London: HMSO and Longmans Green and Co.)

HMSO (1995), *Fighting with Figures: A Statistical Digest of the Second World War*, Text by Peter Howlett (London: CSO)

HMSO (2005), *The Battle of the Atlantic: The Official Account of the Fight Against the U-boats 1939-1945* (Smalldale, Derbyshire: Military Library Research Service Ltd.) Originally published 1946

Hobbs, David (1994), 'Ship-borne Air Anti-Submarine Warfare', in Howarth, Stephen, and Law, Derek (eds.) *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference*, pp. 388-407 (London: Greenhill Books and Annapolis, Maryland: Naval Institute Press)

Hobbs, Commander David, MBE, RN (1996), *Aircraft Carriers of the Royal and Commonwealth Navies: The Complete Illustrated Encyclopedia from World War I to the Present* (London: Greenhill Books)

Hobbs, David (2003), *Royal Navy Escort Carriers* (Liskeard, Cornwall: Maritime Books)

Hobbs, David (2007), *Moving Bases: Royal Navy Maintenance Carriers and MONABS* (Liskeard, Cornwall: Maritime Books)

Hobbs, David (2012), *The British Pacific Fleet: The Royal Navy's Most Powerful Strike Force* (Barnsley: Seaforth Publishing)

Hobbs, David (2013), *British Aircraft Carriers: Design, Development and Service Histories* (Barnsley: Seaforth Publishing)

- Hobbs, David (2017), *The Royal Navy's Air Service in the Great War* (Barnsley: Seaforth Publishing)
- Hobbs, David (2020), *Taranto and Naval Air Warfare in the Mediterranean 1940-1945* (Barnsley: Seaforth Publishing)
- Hone, Thomas C. (1977), 'Battleships vs. Aircraft Carriers: The Patterns of U.S. Navy Operating Expenditures, 1932-1941', *Military Affairs*, Vol. 41, No. 3 (1 October 1977), Periodicals Archive Online, pp.133-141
- Hone, Thomas (1992), 'Fighting on Our Own Ground: The War of Production, 1920-1942', *Naval War College Review*, Vol. 45, No. 2, Article 9
- Hone, Thomas C.; Friedman, Norman; & Mandeles, Mark D. (1999), *American & British Aircraft Carrier Development, 1919-1941* (Annapolis, M.D.: Naval Institute Press)
- Hone, Thomas C.; Friedman, Norman; and Mandeles, Mark D. (2011), *Innovation in Carrier Aviation*. Naval War College, Newport Paper Thirty-Seven (Newport, Rhode Island: Naval War College Press)
- Hore, Peter (ed.) (2003), *Patrick Blackett, Sailor, Scientist and Socialist* (London and Portland, Oregon: Frank Cass)
- Hornby, William (1958), *Factories and Plant* (London: HMSO and Longmans, Green and Co.). Hancock, Sir Keith (ed.), *History of the Second World War, United Kingdom Civil Series*
- Howard, Michael (1968), *The Mediterranean Strategy in the Second World War* (London: Weidenfeld and Nicolson)
- Howard, Michael (1972a), *Grand Strategy, Volume IV, August 1942-September 1943* (London: HMSO). Butler, J.R.M. (ed.), *History of the Second World War, United Kingdom Military Series*
- Howard, Michael (1972b), *The Continental Commitment, The dilemma of British defence policy in the era of the world wars* (The Ford Lectures in the University of Oxford 1971), (London: Temple Smith)
- Howarth, Stephen and Law, Derek (eds.) (1994), *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference* (London: Greenhill Books and Annapolis, Maryland: Naval Institute Press)
- Howlett, Alexander L.N. (2018), 'The Royal Naval Air Service and Anti-Submarine Warfare in the North Sea, 1917-1919', *British Journal for Military History*, Volume 4, Issue 2, pp.32-49
- Howlett, Alexander L.N. (2019), *The Royal Naval Air Service and the Evolution of Naval Aviation in Britain, 1914-1918*, PhD Thesis, King's College London

Howlett, Alexander (2021), *The Development of British Naval Aviation, 1914-1918* (New York and London: Routledge)

Howse, Derek (1993), *Radar at Sea: The Royal Navy in World War 2* (London: Macmillan Press Ltd)

Hull, Isabel V. (2014), *A Scrap of Paper: Breaking and Making International Law during the Great War* (New York: Cornell University Press)

Hyde, H. Montgomery (1976), *British Air Policy Between the Wars 1918-1939* (London: William Heinemann)

Inman, P. (1957), *Labour in the Munitions Industry* (London: HMSO and Longmans, Green and Co.). Hancock, Sir Keith (ed.), *History of the Second World War, United Kingdom Civil Series*

Irving, David (1980), *The Destruction of Convoy PQ17* (London: William Kimber & Co. Limited)

Ito, Masanori, with Pineau, Roger (1962), *The End of the Imperial Japanese Navy* (London: Weidenfeld and Nicolson). Translated by Andrew Y. Kuroda and Roger Pineau

Jane's (1997), *Jane's Fighting Ships of WWII* (London: Random House). Reproduced from 1946/47 edition of *Jane's Fighting Ships*

James, Jonathan T. (1991), *Countering Naval Guerrilla Warfare: Are Convoys Obsolete? A Monograph* (Fort Leavenworth, Kansas: School of Advanced Military Studies, US Army Command and General Staff College)

Jefford, Wing Commander C.G., MBE, RAF (1988), *RAF Squadrons: A Comprehensive Record of the Movement and Equipment of all RAF Squadrons and their Antecedents since 1912* (Shrewsbury, England: Airlife)

Jenner, C. J. (2008), 'Turning the Hinge of Fate: Good Source and the UK-U.S. Intelligence Alliance, 1940-1942', *Diplomatic History*, Vol. 32, No. 2, <http://dh.oxfordjournals.org/>, 1 March 2014

Johnman, Lewis and Murphy, Hugh (2002a), *British Shipbuilding and the State since 1918: A political economy of decline* (Exeter: University of Exeter Press)

Johnman, Lewis and Murphy, Hugh (2002b), 'The British Merchant Shipping Mission in the United States and British Merchant Shipbuilding in the Second World War', *Northern Mariner*, XII, Number 3, July 2002, pp.1-15. https://www.cnrs-scrn.org/northern_mariner/vol12/tnm_12_3_1-15.pdf (accessed 8 September 2019)

Jones, Benjamin (2007), *Ashore, afloat and airborne: The Logistics of British Naval Airpower 1914-1945*, PhD Thesis, King's College London

Jones, Ben (2011), 'The Fleet Air Arm and the Struggle for the Mediterranean, 1940-44', in Benbow, Tim (ed.), *British Naval Aviation, The First 100 Years*, pp.79-98 (Farnham, Surrey: Ashgate Publishing)

Jones, Ben (ed.) (2012), *The Fleet Air Arm in the Second World War: Volume I, 1939-1941, Norway, the Mediterranean and the Bismarck* (Farnham, Surrey: Ashgate for the Navy Records Society)

Jones, Ben (ed.) (2018), *The Fleet Air Arm in the Second World War: Volume II, 1942-1943, The Fleet Air Arm in Transition – the Mediterranean, Battle of the Atlantic and the Indian Ocean* (London and New York: Routledge for the Navy Records Society)

Jones, Ben (2019), 'The Fleet Air Arm and Trade Defence, 1939-1944', in *Decision in the Atlantic, The Allies and the Longest Campaign of the Second World War*, Faulkner, Marcus and Bell, Christopher M. (eds.) (2019), pp.125-149 (Lexington, Kentucky: Andarta Books, The University Press of Kentucky)

Jones, Leslie (1957), *Shipbuilding in Britain, mainly between the two World Wars* (Cardiff: University of Wales Press)

Jones, R.V. (1978), *Most Secret War: British Scientific Intelligence 1939-1945* (London: Book Club Associates)

Joubert de la Ferté, Air Chief Marshal Sir Philip (1960), *Birds and Fishes: The story of Coastal Command* (London: Hutchinson)

Joubert de la Ferté, Sir Philip (1977), *The Fated Sky* (London, Sydney and Toronto: White Lion Publishers Limited). First published 1952

Kahn, David (2012), *Seizing the Enigma. The Race to Break the German U-boat Codes 1939-1943* (London: Frontline Books)

Keegan, John (1988), *The Price of Admiralty: War at Sea from Man of War to Submarine* (London: Hutchinson)

Keegan, John (2004), *Intelligence in War: Knowledge of the Enemy from Napoleon to Al-Qaeda* (London: Pimlico)

Kemp, Paul (1987), *The Russian Convoys 1941-1945 (Warships Illustrated No. 9)* (Poole, Dorset: Arms and Armour Press)

Kemp, Paul (1993a), *Convoy! Drama in Arctic Waters* (London: Arms and Armour Press)

- Kemp, Paul (1993b), *Convoy Protection: The Defence of Seaborne Trade* (London: Arms and Armour Press)
- Kennedy, Ludovic (1979), *Menace: The Life and Death of the Tirpitz* (London: Book Club Associates by arrangement with Sidgwick and Jackson)
- Kennedy, Paul M. (1976), *The Rise and Fall of British Naval Mastery* (New York: Charles Scribner's Sons)
- Kennedy, Paul (1988), *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000* (London: Unwin Hyman)
- Kennedy, Paul M. (1995), 'Levels of Approach and Contexts in Naval History: Admiral Tirpitz and the Origins of Fascism' in Hattendorf, John B. (ed.), *Doing Naval History, Essays Towards Improvement*, pp.26-39 (Newport, Rhode Island: Naval War College Press)
- Kennedy, Paul (2013), *Engineers of Victory: The Problem Solvers Who Turned the Tide in the Second World War* (London: Allen Lane)
- Kenyon, David (2023), *Arctic Convoys: Bletchley Park and the War for the Seas* (New Haven and London: Yale University Press)
- King, Fleet Admiral Ernest J. (1946), *U.S. Navy at War, 1941-1945: Official Reports to the Secretary of the Navy* (Washington, D.C.: United States Navy Department)
- King, Earnest J. and Whitehill, Walter Muir (1953), *Fleet Admiral King – A Naval Record* (London: Eyre & Spottiswoode)
- King, Michelle T. (2016) 'Working With/In the Archives', in Gunn, Simon, and Faire, Lucy (eds.) (2016), *Research Methods for History* (Edinburgh: Edinburgh University Press)
- Klein, Maury (2013), *A Call to Arms: Mobilizing America for World War II* (New York, London, New Delhi and Sydney: Bloomsbury Press)
- Knight, Roger (2022), *Convoys: The British Struggle against Napoleonic Europe and America* (New Haven and London: Yale University Press)
- Kohnen, David (1999), *Commanders Winn and Knowles: Winning the U-Boat War with Intelligence, 1939-1945*. Kapera, Zdzislaw J. (executive ed.) and Boyd, Carl (scholarly ed.), The Enigma Bulletin Series (special issue) (Kraków: The Enigma Press)
- Koistinen, Paul A.C. (2004), *Arsenal of World War II: The Political Economy of American Warfare, 1940-1945* (Lawrence, Kansas: University Press of Kansas)
- Lamb, Richard (1993), *Churchill as War Leader* (New York: Carroll & Graf Publishers)

Lambert, Andrew (1994), 'Seapower 1939-1940: Churchill and the Strategic Origins of the Battle of the Atlantic', *Journal of Strategic Studies*, Vol. 17, No. 1, pp.86-108, <http://dx.doi.org/10.1080/01402399408437541> (accessed 16 March 2014)

Lambert, Andrew D. (1996), 'Seizing the Initiative: the Arctic Convoys 1944-45', in *Naval Power in the Twentieth Century*, in Rodger, N.A.M. (ed.) (1996), pp.151-162 (Basingstoke and London: Macmillan Press Ltd)

Lambert, Andrew (2008), *Admirals: The Naval Commanders who Made Britain Great* (London: Faber and Faber)

Lambert, Andrew (ed.) (2017), *21st Century Corbett: Maritime Strategy and Naval Policy for the Modern Era* (Annapolis, Maryland: Naval Institute Press)

Lambert, Andrew (2021), *The British Way of War: Julian Corbett and the Battle for a National Strategy* (New Haven and London: Yale University Press)

Lane, Frederick C., in collaboration with Coll, Blanche D; Fischer, Gerald J.; and Tyler, David B.; with charts by Reynolds, Joseph T. (1951), *Ships for Victory, A History of Shipbuilding Under the U.S. Maritime Commission in World War II*. Series: Historical Reports on War Administration United States Maritime Commission, No. 1 (Baltimore: The Johns Hopkins Press)

Langenberg, Rear Admiral William H., US Naval Reserve (1981), 'The German Battleship "Tirpitz": A Strategic Warship?', *Naval War College Review*, Vol. 34. No. 4, pp.80-92, <https://www.jstor.org/stable/44635998>

Larkins, William T. (1988), *U.S. Naval Aircraft 1921-1941, and U.S. Marine Corps Aircraft 1914-1959* (New York: Orion Books)

Layman, R.D. (2002), *Naval Aviation in the First World War: Its Impact and Influence* (London: Caxton Editions)

Leighton, Richard M. (1987), 'U.S. Merchant Shipping and the British Import Crisis', in *Command Decisions*, Greenfield, Kent Roberts (ed.) (Washington, D.C.: Center of Military History, United States Army)

Leighton, Richard M. and Coakley, Robert W. (1955), *United States Army in World War II: The War Department, Global Logistics and Strategy 1940-1943*. Series: United States Army in World War II; fourth volume in the sub series: The War Department (Washington, D.C.: Office of the Chief of Military History)

Lenaghan, J. (1983), 'Merchant Aircraft Carrier Ships ("MAC' Ships")', in Baker, R., Holt, W.J., Lenaghan, J., Sims, A.J., and Watson, A.W., *Selected Papers on British Warship Design in World War II: Transactions of the Royal Institution of Naval Architects* (London: Conway Maritime Press Ltd)

- Lenton, H.T. and Colledge, J.J. (1964), *British and Dominion Warships of World War II* (New York: Doubleday)
- Leutze, James R. (1977), *Bargaining for Supremacy: Anglo-American Naval Collaboration 1937-1941* (Chapel Hill: University of North Carolina Press)
- Levy, James P. (2012a), 'The Development of British Naval Aviation: Preparing the Fleet Air Arm for War, 1934-1939' *Global War Studies* 9(2), <http://dx.doi.org/10.5893/19498489.09.02.01> (accessed 2 July 2017)
- Levy, James P. (2012b), 'Royal Navy Fleet Tactics on the Eve of the Second World War', *War in History*, Vol. 19, Issue 3, pp. 379-395, <http://dx.doi.org/10.1177/0968344512440655> (accessed 2 July 2017)
- Lewin, Ronald (1973), *Churchill as War Lord* (London: B.T. Batsford)
- Lindberg, Michael, and Todd, Daniel (2004), *Anglo-American Shipbuilding in World War II: A Geographical Perspective* (Westport, Connecticut, and London: Praeger)
- Linden, Marcel van der, Murphy, Hugh, and Varela, Raquel (eds.) (2017), *Shipbuilding and Ship Repair Workers around the World: Case Studies 1950-2010* (Amsterdam: Amsterdam University Press)
- Llewellyn-Jones, Malcolm Lt-Cdr. (2000), 'Trials with HM Submarine Seraph and British Preparations to Defeat the Type XXI U-Boat, September-October 1944', *The Mariner's Mirror*, Vol. 86, No. 4, pp.434-451, <http://dx.doi.org/10.1080/00253359.2000.10659261> (accessed 3 March 2014)
- Llewellyn-Jones, Malcolm (2003), 'A Clash of Cultures: The Case for Large Convoys', in Hore, Peter (ed.), *Patrick Blackett, Sailor, Scientist and Socialist* (London and Portland, Oregon: Frank Cass)
- Llewellyn-Jones, Malcolm (2004), *The Royal Navy on the threshold of Modern Anti-Submarine Warfare, 1944-1949*. PhD Thesis, King's College London
- Llewellyn-Jones, Malcolm (2006), *The Royal Navy and Anti-Submarine Warfare, 1917-49* (London and New York: Routledge)
- Lorenz, Edward H. (1991), *Economic Decline in Britain: The Shipbuilding Industry, 1890-1970* (Oxford: Clarendon Press)
- Love, Robert William Jr. (ed.) (1980), *Changing Interpretations and New Sources in Naval History: Papers from the Third United States Naval Academy History Symposium* (New York and London: Garland Publishing, Inc.)

- Mably, John R. (2004), *The Effectiveness of Merchant Aircraft Carriers*. MPhil unfinished thesis (passed by examiners in unfinished state). University of Brighton
- MacDonald, Scot (1964), *Evolution of Aircraft Carriers* (Washington, D.C.: Office of the Chief of Naval Operations, Department of the Navy)
- Macintyre, Donald (2006), *The Battle of the Atlantic* (Barnsley, South Yorkshire: Pen & Sword Military Classics). First published in 1961 by B.T. Batsford
- Mackinder, Halford J. (2009), *Democratic Ideals and Reality: A study in the politics of reconstruction* (London: Faber and Faber). First published 1919
- Madsen, Chris (2003), 'Limits of Generosity and Trust: The Naval Side of the Combined Munitions Assignment Board, 1942-1945', *War & Society*, 21:2, pp.77-108, DOI 10.1179/war.2003.21.2.77 (accessed 12 October 2019)
- Madsen, Chris (2008), 'Strategy, Fleet Logistics, and the Lethbridge Mission to the Pacific and Indian Oceans 1943-44', *Journal of Strategic Studies*, 31:6, pp.951-981, <https://doi.org/10.1080/01402390802373255>
- Mahan, Captain A.T. (1889), *The Influence of Sea Power upon History, 1660-1783* (London: Sampson Low, Marston and Company Limited)
- Mahan, Captain A.T. (1892), *The Influence of Sea Power upon the French Revolution and Empire, 1793-1812*, Vol. II (Boston: Little, Brown and Company). <https://archive.org/stream/influenceofseapo02inmaha#page/n0/mode/2up/search/needle> (accessed 14 March 2017)
- Mahan, Captain A.T. (1902), *Retrospect and Prospect: Studies in International relations, Naval and Political* (Boston: Little, Brown and Company). <https://ia902604.us.archive.org/12/items/retrospectprospe00maha/retrospectprospe00maha.pdf> (accessed 28 May 2017)
- Mahan, Rear Admiral Alfred Thayer (1991), *Mahan on Naval Strategy: Selections from the Writings of Rear Admiral Alfred Thayer Mahan*. Hattendorf, John B. (ed.) (Annapolis, Maryland: United States Naval Institute)
- Maiolo, Joseph A. (1996), "'I believe the Hun is cheating": British Admiralty Technical Intelligence and the German Navy 1936-39', *Intelligence and National Security*, Vol. 11, No. 1, pp.32-58, <http://dx.doi.org/10.1080/02684529608432342> (accessed 1 March 2014)
- Maiolo, Joe (1998), *The Royal Navy and Nazi Germany, 1933-39: A Study in Appeasement and the Origins of the Second World War* (Basingstoke, Hampshire, and New York, N.Y.: Palgrave Macmillan in association with King's College London)

- Maiolo, Joseph A. (1999a), 'The Knockout Blow Against the Import System: Admiralty Expectations of Nazi Germany's Naval Strategy 1934-9', *Historical Research*, Vol. 72, No. 178, pp.202-228
- Maiolo, Joseph A. (1999b), 'Deception and intelligence failure: Anglo-German preparations for U-boat warfare in the 1930s', *The Journal of Strategic Studies*, Vol. 22, No. 4 (4 December 1999), pp.55-76, <https://doi.org/10.1080/01402399908437769> (accessed 12 May 2018)
- Maiolo, Joe (2010), *Cry Havoc: The Arms Race and the Second World War, 1931-41* (London: John Murray)
- Maiolo, Joseph A. (2014), 'Did the Royal Navy Decline between the Two World Wars', *The RUSI Journal*, August/September 2014, Vol. 159, No. 4, <https://doi.org/10.1080/03071847.2014.946689> (accessed 22 August 2016)
- Mansbridge, Francis (2002), *Launching History: the Saga of Burrard Dry Dock* (Madeira Park, BC, Canada: Harbour Publishing Co Ltd)
- Marder, Arthur J. (1952), *Portrait of an Admiral: The Life and Papers of Sir Herbert Richmond* (London: Jonathan Cape)
- Marder, Arthur J. (1965), *From the Dreadnought to Scapa Flow, The Royal Navy in the Fisher Era, 1904-1919, Volume II, The War Years: To the Eve of Jutland* (London: Oxford University Press)
- Marder, Arthur J. (1969), *From the Dreadnought to Scapa Flow, The Royal Navy in the Fisher Era, 1904-1919, Volume IV, 1917: Year of Crisis* (London: Oxford University Press)
- Marder, Arthur J. (1970), *From the Dreadnought to Scapa Flow, The Royal Navy in the Fisher Era, 1904-1919, Volume V: Victory and Aftermath (January 1918-June 1919)* (London: Oxford University Press)
- Marder, Arthur J. (1974), *From the Dardanelles to Oran: Studies of the Royal Navy in War and Peace, 1915-1940* (London, New York, and Toronto: Oxford University Press)
- Marder, Arthur J. (1981), *Old Friends, New Enemies, The Royal Navy and the Imperial Japanese Navy, Volume 1: Strategic Illusions 1936-1941* (Oxford: Clarendon Press)
- Marder, Arthur, J., Jacobsen, Mark and Horsfield, John (1990), *Old Friends, New Enemies, The Royal Navy and the Imperial Japanese Navy, The Pacific War Vol. II, 1942-1945* (Oxford: Clarendon Press)
- Martienssen, Anthony (1948), *Hitler and his Admirals* (London: Secker and Warburg)

- Masterson, Daniel M. (general ed.) (1987), *Naval History: The Sixth Symposium of the U.S. Naval Academy* (Wilmington, Delaware: Scholarly Resources Inc.)
- Maurer, John H. (2012), "'Winston has gone mad": Churchill, the British Admiralty, and the Rise of Japanese Naval Power', *The Journal of Strategic Studies*, 35:6, 775-797, DOI: 10.1080/01402390.2012.654648
- Mawdsley, Dean L. (2002), *Steel Ships and Iron Pipe: Western Pipe and Steel Company Of California, The Company, The Yard, The Ships*. Pacific Maritime History Series, Number 5 (San Francisco: Associates of the National Maritime Museum Library at The Glencannon Press)
- Mawdsley, Evan (2019), *The War for The Seas: A Maritime History of World War II* (New Haven and London: Yale University Press)
- McLachlan, Donald (1968), *Room 39: a study in Naval Intelligence* (New York: Atheneum). Published in the UK (1968) as *Room 39: Naval Intelligence in Action 1939-45*
- Messimer, Dwight R. (2001), *Find and Destroy: Antisubmarine Warfare in World War I* (Annapolis, Maryland: Naval Institute Press)
- Meyer, Leo J. (1987), 'The Decision To Invade North Africa (Torch)', in *Command Decisions*, Greenfield, Kent Roberts (ed.) (Washington, D.C.: Center of Military History, United States Army)
- Middleton, David E.S. (2008), *Caledon Ships: A selection from the Dundee City Archives* (Dundee: Friends of Dundee City Archives)
- Miller, Nathan (1980), *The Naval Air War, 1939-1945* (Greenwich, London: Conway Maritime Press)
- Millett, Allan R. and Murray, Williamson (eds.) (2010), *Military Effectiveness, Volume 3, The Second World War* (Cambridge: Cambridge University Press). New edition
- Milner, Marc (1986), *North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys* (Toronto, Buffalo, and London: University of Toronto Press)
- Milner, Marc (1989a), 'Anglo-American Naval Co-operation in the Second World War, 1939-45', in Hattendorf, John B., and Jordan, Robert S. (eds.), *Maritime Strategy and the Balance of Power, Britain and America in the Twentieth Century*, pp.243-268, (New York: St. Martin's Press)
- Milner, Marc (1989b), 'The Dawn of Modern Anti-Submarine Warfare: Allied responses to the U-Boats, 1944-45', *The RUSI Journal*, 134:1, pp.61-68, <http://dx.doi.org/10.1080/03071848908445351> (accessed 25 May 2014)

Milner, Marc (1990a), 'The Battle of the Atlantic' in Gooch, John (ed.), *Decisive Campaigns of the Second World War* (London: Frank Cass)

Milner, Marc (1990b), 'The Battle of the Atlantic', *The Journal of Strategic Studies*, 13:1, pp.45-66, <https://doi.org/10.1080/01402399008437400> (accessed 25 March 2018)

Milner, Marc (1997), 'Naval Control of Shipping and the Atlantic War 1939-45', *The Mariner's Mirror*, 83:2, pp.169-184, <https://doi.org/10.1080/00253359.1997.10656638> (accessed 25 March 2018)

Milner, Marc (2003), *Battle of the Atlantic* (Stroud, Gloucestershire and St Catharines, Ontario: Tempus and Vanwell Publishing Limited)

Milner, Marc (2006), 'From Nelsonic to Newtonian: The Development of Anti-Submarine Warfare in the North Atlantic, 1939-1945', *The Mariner's Mirror*, 92:4, 465-476, DOI: 10.1080/00253359.2006.10657016

Milner, Marc (2017), 'The Atlantic War, 1939-1945: The Case for a New Paradigm', *Global War Studies*, Volume 14, No. 1, pp.45-60, <https://doi.org/10.5893/19498489.140102> (accessed 25 March 2018)

Milner, Marc (2019), "'The Atlantic War, 1939-1945: The Case for a New Paradigm' in Faulkner, Marcus and Bell, Christopher M. (eds.), *Decision in the Atlantic, The Allies and the Longest Campaign of the Second World War* (Lexington, Kentucky: Andarta Books, The University Press of Kentucky)

Milward, Alan S. (1967), *The German Economy at War* (London: University of London, The Athlone Press)

Milward, Alan S. (1987), *War, Economy and Society 1939-1945* (Harmondsworth, England: Penguin). Part of the series, Fischer, Wolfram (general ed.), *The Pelican History of World Economy in the Twentieth Century*

Ministry of Information (2007), *What Britain Has Done 1939 – 1945: A Selection of Outstanding Facts and Figures* (London: Atlantic Books). First published 1945

Mitchell, W.H. and Sawyer, L.A. (1990), *The Empire Ships*, 2nd Edition (London: Lloyds of London Press)

Moore, George (2003), *Building for Victory: The Warship Building Programmes of the Royal Navy 1939-1945* (Gravesend, Kent: World Ship Society)

Moran, Lord (1966), *Winston Churchill: The Struggle for Survival, 1940-1965* (London: Constable)

Morison, Samuel Eliot (1950a), *The Battle of the Atlantic September 1939 - May 1943, History of United States Naval Operations in World War II: Volume I* (Boston: Little, Brown and Company)

Morison, Samuel Eliot (1950b), *Operations in North African Waters October 1942 – June 1943, History of United States Naval Operations in World War II: Volume II* (Boston: Little, Brown and Company)

Morison, Samuel Eliot (1954), *Sicily – Salerno – Anzio, January 1943-June 1944, History of United States Naval Operations in World War II: Volume IX* (Boston: Little, Brown and Company)

Morison, Samuel Eliot (1956), *The Atlantic Battle Won May 1943 – May 1945, History of United States Naval Operations in World War II: Volume X* (Boston: Little, Brown and Company)

Morison, Samuel Eliot (1957), *The Invasion of France and Germany 1944 – 1945, History of United States Naval Operations in World War II: Volume XI* (Boston: Little, Brown and Company)

Morison, Samuel Eliot (1960), *Victory in the Pacific, History of United States Naval Operations in World War II: Volume XIV* (Boston: Little, Brown and Company)

Motter, T.H. Vail (1952), *United States Army in World War II: The Middle East Theater, The Persian Corridor and Aid to Russia* (Washington D.C.: Office of the Chief of Military History)

Mukerjee, Madhusree (2010), *Churchill's Secret War: The British Empire and the Ravaging of India during World War II* (New York: Basic Books)

Munro, Archie (2006), *The Winston Specials: Troopships via the Cape, 1940-1943* (Liskeard, Cornwall: Maritime Books)

Murfett, Malcolm (ed.) (1995), *The First Sea Lords: From Fisher to Mountbatten* (Westport, Ct.: Praeger Publishers)

Murfett, Malcolm (2013), *Naval Warfare 1919-1945: An operational history of the volatile war at sea* (London and New York: Routledge)

Murphy, Hugh (2017), 'Labour in the British shipbuilding and ship repairing industries in the twentieth centuries', in *Shipbuilding and Ship Repair Workers around the World: Case Studies 1950-2010*, (eds.) Marcel van der Linden, Hugh Murphy, and Raquel Varela (Amsterdam: Amsterdam University Press)

Murray, Dr Williamson (1984), 'ULTRA: Some Thoughts on its Impact on the Second World War', *Air University Review*, July-August, pp. 52-64

Murray, Williamson and Millett, Allan R. (2000), *A War to be Won: Fighting the Second World War* (Cambridge, Massachusetts and London, England: The Belknap Press of Harvard University)

Murray, Williamson and Millett, Allan R. (eds.) (2009), *Military Innovation in the Interwar Period* (New York: Cambridge University Press)

Nailer, Roger (1980a), 'The 'Woolworth' Carriers, Part 1', *Warships, Marine News*, Supplement 62 (Autumn 1980), pp. 1-5

Nailer, Roger (1980b), 'The 'Woolworth' Carriers, Part 2', *Warships, Marine News*, Supplement 62 (Winter 1980), pp. 31-34

Nash, Gerald D. (1985), *The American West Transformed: The Impact of the Second World War* (Bloomington: Indiana University Press)

Naval Historical Society of Australia (2005), 'The British Pacific Fleet, 1944-46', *Naval Historical Review*, December 2005. <https://navyhistory.org.au/british-pacific-fleet-1944-46/3/>

Navy Department (1955), *United States Naval Chronology: World War II*. Prepared in the Naval History Division Office of the Chief of Naval Operations, Naval Department (Washington: Government Printing Office)

Neitzel, Sönke (1994), 'The Deployment of the U-boats', in *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference*, Stephen Howarth and Derek Law (eds) (Annapolis: Naval Institute Press)

Neitzel, Sönke (2003), 'Kriegsmarine and Luftwaffe Co-operation in the War against Britain, 1939-1945', *War in History*, 2003 10 (4), pp.448-463

Nesbit, Roy Conyers (2000), *Coastal Command in Action, 1939-1945* (Stroud, Gloucestershire: Sutton Publishing Limited)

Nesbit, Roy Conyers (2002), *The Battle of the Atlantic* (Stroud, Gloucestershire: Sutton Publishing Limited)

Nicholas, H.G. (ed.) (1981), *Washington Despatches 1941-45: Weekly Political Reports from the British Embassy* (London: Weidenfeld and Nicolson)

Niestlé, Axel (2014), *German U-Boat Losses During World War II: Details of Destruction* (London: Frontline Books)

Nofi, Albert A. (2010), *To Train the Fleet for War: The US Navy Fleet Problems, 1923-1940* (Newport, Rhode Island: Naval War College Press)

- Noles, James L., Jr. (2004), *Twenty-Three Minutes to Eternity: The Final Voyage of the Escort Carrier USS Liscome Bay* (Tuscaloosa, Alabama: The University of Alabama Press)
- Northedge, F.S. (1966), *The Troubled Giant: Britain among the Great Powers, 1916-1939* (London: The London School of Economics and Political Science, and G. Bell & Sons)
- O'Brien, Phillips Payson (ed.) (2001), *Technology and Naval Combat in the Twentieth Century and Beyond* (London and Portland, Oregon: Frank Cass)
- O'Connell, John F. (2012), 'Closing the North Atlantic Air Gap: Where did all the British Liberators Go?', *Air Power History*, Summer 2012, pp.32-43
- Okumiya, M. and Horikoshi, J., with Martin Caidin (1991), *Zero* (New York: Bantam Books)
- Olsen, John Andreas (ed.) (2010), *A History of Air Warfare* (Virginia: Potomac Books)
- Olsen, Richard F. (2011), *Bomber Command and the Battle of the Atlantic*. MA Dissertation, University of Birmingham
- Ormston, Maurice J. (1948), 'Labour Relations in the Shipbuilding Industry', *N.E. Coast Institution of Engineers and Shipbuilders. Transactions. Sixty-Fifth Session, 1948-49, Vol. 65*, pp.263-272 (Newcastle Upon Tyne: N.E. Coast Institution of Engineers and Shipbuilders). Published 1949
- Overy, Richard (1995), *Why the Allies Won* (London: Jonathan Cape)
- Overy, Richard (2013), *The Bombing War: Europe 1939-1945* (London: Allen Lane)
- Overy, Richard (2018), *The Birth of the RAF, 1918: The World's First Air Force* (UK: Allen Lane)
- Padfield, Peter (1993), *Dönitz: The Last Führer* (London: Victor Gollancz)
- Padfield, Peter (1995), *War Beneath the Sea: Submarine Conflict 1939-1945* (London: John Murray)
- Parillo, Mark P. (1993), *The Japanese Merchant Marine in World War II* (Annapolis, Maryland: United States Naval Institute)
- Parkinson, J.R. (1956), 'Trends in the Output and Export of Merchant Ships', *Scottish Journal of Political Economy*, Vol. 3, Issue 3 (October 1956), pp.234-245, <http://dx.doi.org/10.1111/j.1467-9485.1956/tb01177.x> (accessed 6 August 2017)
- Paterson, Lawrence (2019), *Eagles over the Sea, 1935-1942: A History of Luftwaffe Maritime Operations* (Barnsley: Seaforth Publishing)
- Paterson, Lawrence (2020), *Eagles over the Sea, 1943-45: A History of Luftwaffe Maritime Operations* (Barnsley: Seaforth Publishing)

Pavitt, Keith (ed.) (1980), *Technical Innovation and British Economic Performance*. Science Policy Research Unit, Sussex (London and Basingstoke: Macmillan)

Pearce, Frank (1996), *Heroes of the Fourth Service* (London: Robert Hale)

Pearcy, Arthur (1996), *Lend-Lease Aircraft in World War II* (Shrewsbury, England: Airlife Publishing)

Peden, G.C. (1979), *British Rearmament and the Treasury: 1932-1939* (Edinburgh: Scottish Academic Press)

Peden, G.C. (2007), *Arms, Economics and British Strategy: From Dreadnoughts to Hydrogen Bombs* (Cambridge: Cambridge University Press)

Peebles, Hugh B. (1987), *Warshipbuilding on the Clyde: Naval Orders and the Prosperity of the Clyde Shipbuilding Industry, 1889-1939* (Edinburgh: John Donald Publishers Ltd)

Pelz, Stephen E. (1975), *Race to Pearl Harbor: The Failure of the Second London Naval Conference and the Onset of World War II* (Cambridge, Massachusetts, and London, England: Harvard University Press)

Piekalkiewicz, Janusz (1987), *Sea War: 1939-1945* (Poole, Dorset: Blandford Press). Originally published as *See Krieg: 1939-1945* in German in 1980

Polmar, Norman (1969), *Aircraft Carriers: A Graphic History of Carrier Aviation and Its Influence on World Events* (London: Macdonald)

Poolman, Kenneth (1970), *The Catafighters and Merchant Aircraft Carriers* (London: William Kimber)

Poolman, Kenneth (1972), *Escort Carrier 1941-1945: An Account of British Escort Carriers in Trade Protection* (London: Ian Allan)

Poolman, Kenneth (1976), *The Giant Killers: A Story of the Cam-ships* (London, New York, Sydney and Toronto: White Lion Publishers Limited)

Poolman, Kenneth (1978), *Focke-Wulf Condor: Scourge of the Atlantic* (London: Macdonald and Jane's)

Poolman, Kenneth (1982), *The Sea Hunters: Escort Carriers v. U-Boats, 1941-1945* (London: Arms and Armour Press)

Poolman, Kenneth (1983), *Escort Carrier: HMS Vindex at War* (London: Leo Cooper in association with Secker & Warburg)

Poolman, Kenneth (1988), *Allied Escort Carriers of World War Two in action* (London: Blandford Press)

- Pope, Dudley (1958), *73 North: The Battle of the Barents Sea* (London: Secker & Warburg)
- Postan, M.M. (1952), *British War Production* (London: HMSO and Longmans, Green and Co.). History of the Second World War, United Kingdom Civil Series
- Postan, M.M., Hay, D., and Scott, J.D. (1970), *Design and Development of Weapons – Studies in Government and Industrial Organisation* (London: HMSO and Longmans Group Limited). History of the Second World War, United Kingdom Civil Series
- Price, Alfred (1980), *Aircraft versus Submarine: The evolution of the anti-submarine aircraft, 1912 to 1980* (London, New York and Sydney: Jane's)
- Probert, Henry (1994), 'Allied Land-Based Anti-Submarine Warfare', in Howarth, Stephen, and Law, Derek (eds.), *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference*, pp. 371-387 (London: Greenhill Books and Annapolis, Maryland: Naval Institute Press)
- Proc, Jerry (2022), 'Naval Radio Operations During World War II', <http://www.jproc.ca/rrp/sradequ.html>, in *Radio Communications and Signals Intelligence in the Royal Canadian Navy*, <http://jproc.ca/rrp/index.html> (accessed 29 June 2022)
- Pugh, Philip (1986), *The Cost of Seapower: The Influence of Money on Naval Affairs from 1815 to the Present Day* (London: Conway Maritime Press)
- Raeder, Grand Admiral (1959), *Struggle for the Sea* (London: William Kimber)
- Raeder, Grand Admiral, and Dönitz, Grand Admiral (1990), *Fuehrer Conferences on Naval Affairs 1939-1945*. Wagner, Admiral Gerhard (ed. of German edition) (London: Greenhill Books; first published by the Admiralty in 1947), with new forward by Jake P. Mallmann Showell
- Ranft, Bryan (ed.) (1977), *Technical Change and British Naval Policy 1860-1939* (London: Hodder & Stoughton)
- Redford, Duncan (2007), 'The March 1943 Crisis in the Battle of the Atlantic: Myth and Reality', *History*, Vol. 92, No. 1 (305) (January 2007), pp.64-83, <http://www.jstor.org/stable/24428699> (accessed 15 July 2016)
- Redford, D. (2009), 'Inter- and Intra-Service Rivalries and the Battle of the Atlantic', *Journal of Strategic Studies*, Vol. 32, No. 6, pp.899-928, <http://dx.doi.org/10.1080/0180/01402390903189642> (accessed 7 November 2015)
- Redford, Duncan (2014a), *A History of the Royal Navy: World War II* (London and New York: I.B. Taurus & Co. Ltd, in association with the National Museum of the Royal Navy)

Redford, Duncan and Grove, Philip D. (2014b), *The Royal Navy: A History Since 1900* (London and New York: I.B. Taurus & Co. Ltd, in association with the National Museum of the Royal Navy)

Reynolds, David (1982), *The Creation of the Anglo-American Alliance 1937-41: A Study in Competitive Co-operation* (Chapel Hill: The University of North Carolina Press, by arrangement with Europa Publications Ltd)

Richards, Denis (1953), *Royal Air Force 1939-1945, Vol. I: The Fight at Odds* (London: HMSO)

Richards, Denis and Saunders, Hilary St. George (1954), *Royal Air Force 1939-1945, Vol. II: The Fight Avails* (London: HMSO)

Richards, Denis (1977), *Portal of Hungerford: The Life of Marshal of the Royal Air Force, Viscount Portal of Hungerford KG, GCB, OM, DSO, MC* (London: Heinemann)

Richmond, Admiral Sir Herbert (1914), 'Protection of Trade in Past Wars', *The Naval Review*, Vol. II, No. 4, pp.249-257, <http://www.naval-review.com/pastiss.asp> (accessed 1 December 2017)

Richmond, Admiral Sir Herbert (1920), 'The Future of the Battleship', *The Naval Review*, Vol. III, No. 3, pp. 368-369, <http://www.naval-review.com/pastiss.asp> (accessed 30 December 2017)

Richmond, Admiral Sir Herbert (1934), 'A Problem of Defence of Communications', *The Naval Review*, Vol. XXII, No. 1, pp.1-10, <http://www.naval-review.com/pastiss.asp> (accessed 1 December 2017)

Richmond, Admiral Sir Herbert (1947), *Statesmen and Seapower* (Oxford: Oxford University Press)

Ritchie, Sebastian (1997), *Industry and Air Power: The Expansion of British Aircraft Production 1935-1941* (London: Frank Cass & Co.)

Robb-Webb, Jon (2011), 'New Tricks for Old Sea Dogs: British Naval Aviation in the Pacific, 1944-45' in Benbow, Tim (ed.), *British Naval Aviation, The First 100 Years*, pp. 99-124 (Farnham, Surrey: Ashgate)

Robb-Webb, Jon (2013), 'The British Pacific Fleet and the decline of Empire, Adaptions to Change', in Till, Geoffrey and Bratton, Patrick C. (eds.), *Sea Power and the Asia-Pacific, The Triumph of Neptune?* pp.214-236 (London and New York: Routledge)

Robb-Webb, Jon (2016), *The British Pacific Fleet Experience and Legacy, 1944-50* (London and New York: Routledge)

Roberts, Andrew (2008), *Masters and Commanders: How Roosevelt, Churchill, Marshall, and Alanbrooke Won the War in the West* (London: Allen Lane, an imprint of Penguin Books)

Roberts, A. (2018), *Churchill: Walking with Destiny* (UK: Allen Lane, Penguin Random House)

Roberts, Geoffrey (2012), *Stalin's General: the Life of Georgy Zhukov* (London: Icon Books Ltd in association with Random House)

Roberts, Professor Peter (2014), 'The Queen Elizabeth Class: How Innovative is the Design?', RUSI Defence Systems, Vol. 16, 9 September 2014

Robertson, E.D.M. (1933), 'The Value of Aircraft for Protecting Sea-Borne Trade', *The RUSI Journal*, Vol. 78:551, pp.463-482, <https://doi.org/10.1080/03071843309419403> (accessed 26 November 2017)

Robertson, Scot (1995), *The Development of RAF Strategic Bombing Doctrine, 1919-1939* (Westport, Connecticut and London: Praeger)

Robertson, Terence (1979), *Escort Commander: The story of Captain Frederick John Walker* (New York: Nelson Doubleday). Originally published in 1956 as Walker R.N.

Rodger, N.A.M. (ed.) (1996), *Naval Power in the Twentieth Century* (Basingstoke and London: Macmillan Press Ltd)

Rodger, N.A.M. (2011), 'The Royal Navy in the Era of the World Wars: Was it fit for purpose?', *The Mariner's Mirror*, 97:1, pp.272-284, <https://doi.org/10.1080/00253359.2011.10709045> (accessed 26 November 2017)

Rohwer, J. and Hummelchen, G. (1972), *Chronology of the War at Sea: 1939-1945, Volume One, 1939-1942* (London: Ian Allan)

Rohwer, J. and Hummelchen, G. (1974), *Chronology of the War at Sea: 1939-1945, Volume Two, 1943-1945* (London: Ian Allan)

Rohwer, Jürgen (1977), *The Critical Convoy Battles of March 1943: The Battle for HX.229 / SC122* (London: Ian Allan Ltd)

Rohwer, Jürgen (1994), 'The Wireless War', in *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference*, Stephen Howarth and Derek Law (eds) (Annapolis: Naval Institute Press)

Roosevelt, Franklin D. (1950), *Public Papers and Addresses of Franklin D. Roosevelt: 1942 Volume, Humanity on the Defensive*, Rosenman, Samuel I. (ed.) (New York: Harper & Brothers Publishers)

Roskill, Captain S.W., RN (1959), *The Secret Capture* (London: Collins)

- Roskill, Captain S.W., DSC, RN (Retd.), (1960a), *The Navy at War, 1939-1945* (London: Collins, by arrangement with United States Naval Institute, Annapolis, Maryland)
- Roskill, Captain S., DSC, RN (1960b), *The War at Sea: 1939-1945, Vol. III, The Offensive, Part I: 1st June 1943-31st May 1944* (London: HMSO)
- Roskill, Captain S.W., DSC, RN (1961a), *The War at Sea: 1939-1945, Vol. I: The Defensive* (London: HMSO). Fifth impression
- Roskill, Captain S.W., DSC, RN (1961b), *The War at Sea: 1939-1945, Vol. III, The Offensive, Part II: 1st June 1944-14th August 1945* (London: HMSO)
- Roskill, Captain S.W. (1962a), *The Strategy of Sea Power: Its Development and Application* (London: Collins)
- Roskill, Captain S.W., DSC, RN (1962b), *The War at Sea: 1939-1945, Vol. II: The Period of Balance* (London: HMSO). Third impression
- Roskill, S.W. (1967), 'Review of British Sea Power: Naval Policy in the Twentieth Century by B.B. Schofield', *International Affairs* (Royal Institute of International Affairs), Vol. 43. No. 4, October 1967, pp.733-734
- Roskill, Stephen (1968), *Naval Policy Between the Wars, 1: The Period of Anglo-American Antagonism 1919-1929* (London: Collins)
- Roskill, Captain S.W., DSC, RN, MA (ed.) (1969), *Documents Relating to the Naval Air Service, Volume I, 1908-1918* (Royal Naval College, Greenwich: Navy Records Society)
- Roskill, Stephen (1972), 'The Ten Year Rule – The Historical Facts', *The RUSI Journal*, Vol. 117:665, pp. 69-71, <http://dx.doi.org/10.1080/03071847209421754> (accessed 21 August 2017)
- Roskill, Stephen (1974), *Hankey: Man of Secrets, Volume III, 1931-1963* (London: Collins)
- Roskill, Stephen (1976), *Naval Policy Between the Wars, 2: The Period of Reluctant Rearmament 1930-1939* (London: Collins)
- Roskill, Stephen (1977), *Churchill and the Admirals* (London: Collins)
- Rössler, Eberhard (2001), *The U-Boat: The evolution and technical history of German submarines* (London: Cassell & Co). Original German edition Lehmanns Verlag, J.F. (1975), *Geschichte des deutschen Ubootbaus*
- Ruegg, Bob and Hague, Arnold (1993), *Convoys to Russia 1941-1945* (Kendal: World Ship Society)

- Ruge, Vice-Admiral Friedrich (1957), *Sea Warfare 1939-1945: A German Viewpoint*.
Saunders, Commander N.G., R.N. (trans), (London: Cassell)
- Runyan, Timothy J. and Copes, Jan M. (1994), *To Die Gallantly: The Battle of the Atlantic*
(Boulder, San Francisco, and Oxford: Westview Press)
- Sainsbury, A.B. (1994), 'The Front Line: Convoy HG 76 – The Defence', in *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference*, Stephen Howarth and Derek Law (eds) (Annapolis: Naval Institute Press)
- Salter, J.A. (1921), *Allied Shipping Control: An Experiment in International Administration*
(Oxford: Clarendon Press). Part of Economic and Social History of the World War (British Series), General Editor James T. Shotwell. Accessed from
<http://www.archive.org/details/alliedshippingco00saltuoft>
- Saunders, Hilary St. George (1954), *Royal Air Force 1939-1945, Vol. III: The Fight is Won*
(London: HMSO)
- Sawyer, L.A. and Mitchell, W.H. (1973), *The Liberty Ships: The History of the 'Emergency' Type Cargo Ships Constructed in the United States during World War II* (Newton Abbott, Devon: David & Charles). Revised edition
- Sayers, R.S. (1956), *Financial Policy 1939-45* (London: HMSO and Longmans, Green and Co.)
History of the Second World War, United Kingdom Civil Series
- Scammell, Claire M. (2001), *Anglo-American Strategic Co-operation: The Role of Carrier Aviation in Western Strategy, 1945-1955*. PhD Thesis, King's College London
- Schoenfeld, Max (1988), 'Winston Churchill as War Manager: The Battle of the Atlantic Committee, 1941', *Military Affairs*, Vol. 52, No. 3, July 1988, pp.122-127,
<http://www.jstor.org/stable/1988245> (accessed 2 February 2018)
- Schofield, B.B. (1967), *British Sea Power: Naval Policy in the Twentieth Century* (London: B.T. Batsford Ltd)
- Schofield, Vice Admiral B.B. (1977), *The Arctic Convoys* (London: Macdonald and Jane's)
- Schofield, B.B. (1981), 'Defeat of the U-Boats during World War II', *Journal of Contemporary History*, Vol. 16, No. 1, The Second World War: Part I, January 1981, pp.119-129
- Schofield, Vice Admiral B.B. (2008), *Operation Neptune: The Inside Story of Naval Operations for the Normandy Landings 1944* (Barnsley, South Yorkshire: Pen and Sword Military)
- Schull, Joseph (1987), *Far Distant Ships: An Official Account of Canadian Naval Operations in World War II* (Toronto, Canada: Stoddart). First published 1950 by authority of the Minister of National Defence, King's Printer, Ottawa

Scott, J.D. and Hughes, Richard (1955), *Administration of War Production* (London: HMSO and Longmans, Green and Co). History of the Second World War, United Kingdom Civil Series

Sexton, Donal J., Jr. (compiler) (1996), *Signals Intelligence in World War II: A Research Guide* (Bibliographies of Battles and Leaders, Number 18), (Westport, Connecticut and London: Greenwood Press)

Sharpe, Peter (1998), *U-Boat Fact File, 1935-1945* (Earl Shilton, Leicester: Midland Publishing Ltd.)

Shay, Robert Paul, Jr. (1977), *British Rearmament in the Thirties: Politics and Profits* (Princeton, New Jersey: Princeton University Press)

Showell, Jak P. Mallmann (1979), *The German Navy in World War 2: A Reference Guide to the Kriegsmarine, 1935-1945* (London: Arms and Armour)

Showell, Jak P. Mallmann (1989), *U-Boat Command and the Battle of the Atlantic* (London: Conway Maritime Press Ltd.)

Showell, Jak P. Mallmann (2002), *U-Boat Warfare: The Evolution of the Wolf Pack* (Hersham, Surrey: Ian Allan Publishing)

Showell, Jak P. Mallmann (2013), *Dönitz, U-boats, Convoys: The British Version of His Memoirs from the Admiralty's Secret Anti-Submarine Reports* (London: Frontline Books)

Simms, Brendan and Laderman, Charlie (2021), *Hitler's American Gamble: Pearl Harbor and the German March to Global War* (London: Allen Lane, an imprint of Penguin Random House)

Simpson, Michael (2010), *Anglo-American Naval Relations, 1919-1939* (Farnham, Surrey: Ashgate for the Navy Records Society)

Simpson, Michael (2012), *A Life of Admiral of the Fleet Andrew Cunningham: A Twentieth-Century Naval Leader* (London and New York: Routledge, Taylor & Francis Group)

Simpson, Michael (ed.) (2021), *Anglo-American-Canadian Naval Relations, 1943-1945* (London and New York: Routledge for the Navy Records Society)

Skeldon, Walter E. (2002), *Escort Carriers in the Pacific* (Victoria, B.C.: published in cooperation with Trafford Publishing)

Skiera, Joseph A. (ed.) (1965), *Aircraft Carriers in Peace and War* (New York: Franklin Watts, Inc.)

Slessor, Sir John (1957), *The Central Blue: The Autobiography of Sir John Slessor, Marshal of the RAF* (New York: Frederick A. Praeger)

- Sloan, Geoffrey (2019), 'The Royal Navy and Organizational Learning, The Western Approaches Tactical Unit and the Battle of the Atlantic', *Naval War College Review*, Vol. 72, No. 4, Article 9. <https://digital-commons.usnwc.edu/nwc-review/vol72/iss4/9>
- Smith, Adrian (2010), *Mountbatten: Apprentice War Lord* (London and New York: I.B. Taurus)
- Smith, Kevin (1996), *Conflict over convoys: Anglo-American logistics diplomacy in the Second World War* (Cambridge: Cambridge University Press)
- Smith, Kevin (2013), 'Maritime War: Combat, Management and Memory', in *A Companion to World War II*, Thomas W. Zeiler (ed.), with Daniel M. DuBois (Blackwell Publishing Ltd)
- Smith, Kevin (2019), 'Immobilized by Reason of Repair and by the Choice Between Lithgow and Hitler, Class Conflict in Britain's Wartime Merchant Shipping Repair Yards', in *Decision in the Atlantic, The Allies and the Longest Campaign of the Second World War*, Faulkner, Marcus and Bell, Christopher M. (eds.) (2019) (Lexington, Kentucky: Andarta Books, The University Press of Kentucky)
- Smith, Michael (2000), *Station X: The Codebreakers of Bletchley Park* (London, Basingstoke and Oxford: Channel 4 Books, an imprint of Macmillan Publishers Ltd)
- Smith, Peter C. (1994a), *Arctic Victory: The Story of Convoy PQ18* (Manchester: Crécy Books). First published 1975 by William Kimber
- Smith, Peter C. (1994b), *Task Force 57: The British Pacific Fleet, 1944-1945* (Manchester: Crécy Books Limited). First published 1969 by William Kimber
- The Society of Naval Architects and Marine Engineers (1943), *Transactions, Volume 50, 1942* (New York City: The Society of Naval Architects and Marine Engineers)
- Somerville, Admiral of the Fleet Sir James (1995), *The Somerville Papers: Selections from the Private and Official Correspondence of Admiral of the Fleet Sir James Somerville*. Simpson, Michael (ed.) (Aldershot: Scholar Press for the Naval Records Society)
- Soybel, Phyllis L. (2005), *A Necessary Relationship: The Development of Anglo-American Cooperation in Naval Intelligence* (Westport, Connecticut and London: Praeger)
- Speer, Albert (1970), *Inside the Third Reich: Memoirs by Albert Speer*. Translated from the German by Richard and Clara Winston (London: Weidenfeld & Nicolson)
- Speller, Ian (ed.) (2005), *The Royal Navy and Maritime Power in the Twentieth Century*. Till, Geoffrey (series editor), *Naval Policy and History Series*, (Abingdon and New York: Frank Cass)

- Stille, Mark (2017), *US Navy Escort Carriers, 1942-45* (Oxford and New York: Osprey Publishing)
- Sturtivant, Ray (1984), *The Squadrons of the Fleet Air Arm* (Tonbridge: Air-Britain (Historians))
- Sullivan, Jim (2013), *F4U Corsair*. In Action Series (Carrollton, Texas: Squadron/Signal Publications)
- Sumida, Jon (1992), 'The Best Laid Plans: The Development of British Battle-Fleet Tactics 1919-1942', *The International History Review*, Volume 14, No. 4, pp.681-700, <http://www.jstor.org//stable/40107114> (accessed 1 September 2016)
- Sumida, Jon Tetsuro and Rosenberg, David Alan (1995), 'Machines, Men, Manufacturing, Management, and Money: The Study of Navies as Complex Organizations and the Transformation of Twentieth Century Naval History', in Hattendorf, John B. (ed.), *Doing Naval History, Essays Towards Improvement*, pp.26-39 (Newport, Rhode Island: Naval War College Press)
- Sumida, Jon T. (2001), 'British Naval Procurement and Technological Change, 1919-1939', in O'Brien, Phillips Payson, (ed.), *Technology and Naval Combat in the Twentieth Century and Beyond*, pp.128-147 (London and Portland, Oregon: Frank Cass)
- Sumida, Jon Tetsuro (2002), 'Review of The Royal Navy, Seapower, and Strategy between the Wars', by Christopher M. Bell, *The Journal of Military History*, Vol. 66, No. 4 (October 2002), pp.1224-1225, <http://www.jstor.org/stable/3093303> (accessed 14 August 2016)
- Sutcliffe, Paul M. (1994), 'Operational Research', in *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference*, Stephen Howarth and Derek Law (eds) (Annapolis: Naval Institute Press)
- Syrett, David (1983), 'Review Essay, The Secret War and the Historians', *Armed Forces and Society*, Vol. 9, No. 2, pp.293-328, <http://afs.sagepub.com/content/9/2/293.citation> (accessed 12 March 2014)
- Syrett, David and Douglas, W.A.B (1986), 'The North Atlantic Triangle in Disarray, Closing the Greenland Air Gap, 1942-1943' (English version of article published as 'Die Wende in der Schlacht im Atlantik: Die Schliessung des "Grönland-Luftlochs" 1942-3', *Marine-Rundschau* 83, pp.1-3, October 1985). Accessed from Directorate of History and Heritage (DHH), Ottawa: 99/36 Box 69 File 10
- Syrett, David (1994), *The Defeat of the German U-Boats: The Battle of the Atlantic* (Columbia, South Carolina: University of South Carolina)

Syrett, David (1998), *The Battle of the Atlantic and Signals Intelligence: U-Boat Situations and Trends, 1941-1945* (Aldershot, Brookfield USA, Singapore and Sydney: Ashgate for Navy Records Society)

Syrett, David (ed.) (2002a), *The Battle of the Atlantic and Signals Intelligence: U-Boat Tracking Papers, 1941-1947* (Aldershot, Hampshire and Burlington, Virginia: Ashgate for Navy Records Society)

Syrett, David (2002b), 'The Infrastructure of Communications Intelligence: the Allied D/F Network and the Battle of the Atlantic', *Intelligence and National Security*, Vol. 17, No. 3, pp.163-172, <http://dx.doi.org/10.1080/02684520412331306590> (accessed 3 March 2014)

Talbot, Vice-Admiral Sir Cecil P., K.C.B., K.B.E., D.S.O. (1949), 'Dockyard Organization in the Second World War', *Royal United Services Institution. Journal*, 94:574, 197-208, DOI:10.1080/03071844909442139 (accessed 20 July 2021)

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

Taylor, H.A. (1984), *Fairey Aircraft since 1915* (London: Putnam)

Terraine, John (1985), *The Right of the Line: The Royal Air Force in the European War 1939-1945* (London, Sydney, Auckland and Toronto: Hodder and Stoughton)

Terraine, John (1989), *Business in Great Waters: The U-Boat Wars, 1916-1945* (London: Leo Cooper)

Terraine, John (1993), 'Atlantic victory: 50 years on', *The RUSI Journal*, 138:5, pp.53-59, <https://doi.org/10.1080/03071849308445751> (accessed 22 July 2019)

Terzibaschitsch, Stefan (1981), *Escort Carriers and Aviation Support Ships of the US Navy*. Thomas, Keith (trans.) (Greenwich: Conway Maritime Press). Originally published in 1979 as *Flugzeugträger der US Navy: Band 2: Geleitflugzeugträger*

Thetford, Owen (1971), *British Naval Aircraft since 1912* (London: Putnam). Third revised edition

Thomlinson, J (1975), 'Oral history regarding catapult systems for aircraft carriers and converted merchant aircraft carriers' (London: IWM). <https://www.iwm.org.uk/collections/item/object/80000601>. (accessed 16 June 2022)

Till, Geoffrey (1979), *Air Power and the Royal Navy 1914-1945: a historical survey* (London and Sydney: Jane's Publishing Company)

Till, Geoffrey (1980), 'Airpower and the British Admiralty between the World Wars' in Love, Robert William Jr. (ed.), *Changing Interpretations and New Sources in Naval History, Papers*

from the Third United States Naval Academy History Symposium, pp.340-351, (New York and London: Garland Publishing, Inc.)

Till, Geoffrey (1993), 'Corbett and the 1990s', in Goldrick, James, and Hattendorf, John B. (eds), *Mahon is not Enough, The Proceedings of a Conference on the Works of Sir Julian Corbett and Admiral Sir Herbert Richmond* (Newport, Rhode Island: Naval War College Press)

Till, Geoffrey (2009), 'Adopting the Aircraft Carrier, The British, American, and Japanese case studies', in Murray, Williamson and Millett, Allan R (eds.), *Military Innovation in the Interwar Period*, pp.191-226 (New York: Cambridge University Press)

Till, Geoffrey (2011), 'Competing Visions: The Admiralty, the Air Ministry and the Role of Air Power', in Benbow, Tim (ed.), *British Naval Aviation, The First 100 Years* (Farnham, Surrey: Ashgate)

Till, Geoffrey and Bratton, Patrick C. (eds.) (2013), *Sea Power and the Asia-Pacific: The Triumph of Neptune?* (London and New York: Routledge)

Tillman, Barbara (1988), *Hellcat: The F6F in World War II* (Shrewsbury, England: Airlife)

Tillman, Barrett (1979), *Avenger at War* (London: Ian Allan)

Toland, John (1971), *The Rising Sun: The Decline and Fall of the Japanese Empire 1936-1945* (London: Cassell & Company Ltd)

Tomblin, Barbara Brooks (2004), *With Utmost Spirit: Allied Naval Operations in the Mediterranean, 1942-1945* (Lexington: The University Press of Kentucky)

Tomblin, Barbara Brooks (2013), 'The Naval War in the Mediterranean' in *A Companion to World War II*, Thomas W Zeiler (ed.) with Daniel M. DuBois (Blackwell Publishing Ltd)

Tosh, John (2022), *The Pursuit of History: Aims, Methods and New Directions in the Study of History* (Abingdon, Oxon: Routledge, an imprint of the Taylor & Francis Group)

Tracy, Nicholas (1991), *Attack On Maritime Trade* (Basingstoke and London: Macmillan)

Trimble, William F. (1990), *Wings for the Navy: A History of the Naval Aircraft Factory, 1917-1956* (Annapolis, Maryland: Naval Institute Press)

Trimble, William F. (1994), *Admiral William A. Moffett: Architect of Naval Aviation* (Washington and London: Smithsonian Institution Press)

Trimble, William F. (2019), *Admiral John S. McCain and the Triumph of Naval Air Power* (Annapolis, Maryland: Naval Institute Press)

Tucker-Jones, Anthony (2009), *Operation Dragoon: The Liberation of Southern France 1944* (Barnsley: Pen and Sword)

Turnbull, Captain Archibald D., USNR, and Lord, Lieutenant Commander Clifford L., USNR (1949), *History of United States Naval Aviation* (New Haven: Yale University Press; and London: Geoffrey Cumberlege, Oxford University Press)

United States Maritime Commission (1946), *Report to Congress for the Period Ended June 30 1945* (Washington, DC: United States Maritime Commission)

US Navy, Escort Carrier Force (1946), *The Escort Carriers in Action: The Story, in Pictures, of the Escort Carrier Force, U.S. Pacific Fleet, 1945* (Atlanta, GA; Ruralist Press)

Utz, Curtis Alan (1989), *Carrier Aviation Policy and Procurement in the US Navy, 1936-1940*, Master's Thesis, University of Maryland at College Park, MD

Vat, Dan van der, with research by Vat, Christine van der (1988), *The Atlantic Campaign: The Great Struggle at Sea 1939-1945* (London, Sydney, Auckland and Toronto: Hodder & Stoughton)

Vleet, Clarke Van; Pearson, Lee M.; and Wyen, Adrian O. Van (1970), *United States Naval Aviation 1910-1970* (Washington DC: Department of the Navy)

Waddington, C.H. (1973), *O.R. in World War 2: Operational Research against the U-boat*. Histories of Science Series (London: Elek Science). Almost verbatim version of unpublished text of 1946

Walter, John C. (1980), 'Congressman Carl Vinson and Franklin D. Roosevelt: Naval Preparedness and the Coming of World War II, 1932-40', *The Georgia Historical Quarterly*, Vol. 64, No. 3 (Fall, 1980), pp. 294-305, <http://www.jstor.org/stable/40580647> (accessed 29 September 2018)

Warlow, Lt. Cdr. B., RN (1992), *Shore Establishments of the Royal Navy, Being a list of the Static Ships and Establishments of the Royal Navy* (Liskeard, Cornwall: Maritime Books)

War Production Board (1969), *Industrial Mobilization for War: History of the War Production Board and Predecessor Agencies, 1940-1945, Volume I, Program and Administration* (New York: Greenwood Press). Originally published 1947

Warren, John (2020), 'The Rankean tradition in British historiography (1840 to 1950)' in Berger, Stefan; Feldner, Heiko; & Passmore, Kevin (eds.) (2020), *Writing History, Theory and Practice* (London: Bloomsbury Academic)

Warren, Kenneth (1998), *Steel, Ships and Men: Cammell Laird, 1824-1993* (Liverpool: Liverpool University Press)

Watts, Anthony J. and Gordon, Brian G. (1971), *The Imperial Japanese Navy* (London: Macdonald & Co)

Webster, Sir Charles and Frankland, Noble (1961a), *History of the Second World War, United Kingdom Military Series: The Strategic Air Offensive against Germany, 1939-1945, Volume I: Preparation* (London: HMSO)

Webster, Sir Charles, KCMG, FBA, D.Litt., and Frankland, Noble, DFC, MA, DPhil (1961b), *History of the Second World War, United Kingdom Military Series: The Strategic Air Offensive against Germany, 1939-1945, Volume II: Endeavour* (London: HMSO)

Webster, Sir Charles and Frankland, Noble (1961c), *History of the Second World War, United Kingdom Military Series: The Strategic Air Offensive against Germany, 1939-1945, Volume III: Victory* (London: HMSO)

Weir, Philip Anthony (2006), *The Development of Naval Air Warfare by the Royal Navy and Fleet Air Arm Between the Two World Wars*, PhD Thesis, University of Exeter

Werth, Alexander (1964), *Russia at War, 1941-1945* (London: Barrie and Rockliff)

Widen, J.J. (2009), 'Julian Corbett and the Current British Maritime Doctrine, Comparative Strategy', 28:2, pp. 170-185, <https://doi.org/10.1080/01495930902799764> (accessed 26 November 2017)

Williams, Mark (1979), *Captain Gilbert Roberts R.N. and the Anti-U-Boat School* (London: Cassell)

Williamson, Corbin (2019), 'A One Way Street? Admiral James Somerville and Anglo-American Naval Relations, 1942' (2019 McMullen Naval History Symposium, Annapolis)

Willmott, H.P. (1996), *Grave of a Dozen Schemes: British Naval Planning and the War Against Japan, 1943-1945* (England: Airlife). First published by the Naval Institute Press, US

Wilson, Alistair (2013), *A Biographical Dictionary of the Twentieth-Century, Royal Navy: Vol. 1, Admirals of the Fleet and Admirals* (Barnsley: Seaforth Publishing)

Wilson, Desmond Porter, Jr. (1966), *Evolution of the Attack Aircraft Carrier: A Case Study in Technological Strategy*, PhD Thesis, Massachusetts Institute of Technology

Wilson, Theodore A. (1969), *The First Summit: Roosevelt and Churchill at Placentia Bay 1941* (London: Macdonald)

Wilson, Thomas (1995), *Churchill and the Prof* (London: Cassell)

Winton, John (1977), *Air Power at Sea 1939-45* (London: Book Club Associates by arrangement with Sidgwick & Jackson)

Winton, John (1980), *Find, Fix & Strike: The Fleet Air Arm at War 1939-45* (London: B.T. Batsford Ltd.)

Winton, John (1983), *Convoy: The Defence of Sea Trade 1890-1990* (London: Michael Joseph)

Winton, John (1988), *Ultra at Sea* (London: Leo Cooper)

Winton, John (1995), *The Forgotten Fleet: The Story of the British Pacific Fleet 1944-45* (Wadhurst, East Sussex: Douglas-Boyd Books). First published by Michael Joseph (1969)

Wood, Derek (ed.) (1992), 'Seek and Sink, Bracknell Paper No 2, A Symposium on the Battle of the Atlantic', 21 October 1991 (London: Royal Air Force Historical Society), <https://www.rafmuseum.org.uk/documents/Research/RAF-Historical-Society-Journals/Bracknell-No-2-Battle-of-the-Atlantic.pdf> (accessed 12 July 2018)

Woodman, D.W.J. (1987), *HMS Tracker & the Attacker Class Escort Carriers*, Monograph No. 2, Gibbings, David (introduction and technical details, and series ed.). (Society of the Friends of the Fleet Air Arm Museum in association with The Skylark Press)

Woodman, Richard (1994), *Arctic Convoys: 1941-1945* (London: John Murray)

Woodman, Richard (2000), *Malta Convoys* (London: John Murray)

Woodman, Richard (2004), *The Real Cruel Sea: the Merchant Navy in the Battle of the Atlantic, 1939-1943* (London: John Murray)

Wragg, David (2001), *The Fleet Air Arm Handbook 1939-1945* (Stroud: Sutton Publishing)

Wragg, David (2004), *Stringbag: The Fairey Swordfish at War* (Barnsley: Pen & Sword Aviation)

Wragg, David (2005), *The Escort Carrier in The Second World War: Combustible, Vulnerable, Expendable!* (Barnsley: Pen & Sword Maritime)

Wragg, David (2009), *A Century of British Naval Aviation, 1909-2009* (Barnsley: Pen & Sword Maritime)

Wyen, Adrian O. Van, and the Editors of Naval Aviation News (1969), *Naval Aviation in World War I* (Washington D.C.: Chief of Naval Operations), <http://www.ibiblio.org/pha/USN/Navy/Naval%20Aviation%20in%20World%20War%20I.pdf> (accessed 15 March 2018)

Y'Blood, William T. (1983), *Hunter-Killer: US Escort Carriers in the Battle of the Atlantic* (Annapolis, Maryland: Naval Institute Press)

Y'Blood, William T. (1987), *The Little Giants: U.S. Escort Carriers Against Japan* (Annapolis, Maryland: Naval Institute Press)

Zeiler, Thomas W., with DuBois, Daniel M. (eds.) (2013), *A Companion to World War II* (Blackwell Publishing Ltd)

Zeitlin, Jonathan (1995), 'Flexibility and Mass Production at War: Aircraft Manufacture in Britain, the United States, and Germany, 1939-1945', *Technology and Culture*, Volume 36, No. 1, January 1995, pp. 46-79, <http://www.jstor.org/stable/316341> (accessed 30 July 2014)

Zimmerman, David (1989), *The Great Naval Battle of Ottawa* (Toronto, Buffalo and London: University of Toronto Press)

Zimmerman, David (1994), 'Technology and Tactics', in Howarth, Stephen, and Law, Derek (eds.), *The Battle of the Atlantic 1939-1945, The 50th Anniversary International Naval Conference* (London and Annapolis: Greenhill Books)

Zimmerman, David (1996), *Top Secret Exchange: The Tizard Mission and the Scientific War* (Stroud, Glos.: Alan Sutton Publishing Limited)