

The Genesis of a Cruiser Navy:
British First-Class Cruiser Development
1884 – 1909

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Abstract

From the middle of the 1880s until the commencement of the Great War 1914-'18 the first-class cruiser was an vital component of the British battlefleet. This was a period in which technology and tactics evolved at an extremely rapid pace, forming the material basis for Sir John Fisher's 'Dreadnought Revolution', in which cruiser qualities of speed, range and offensive power were greatly prized. Throughout this era enormous sums were spent on such types: they were frequently longer than and cost almost as much as their battleship contemporaries, while carrying a near-equivalent armament and possessing significant advantages in both speed and endurance.

Despite these capabilities, British first-class cruisers, especially those of the 1890s, are comparatively rarely examined by historians. This thesis fills the gap in the historiography by examining the place and development of the type in the Royal Navy from 1884-1909, and illustrates how they would progress from being a trade-defence vessel, to a genuine alternative to the battleship, and would ultimately form the basic inspiration for all of the service's first all-big-gun capital ships. It begins by assessing the origins of the type in the mid-Victorian era and considers how the contemporary strategic position and materials drove vessel characteristics, resulting in the development of the first unofficially termed 'battle-cruisers' to counter the threat of a Franco-Russian *guerre de course* employing dedicated raiding types and armed high-speed liners. Following a dramatic advance in the protective capacity of armour that occurred in the mid-1890s, it is shown how the first-class cruiser would gain a fighting ability at least equal to their battleship contemporaries in addition to their continued utility in the trade-defence role, and how latterly, these characteristics would become the cornerstone of Sir John Fisher's planned radical transformation of the service in the first decade of the 20th Century.

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List of abbreviations

ADM	Admiralty
AMC	Armed Merchant Cruiser
AP	Armour Piercing (and armour piercing projectile)
APC	Armour Piercing Capped (projectile)
BL	Breech Loading gun
BLR	Breech Loading Rifle
Board	Board of Admiralty
BS	Battle Squadron
C-in-C	Commander in Chief
cm.	Centimetre (unit of measurement)
CO	Commanding Officer
CPC	Common Pointed Capped (projectile)
CS	Cruiser Squadron
CT	Conning Tower
DNC	Director of Naval Construction
DNI	Director of Naval Intelligence
DNO	Director of Naval Ordnance
E-in-C	Engineer-in-Chief
FIC	Foreign Intelligence Committee
First Lord	First Lord of the Admiralty
FO	Foreign Office
ft.	Foot (unit of measurement)
GM	Metacentric Height
GZ	Righting leaver (unit of measurement)
Harvey	Steel armour face-hardened by the Harvey process
HE	High explosive (high capacity)
HMS	Her / His Majesty's Ship
HMSO	Her / His Majesty's Stationary Office
Holtzer	Brand of forged steel shot (projectile)
in.	Inch (unit of measurement)
ihp.	Indicated Horse Power (unit of measurement)
INA	Institution of Naval Architects
JRUSI	Journal of the Royal United Service Institution

KC	Krupp Cement armour process or armour plate
KNC	Krupp Non Cemented armour process or armour plate
lb.	Pound (unit of measurement)
ld.	Laid Down (year)
Mk.	Mark
MLR	Muzzle Loading Rifle
MP	Member of Parliament
NID	Naval Intelligence Department
NMM	National Maritime Museum
Palliser	Chilled solid iron shot or shell (projectile)
pdr.	Pounder (gun. Fires projectile of designated number of lbs.)
ProcICE	Proceedings of the Institute of Civil Engineers
QF	Quick Firing gun
RML	Rifled Muzzle-Loader
RN	Royal Navy
RPM	Revolutions per minute
RUSI	Royal United Service Institution
shp.	Shaft Horse Power (unit of measurement)
TNA	The National Archives (formerly PRO: Public Record Office)
TransINA	Transactions of the Institution of Naval Architects
USN	United States Navy
Yds.	Yards (unit of measurement)

Introduction

To date, relatively little has been written about the first-class cruisers of the late-Victorian era Royal Navy.¹ Outside of design studies, references to the type have been mainly confined to sub-sections within texts on wider matters of strategy and national policy.² Mentions are frequently encountered in works on the Royal Navy during the First World War, but these tend principally to confine themselves to remarks upon the outdated nature of such vessels during the conflict. A typical example, in the context of the Jutland engagement, refers to ‘Sir Robert Arbuthnot, with three of his large, obsolescent armoured cruisers (the Grand Fleet’s own *Funf Minuten* squadron).’³ No major attempt at analysing the evolution of the type as a whole, or its significance for the British naval service prior to the Great War has yet been made. As a result, the belief that these first-class cruisers pre-dating the famous big-gun armed types were of secondary importance in the development of the contemporary service persists.⁴ Yet an examination of the archival and published

¹ The first major work is the recently published design-history by N. Friedman *British Cruisers of the Victorian Era* (Barnsley: Seaforth, 2012), which also covers 2nd & 3rd class types

² A. Marder *The Anatomy of British Sea Power: A History of British Naval Policy in the Pre-Dreadnought Era, 1880-1905* (London: Frank Cass & Co., 1964), D. Schurman *The Education of a Navy: The Development of British Naval Strategic Thought 1867 – 1914* (London: Cassell, 1965), J. Sumida *In Defence of Naval Supremacy: Finance, Technology and British Naval Policy, 1889-1914* (London: Routledge, 1993), J. Beeler ‘Steam, Strategy and Schurman: Imperial Defence in the Post-Crimean Era, 1856-1905’ in G. Kennedy and K. Neilson [eds.] *Far Flung Lines: Studies in Imperial Defence in Honour of Donald Mackenzie Schurman* (London: Routledge, 1996) N. Lambert *Sir John Fisher’s Naval Revolution* (Columbia: University of South Carolina Press, 2002), R. Parkinson: *The Late Victorian Navy: The Pre-Dreadnought Era and the Origins of the First World War* (Woodbridge: The Boydell Press, 2008), S. Grimes *Strategy and War Planning in the British Navy, 1887-1918* (London: Boydell, 2012). Notable design studies include the aforementioned work by Friedman, with sections on the vessels to be found in D. Brown *Warrior to Dreadnought: Warship development 1860-1905* (London: Caxton, 2003), D. Brown *The Grand Fleet: Warship Design and Development 1906-1922* (London: Caxton, 2003), R. Chesneau and E. Kolesnik [eds.] *Conway’s All the World’s Fighting Ships 1860-1905* (London: Conway Maritime Press, 2002), Gray, R. [ed.] *Conway’s All the World’s Fighting Ships 1906-1921* (London: Conway Maritime Press, 1985)

³ A. Gordon *The Rules of the Game: Jutland and British Naval Command* (London: John Murray, 1996) p.443 Further examples may be found in G. Bennett *The Battle of Jutland* (Ware: Wordsworth Editions, 1999), G. Gordon ‘Jellicoe: Jutland, 1916’ in E. Grove [ed.] *Great Battles of the Royal Navy* (London: Arms and Armour Press, 1994), E. Grove *Fleet to Fleet Encounters* (London: Arms and Armour Press, 1991), P. Halpern *A Naval History of World War I* (London: Routledge, 2005), R. Hough *The Great War at Sea 1914-1918* (Edinburgh: Birlinn, 2000), N. Steel & P. Hart *Jutland 1916: Death in the Grey Wastes* (London: Cassel, 2004). The point made, that the first-class cruisers designed prior to 1905 were obsolete in the context of a First World War fleet action dominated by heavy artillery, taken purely in itself is reasonable. However, these negative connotations have coloured wider perceptions of the type, and likely resulted in the relative lack of interest in such vessels

⁴ The big-gun armed types are what would later come to be officially termed, and are generally known to historians as, ‘battlecruisers.’ For the purposes of this thesis, heavy artillery (nee ‘big-gun’) is taken to

primary source materials reveals a very different situation; one in which the standing of the type was very much greater than their current place in the historiography would suggest. In 1898, noting remarks of George Goschen, First Lord of the Admiralty in the House of Commons, we find Thomas Brassey, editor of *The Naval Annual*, writing that

Whether it is true or not that “power on the sea has been transferred rather to cruisers than to battleships,” it is to cruisers, Mr. Goschen tells us, that we are directing our main attention.⁵

To an extent the importance of such vessels has been noted, albeit sporadically by naval historians: nevertheless, the subject is one that remains largely unexplored.⁶ This dissertation fills the gap in the current historiography by specifically examining the development of the British first-class cruiser during the period 1884-1909, and the wider technological, strategic and tactical contexts in which this occurred. It demonstrates how, from the early 1880s, the type would grow from being a trade-defence vessel, to a second form of capital ship, and finally, the model for all of the first all-big-gun vessels constructed by the Royal Navy.

Naval history and the first-class cruiser 1884-1909

Recently there has been a considerable upsurge of scholarly interest in the late-Victorian and Edwardian period, particularly in terms of Royal Naval strategy, and how this would extend to the First World War.⁷ The classic text on the pre-1905 Royal Navy, Marder’s *Anatomy of British Sea Power*, dates back to 1940 and itself owes a considerable amount to the earlier work of Woodward on the *Anglo-German Naval Rivalry*, and to Ropp’s then-unpublished work on the late-Nineteenth Century French

begin at 10in calibre weapons or greater, with intermediate calibre weapons falling into the 4.7in – 9.2in calibre region

⁵ T. A. Brassey ‘The Progress of the British Navy’ in T. A. Brassey [ed.] *The Naval Annual*, 1898 (Portsmouth: J. Griffin and Co., 1898) p.4

⁶ In particular, Marder, Schurman, Sumida & Grimes *Op. Cit.* have considered them within wider naval strategy, but no dedicated work at present exists

⁷ See S. Grimes *Op. Cit.*; M. Seligmann *The Royal Navy and the German Threat 1901-1914: Admiralty Plans to Protect British Trade in a War Against Germany* (Oxford: OUP, 2012). Also N. Lambert *Planning Armageddon: British Economic Warfare and the First World War* (London: Harvard University Press, 2012)

naval service.⁸ Marder's analysis, in essence, states that the Royal Navy went through a period of decline in the mid-Victorian period during which it became dangerously weak compared to rival naval powers, let alone approaching a 'two-power' standard which required equality in strength to any two rival forces combined. The weakness, Marder asserts, would be addressed following several war 'scares' with Russia and France during the 1880s which resulted in an upsurge in naval spending. This further coincided with the emergence of a new generation of naval theorists, most notably John and Philip Colomb, who eliminated the confusion that existed in the service and used the lessons of the past to promote a classical, 'blue-water' battlefleet model of operations. Navalist agitators, extensively employing these strategic views and claims of British naval weakness were largely responsible for the Naval Defence Act of 1889.

With these points made, much of the rest of Marder's work is given over to the consequences of the Naval Defence Act, the relationship between contemporary economics, politics and diplomacy with the general concept of 'sea power' and more particularly British naval power. The overriding emphasis, as far as the fleet was concerned, is upon battleships and battlefleet strategy with little major attention given to possible alternatives, although the first-class cruiser is frequently referred to and its significance to the service noted. The subject of commerce protection, a matter naturally closely associated with the cruiser, is raised, as were the theoretical consequences of a *guerre de course* against Britain, but Marder appears to have employed sources mostly concerned with the protection of food supply, whether by choice or a matter of access.

There is, however, a contradiction in Marder's argument between his emphasis on the potential decisive impact of an assault on British shipping, and his acceptance that Britain would have had sufficient produce to avoid potential starvation for at least three to six months.⁹ He also suggested that no 'clear and definite policy' existed for the protection of commerce 'owing to the absence at the Admiralty of any first-class strategist' until Reginald Custance became DNI in 1899.¹⁰ This assertion has not stood the test of time.

⁸ Marder *Op. Cit.*, E. Woodward *Great Britain and the German Navy* (Oxford: Cass, 1935). Ropp's thesis was later published as T. Ropp [ed. S. Roberts] *The Development of a Modern Navy: French Naval Policy, 1871-1904* (Annapolis: Naval Institute Press, 1987)

⁹ Marder *Op. Cit.* p.85

¹⁰ *Ibid* p.97 & 95

Despite the flaws in his work, Marder's influence was considerable, and many historians have concurred with his views. Notably, Parkes, in his monumental study of *British Battleships* agrees with Marder's assessment of a mid-Victorian naval weakness which was addressed by the Naval Defence Act, and the subsequent dominance of the 'blue-water' school of naval strategy, with the battleship being the principal means of achieving naval supremacy.¹¹ This was also echoed and expanded by Rodger, who went even further in questioning the competence of the mid-Victorian Admiralty and its professional advisers.¹² Sandler also takes a similar view of the period, pointing to the creation of a vessel with a similar layout to a later battleship, but then writing the period off as one of stagnation in vessel design.¹³

There are however numerous significant shortcomings in this analysis. Beeler and Andrew Lambert have recently done much to demonstrate the fallacy of the concept of mid-Victorian naval weakness, pointing out that it has been judged by later standards rather than in reference to contemporary rivals.¹⁴ Marder, Parkes and many of their successors also largely missed the fact that owing to the limitations of contemporary material technologies, the Royal Navy during the mid-Victorian period moved away from the traditional policy of battlefleet-blockade, toward one of coast-assault, not out of confusion, but as a matter of necessity. They are notably weak in their understanding of the limitations imposed by the new materials on strategy, tactics and the inherent design of major naval vessels, be they small craft, battleships, or, of particular

¹¹ O. Parkes *British Battleships: A History of Design, Construction and Armament 1860 – 1950* (London: Leo Cooper, 1990) Since Parkes's work was written over a period of some 31 years, from 1925-1956, there is some question about whether he may have developed this view independently of Marder, or whether Marder influenced his thinking

¹² N. Rodger 'The Dark Ages of the Admiralty, 1869-85, Part I: Business Methods, 1869-74' *Mariner's Mirror* 61/4 (November 1975), 'The Dark Ages of the Admiralty, 1869-85, Part II: Change and Decay, 1874-80' *Mariner's Mirror* 62/1 (February 1976), 'The Dark Ages of the Admiralty, 1869-85, Part III: Peace, Retrenchment and Reform, 1880-85' *Mariner's Mirror* 62/2 (May 1976), 'British Belted Cruisers' *Mariner's Mirror* 64/1 (February 1978). It must be said, however that Professor Rodger has recanted from some of his earlier critical views: see the remarks on his earlier work in the bibliographies to his monumental *Naval History of Britain*.

¹³ S. Sandler *The Emergence of the Modern Capital Ship* (Newark: University of Delaware Press, 1979)

¹⁴ J. Beeler *British Naval Policy in the Gladstone-Disraeli Era. 1866-1880* (Stanford: Stanford University Press, 1997), 'Steam, Strategy and Schurman: Imperial Defence in the Post-Crimean Era, 1856-1905' in G. Kennedy and K. Neilson [eds.] *Far Flung Lines: Studies in Imperial Defence in Honour of Donald Mackenzie Schurman* (London: Routledge, 1996), *Birth of the Battleship: British Capital Ship Design 1870-1881* (London: Caxton Editions, 2003), 'A One Power Standard? Great Britain and the Balance of Naval Power 1860-1880' *Journal of Strategic Studies* 15/4 (December 1992), 'In the Shadow of Briggs: A New Perspective on British Naval Administration and W. T. Stead's 1884 "Truth About the Navy" Campaign' *International Journal of Naval History* 1/1 (April 2002)

significance to this thesis: cruisers. Again, Beeler, Brown, Friedman and Andrew Lambert have largely overturned this perspective, providing a more balanced and deeper appreciation of the strategic and material aspects of the 1870s and 1880s.

The subject of trade-defence is one touched upon by many authors, Ranft being the first to make it a major study, but appreciation of the general strategic position seems to have been coloured by the failure of the Royal Navy to effectively counter the U-Boat *guerre de course* during the First World War. The almost complete abandoning of convoy is widely condemned; Parkinson recently has placed considerable emphasis upon the subject, the evidence supplied to the often-forgotten Carnarvon Commission, and the influence of Captain W. H. Hall as head of the Foreign Intelligence Committee (FIC), set up in 1883, who it is suggested committed a ‘massive misreading of history’ in rejecting convoy as no longer possible, inherently defensive and not part of the service’s tradition.¹⁵ Yet despite the frequent criticism directed at the abandoning of convoy, it is much more seldom asked whether convoy was a practical, or even a necessary proposition in the last decades of the Nineteenth and first decade of the Twentieth Centuries, nor whether the strategy the Royal Navy adopted was inherently mistaken. Beeler and Friedman have recently started to point out that the matter was by no means clear-cut.¹⁶ It also seems evident that some historians have misunderstood the nature of the alternative approach the Royal Navy adopted.

The development of the first-class cruiser itself and its increase in dimensions over the period in question has also come in for criticism. Schurman, while discussing Sir Julian Corbett and his views, remarks

Their permanent function was to exercise the sea supremacy won by the doughty ‘line’ ships. Misapprehension of the basic needs behind Nelson’s oft-quoted cry for more cruisers had led Corbett’s contemporaries to over-value the ‘eyes of the fleet’ function for cruisers to the point where they were being increased in size and up-graded in

¹⁵ R. Parkinson *The Late Victorian Navy: The Pre-Dreadnought Era and the Origins of the First World War* (Woodridge: The Boydell Press, 2008) pp.241-242

¹⁶ Beeler *Birth of the Battleship*, Friedman *British Cruisers of the Victorian Era*, B. Ranft ‘The protection of British seaborne trade’ in Brian Ranft [Ed.] *Technical Change and British Naval Policy 1860-1939* (London: Hodder and Stoughton, 1977)

function to rival battleships themselves and hence their main purpose, the functional tasks of convoy, commercial blockade and search were much neglected.¹⁷

Although appealing, this interpretation, which also appears to have some connection to Marder, is difficult to reconcile with the evidence contained in the Admiralty archives, Ship Covers, and various private collections. Two major factors were at work. Firstly, the vessels were gradually becoming a fusion type, capable of both functions. This was far from a confusion of purpose but a practical reality.

The first British cruisers to re-introduce side-armour were specifically designed to function as the fast wing of a battlefleet, but were perfectly capable of independent operations should they be called upon to do so. Their successors, the even larger *Drakes*, were designed for the trade-defence role with fleet duties a secondary capability; their size reflected their speed, range, protection, armament and sea keeping abilities, all of which were calculated to overwhelm any existing or projected rival cruiser at the time of their design. Though they never received the name, these types were probably the vessels most accurately described by the 'battlecruiser' term. In effect, the largest first-class cruisers had moved beyond a pure trade defence remit, and had become a second type of highly flexible capital ship, capable of multiple different operational functions. The matter of large dimensions was relevant to most of the vessels produced during the period covered by this thesis however: the objective was qualitative superiority over rivals on an individual unit basis. When this principle was temporarily abandoned, the vessels were of much reduced utility, and suffered rapid obsolescence.

With his ground-breaking 1989 work *In Defence of Naval Supremacy* Sumida produced one of the first major texts to depart significantly from the Marder interpretation of the era. Sumida's careful assessment of finances began to lay the foundation for a somewhat different interpretation of the period; one in which the first-class cruiser was given greater importance than it had generally received to date. Sumida also pointed toward the evolutionary nature of vessel design, even in the early 20th Century, although he also largely accepted the Marder-esque view of naval weakness leading to the Naval

¹⁷ D. Schurman *The Education of a Navy: The development of British naval strategic thought, 1867-1914* (London: Cassel, 1965) pp.178-179

Defence Act, despite Kennedy, and indeed, Ropp's work on French naval policy in the era indicating that this was rather more an image manufactured by the contemporary navalist agitators than actual. This concept has more recently been almost completely discredited by the work of Beeler, Lambert, Grimes and Seligman.¹⁸

The vast number of studies produced on Sir John Fisher, his influence, and the service in the first decade of the 20th Century shows no sign of abating, with three major works recently having been published covering this era.¹⁹ Marder again 'got there first', with his five volume series *From the Dreadnought to Scapa Flow*. The contention of Marder's work, as indicated above, is that Fisher wrought a revolution in the Admiralty when appointed First Sea Lord in 1904 in almost every conceivable area, from strategy to vessel design and administration. He was the father of the all-big-gun vessel in the form of the 'revolutionary battleship' HMS *Dreadnought*, though his real love was for the faster, more lightly protected battlecruisers. Strategically, his great contribution was to concentrate the Royal Navy's battle-squadrons in European waters. These views, like those expressed on the previous years, were widely accepted, Parkes and Hough notably following this general theme, and it continues to be expressed in many popular histories.²⁰

It is beyond question that Fisher had a massive impact on the service, but many of these themes have required severe revision. Kennedy and Sumida (particularly the latter) were amongst the first to produce major works suggesting that Fisher's plans and actions were somewhat different from the Marder-model, being the product of both adapting economic and political circumstances.²¹ With Britain forming alliances with other powers, and following the annihilation of the Russian fleet at the hands of the Japanese off Tsushima in 1905, there was a much reduced requirement to maintain battle-

¹⁸ Beeler *Op. Cit.*, Lambert *Sir John Fisher's Naval Revolution*, Grimes, Seligmann *Op. Cit.*

¹⁹ S. Grimes *Strategy and War Planning in the British Navy, 1887-1918*; Lambert *Planning Armageddon*, Seligmann *The Royal Navy and the German Threat*

²⁰ Parkes *Op. Cit.* Hough *First Sea Lord: An Authorised Biography of Admiral of the Fleet Lord Fisher* (Bristol: Severn House, 1977), The Great War at Sea 1914-1918 (Oxford: Oxford University Press, 1983), R. Massie *Dreadnought: Britain, Germany and the Coming of the Great War* (London: Pimlico, 2004)

²¹ P. Kennedy *The Rise and Fall of British Naval Mastery* (London: Classic Penguin, 2001), *The Rise of Anglo-German Antagonism* (London: George Allan and Unwin, 1980), *Strategy and Diplomacy 1870-1945. Eight Studies* (London: George Allan and Unwin, 1983) M. Seligmann 'Britain's Great Security Mirage: The Royal Navy and the Franco-Russian Naval Threat, 1898-1906' *Journal of Strategic Studies*, 35:6; 'A prelude to the reforms of Admiral Sir John Fisher: the creation of the Home Fleet, 1902-3' *Historical Research*, vol. 83, no. 221; Sumida *Op. Cit.*

squadrons outside European waters, ergo bringing the battleships home was a perfectly reasonable strategic move. It was also to an extent economic, since there was an opportunity for placing vessels into reserve, reducing permanent manning costs. Fisher was further attempting to exploit the new technologies of the era: the all-big-gun armed first-class cruiser, equipped with the new fire-control equipment then being developed, was the ultimate expression of his personal preferences for capital ship design.²²

Most historians of the late-Victorian and Edwardian era navies now accept this general contention, and in recent years, Lambert, Grimes and Seligmann have produced material expanding on aspects of this theme. Strategic war planning in this later period has however recently been the subject of works by both Grimes and Nicolas Lambert, which shed greater light on contemporary naval thinking.²³ Lambert's recent work suggests the service, under Fisher in the first decade of the Twentieth Century, had in mind a dramatic concept for exploiting British control of the global trading routes and networks to rapidly destroy an enemy economy, though as a text dealing largely with wider theoretical economics and strategy, it does not explore the place of the first-class cruiser, or its rise to prominence. Grimes's text has exposed the detailed practical war-planning that was engaged in from the late 1880s, the influence of the Naval Intelligence Department on this, and how these related to the service's annual Manoeuvres: large mock 'wars' that examined particular scenarios, and tested new strategic and tactical ideas, along with the latest material developments. Like Lambert's though, with its broad coverage of war-planning and the service's gradually adapting strategic goals, Grimes does not chart the increasing significance of the first-class cruiser through this time in great detail. Seligmann has done some work upon this subject however, suggesting that the Royal Navy took a possible German naval challenge seriously rather sooner than 'revisionist' historians believe to be the case, but their concerns were directed rather toward a possible commerce-raiding threat from this quarter than a battle-fleet challenge *per se*. This, Seligmann contends, had a considerable impact on Admiralty thinking throughout the first decade of the Twentieth Century, and may have been responsible for the development of the *Invincible* class battlecruisers.²⁴

²² N. Lambert *Sir John Fisher's Naval Revolution*

²³ Grimes *Op. Cit.* N. Lambert *Op. Cit.*

²⁴ Seligmann *The Royal Navy and the German Threat*; 'New Weapons for New Targets: Sir John Fisher, the Threat from Germany, and the Building of HMS Dreadnought and HMS Invincible, 1902–1907' *The International History Review* 30:2;

Few authors to date however, have considered whether Fisher actually did replace the battleship, albeit briefly, with the first-class cruiser. Grove, in his Society for Nautical Research Lecture and *Mariner's Mirror* paper was one of the first to suggest *Dreadnought* was closer to a cruiser than a 'traditional' battleship, as they had nominally developed since 1890.²⁵ The issue is to an extent one of nomenclature, as is illustrated over the following chapters. That there was a degree of crossover between the battleship and cruiser types was noted by Sumida and has more or less quietly continued to be observed ever since.²⁶ It had, as noted above, been developing for some years.

Primary source materials

With an assessment of the technological evolution of the British first-class cruiser forming a major part of this thesis, the papers delivered before the Institution of Naval Architects (INA) are an invaluable resource.²⁷ The INA was established in 1860 by four principal founders, John Scott Russell, Edward Reed, Nathaniel Barnaby and Rev. Joseph Woolley. The papers delivered before it were published in yearly volumes of Transactions. Original copies appear to be becoming quite rare, and collections are often incomplete and difficult to access. The Maritime Historical Studies Centre, University of Hull has a respectable collection which were made available to this author, and all of the transactions continue to be available from the Royal Institution of Naval Architects in printed or electronic form, though at a prohibitive cost for many private researchers if numerous full editions are required. The INA papers have not been especially extensively used to date by many naval historians for reasons which are unclear. Brown, in his design histories, has used them more extensively than most.

During the period in question the papers were read mostly in the Lecture Hall of the Royal Society of Arts and contain a wide range of contributions from leading naval architects, senior officers both serving and retired, and industry figures; equally valuable are the discussions which followed each paper, which frequently contained

²⁵ E. Grove 'Battleship or First Class Cruiser? HMS Dreadnought and the Limitations of Jackie Fisher's Radicalism' Society for Nautical Research Annual Lecture, 1 December 2006; aka 'The Battleship is Dead, Long Live the Battleship; HMS Dreadnought and the Limits of Technological Innovation' *Mariner's Mirror* Vol. 93/4 (2007)

²⁶ Sumida *Op. Cit.* pp.53-56

²⁷ Now Royal Institution of Naval Architects, having received its Royal Charter of Incorporation in 1910, and latterly, 1960

further insights and information. The subject of cruisers was a popular one, and the topic of several papers and many debates. It is difficult to overstate the value of these Transactions, the papers and discussions, although a degree of care must be taken in certain cases, particularly where a commercial interest may be involved (such as those produced by the employee of an armaments manufacturer), or when a wider disagreement carried over into debates (Sir Edward Reed was notorious for attacking the Admiralty and its officials, often by highly unscrupulous methods).

The Journal of the Royal United Service Institute (RUSI) provides an excellent companion to the INA Transactions. Founded slightly earlier than the INA, and covering a much wider field of military subjects, the two institutions shared many of the same members, and where the INA papers provide principally technical data, the RUSI papers and debates frequently covered strategic and tactical matters; John Knox Laughton, John and Philip Colomb all read major papers there, while prize-winning and highly commended annual naval essays were also printed, and may be found alongside proposed rules for naval war-games or board-games, which themselves provide an interesting insight into contemporary strategic and particularly tactical thought, especially on the part of relatively junior or mid-ranking officers. As noted, there was some overlap between the institutions, the RUSI often seeing technical papers, and the somewhat more specialised INA less frequently seeing those touching upon strategic and historical matters. The papers are slightly more accessible than the INA. Printed copies are more readily found at many libraries and institutions, often with more complete collections. At the time of writing the majority of the papers delivered are also available on the internet to institutions subscribing to various collected Periodicals archives, a more restricted number being made available to RUSI members via the RUSI website. Like the INA papers, these, in conjunction with other materials are an extremely valuable resource, providing a detailed backdrop to contemporary thinking and developments, although similar care must be exercised in assessing the background in which the paper was delivered.

The establishing of a large number of professional and semi-professional societies in the Victorian era like the RUSI and INA has left a considerable additional body of valuable material in their respective yearly Transactions and Journals. Relevant papers may be found in the Transactions of the (American) Society of Naval Architects and Marine

Engineers, and Institute of Civil Engineers, as might be reasonably expected. However, material may also be found in the Journals of other, less obviously related bodies such as the Society of Arts.

Official Admiralty records are mostly held at the National Archives (formerly the Public Records Office) in Kew, starting with ADM 1. Containing a vast array of correspondence from senior officers at home and abroad, memoranda, reports, proceedings, this section gives a reasonably complete record of major decisions taken and the implementation of these. Background information supplied to the Board of Admiralty in particular can be found in other sub-sections. ADM 8 contains the List Books showing the monthly returns of vessel and fleet dispositions, along with the names of relevant senior officers. The data from the late 1880s in particular is of value, since it shows the change in vessel classifications that took place during this time, pointing toward a more fundamental shift in technology and the service's strategic approach. ADM 123-128 contain reports from the more remote Eastern Foreign Stations, including the Cape, East Indies, and China Stations, which as major trade-centres have a particular interest for this thesis. Reports from the Admiralty Experimental Works can be found in ADM 226; generally of a technical nature, covering sketches to model experiments, some of these may also be found repeated in the Ship Covers held by the National Maritime Museum, although in general, those held by the National Archives appear to be the sole surviving copies.

The establishing of the Naval Intelligence Department (NID) in 1887, superseding the FIC, provided a division nominally dedicated to supplying the Board with intelligence data, although as several historians have pointed out, both bodies under William Hall appeared to move well beyond their theoretical remit, and toward something akin to a Naval Staff.²⁸ An examination of the voluminous FIC / NID papers, primarily contained within ADM 231 appears to confirm this suggestion, at least to an extent, although it can also be exaggerated. Topics covered were wide-ranging, and includes assessments of coal supply in peace and wartime scenarios, summaries of strategic and tactical war games by the Royal Naval College, annual comparisons of the fleets of major powers and not least extensive reports on the annual Naval Manoeuvres. These massive

²⁸ Parkinson *Op. Cit.* p.242

exercises, spanning several weeks of each year were the testing and proving grounds for service strategy and tactics, the scenarios being largely developed by the NID.

Case records: large groups of related Admiralty documents collected into specific 'cases', are collected in ADM 116; several are of particular interest to this thesis, ranging over a number of interlinked subjects, from commerce protection, the rearrangement of Station boundaries, wartime standing orders for Foreign Stations, and construction programmes for vessels and shore bases / facilities.

In addition to the Admiralty records, the National Archives also contain a large number of Cabinet, Colonial and Foreign Office records of relevance to this study. Predating the nominal selected starting point, but of interest are the reports of the Carnarvon Commission in CAB 7, which contains a wide variety of defence committee correspondence and reports. CAB 16, 17 and 35 contain further sub-committee minutes, memoranda and reports, including those on the protection of ocean trade, and requirements for cruisers, and the Colonial Office papers in CO 537 also link closely to these, containing the report of a Committee established to consider the limits of Foreign Stations. CAB 37 is of particular value, containing photographic copies of Cabinet Papers, those pertaining to naval matters giving the political companion piece to Admiralty memoranda. These include minutes providing views on the naval estimates, assessments provided to Government of the relative strengths of fleets and rival nations' shipbuilding programmes, an appreciation of the status of British food-supply in the event of a maritime conflict at the end of the 19th Century, and various papers by the Chancellor of the Exchequer and First Lord strongly debating naval expenditure in light of contemporary national finances. These are particularly significant when viewed alongside the yearly Navy Estimates contained in the House of Commons Parliamentary Papers (copies also in ADM 181).

The National Maritime Museum (NMM) holds the Ship Covers for the various classes of vessels considered in this thesis at the Brass Foundry outstation. These files contain surviving papers from the Constructor's department pertaining to the design and development of ships built, from the inception of the type through to final modifications, and frequently hold early sketch designs. Gaps do exist, and some Covers are considerably larger than others, suggesting that certain documentation has

been lost. For example, it is known that details pertaining to the re-positioning of certain intermediate-calibre guns in the *Duke of Edinburgh* class armoured cruisers were destroyed during the Second World War.²⁹ In combination with Admiralty records at the National Archives, INA and JRUSI papers, and private correspondence and collections, a reasonably complete picture of the history of these vessels can be established. Scale plans, and the NMM's photograph collection are also held by the Brass Foundry.

Private collections of correspondence by naval officers and related officials are contained at the NMM's Caird Library. The papers of Admiral Sir Alexander Milne, Admiral Sir Gerard Noel, Admiral Sir Cyprian Bridge, and Sir Eustace Tennyson d'Eyncourt are of considerable value. Milne, though pre-dating the nominal commencing year of this thesis established the Royal Navy's trade-defence policy; a policy which was to continue, modified, but following the same principle, throughout the period covered.

Bridge and Noel are interesting figures historically; both served in senior roles at the Admiralty, as C-in-C China Station, and held strong views which were not always entirely in keeping with those of the Board of Admiralty. Both were able strategists of the battle-fleet school, Bridge producing several books on the subject, while both were more or less frequent contributors to journals and societies when they were in the country. Noel as a junior officer won several prizes for his essays on naval tactics, and in later years he became a staunch supporter of the theories of Alfred Mahan. In principle, he and Philip Colomb also had much in common on such matters, but in character they were completely dissimilar and the two men fell out in 1893, following the loss of HMS *Victoria* under almost farcical conditions, and Colomb's spectacularly ill-judged pontificating on the matter in the letters pages of *The Times*.³⁰

D'Eyncourt's papers, though of a somewhat lesser scale, provide useful independent data on service cruisers; he would become Director of Naval Construction (DNC) following Sir Philip Watts, but during the early years of the 20th Century he was employed by the Armstrong armaments firm who built several such vessels for the

²⁹ Parkes *Op. Cit.* p.443 Parkes does not state how this occurred, though the conjecture of an air-raid does not seem improbable

³⁰ Colomb's remarks met with a strong riposte in *The Times* from both Noel, and Captain (later Admiral) C. C. Penrose FitzGerald

Royal Navy under contract. d'Eyncourt appears to have back-engineered certain areas of Admiralty designs, and also produced a series of power and efficiency curves for several types, which correlate closely with official data. His archive has an additional value since the papers of his predecessors as DNC, Sir Philip Watts and Sir William White, have not survived. Possibly this is a reflection of social status, since White and Watts came from the emergent lower-middle class, while d'Eyncourt came from a somewhat higher position, where the preservation of personal papers was more common.

Further primary source material are the papers and magazines of the era. These range from professional publications such as *The Engineer* to more popular productions including *The Times*, *The Spectator*, *The Nineteenth Century* (subsequently '*The Nineteenth Century and After*') *The Pall Mall Gazette*, *The National Observer* and many others, including both articles and letters to their respective Editors. *The Naval Annual*, published from 1886, edited first by Lord Brassey, and later by his son (with two years under Leyland at the turn of the century), was the most prominent journal dedicated to naval affairs of the age, and a fixed place in the wider landscape.³¹ As such, *The Naval Annual* is an extremely important resource, and covered a wide range of naval matters ranging from the Estimates, assessments of the current states of various major naval powers, opinion pieces on strategic and policy issues, annual manoeuvres, and tabulated data on the various vessels in commission, major features of these, their builders and cost. Nevertheless, it must be used with a considerable degree of caution; there has been a tendency to accept the information and many statements printed in *The Naval Annual* at face value when in fact their accuracy is not always clear-cut, and sometimes demonstrably erroneous.

³¹ Although frequently described as 'Brassey's Naval Annual', and just as frequently abbreviated to "Brassey's" the publication during the years in question was in fact simply entitled 'The Naval Annual' of x year

Thesis Structure

This thesis is divided into five interrelated chapters, with an additional concluding section. The first provides an overview of the strategic backdrop of the mid-Victorian era, and the beginnings of the late-Victorian period. It argues the reclassification of the fleet in October 1887 was a much more significant event than a simplifying of service nomenclature, in reality reflecting changing material and strategic conditions, and the transition of the service from one largely dominated by coast-assault toward a more classical ‘blue-water’ battlefleet model akin to that of the sailing era. The emphasis of the fleet once again turned to blockade as the primary means to defending trade, in conjunction with a system of focal-area defence first set out by Alexander Milne in the 1870s, which is also assessed. It further suggests that several of the older masted ironclads were rated as ‘cruisers’ less in order to keep elderly and inefficient types on the books, but because they remained by virtue of their ocean-going capacity useful vessels in such a role, albeit as a temporary measure. Finally, it assesses the still severe technological limitations of the 1880s, and the first new class to be commissioned as ‘cruisers’ into the service.

The second chapter examines the development of the first-class cruiser from 1888-1894. This covers the ‘protected deck’ era of design, in which the Royal Navy’s Director of Naval Construction, William White, abandoned almost all side-armour on cruiser type vessels in favour of internal oblique protection, reaping a considerable performance gain in the process. The impact of the Naval Defence Act is assessed, as is White’s influence upon the service, both as a designer and on wider strategic and tactical matters. During this period, the first vessels to be termed ‘battle-cruisers’ were developed, and their practical functions and abilities are gauged. The subject of contemporary armour development is examined in detail, as is the rise of the intermediate-calibre quick-firing gun. Both matters are considered of paramount importance to vessel design, construction, overall strategy and contemporary tactics up to the middle of the first decade of the 20th Century. It is further demonstrated that the experiments carried out on the old ironclad HMS *Resistance* experiments had a major impact upon the design of Royal Navy cruisers. The contemporary strategic environment and naval rivals are evaluated, with the threat of the *guerre de course* or a *guerre industrielle* still remaining of major concern to the service, which it is argued was effectively forced to counter two different strategic threats partly owing to the vacillating policy of the major naval rivals.

Contemporary cruisers, it is demonstrated, were intended as trade defence types, although it is argued that they would have been more capable in a fleet role than is often believed.

Chapter Three, covering the approximate period 1894-1901 examines the impact of new armour technologies on vessel (and particularly first-class cruiser) design, and how this had a significant impact upon contemporary strategy and tactical thinking. The crossover point from the protected-deck vessels to side-armoured ships carrying these new forms of face-hardened plate is considered. Although the introduction of such armoured vessels by France is often regarded as rendering British protected cruisers obsolescent, it is argued that initially, the advantage was not as great as widely believed. The gradually evolving means of protecting commerce is examined, along with the significance of the 'Spencer Programme' of funding and construction. It is argued that the introduction of face-hardened side-armour into Royal Navy vessels produced a type that effectively rendered the contemporary battleship obsolescent, was an inherently more flexible and useful type for the service, and that it would not have been an especially unrealistic proposition for such vessels to supersede the slower, more heavily armoured battleship type. In this time, the largest first-class cruisers became a genuine alternative, or second form of, capital ship. Construction policy, and the question of quantity *verses* quality is examined, and it is suggested that a rare error was made in producing first-class types of reduced displacement and fighting capacity at the end of the 19th, and beginning of the 20th Century.

Chapter Four departs from Europe and matters of vessel design, and considers the presence of first-class cruisers in operational conditions in the Far East. This region makes for a particularly valuable case-study since it was a major trade-hub, with significant routes passing through and close by, and of considerable economic importance to the British Empire. It also had an unusually demanding set of geographical conditions, requiring vessels with the ability to work in the littoral region (including upon the major rivers) while also being capable of hunting commerce-raiding types stationed in the area by rival colonial powers, and operating with the battle-squadron that were stationed there until the post-Tsushima years. The strategic and logistical impact of the contemporary first-class cruiser on the local stations is explored, supporting the contention that the type provided much-improved operational capacity on

foreign stations than the miscellaneous small-craft that had been widely employed to date, and that this model would be continued and extended, following the appointment of Admiral Lord Fisher as First Sea Lord.

The final chapter deals with the first-class cruiser during the first decade of the 20th Century, its material development and also the next stage in the evolution of strategic thinking brought by Admiral Lord Fisher. The last intermediate-gun-armed vessels are considered, and how in response to the changing nature of foreign construction, these moved the type back toward a fleet-cruiser concept, abandoning attempts to restrict displacement and reduce individual unit-cost. It is argued however that there was a certain loss of clarity in the details of design during this period. The financial implications of the large-scale cruiser and battleship construction programmes are illustrated, and how this would become an opportunity for Fisher to forward his new strategic vision for the service, which at least in part was a radical extension of existing policy. It is demonstrated how Fisher in fact achieved far more of his plans than is commonly realised, and that the first-class cruiser became the model type for the first all-big-gun capital ships built for the service, including HMS *Dreadnought* which in design and function was not quite the line-of-battleship she is usually described as being.

The conclusion consolidates the findings of the previous chapters, illustrating how the first-class cruiser in the Royal Navy, over the quarter century principally covered, moved from being primarily a trade-defence vessel (with some fleet capacity) to being an alternate form of capital ship, and finally, for a brief period, became the basis for all of the service's first-class vessels, irrespective of the nomenclature attached to them. This in part reflected the gradually evolving strategic situation, but it also was a consequence of technological developments. In the 1890s, the major changes were water-tube boilers, the quick-firing gun and, most significantly, the introduction of face-hardened armour plate. White and Fisher are shown to have been the major contemporary figures in the development of the type, although they did not always carry their views. Strategically, the Royal Navy continued to employ variations on the focal area-defence policy created by Alexander Milne for the protection of commerce. In the mid-Victorian era, this had been in conjunction with European fleets largely built for coast-assault. By the end of the 1880s, littoral combatants were giving way to ocean-

going types capable of blockade. Fisher brought a further transition with the object of abandoning the battleship type, relying on a flotilla-defence system of surface and sub-surface torpedo-boats for defending the UK, major foreign ports, and use in narrow seas. Ocean-going duties would be given over almost entirely to a new generation of high-speed, heavily armed first-class cruisers which could hunt down and overwhelm commerce-raiders.

The first-class cruiser of the late Victorian and Edwardian eras has been frequently overlooked, its importance to the contemporary service and its true strategic value often marginalised in the historiography. The ‘old’ armoured cruisers of the First World War: targets for U-Boats and battlecruisers, has become a widely accepted view. Yet in the late 1890s, the introduction of new technologies allowed designer Sir William White to develop the first-class cruiser into the most formidable naval vessel of its generation, a point not lost on Admiral Sir John Fisher and other radical naval thinkers who would later attempt to exploit the capabilities of the type to the ultimate degree.

Chapter 1

Beginnings:

The birth of the modern cruiser, politics, strategy and rivals

During October 1887 the Royal Navy embarked upon a large scale reclassification of its fleet.¹ By the end of the month the administrative work was completed, and the new nomenclature it introduced was employed for parliamentary purposes from 1 November.² It was this reclassification that saw the term ‘battleship’ finally supersede the miscellaneous designations which had been employed until that time in the service.³ Of no less significance was the simultaneous widespread adoption and rationalisation of the term ‘cruiser’ which like ‘battleship’ had been sporadically employed for some years, albeit in an apparently rather haphazard fashion, most notably in connection with the *Leander*, *Mersey* and *Imperieuse* classes, as well as for (armed) chartered merchant steamers.⁴

The fleet reclassification has lately been noted by naval historians, but thus far its significance does not appear to have been fully appreciated, nor has the exact sequence of events been thoroughly explored.⁵ There is a temptation to regard it purely as a matter of administrative convenience, and the replacement of the previous system of categorisation, with its disparate types, with something simpler and more efficient. One recent author unequivocally states that the reclassification occurred along the lines of size, with ‘battleship’

¹ E. Grove *The Royal Navy Since 1815: A New Short History* (Houndmills: Palgrave Macmillan, 2005) p.73

² House of Commons Parliamentary Papers (henceforth HCPP) ‘Navy Estimates for the Year 1888 – 89 with Statement by the Financial Secretary Descriptive of the Rearrangement of the Votes and Explanation of Differences.’ 1888 (71) LXVIII, 1, pg.18

³ TNA ADM 8/166 (Confidential) *A List of Her Majesty’s Ships in Commission* (London: Her Majesty’s Stationary Office [henceforth HMSO], 1887). See also F. T. M. Gibbs [Ed.] *The Illustrated Guide to the Royal Navy and Foreign Navies; Also Mercantile Marine Steamers Available as Armed Cruisers and Transports* (London: Waterlow Bros. & Layton Ltd., 1896) for a comprehensive published breakdown of Royal Naval vessels and their official classifications, albeit some years after the fact.

⁴ For examples, see HCPP ‘Navy (Admiralty Cruisers). Return showing the number, names, tonnage, and terms under which the Admiralty chartered merchant steamers for employment as naval cruisers’ 1885 (331) XLVIII, 447, pg.1. Also HCPP ‘Navy (fighting and sea-going ships). Copy of statement of the fighting and the seagoing ships of Her Majesty’s navy on 1 January 1884, together with statements explanatory of the shipbuilding and repairing programme for 1884-85.’ 1884 (101) L, 531, pp. 1, 4-5. It appears that at least for official documentation, including parliamentary purposes, the term ‘cruiser’ was starting to be employed as an addition to other designations employed at the time, e.g. ‘corvette’, ‘sloop’ etc.: designations which it would ultimately supersede in the 1887 fleet reclassification, such types becoming cruisers of the 2nd and 3rd classes.

⁵ Most notably Grove, *Op. Cit.*, and R. Parkinson *The Late Victorian Navy: The Pre-Dreadnought Era and the Origins of the First World War* (Woodbridge: Boydell Press, 2008)

being adopted for the larger and ‘cruiser’ for the smaller naval vessels, this ‘change in nomenclature [giving] the new-age steel-built ships a sharpened focus in the public mind.’⁶

Insofar as they go, these are valid points, but there are also flaws. Most obvious of these is that two of the largest vessels laid down in the 1880s, the 9,150 ton *Blakes*, were not battleships but first-class cruisers.⁷ Moreover, there is an abundance of evidence in contemporary official papers that indicates to assess the reclassification purely in these simplistic terms is also to misunderstand the strategic and material realities of the middle and late Victorian periods. The real importance of the 1887 reclassification and rationalisation of vessel designations is that it marked the culmination of a gradual process which had begun some years earlier: ‘the growing maturity of the ocean-going battlefleet, now abandoning sail power, and making the transition back to engaging its enemies at, rather than from the sea.’⁸ It was in this mid-Victorian crucible that the cruiser, as it is seen today, was born.

The ‘Dark Ages’ reconsidered: international rivals and the domestic situation 1884-1889

The mid-Victorian period has been and frequently still is regarded as a low point in the modern history of the Royal Navy. In 1940, Marder bleakly argued that it witnessed a steady weakening of the service in terms of finance, leadership, strategic outlook and not least, material. Parkes famously denounced the period as the ‘dark ages’ and this opinion of the era was widely accepted for many years.⁹ The charge was that ‘although the cost of individual ships was rising rapidly, the Estimates were kept at round about £11 millions, and our administration was mainly a matter of waste and reckless economy which might well have succeeded in endangering the security of the Empire.’¹⁰ Another author, concurring with this

⁶ Parkinson *The Late Victorian Navy* p.204

⁷ R. Chesneau & E. Kolesnik [eds.] *Conway’s All The World’s Fighting Ships 1860-1905* (London: Conway, 1979) Pp.66 At 399ft in length, only the initial batch of *Royal Sovereign* class battleships, laid down in 1899, were longer.

⁸ Grove *Op. Cit.* p.73

⁹ Oscar Parkes *British Battleships 1860-1950: A History of Design, Construction and Armament* (London: Leo Cooper, 1990) p.230 It is possible that this phrase was influenced, consciously or otherwise, by the first of Admiral Ballard’s ‘Black Battlefleet’ papers in the *Mariner’s Mirror*. See G. A. Ballard ‘The Black Battlefleet: some notes on the mid-Victorian transformation in battleship design’ *The Mariner’s Mirror* XV (1929) pp.122-123. Ballard’s reference was, of course, purely to the fact that the battleship hulls of the 1860s and early 1870s were unrelieved black, but the similarity of phrase is striking, and while a matter of conjecture, it does not seem unlikely.

¹⁰ Parkes *Op. Cit.* p.230

general view, has gone even further, condemning it as a period in which ‘the Navy was subject to gross neglect, and weakened both in numbers and effectiveness.’¹¹

There are two basic sources from which such interpretations of the mid-Victorian Royal Navy are derived. Firstly and most obviously, they have origins in the claims made by contemporary navalist agitators.¹² There was little new about naval agitation or even feelings of insecurity, but from the laying down of HMS *Warrior* in 1859 until 1884 these concerns were rather more frequently over details of vessels than naval strength in general. A notable example from the 1860s was the lengthy press campaign orchestrated by Captain Cooper Coles for turret armament, the outcome of which was the unseaworthy HMS *Captain* and the worst peacetime disaster ever suffered by the modern Royal Navy when she exceeded her minimal stability, capsized, and sank off Finisterre with the loss of all but 18 of her crew.¹³ The regular furores raised during the 1870s and '80s (most notably by Sir Edward Reed, the former Chief Constructor of the Royal Navy) regarding individual vessels and most especially protective schemes caused considerable comment and interest, but again, largely did not develop into a wide scale concern over the relative strength of the Royal Navy *vis-à-vis* rival powers *per se*.¹⁴

The first such major naval scare for some years appeared in the September of 1884 when William Thomas Stead, ‘a clever journalist who indulged an unfortunate talent for sensations,

¹¹ Antony Preston ‘The end of the Victorian Navy’ *Mariner’s Mirror* 60/4 (November 1974) p.363

¹² See in particular John Beeler *British Naval Policy in the Gladstone-Disraeli Era 1866–1880* (Stanford: Stanford University Press, 1997); also *Birth of the Battleship: British Capital Ship Design 1870–1881* (London: Caxton Editions, 2003)

¹³ Arthur Hawkey *Black Night off Finisterre: The Tragic Take of an Early British Ironclad* (London: Airlife, 1999) p.183 Hawkey provides a list of survivors and their age and rank. Although largely unreferenced, Hawkey’s sources can be easily identified. See also the Court Martial proceedings contained in the House of Commons Parliamentary Papers

¹⁴ Reed, who resigned over the debacle of HMS *Captain* (and subsequently being proven correct regarding her lack of seaworthiness), looked askance on most vessels laid down by his successor, his brother-in-law Nathaniel Barnaby, but the *Inflexible* bore the brunt of his ire for many years. Reed favoured a full-length protective waterline armour belt over the principle employed in the *Inflexible*, viz. a central armoured citadel, with heavily subdivided soft ends. His stated belief was that were the ends to be riddled, the central armoured portion would lack sufficient buoyancy to keep the vessel afloat (later disproved). Ironically, despite his later thunderous polemic against the vessel, he also claimed to be the originator of the protective scheme employed in *Inflexible*. See *The Times*, 4 August 1873, p.4 Reed’s expressed views were frequently inconsistent and even self-contradictory on numerous matters; he was not above deliberately misrepresenting statements by others and frequently used his position in Parliament to cause as much trouble as he could for the Admiralty, in addition to regular letters and articles in the press and producing pamphlets. This unfortunately tarnishes his reputation, for he was an able warship designer and could have been of greater service to the Admiralty, or private warship firms than was ultimately the case –largely a reflection, one suspects, of his behaviour following his resignation from public service.

restarted the old business of naval panic-monger in the *Pall Mall Gazette*.¹⁵ The series of four articles: ‘What is the Truth about the Navy’; ‘A Startling Revelation’; ‘Who is Responsible for the Navy’ and ‘The Responsibility for the Navy’ (along with the often forgotten two part follow up: ‘The Truth About Our Coaling Stations’) were a demand for increased naval spending based on the premise that rival nations had substantially increased their own naval spending while in Britain the naval Estimates remained relatively unchanged. The Royal Navy was thus alleged to be dangerously weak and underfunded, rendering the security of both the Empire and Great Britain itself at grave risk.¹⁶ The trigger for the articles was the considerable increase in the French Estimates from 1878 and continuing for a five year period. The opening paragraphs of Stead’s first article established a highly populist tone:

The scramble for the world has begun in earnest. In face of that phenomenon, how far are we able to prevent our own possessions being scrambled for by our neighbours?

The answer to that question depends upon the condition of our navy. If it is as strong as it ought to be, we have nothing to fear. If, on the other hand, it is no longer in a position of incontestable superiority to the navies of the world, we are in a position of peril too grave to be capable of exaggeration.

Not only our Imperial position, but the daily bread of twenty millions out of the thirty millions of our population depends entirely upon our dominion of the sea. If that is lost, or even endangered, our existence is at stake.¹⁷

Stead was described as ‘the most powerful journalist in the island’, and there is considerable accuracy in this view, since he helped set the foundations of the modern tabloid press.¹⁸ It has been claimed that the ‘revelations of naval weakness... fell like a bomb upon a public already uneasy at the commercial and colonial threats to Britain’s world interests.’¹⁹ An alternative perspective is provided by the liberal F. W. Hirst, writing closer to the time (which he had lived through, albeit as a child), who remarks that ‘of popular panic there was no trace; but Mr. Stead and his fellow co-conspirators managed to produce a feeling of nervous

¹⁵ F. W. Hirst *The Six Panics and Other Essays* (London: Methuen and Co. Ltd., 1919) p.41

¹⁶ A. Marder *The Anatomy of British Sea Power; A History of British Naval Policy in the Pre-Dreadnought Era, 1880-1905* (London: Frank Cass, 1964) pp.121-122

¹⁷ W. T. Stead ‘What is the Truth About the Navy?’ *The Pall Mall Gazette* 6069 (Monday 15 September, 1884) p.1

¹⁸ Marder *Op. Cit.* p.121

¹⁹ P. Kennedy *The Rise and Fall of British Naval Mastery* (London: Penguin Classics, 2001) p.178

disquietude in high society'.²⁰ The actual truth in terms of the public reaction, as is often the case, lay somewhere in between.

The 'Truth About the Navy' articles and the public reaction to them are generally held to be the prime motivation for what has come to be known as the 'Northbrook programme', after the First Lord of the Admiralty, Thomas Baring, 1st Earl of Northbrook.²¹ The name of the programme is somewhat ironic given that the First Lord was out of the country at the time of Stead's publication, and did not personally believe that expenditure on additional ships was the best use of resources. Nevertheless 'in his absence it was decided to provide a further £3 million for the Navy which Northbrook announced in Parliament on 4 December –just six months after he had said that he would not know what to do with additional funds even if available!'²² The First Naval Lord (Sir Astley Cooper Key) also

threw in his lot with the agitators. In a memorandum to the Board he urged an increase in naval expenditure to keep pace with other European powers, on the ground that, with the amount being annually voted for the navy, during the next five years their present naval superiority would gradually decrease to equality with "one powerful neighbour" only; and by that time they would be inferior to two powers combined.²³

It is of course hardly surprising that the First Naval Lord would take advantage of the situation in order to obtain extra funding and ships, even if his political overlord was not in favour of such a course. All other things being equal, he would have been unsuited to his post if he had failed to do so. Cooper Key himself makes for an interesting study, inasmuch as although he was a technocrat with considerable knowledge of the new materials then emerging, he was also inherently conservative on other matters. Although far from rivalling Geoffrey Phipps-Hornby, Alexander Milne or Philip Colomb as a strategist, it is also easy to overstate his apparent lack of vision and he does not appear to have been as inept in this

²⁰ Hirst, *The Six Panics* p.42

²¹ Marder *Op. Cit.* pp.121-122

²² D. Brown *Warrior to Dreadnought: Warship Development 1860–1905* (London: Caxton Editions, 2003) p.113
Actually the Northbrook programme was around the £3.1M mark

²³ Marder *Op. Cit.* p.122 Note that Marder actually employs the anachronistic nomenclature 'First Sea Lord', which would not be revived until Admiral Sir John Fisher was appointed in 1904.

regard as some have claimed or implied.²⁴ In fact, Cooper Key agreed with Northbrook on several levels, and did not actively seek increases in the Estimates since he saw little actual requirement for additional spending, believing the service fit for contemporary requirements. With that said, although he and Northbrook shared a similar view of this matter it seems that he was also relatively easily manipulated, at least partly due to financial worries: his second wife had expensive tastes and some ascendancy over her husband, while the marriage of his daughter produced additional monetary strain.²⁵

Cooper Key had also broken a compact between himself and Admirals Hornby and Beauchamp Seymour, in which all three had agreed to refuse the post of First Naval Lord unless some reform at the Admiralty was forthcoming. However, Colomb states that Cooper Key informed the First Lord that Hornby should be appointed instead of himself when he became aware that he was to be offered the post of senior naval lord.²⁶ Whether this was genuinely meant or was a veiled apology to Hornby and Beauchamp Seymour is difficult to ascertain. Colomb points out that in principle, it would have been difficult to pass over Cooper Key in any case given his seniority, although it certainly would not have been impossible had the First Lord been willing to make the effort in favour of another officer.²⁷ What does seem clear is that, had he maintained the compact with his service friends and refused the position, it is likely they could between them have forced the government's hand on service matters if they had felt a significant requirement to do so. Nicholas Lambert has suggested that

Britain's naval leaders deliberately made little effort to educate their political masters on the true workings of sea power. For the Admiralty there was some advantage in using "vague and insubstantial" language whenever the first lord was obliged to ask Parliament for more money... whereas in the age of sail, laymen could estimate the relative strength of a fleet, in the age of industrial navies, especially during an age of rapid technological change, estimates of the fighting value of warships were highly subjective, and, thus, only professional naval officers were in a position to say with

²⁴ Beeler *British Naval Policy in the Gladstone-Disraeli Era 1866-1880* (Stanford: Stanford University Press, 1997) p.185

²⁵ A. Lambert, 'Key, Sir Astley Cooper (1821-1888)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004 [<http://www.oxforddnb.com/view/article/15494>, accessed 5 November 2010]

²⁶ P. H. Colomb *Memoirs of Admiral the Right Honourable. Sir Astley Cooper Key G.C.B. &c.* (London: Methuen & Co. Ltd., 1898) p.410

²⁷ *Ibid* pp.410-411

any authority how many ships were required to uphold naval supremacy –if such a number existed.²⁸

While a potentially polemical argument, there is a reasonable amount of circumstantial evidence spanning the period covered by this thesis, to suggest Lambert's view is not without a degree of merit. Several examples of the apparent reticence on the part of professional naval officers to give their political masters operational details are covered below, and in later Chapters.

John Beeler has identified a second source for the negative interpretation of the mid-Victorian era as being the influential strategic writers of the early 1890s, most notably Alfred Thayer Mahan, John and Phillip Colomb, who popularised the doctrine that not only Britain's national security 'but its great power status were dependent on the possession of a large fleet of capital ships, capable of beating back any challenges to its maritime supremacy through the strategy of *guerre d'escadre*.'²⁹

Recently however, these traditional assessments of the mid-Victorian era navy, and Britain's naval position during this time have also started to be reassessed. An early seed of doubt was sown by Sumida, who forwards the idea that increases 'in naval capital costs, rate of capital depreciation and overhead expenses did not pose serious financial problems during much of the 19th century, because the weakness of foreign navies enabled Britain to maintain her naval supremacy with a fleet that was neither large nor wholly up-to-date.'³⁰ Several subsequent studies have substantially expanded upon this general theme, and have re-examined the period from contemporary sources

rather than those rendered *ipso post facto*. Post-Mahanian assessments of the size, strength and war-readiness of the pre-Mahanian fleet have been almost without exception dismissive, but these assessments typically contrast the Navy of 1870 or

²⁸ N. Lambert *Sir John Fisher's Naval Revolution* (Columbia: University of South Carolina Press, 2002) pp.17-18

²⁹ Beeler *Birth of the Battleship* p.14

³⁰ J. Sumida *In Defence of Naval Supremacy: Finance, Technology and British Naval Policy, 1889-1914* (London: Unwin Hyman, 1989) p.8 Sumida further tempered this on the following page by a reiteration of the Mackinderite notion that 'the manifold effects of industrialisation not only diminished Britain's naval power, but also magnified her national danger in other ways'.

1880 with that of 1895 or 1900, rather than with the contemporary French, Russian, Italian or American navies.³¹

The tendency to view pre-Mahanian British naval policy through post-Mahanian lenses is clearly deeply misleading, since apart from its anachronism it also ‘distorts the interpretation of events prior to the Naval Defence Act.’³² It may be observed that this interpretation also appears to be paralleled by a similar propensity for anachronistically assessing the generation immediately preceding the Fisher reforms by post-Fisher criteria. Moreover, more or less accepting the claims of naval agitators at face value is dangerous, given the inevitable inherent bias involved. The relative strength of the mid-Victorian Navy should be determined by assessing whether it was capable of performing the duties required of it, viz. dealing with contemporary rivals should a conflict occur.

Throughout the period, and indeed until the signing of the Anglo-Japanese Alliance and *Entente Cordiale*, the principle naval rivals to Britain were France and Russia, and

although the British [or at least the British press] were to remain anxious about the Franco-Russian naval challenge until the events of 1905, it seems in retrospect that they probably overestimated the danger from this direction, forgetting the weakness of their rivals and seeing only those in their own fleet.³³

This is in fact a somewhat more accurate assessment of the naval situation during the mid-Victorian era. As far as the *Guerre d’Escadre* was concerned, considering France as the principle naval challenger, this is underlined by the fact that in 1870, the ratio of British to French ironclads was 40 to 30 in Britain’s favour: by 1890 this had become 96 to 78, and the gap was even wider than the figures suggest, since 11 of the latter were merely small floating batteries.³⁴ Stead’s ‘Truth About the Navy’ articles when objectively considered clearly contained very little truth about the contemporary naval situation, Kennedy pointing out that they were in effect

³¹ Beeler *Birth of the Battleship* pp.14-15

³² Beeler *British Naval Policy* p.3

³³ Kennedy *Op. Cit.* p.179

³⁴ Beeler *Birth of the Battleship* p.20

a belated, hysterical, and largely unjustified response to the ambitious French replacement shipbuilding of the early 1880s. By the time Stead published, the French naval budget, which had climbed rapidly between 1878 and 1883, was on the decline again. Discerning spectators were quite aware of not only French aims, but also the means used to finance them.³⁵

The most significant word is of course ‘replacement.’ The French building programme of the early 1880s was not a matter of naval expansion so much as one of necessity. Many of the earliest French ironclads were of wooden construction and quickly wearing out, while the extreme pace of technological progress seen during this era meant that by the early 1880s their armour was ineffective and their armament incapable of piercing the protection of newer vessels. Their date-equivalents in Britain, by comparison, were more likely to be iron-hulled and could be effectively employed for a variety of duties even in later years when they were no longer first-rank fighting units.³⁶ The vessels of the French replacement programme were also financed by a large increase in the French national debt, and a continuation of this would have been completely unsustainable over the long term. Given the state of the French economy over the period, even medium-term sustainability was out of the question.

In comparison to other nations, the situation was even more favourable, since the Russian fleet had few first-class fighting ships by the standards of the 1880s, with Germany and Austria-Hungary in a similar position, while the United States was in terms of such types nowhere, since its ironclads were all coastal monitors incapable of making ocean transit in any kind of safety. The Italian fleet had two impressive first-class fighting vessels in the early 1880s in the form of the *Duilio* class, designed by Benedetto Brin, with 4 gigantic 100 ton Armstrong built 17in muzzle-loaders in twin turrets mounted *en echelon* amidships.³⁷ These would be joined by the equally innovative *Italia* class battleships later in the decade, which have been described as forerunners of the battlecruisers owing to their heavy armament and apparently light protection (for a nominal capital ship).³⁸ However, as Beeler observes,

³⁵ *Ibid* p.22

³⁶ The wooden hulled British ironclads were also often better built, with the notable exception of the *Lord Clyde* which was built from incompletely seasoned wood (mostly oak), and fell prey to ‘timber fungus’ (presumably a form of dry rot) –see Admiral G. A. Ballard *The Black Battlefleet* (London: Nautical Publishing Co., 1980) p.84 Ballard’s account is not entirely consistent in terms of dates, but otherwise his information is sound.

³⁷ Chesneau & Kolesnik [eds.] *Op. Cit.* p.340

³⁸ *Ibid* p.341

‘provocative designs aside, four ships do not a fleet make’, and given the fact that these vessel’s predecessors were obsolescent by the 1880s, the Italian navy posed little practical threat to the Royal Navy, let alone British interests in a wider sense.³⁹

In no case did naval spending ever approach that of Britain, aside from in France during the years mentioned, in which it peaked at some £8.8 million, or around 82 per cent of that year’s Estimates in Britain.⁴⁰ The traditional two-power standard (where Britain was to possess naval strength equal or greater than any other two powers combined) was in practical terms easily maintained or exceeded, despite the trumpeting of sensationalist press. A further vital point to be considered is that even if two rival powers did indeed fight jointly against Britain they would have had almost no experience of combined fleet operations: communications and signalling would have proven difficult owing to different methods and languages employed, while neither France nor Russia, as the most probable rivals, were ever in the position of being able to dedicate more resources on their navies when relations with continental rivals were at best problematical.⁴¹

The entire naval ‘scare’ of 1884 may be assessed as having been manufactured by navalist agitators, and was indeed their first major success for some years, although certainly not their last. Much of the information that was used in the production of Stead’s articles was surreptitiously provided by John Fisher, then a Captain, and was clearly very carefully selected and presented to create the desired impression of naval weakness. This coincides rather well with Fisher’s famous remark that ‘when I was Controller I had an excellent secretary. Whenever I asked him for facts, he asked me what it was I wanted to prove! There is no doubt that facts can be most misleading.’⁴² Despite the facetious humour, Fisher’s point is a good one: naval affairs are almost always too complicated to be reduced to simple statements, numbers and tables. Whether Stead himself was aware of this or not is questionable: he was no more a naval expert than most members of the public, and unlikely to recognise that information he was given had been manipulated to produce a desired appearance. Whether he would have cared can only be a matter of conjecture, although given his proto-tabloid approach, it is probable that he had little interest. Similar assessments would

³⁹ Beeler *Birth of the Battleship* p.18

⁴⁰ *Ibid* p.22

⁴¹ Kennedy *The Rise and Fall...* p.179

⁴² Richard Hough *First Sea Lord: An Authorised Biography of Admiral of the Fleet Lord Fisher* (Bristol: Severn House, 1977) p.298

become a particular annoyance for William (later Sir William) White, both during and subsequent to his tenure as Director of Naval Construction (DNC).⁴³

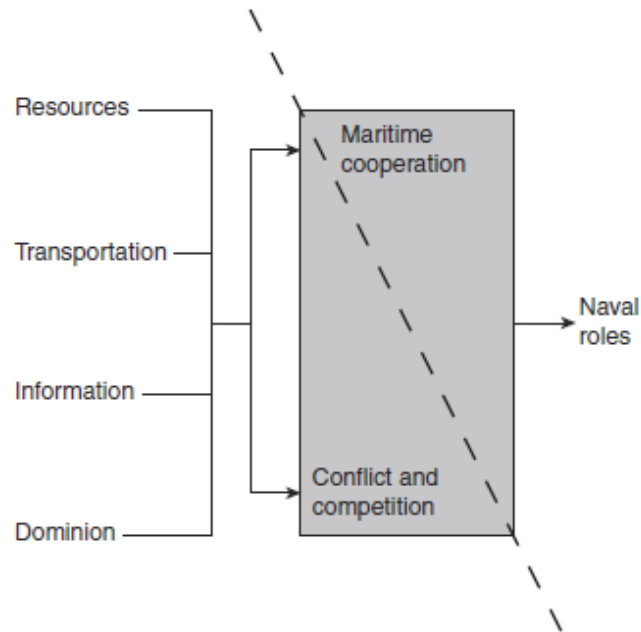
Defending the Empire: strategy during the mid-Victorian era reconsidered

The Royal Navy's basic functions during the mid-Victorian period were derived, as in any other era, from the four elemental attributes of the sea –Till's graphic reproduction is shown in Figure 1.1. The functions themselves can be usefully summarised by the Use of the Sea Triangle shown in Figure 1.2, these being the military, diplomatic and constabulary roles. The mid-Victorian period was no different to others in that the military role is the ultimate reason for the existence of a naval force, the other two forming subsidiary, though still highly important functions.⁴⁴

⁴³ See W. H. White 'A Note on "British Ships in Foreign Navies"' *Nineteenth Century: A Monthly Review* (May: 1898) pp.866-867 White would regularly take up this gambit in official correspondence, and in professional bodies such as the Institute of Naval Architects

⁴⁴ K. Booth *Navies and Foreign Policy* (New York: Holmes and Meier, 1977) p.16

Figure 1.1 Responding to the Four Attributes of the Sea



Source: Geoffrey Till *Seapower: A Guide for the Twenty-First Century* (London: Frank Cass, 2004)

Figure 1.2 The Use of the Sea Triangle



Source: Eric Grove *The Future of Seapower* (Annapolis: Naval Institute Press, 1990)

That the British fleet of the 1870s and much of the 1880s was at best heterogeneous is generally accepted, and few would attempt to argue otherwise. The era was unique in that the introduction and sporadic development of the new industrial age products had thrown development and operations into a state of severe confusion.⁴⁵ Ideally, material should be the servant of strategy, and armaments the servant of tactics, as forcibly voiced by Fisher years later.⁴⁶ Unfortunately, this is predicated upon the assumption that the contemporaneous materials are sufficiently advanced to allow the pursuit of a desired policy. This was manifestly not the case during the mid-Victorian era, when centuries of hard-won experience under sail had ‘gone by the board when the fruits of industrialisation were applied to warship design in the middle of the nineteenth century.’⁴⁷ The naval administrators of the period were the first to fully confront the phenomenon of

unceasing rapid technological change, a revolutionary, confusing, and often unsettling situation... This lack of certainty was equally evident regarding what sort of gun the Navy should employ, the type, extent, and thickness of armour, whether armour should be used at all, and whether to retain sails.⁴⁸

These problems severely affected the entire fleet -both the main battlefleet and vessels intended for operations on a wider scale. The result of these issues, the fact that the fleet lacked the cohesive nature that it would possess in the late Victorian and Edwardian periods, and the fact that the era predated Mahan has often been interpreted to mean that little or no strategic thinking existed.⁴⁹ This was far from being the case.

By the 1880s it is clear that the traditional naval rivals to Britain, most especially France and Russia, would have been unable in time of conflict to challenge the Royal Navy through the strategy of *guerre d’escadre* and appreciating this fact, increasingly moved toward alternatives in which the *guerre de course* played a significant part. In the case of France this would culminate in the rise of the *Jeune École*.⁵⁰ In consequence of the fluctuating strategy on

⁴⁵ Beeler *Birth of the Battleship* p.204

⁴⁶ Admiral Sir John Fisher in Lieut.-Commander P. Kemp [ed.] *The Papers of Admiral Sir John Fisher: Volume I* (London: Navy Records Society, 1960) p.40

⁴⁷ *Ibid* p.104

⁴⁸ Beeler *Birth of the Battleship* p.87

⁴⁹ N. A. M. Rodger ‘The Dark Ages of the Admiralty, 1869-85, Part I: “Business Methods”, 1869-74’ in *Mariner’s Mirror* 61/4 (November 1975) p.331

⁵⁰ Note that the *Jeune École* was never adopted as the official strategic approach, though its importance waxed and waned with the prevailing political interests

the part of its rivals, the British fleet during the mid-Victorian period gradually became an amalgam 'of two forces designed for two largely incompatible, if not wholly unrelated, roles. One was suited for national defence and intervention in European affairs, the other was a peacetime police force that operated almost exclusively in extra-European waters.'⁵¹

This separation can to a considerable degree be traced directly back to Admiral Sir Alexander Milne, First Naval Lord 1866-1868, and again from 1872-1876. During his second term of office, Milne became increasingly concerned about the danger fast French cruisers, operating from bases near main trade arteries, posed to British merchantmen, and this

led him to accept the dual necessity for Britain to deploy cruiser squadrons wherever her trade could be threatened as well as having the superiority in ironclads needed to blockade the main fleets of the next two maritime powers, France and Italy. Here was the germ of the worldwide naval strategy which was the core of Britain's defence posture for the rest of the century and in support of which she was eventually to go to war with Germany.⁵²

Milne has been described as 'the one flag officer of his generation with a fully developed concept of imperial strategy, and the ability to meet national needs with naval forces.'⁵³ An outstanding administrator and advocate of a steam navy, 'his professional interests lay in the fields of strategy and tactics.'⁵⁴ The overall concept Milne devised was an extremely aggressive proto-unified strategic approach in which the Royal Navy's battlefleets would immediately on outbreak of war attack opposing fleets in their own harbours. This would also deal with a good proportion of possible commerce raiders. Those that remained would be countered by cruisers stationed in specific focal areas where shipping density was at its highest, which commerce-raiders would naturally tend to concentrate upon.⁵⁵ This general

⁵¹ *Ibid* p.6

⁵² B. Ranft 'The protection of British seaborne trade' in Brian Ranft [Ed.] *Technical Change and British Naval Policy 1860-1939* (London: Hodder and Stoughton, 1977) p.2

⁵³ A. Lambert, 'Milne, Sir Alexander, first baronet (1806-1896)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn., May 2009 [<http://www.oxforddnb.com/view/article/18781>, accessed 18 Oct 2010]

⁵⁴ *Ibid*

⁵⁵ NMM MLN / 142 / 2 Draft report by Milne, 1858.

strategic approach would dominate the pre-Naval Defence Act service, and to a considerable extent beyond, in theme if not in detail.⁵⁶

The reason for the division, and the emphasis upon coast-assault with the battlefleets was the inevitable product of the rapidly increasing power of naval artillery and the inability of contemporary wrought-iron armour technology to keep pace.⁵⁷ Until the laying down of HMS *Devastation* in 1869 all of the first-class ironclads constructed for the Royal Navy were ‘cruising’ types, retaining the masts and sails necessary for operations on the high seas during the era. Contemporary simple-stage expansion engines were too inefficient to allow practical operations outside European waters without auxiliary sail power, above all since a global network of coaling stations would not be fully established until the early 1890s. This in turn further mandated high freeboard to ensure sufficient stability, a requirement the *Captain* disaster of 1870 emphasised.⁵⁸ A reasonable freeboard also significantly improved crew comfort, an often overlooked matter in maintaining running and fighting efficiency, and sea keeping in general, most notably the ability to maintain speed in poor weather or a headway.⁵⁹

Unfortunately, as the power of naval artillery rapidly increased, it became increasingly difficult for such types with their large area of exposed hull and heavy rig to carry sufficient quantities of the contemporary wrought-iron armour to withstand assault from the latest heavy weapons. The 1871 Committee on Designs of Ships of War that was set up in the aftermath of the *Captain* disaster emphasised this point, remarking that as far as first-class types were concerned

We all view with regret what presents itself to the minds of most of us as the inevitable failure of the attempt to unite in one ship a very high degree of offensive and defensive power with real efficiency under sail... But at present we find ourselves compelled to regard the attainment of this very desirable object as an insoluble problem, and we believe that our transmarine possessions, and other important

⁵⁶ Ranft *Op. Cit.* makes the further point that Milne was a member of the 1879 Carnarvon Commission, which strongly supported his general strategic views. Within the context of the era Milne does appear to have been justified in many of his views.

⁵⁷ The National Archives (henceforth TNA) ADM1/6212 *Report of the Committee on Designs for Ships of War* 26th July 1871 (henceforth 1871 Committee) pp.ix–x The Committee stated that in their view there was little reason to suppose that even 24in of iron armour plate would remain impenetrable, long term.

⁵⁸ Brown *Op. Cit.* pp. 47–51

⁵⁹ *Ibid* p.214 See further discussion on freeboard during the period 1887–1909 in Chapters 2 and 3.

interests in distant parts of the world, will be more efficiently protected by the establishment, where requisite, of centres of naval power, from which vessels of the “Devastation” class may operate, than by relying upon cruising ships of [such] limited fighting power...⁶⁰

HMS *Devastation*, a low-freeboard, mastless breastwork monitor, thus ‘marked the emergence of the cruising / coast-assault dichotomy as it pertained to first-class vessels.’⁶¹ Following her, only two further masted first-class (cruising) ironclads, *Alexandra* and *Temeraire*, would be laid down. Unlike their masted predecessors, which were capable of operations on a global scale these new, low-freeboard, mastless monitor-style designs were not intended for, and were all but incapable of, operations outside the European theatre. Blockade was also impractical owing to their modest endurance and poor sea-keeping capabilities, thus the Royal Navy’s battlefleet was optimised as far as possible for coast-assault duties. This also applied to the euphemistically titled ‘coast defence’ vessels. These have been described as ‘relatively useless.’⁶² In reality, they too were also principally intended for operations against enemy harbours and fortifications.⁶³ The most graphic illustration of the service’s intended approach to dealing with opposing fleets in the European theatre during the mid-Victorian era occurred during the 1885 manoeuvres, in the twilight of the coast-assault era, Hornby

...took his ‘menagerie’ fleet to Berehaven (Bantry Bay) in the south of Ireland, and set up a boom stretched across one of the entrances to the Berehaven anchorage. The

⁶⁰ 1871 *Committee* p.xiv The dissenting voices on the Committee in this regard were Admiral Stewart, Captain Hood and Dr. Woolley, who believed first-class cruising ironclads were capable of improvement. Note that HMS *Monarch* was one of the last of the masted first-class cruising ironclads, and aside from the unfortunate *Captain*, the only one of its type in the Royal Navy to carry turrets.

⁶¹ Beeler *Birth of the Battleship* p.108

⁶² D. Schurman *The Education of a Navy: The development of British naval strategic thought, 1867-1914* (London: Cassell, 1965) pp.40-41

⁶³ Beeler *British Naval Policy* p.23 Beeler’s suggestion that the offensive capacity of these ‘coast defence’ vessels was downplayed to avoid an outcry from the left wing of the Liberal Party seems highly plausible, since such an outcry would have likely resulted in a catastrophic split in the party itself. It is not unlikely that it would have been of sufficient magnitude to bring down a government. This point may be extended into a more general question of whether all of the implications on both national and international policy and relations had been fully thought through. To an extent, this may be viewed as rather academic, since as far as the Royal Navy was concerned during the mid-Victorian era there was no realistic alternative available owing to the limitations of contemporary material. Nevertheless, the Cabinet and Foreign Office would likely have had severe reservations about such an approach, as would many others in the country. The protests in the press about the simulated attacks on ports and their associated cities and towns of the 1888 Manoeuvres being unrealistic for wider strategic and policy reasons is instructive, and lends further weight to the idea that the RN was deliberately disingenuous in some of its vessel designations. Further research is needed on this matter.

attack on the boom by the torpedo-ram *Polyphemus* simulated an attack on a defended harbour, arguably Cronstadt. The boom was defended by four rows of observation mines ten yards apart, also 24 field guns and 24 machine guns. At 18 knots speed the *Polyphemus* steered for the boom and avoided four out of the five torpedoes fired at her. She swept through spars and steel hawsers without even a momentary check. It was a triumphant success.⁶⁴

Despite the emphasis on littoral warfare, cruising vessels still had major roles with the battlefleet. There was still a requirement for scouting vessels since they could at least ascertain the presence, numbers, more-or-less exact positions and status of an enemy before an assault on a harbour or similar naval base or station commenced. Equally, while it was preferable to destroy the enemy in harbour rather than attempt to fight at sea with vessels inherently unsuited for the task, it was appreciated that this might not be possible, and therefore large cruising type vessels would retain their heavy scouting function, while also potentially forming a fast wing capable of enveloping manoeuvres or assaulting the rear of a fleeing opponent. This would have had significant value, since many officers expected ramming tactics to play a major role in contemporary fleet actions, Lieutenant (later Admiral of the Fleet) Gerard Noel stating in his prize-winning essay to the Royal United Services Institution that

There can be little doubt of the prominent part that ‘Rams’ will play in the next naval battle... All Naval nations must have rams, and must have men who can guide them. I would go further and say that all ships ought to be rams, and that all officers ought to be practiced in manoeuvring them... no fleet can ignore the enemy’s rams so entirely as to expose its broadside to their attack. The first encounter, therefore, between two fleets equally anxious to engage, will be most likely from an end-on position.⁶⁵

Ramming tactics have been ridiculed for many years as a morbid and deeply misguided contemporary fascination, but this is short sighted. Although there were many difficulties involved, it was essentially the only effective means of sinking an enemy vessel at sea during the mid-Victorian era. Contemporary big guns were slow-firing and relatively inaccurate, thus they were unlikely to score a hit except at point-blank range. The torpedo of the era was

⁶⁴ Parkinson *The Late Victorian Navy* p.58

⁶⁵ G. Noel *The Gun, Ram and Torpedo* [Prize Essay] (London: J. Griffin & Co., 1874) pp.74-76

short-ranged, slow and unreliable, while the quick-firing guns that would dominate the 1890s and first years of the 20th Century had not yet been developed. Realistically, that left the ram as the only available option, and assuming it could be delivered effectively it made, as peacetime accidents spectacularly demonstrated, an extremely formidable weapon. As a result, many of the tactics and procedures of the era which have also been criticised make somewhat more sense if considered in such a context. No less a strategist than Philip Colomb would remark in (inevitably prolix) papers addressed to the Royal United Service Institution that ‘the serious part of a future naval attack does not appear to be the guns, but the rams.’⁶⁶

Colomb today lacks the prestige of Alfred Mahan and Sir Julian Corbett, but a case can be made that, as Alexander Milne was primarily responsible for the Royal Navy’s strategic outlook during the mid-Victorian era, he, along with Sir Geoffrey Phipps-Hornby, Sir George Tryon, and some younger officers like John Fisher and Gerard Noel was at least in responsible for the Royal Navy’s tactics. The enormously complex Signal Books were also largely his creation, and while rightly condemned by many officers and historians over this point of complexity, ramming and end-on tactics also suggests a slightly different perspective.⁶⁷ Ramming a ship that did not wish to be rammed in an individual action was extremely difficult; in a fleet action, where independent manoeuvring abilities were heavily circumscribed for obvious reasons, it became somewhat more practical. Therefore, while the Signal Books were overly complex and a cause of many problems, in such an environment, the fleet that could maintain the best cohesion and manoeuvre most precisely would almost certainly be the victor. Within this tactical environment, anything that could disrupt an opponent’s cohesion would be an advantage, thus large, swift cruising types engaging in flanking manoeuvres, distracting the outer portions of a fleet and potentially causing havoc with enemy signalling could play a vital role.

Coast assault, and the popularity of ramming tactics (if only as an interesting academic exercise for off-duty officers) only began to dwindle with advances in material; most notably the introduction of the triple-expansion reciprocating engine, the widespread use of steel, and the development of compound armour. The first of these saw a considerable improvement in efficiency and economy for a given weight. Steel allowed for lighter and stronger structures,

⁶⁶ P. Colomb ‘Modern Naval Tactics’ *Journal of the Royal United Service Institute* (henceforth *RUSI*) Volume IX (1865) p.22

⁶⁷ Gordon *Op. Cit.*

while compound armour, which featured a hard steel face welded to a tough iron back provided a substantial improvement in protective ability for a given thickness of plate.⁶⁸ The *Admiral* class, and the one-off HMS *Collingwood* on which they were based are often considered to be the first step back toward an ocean-going fleet, although they were themselves an uneasy compromise, featuring the low-freeboard hull of a coast-assault vessel with barbette armament more suitable for seagoing operations.⁶⁹ This was less-than-ideal, since barbettes offered little protection against plunging fire that could be expected from shore batteries, while the low-freeboard hull ensured they were unable to maintain high speed in a seaway –something that was sharply criticised during the annual Manoeuvres of 1889.⁷⁰ Nevertheless, the type for all its faults did indicate a way forward that would later be fully exploited, and it was this increasing ocean-going capacity that the 1887 reclassification of the fleet reflected.

In the aftermath of the fleet reclassification of 1887 (and the 1889 Naval Defence Act) the majority of the earliest, masted high-freeboard ironclads would eventually come to be rated as first-class cruisers or third-class battleships.⁷¹ Although this could be interpreted as an attempt to keep elderly vessels on the active list by down-rating them, their being reclassified as cruisers was also highly practical. Since vessels outside the European theatre would be unlikely to meet first-class fighting units, the relatively weak armour and armament of these early ironclads was not a major handicap. They were also relatively swift, having good sea-keeping and hull-forms. Indeed, even in 1897 Charles Beresford was still advocating the use of ‘four of the armoured cruisers which could be made serviceable and efficient fighting vessels *if re-armed*.’⁷² Beresford additionally made the case for several of the later masted cruising type ironclads that had been classified as 3rd class battleships to be re-armed in the

⁶⁸ Chapter Two examines the development of armour in greater detail

⁶⁹ The original turret was essentially a large armoured pillbox sitting on a turntable. The barbette was subtly different in featuring an armoured tube, with the turntable moving only the top plate, with the guns affixed to it. As a result it was much lighter, particularly in its original form, when the guns were exposed, without any form of shield protection. Only later would armoured shields be added, until the weapons were finally fully enclosed in a gunhouse, becoming the modern ‘turret.’

⁷⁰ 1889 Manoeuvres Report cited in Parkes *Op. Cit.* p.319

⁷¹ See TNA ADM 8/166-172; also Gibbs [Ed.] *Op. Cit.* In practical terms, there was little functional or operational difference between these nominal classifications

⁷² Captain the Right Honourable C. Beresford ‘On the fighting value of certain of the older ironclads if rearmed’ *Transactions of the Institute of Naval Architects* (henceforth *TransINA*) Volume XXXVIII (1897) p.199 The vessels in question were *Northumberland*, *Agincourt*, *Achilles* and *Minotaur* which were amongst the earliest cruising / masted ironclads to be built by Britain, and had been re-rated as cruisers some years earlier. By this point, with new modern cruisers built under the Naval Defence Act emerging, their value was significantly reduced compared to what it was at the start of the decade.

same fashion.⁷³ The subsequent discussion indicated a certain amount of sympathy for Beresford, although it is perhaps more interesting to note that there was little in the way of advocacy for removing the vessels from the list of Ships in Commission, still less from the Fleet Reserve.⁷⁴

Outside of fleet operations and the European theatre, cruising types also had their traditional function of trade defence. As outlined above, the preferred means of achieving this began to be developed by Milne around 1858. During his second tenure as First Naval Lord, Milne produced multiple memoranda on the subject, in which it was argued that in addition to explicitly offensive operations by the main battlefleet some fifty or sixty fast British cruisers should be stationed at eighteen specific focal points he identified where shipping density was highest, with telegraph stations being extensively employed for the reporting of intelligence information.⁷⁵ Enemy cruisers wishing to attack British trade, Milne argued, would naturally gravitate to such locations where shipping was concentrated. Two or three cruisers would be stationed at each of the stations identified, the remainder of the fifty to sixty vessels being made up of relief and intelligence-gathering vessels.⁷⁶

Since Milne was a member of the Carnarvon Commission of 1879, he was able to use it as a platform to help forward the doctrine he outlined.⁷⁷ It would be confirmed and elaborated upon in 1885 in a report by the Foreign Intelligence Committee 'The Protection of Commerce by Patrolling the Ocean Highways and by Convoy', which proposed the use of eighty-three cruisers and seventy-five mercantile auxiliaries for the protection of trade routes.⁷⁸ This

⁷³ *Ibid* p.200

⁷⁴ *Ibid* pp.219-239 This could be held as an instance of conservatism, but even at this late stage, it is worth considering whether the basic vessels themselves, despite being relatively elderly, could have had any use. To an extremely limited extent, this seems probable, although clearly it could not last for much longer. See FitzGerald's remarks during the discussion following Beresford's paper, that 'they are an element of power, although not very great.' p.221

⁷⁵ TNA CAB 17 / 3. Secret. 'The Protection of Ocean Trade in Time of War' (contains brief summary of Milne's paper[s]) Meeting referred to dated 31 April 1905; NMM MLN / 144 / 3 / 1 'Paper Relative to Unarmoured Ships for Protection of Trade' (Copy)

⁷⁶ N. Friedman *British Cruisers of the Victorian Era* (Barnsley: Seaforth, 2012) p.17

⁷⁷ B. Ranft 'The protection of British seaborne trade and the development of systematic planning for war, 1860-1906' in B. Ranft [ed.] *Technical Change and British Naval Policy 1860-1939* (London: Hodder & Stoughton, 1977) p.2

⁷⁸ TNA ADM 231 / 6 Foreign Intelligence Committee Report No. 73 'The Protection of Commerce by Patrolling the Ocean Highways and by Convoy' May 1885 The report also contained a second, substantially reduced proposal for thirty-eight cruisers and thirty-seven auxiliaries detailed to this role assuming the majority of the enemy fleet was either successfully destroyed or blockaded. The use of mercantile auxiliary cruisers garnered considerable attention from the 1870s onward, one of the most useful papers

scheme was viewed as an alternative to convoy, which was believed to have been rendered unsuitable for the protection of contemporary shipping for a variety of reasons, which may be outlined as

- (1) Steam power was not subject to potential delays in dangerous waters, unlike sail, which was always at the mercy of the wind, and therefore had far greater flexibility in choosing the time and exact route
- (2) The assembly of a convoy could not be kept secret due to modern communications techniques, such as telegraph, wireless &c., while the mass of smoke would tend to give away its position and draw enemy commerce raiders
- (3) For commercial reasons, too much time would be lost in assembling, and unloading cargo owing to a number of ships arriving in port at the same time
- (4) Foreign trade was so much larger than it had been in the past, it would be impossible to convoy more than a small percentage of this shipping.⁷⁹

An additional, uncomfortable reality was that the Royal Navy did not possess cruisers that were capable of operating with the fastest merchant vessels, either in terms of speed or endurance (a consequence of the differing requirements of naval and mercantile vessels rather than any lack of skill on the part of naval constructors).⁸⁰ Thus, Milne's concept of focal area defence as a part of a wider integrated strategy was seen as the most effective and realistic of the available options, though it was not made, or considered suitable for, public consumption. The only other alternative, that of patrolling the trade routes with cruisers was rejected as impossible on account of the number of vessels it would require.⁸¹

Milne's system would be refined over time, the main later development being 'to analyse trade routes to decide exactly what areas demanded cruisers' but the basic approach remained in essence unchanged.⁸² In these later refinements, larger first-class cruisers would be stationed at the most critical of the identified regions, and / or between several, thereby offering potential heavy-support to smaller vessels, or to use their greater range and sea-

by Nathaniel Barnaby 'The fighting power of the merchant ship in naval warfare' *TransINA* Volume XVIII (1876) pp.1-23

⁷⁹ TNA CAB 17/3 pp.34-35

⁸⁰ Friedman *British Cruisers of the Victorian Era* p.18

⁸¹ *Ibid*

⁸² *Ibid*

keeping capabilities to hunt down escaped raiders. The use of wireless and electric telegraph, along with passing shipping for the purposes of intelligence gathering and communication of the enemy's movements would become an increasingly important aspect to the general approach.

Although objections have been raised on the grounds that raiders could have transferred their activities elsewhere and would have been able to continue their depredations unhindered, this fails to account for the fact that foreign vessels engaged in a *guerre de course* did not possess an unlimited coal supply, and were circumscribed in their movements and radius of action by the limited number of coaling stations practically available to them. For their voyage to be worthwhile, enemy commerce raiders would have had little alternative but to risk entering regions where shipping concentrated, in the process markedly increasing their risk of interdiction by British cruisers stationed in the area.

The rejection of convoy in favour of focal area defence has been heavily criticised, mostly it would appear due to its failure during the Great War 1914-1918 to protect against the U-Boat *guerre de course*. This however ignores the fact that the U-boat's success was almost entirely due to the unique nature of the attacker. In the absence of this, there seems little evidence to suggest the strategy, in conjunction with blockade (or, as in the mid-Victorian era, a direct assault on the enemy while they were still in their bases) would not have worked. In fact, precisely this strategy was successfully used to hunt down German surface raiders during the opening months of the First World War: all such surface raiders that had been at sea in August 1914 had been chased down by December.⁸³

It should be stressed however that not all contemporaries ruled out the convoy system. To be sure, quite apart from the technical issues it is clear from the evidence given to the Carnarvon Commission that the majority of ship owners and those with commercial interests did not wish for their trade to be interfered with in any way by the Admiralty, but while they may have held concerns over profit losses if convoy was applied –concerns which, in the aspirational Victorian society, were understood, if not necessarily appreciated or agreed with by most in the service and elsewhere– nor were they devoid of common sense. In a paper at the Royal United Services Institute, Philip Colomb pointed out the sensitivity of commerce,

⁸³ Beeler *Birth of the Battleship*. pp.25-26

and that in his view, if a naval war were declared and a valuable English ship was known to have been captured, many merchants or ship owners would have likely been willing to delay their vessels sailing if it was known that this would allow them to travel in company with a warship.

...It almost seems that whenever the markets allowed of it the merchant and the ship-owner would ask for convoy at the hands of the Government just as in older days, unless they were well assured that the enemy's cruisers were entirely masked by our own fleets and cruisers.⁸⁴

A difficulty that cruising vessels faced in the mid-Victorian era was that in addition to being able to chase down unarmoured commerce-raiders, they were often also expected to be able to deal with opposing 'station ironclads'—effectively second-class battleships intended for use on foreign stations and challenging for local command of the sea.⁸⁵ The same technological issues which restricted the capabilities of first-class fighting vessels also caused problems for these units intended for use on foreign stations. Sail was particularly necessary until the development of the triple expansion engine, along with an expansion of the global coaling network that could support a wholly steam-powered navy.⁸⁶

The quandary faced was basically an insoluble one, largely caused by the introduction of armour. The traditional approach of designing moderately sized second-class ironclads, and swift, unarmoured cruising type vessels to counter their equivalents was turned on its metaphorical head by the introduction by foreign powers (notably Russia, and later, France) of swift armoured commerce raiders. Station-ironclads lacked the speed to catch this new breed, while the unarmoured vessels, though possessing sufficient speed, lacked protection.⁸⁷ However, since rival nations continued constructing station-ironclads, the type could not be completely discontinued.⁸⁸ As a result, British cruising vessels for some years were an uneasy compromise that attempted to address all three of the basic roles defined above. HMS *Shannon*, sometimes called the first armoured cruiser (she was

⁸⁴ P. Colomb 'Convoys: are they any longer possible?' *JRUSI* Volume 31 (1887/1888) pp.311-312

⁸⁵ Beeler *Birth of the Battleship* pp.198-199

⁸⁶ *Ibid* p.203

⁸⁷ The *Inconstant* and *Volage* types of the 1860s and early 1870s are examples of the latter. How accurate this assessment would have been proven in practice is open to question, but although at an obvious disadvantage, it is possible that unarmoured types would have stood a chance of disputing terms if handled correctly. The primary duty of a commerce raider is to raid commerce, not to become involved with naval opponents, and given that the Royal Navy had a substantial advantage over other nations in terms of global bases even during this era, any damage to the commerce raider might have negated its effectiveness.

⁸⁸ Beeler *Birth of the Battleship* p.183-184

officially designated as a ‘broadside, armour-belted cruising ship’) in the Royal Navy was a failure primarily for these reasons.⁸⁹ It would not be until the *Imperieuse* and *Warspite* of 1881 that any significant advance was made, largely through accepting that a general type was impractical and placing a greater design emphasis upon the cruiser aspect of their duties.⁹⁰ Nevertheless, Beeler contends that even with these vessels and the seven *Orlando* class that followed there was still a significant desire to produce a multipurpose type capable of tangling with station battleships, and points to their thick (but narrow) waterline armour belt as evidence of such wishful thinking.⁹¹ This assertion seems highly questionable though given that the means of protecting cruisers was a hotly debated one, and during the design stages of the *Orlandos* stages it was in fact discussed whether the type should carry a waterline belt of armour plate, or employ the alternative method of utilising an internal curved armour deck.⁹² That the belted type was favoured by the Civil Lord, George Rendel, is actually rather more surprising than otherwise since he had himself designed the first recognisably modern cruiser (the *Esmeralda*) when he worked at the Armstrong armaments firm, the key element to her success being the use of the protective deck system rather than an armour belt.⁹³

In a tactical sense, most of these vessels would operate individually or in small groups on foreign stations in the commerce-protection role, as indicated above, and would only be employed in greater force should there be an equivalent to deal with in the vicinity. Single ship actions, as may be anticipated, did not emphasise the ram (or the torpedo) as much as contemporary fleet actions, since with room to manoeuvre such tactics were largely ineffective, assuming the opposing captain was competent at handling his vessel, and the gun remained the predominant weapon. Although predating the true Quick-Firer, the lighter calibre weapons commonly used were substantially faster firing and loading than the big guns of a first-class fighting unit / battleship, and thus more likely to score a hit at modest ranges by quantity of fire and the law of percentages.

⁸⁹ Brown *Ibid* p.69 The need for some form of rationalisation of vessel designations becomes obvious. She was crewed to the level of a second-class battleship, which in practice, was exactly what *Shannon* was.

⁹⁰ N. Rodgers ‘British Belted Cruisers’ *Mariner’s Mirror* 61/4 (February 1978) p.32

⁹¹ Beeler *Birth of the Battleship* p.203

⁹² Brown *Op. Cit.* p.113

⁹³ See Chapter Two for a detailed consideration on the subject of contemporary armour types and protective schemes

The First New Builds

The first vessels to be laid down as ‘cruisers’ were the four 2nd class *Leanders*.⁹⁴ Modified versions of the *Iris* class dispatch vessels, with a 6in Breech Loader (BL) armament and a protective deck, these, together with the somewhat adapted follow-on *Mersey* class, may be regarded as the basic model from which all cruisers built for the Royal Navy would be derived for the next fifteen years.⁹⁵ Arguably of more practical significance in themselves, and the direct product of the Northbrook programme, were the aforementioned 7-stong *Orlando* class, laid down between 1885-1886, and completed during 1888-1889. These vessels were also amongst the first to be specifically designed, laid down and built under the ‘cruiser’ cognomen.⁹⁶

On their 5600 ton displacement and 300ft between points, the pretty *Orlandos* carried two 9.2in chase guns and ten 6in BL, and were amongst the first RN vessels to be fitted with triple-expansion engines, giving a trial speed on the order of 19 knots.⁹⁷ Figure 1.3 shows an elevation and deck plan of the *Orlando* class from the 1902 edition of *The Naval Annual*. Essentially, they were enlarged versions of the *Mersey* class with a shallow 10in compound armour belt.⁹⁸ Speaking in his role as Secretary of the Admiralty on 2 December 1884 Sir Thomas Brassey placed some emphasis upon the latter feature, humorously commenting that the Right Hon. Sir Edward Reed, who was sitting behind him during his speech, would doubtless approve.⁹⁹

⁹⁴ HCPP ‘Navy Estimates for the Year 1884 – 85 with Appendix 1884 (76) LI, 1, p.210

⁹⁵ Chesneau & Kolesnik *Op. Cit.* p.75

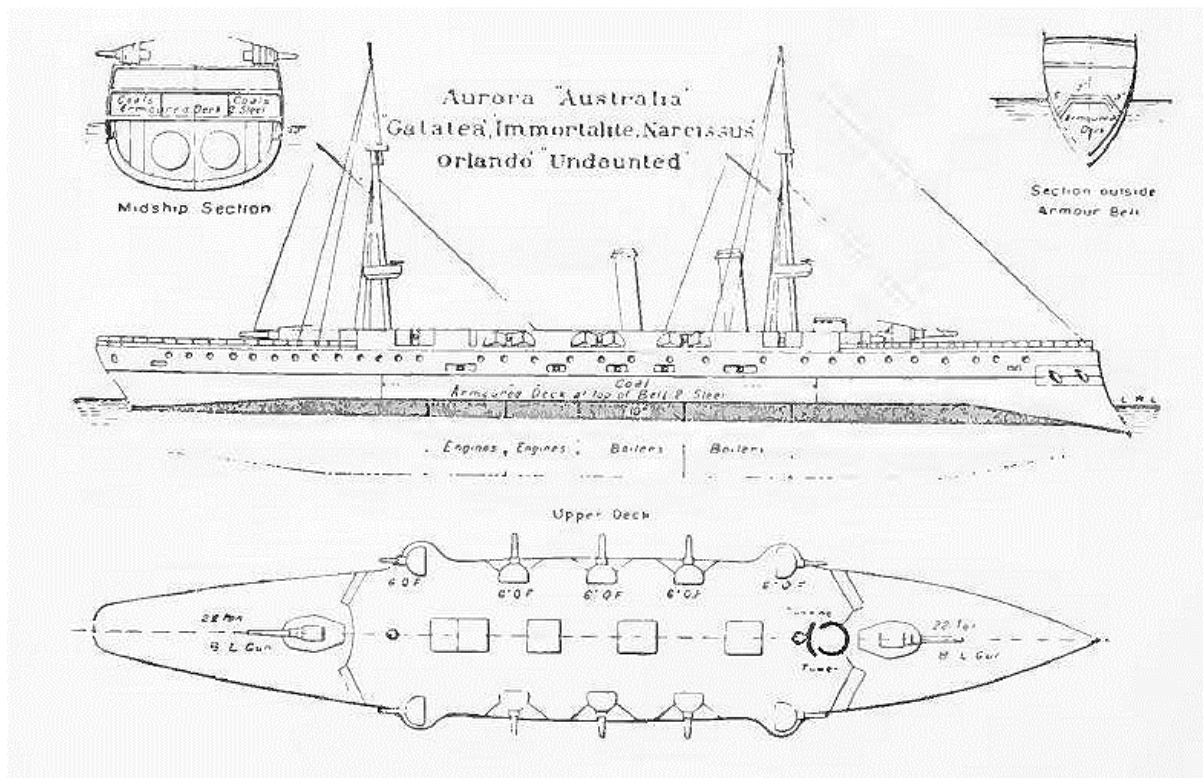
⁹⁶ *Ibid* p.65

⁹⁷ *Ibid* Note that the design speed with forced draught was 18 knots; all exceeded this specification, although the trials speeds were run light

⁹⁸ Compound armour consisting of a hard steel plate welded to a softer wrought iron back. See Chapter Two

⁹⁹ Hansard: House of Commons vol. 294 c455 (2 December 1884) Sir Thomas Brassey, Secretary to the Admiralty

Figure 1.3 Elevation and plan of *Orlando* class cruisers



Source: T. A. Brassey [ed.] *The Naval Annual*, 1902 (Portsmouth: J. Griffin & Co., 1902)

Plate 2

In point of fact, the *Orlandos* floated approximately 18in deep with the result that the top of their narrow armour belt was on the load water-line, and was often somewhat below, rendering its protective properties almost worthless, given that it had been provided to defend the waterline.¹⁰⁰ They were the last British first class cruisers to possess an armoured belt until the *Cressy* class of 1899. Rodger was scathing in his assessment of them, claiming that the design of the Orlando class

served to epitomize the faults of the old system of which they were the last products. They were the last belted cruisers ever constructed for the Navy, and when armoured cruisers were again built at the end of the century, it was to very different models... it was no longer sufficient that the *Orlandos* were a great improvement on their predecessors; they were compared with their rival designs, existing and projected, and they were found wanting. In particular, the protected cruiser seemed to offer far better cruiser qualities for only a notional sacrifice of fighting capacity.¹⁰¹

This view was shared by William White, who, having left the Admiralty at this point for a commercial post at Armstrong's Elswick yard, remarked in January 1885 that 'The use of thick and costly side armour instead of a sloping deck of equal defensive power I think is a mistake. The speed is also too low. For equal cost I think we could produce a swifter and more powerful ship.'¹⁰²

A slightly different perspective is provided by the irascible Penrose Fitzgerald who, while regarding them as 'a travesty –a burlesque – of the principles of a belted ship, or endeavouring to protect stability or buoyancy by armour', like former Chief Constructor Sir Edward Reed, still favoured side-armour belts for major naval vessels, including cruisers.¹⁰³

Assessing the *Orlandos* from a historical perspective is difficult. As Rodger points out, had the autumn of 1884 given more time for reflection, they might not have been built to the

¹⁰⁰ Brown *Warrior to Dreadnought* p.113

¹⁰¹ Rodger's *Op. Cit.* p.34

¹⁰² William White, letter to Captain Noble dated 26 January 1885, cited in F. Manning *The Life of Sir William White, K.C.B. F.R.S.* (London: John Murray, 1923) p.158

¹⁰³ Captain C. C. P. Fitzgerald remarks in discussion subsequent to the paper by J. H. Biles 'Comparative effects of Belted and Internal Protection upon the Other Elements of Design of a Cruiser.' *TransINA* 28 (April 1887) p.345

design they were.¹⁰⁴ Although quickly rendered obsolescent, the *Orlando* class vessels do appear to have been at least a reasonable match for contemporary cruisers, and well suited to their trade protection role and for use on foreign stations. Despite the major error regarding their displacement, which left their protection almost invariably submerged and all but valueless, they had a powerful armament for the era and their triple expansion engines provided a decent turn of speed and range when coupled with their 900t nominal coal supply: exactly what was required for commerce protection. Their successors, the defensive protection and the armour belt *verses* the internal protective deck, along with White's design views and influence are considered in detail in Chapter Two.

The mid-Victorian origins in perspective

The mid-Victorian era had been a period of confusion and conflict wrought by the introduction of an array of new technologies, many of which were initially debilitating in the strategic and tactical senses. Most significant of these were issues of propulsion, armour and armament. For a time, both strategy and tactics by necessity were forced to react to and reflect the material realities of the era. The fact that developments in the various major fields of warship engines, protection and armament were sporadic, and the pace of change so rapid that a vessel could be obsolete on completion did not help matters. The period of confusion would end however, and by the mid-1880s, the disparate material technologies had started to attain a reasonable level of maturity: these improvements would be quickly seen in a new generation of vessels that made a substantial jump in capability over their predecessors. Nevertheless, these vessels would owe much to the groundwork that had been laid down, and the mid-Victorian Royal Navy was by no means the weak, underfunded, hidebound and poorly led force it is still frequently believed to be. Though far from perfect, it was during this period that the cruiser-type would gradually emerge in the Royal Navy, and much progress was also made in strategic thought, most notably regarding the best means to protect the enormous British mercantile fleet and interests. Admiral Alexander Milne established the model for trade-defence that would be employed (subject to periodic mild revisions) throughout the period covered, and despite the many misunderstandings that have plagued this subject, the system of focal area defence appears sound, and would later prove highly

¹⁰⁴ Rodger *Op. Cit.* p.34

effective in the Great War 1914-'18 until a new threat in the form of a submarine *guerre de course*, which had not previously existed, emerged.

Chapter 2

Birth of the Battle-Cruiser: Strategy and Design 1888-1894

Chapter One established the strategic, tactical and material origins of the first-class cruiser during the mid-Victorian era. Although for many years regarded by historians as a period of stagnation in the Royal Navy, with little in the way of strategic thinking and a chaotic approach to design, this has been demonstrated to be too simplistic an assessment. Strategic thinking there was, but it was to a considerable extent necessarily governed by the material realities of the age. To be sure, there was confusion and disagreement amongst senior officers and designers, but given the pace of technological change and the lack of naval conflicts from which to draw guidance this was an rather an inevitability than otherwise, and much of this was a matter of detail, or caused by attempting too much on restricted displacements.

Such periods of uncertainty inevitably end however, and as the new technologies attained a reasonable degree of maturity by the final years of the 1880s, so the strategic outlook of the Royal Navy, and that of the whole nation began a transition toward a more traditional model akin to that of the sailing era. Thus began a process which would culminate in the first-class cruiser effectively supplanting the ‘traditional’ concept of the line-of-battleship. This chapter examines the presence and progression of the type during the period 1888-1894, along with several of the key figures involved in their development, most notably being the Director of Naval Construction Sir William White. It was in this time that trade defence against the possibility of an organised, systematic *guerre industrielle* received greater interest in response to perceived threats from the traditional French and Russian rivals. The various means of achieving this, and what type of cruiser would best meet the requirements of the day were the subject of much contemporary debate. It was also during this time that the term ‘battle-cruiser’ was first voiced to describe the new breed of vessels being constructed.¹

¹ Rear-Admiral Samuel Long, Associate, Member of Council ‘On the Present Position of Cruisers in Naval Warfare’ *TransINA* Volume XXXVI (1893), p.3 Note the hyphenation of the original terminology employed by Long

The Strategic Environment & the guerre de course 1888-1894

The importance of viewing vessels in their proper context is a perennial issue. As early as 1888, Director of Naval Construction William White was obliged to point out in discussion at the Institution of Naval Architects, that

...it is sometimes forgotten that we do not build our ships to fight other ships of the Royal Navy, but must design with reference to what is being done abroad... In considering the offensive and defensive qualities which our ships should possess, regard must obviously be had to existing vessels of other nations, and to those in the course of construction.²

The Royal Navy of the late 1880s, as established in Chapter One, underwent a paradigm shift in its approach to strategy. The ironclad fleet of the mid-Victorian era had largely bifurcated as a consequence of the limitations of contemporary materials. With the traditional policy of close-blockade impossible, the service adopted a strategy of littoral warfare and built dedicated first and second-class coast-assault vessels capable of 'slugging it out' with forts, or battering their way into defended harbours and destroying enemy fleets still at anchor.³ Simultaneously, cruising vessels (ironclad or otherwise) capable of seagoing operations on a global basis were also required for those duties the coast-assault types were incapable of performing, and again, both first and second classes of this type were produced.⁴ In the late 1880s, with a degree of technological maturity attained, the coast-assault combatants would slowly develop into the seagoing line-of-battleship of the late 1880s, while the cruising ironclads would evolve into the first-class cruisers of the post-fleet-reclassification era.

Admiral Samuel Long in 1893 summarised the roles of Royal Navy cruisers during this period as falling into three basic categories

² William White, in discussion on paper by Captain C. C. Penrose FitzGerald, R.N., Associate 'On Unarmoured Waterlines in Warships' *TransINA* Volume XXIX, p.199 Note that White was knighted in 1895

³ J. Beeler *Birth of the Battleship: British capital ship design 1870-1881* (London: Caxton, 2003) p.90

⁴ *Ibid*

- (1) To act as look-out ships or scouts for fleets
- (2) To act independently of fleets for the protection or attack of commerce, as well as for distant operations
- (3) To convoy slow steam traders⁵

The first and second of these are obvious enough, and were accepted by the service as a whole; the third point, that of convoy escort, was a rather more contentious matter since convoy had, as discussed below and in the previous chapter fallen out of general favour since the late 1860s.

At this time, France and Russia formed the principal naval rivals to Britain, as they had during the mid-Victorian era and indeed it was taken as axiomatic by the Board that France in particular was the major naval opponent to be countered.⁶ Italy was gradually building or acquiring a respectable fleet, but was little threat to British global interests, though it was naturally a factor to be considered in the Mediterranean. Much the same applied to Germany, and to lesser extent, Austria-Hungary. All possessed vessels of reasonable to good capability, but numbers were few, colonial possessions limited, and as continental powers, their strategic priorities differed considerably from those of Britain. As had occurred in 1884 however, navalist agitation in conjunction with the latest French invasion-scare triggered an even more widespread public clamour for naval expansion.⁷ The on-going British occupation of Egypt following the 1882 war was a major source of tension, and it was trumpeted by navalist agitators that a major expansion of, or upgrade to the fleet was essential to counter the potential threat from across the channel, above all if this was supplemented by support from Russia. In material terms, this was at best an exaggeration in the short and medium term, though the practical / material realities were somewhat less important diplomatically speaking than matters of appearance. The size of the fleet had become ‘politically outdated.’⁸ Lord Salisbury, in response to this alleged menace

⁵ Rear Admiral Samuel Long ‘On the Present Position of Cruisers in Naval Warfare’ *TransINA* Volume XXXIV (1893), p.4

⁶ C. Lowe *Salisbury and the Mediterranean, 1886-1896* London: Routledge & K. Paul, 1965) p.41

⁷ J. Sumida *In Defence of Naval Supremacy: Finance, technology and British naval policy, 1889-1914* (London: Unwin Hyman, 1989) p.11

⁸ Lady Gwendolyn Cecil *Life of Robert, Marquis of Salisbury* Vol. IV (London: Hodder & Stoughton, 1932) p.187

found himself now compelled to enter England in that race whose progress on the Continent had called from him such earnest warnings of danger. At the close of his speech he hinted that, apart from the actuality of strategical calculation, the panic of that summer had been an evil whose recurrence could not be risked.⁹

At least some of the agitation for increased naval expenditure can be traced to the influence of the armament industry and the related heavy engineering trades that benefitted from naval construction programmes. Marder quoted the *Iron and Coal Trades Review* which on Valentine's day 1902 boasted: 'There are no interests that have more directly and more largely benefitted by our improved navy than the iron and steel industries.' The Admiralty had 'been like a fairy godmother to the steel and iron industries of the country and to the many auxiliary trades.'¹⁰ Navalist agitation also coincided with a somewhat improved national financial situation. During the first half of the 1880s budgets had been constrained by the necessity of paying off loans from the late 1870s that had been taken to cover the costs of colonial wars; after 1885 Britain avoided major confrontations with great powers in the colonial sphere, and as a result,

...large budget surpluses were thus achieved in the late 1880s in spite of a slight fall in the level of revenue. And in 1888, G. J. Goschen, the Chancellor of the Exchequer, put through a conversion scheme that achieved a considerable decrease in the cost of servicing the National Debt that was to become effective from April, 1889. By the end of the 1880s, it had thus become possible to spend much more on the navy without recourse to the politically dangerous alternatives of borrowing or greatly increased taxation.¹¹

The Board's position at this time is interesting, and somewhat equivocal. It has been suggested that the naval lords did not believe that there was any requirement for a substantial increase in construction, the First Naval Lord Arthur Hood testifying to the 1888 House of

⁹ *Ibid*

¹⁰ Arthur Marder *The Anatomy of British Sea Power: A history of British naval policy in the pre-Dreadnought era, 1880-1905* (London: Frank Cass, 1964) p.24 Although his analysis has in many areas been overtaken by revisionist authors, Marder's work on this point continues to carry some weight. Certainly, as a matter of enlightened self-interest, the armaments, and wider British industry were hardly likely to attempt any cuts to naval expenditure, and the considerable profits this brought to their respective companies

¹¹ Sumida *Op. Cit.* p.12

Commons Select Committee on Navy Estimates ‘that in general, he and the other naval lords were satisfied with the strength of the Royal Navy.’¹² However, there were almost certainly other factors at work. Hood inherently ‘was not enamoured of theoretical speculation on a public platform, particularly one set up by Lord Charles Beresford.’¹³ It is therefore possible, or even probable that he was simply playing his cards close to his chest, in a similar way to how his predecessor, Cooper-Key may have been on the subject of trade defence some years earlier in his evidence before the Carnarvon Commission. This speculation is lent greater credence by the fact that in June 1887, the DNC sent a memo to the Board ‘drawing attention to the number of ships which were obsolescent, or would become so within the next five years. His paper included very detailed proposals for the number and type of replacement ships together with planned building schedules, and a detailed estimate of the rate of spending.’¹⁴ It scarcely seems necessary to point out that Hood was perfectly aware of this, and he participated with the rest of the Board in submitting a memo to Cabinet on 1 December 1888 recommending an extensive construction programme very similar to White’s proposals of the previous year.¹⁵ In the face of popular support (or at least populist agitation) for greater naval expenditure, the proposed programme was further augmented by Cabinet to include an extra five cruisers.

The provisions of the Naval Defence Act that directly have been covered by several authors and will not be repeated here in great detail.¹⁶ In broad terms, the Bill passed by Parliament 7 March 1889 authorised the spending of £21,500,000 sterling over a five year period on a large programme including ten battleships, forty-two cruisers, and eighteen torpedo gunboats.¹⁷ This broke down into the following classes:

¹² *Ibid* p.13

¹³ A. Lambert ‘Hood, Arthur William Acland, Baron Hood of Avalon (1824–1901)’, Oxford Dictionary of National Biography, Oxford University Press, 2004 [<http://www.oxforddnb.com/view/article/33966>, accessed 19 December 2011] ‘Charlie B’ was one of the main navalist agitators of the age. An able naval officer at this stage of his career, though a chronic self-publicist a severe personality clash with the severe Hood was an inevitability

¹⁴ D. Brown *Warrior to Dreadnought: Warship development 1860-1905* (London: Caxton, 2003) p.124

¹⁵ HCPP ‘Navy Estimates for the Year 1888 – 89 with Statement by the Financial Secretary Descriptive of the Rearrangement of the Votes and Explanation of Differences.’ 1888 (71) LXVIII, 1

¹⁶ Most notably Marder *Op. Cit.*, , Sumida *Op. Cit.*, and recently, albeit in a rather disorganised fashion, R. Parkinson *The Late Victorian Navy: The pre-Dreadnought Era and the Origins of the First World War* (Woodbridge: The Boydell Press, 2008)

¹⁷ L. Sondhaus *Naval Warfare, 1815-1914* (London: Routledge, 2005) p.161; Sumida *Op. Cit.* p.13

Battleships: First Class	7 x <i>Royal Sovereign</i> + 1 x <i>Hood</i>
Battleships: Second Class	2 x <i>Centurion</i>
Cruisers: First Class	9 x <i>Edgar</i>
Cruisers: Second Class	21 x <i>Apollo</i> + 8 x <i>Astraea</i>
Cruisers: Third Class	4 x <i>Pallas</i>
Torpedo Gunboats	18 x <i>Sharpshooter</i> ¹⁸

Also formalised was the traditional ‘two power’ principle beloved of the popular media whereby the Royal Navy’s strength was (notionally) established as at least equal to that of any two rival nations.¹⁹ The eight first-class battleships and arguably the two second class *Centurions* are generally regarded as the backbone of the programme, but the number of cruisers included testifies to requirements beyond the pure *guerre d’escadre* that was then making a return to practicality, and that it was appreciated that especially the French and Russian rivals set great store by the strategy of commerce-raiding in the event of a naval war with Great Britain. The post-1889 service has been described by Parkinson as a ‘cruiser-battleship navy’ on the basis of spending across the period 1889-1906, and while aspects of his financial arguments are distinctly unconvincing, the emphasis laid on the significance of cruisers within the contemporary service at least is well-made.²⁰

It is easy to be cynical about some of the political and business interests that ‘encouraged’ the NDA; nevertheless the less-easily quantified diplomatic factors are important. Britain needed to make a demonstration to prevent rival colonial powers, especially France, the occasion of making apparently credible naval threats to gain leverage. A stronger charge is that that NDA, far from acting as a deterrent to rival nations, as claimed by Lord George Hamilton, actually

¹⁸ Brown *Op. Cit.* p.125

¹⁹ In reality Britain’s relative naval strength throughout much of the mid-Victorian era can be realistically assessed as substantially greater than a two power equivalent, making the formalised two-power standard in effect a downgrade, despite appearing otherwise

²⁰ Parkinson *Op. Cit.* p.207 A total of £66.7 million is cited as being spent on cruisers of the first – third classes, as against £63 million for first & second class battleships. Given the global nature of the British Empire at the time, such sums, essentially confirmed by the Estimates and addenda, contain no real surprises. But it is also suggested that the battleship figures were distorted upward by the expensive *King Edward VII* class vessels, and Parkinson argues that if these, and the following two *Lord Nelson* class vessels are discounted from the reckoning, a near 2:1 split on spending between cruisers and battleships is revealed: the aforementioned £66.7 million on cruisers, and £45.4 million on battleships. Since the *King Edward VII*s undeniably existed however, simply deducting them from the reckoning does not appear to prove anything of value

triggered a naval arms race.²¹ Certainly given the subsequent French Gervais (some £37 Million), and Russian construction (£26.8 Million) programmes, this appears to be partially true.²² The former most especially was an obvious reply to the British construction. The NDA did not receive an immediate successor though, although Hamilton drafted a new programme shortly before the 1892 general election. Much of this was suspended even before the Liberals under Gladstone came to power (albeit as a minority government), but did result in the authorising of the two largest first-class cruisers built to date and the second class battleship HMS *Renown* as part of the 1892/1893 Estimates, and it formed a basic blueprint for the Spencer Programme discussed in Chapter Three.²³

Throughout the period 1888-1894 the Royal Navy was still faced with the necessity of countering two distinct strategic approaches. The 1880s had seen the *Jeune École*, which emphasised the use of vessels such as cruisers, variant forms of gunboats and torpedo boats over the traditional *guerre d'escadre*, gain considerable traction, although this was tempered by repeated changes in French naval administration which frequently resulted in alternating support of the two strategic concepts.²⁴ By 1886-1887, when its greatest advocate, Admiral Hyacinthe Laurent Théophile Aube served as French Minister of Marine, it reached its zenith, and thereafter, as a complete concept, began to wane. This was in part the result of the changing material and strategic environment, with the development of new technologies (such as the quick-firing gun discussed below), undermining the supposed ability of small vessels such as torpedo-boats to attack battleships at sea or stationary in harbour.²⁵ Equally, the death of Aube at the end of 1890 deprived the movement of its main figurehead, while the publication that year of Captain Alfred Mahan's seminal *The Influence of Sea Power upon History 1660-1783* provided strong arguments for the *guerre d'escadre* in a more easily

²¹ See for example Sumida *Op. Cit.* p.16, Sondhaus *Op. Cit.* p.168, Marder *Op. Cit.* pp.162-163

²² *Ibid* p.247

²³ William Ewart Gladstone, FRS, FSS, Liberal Prime Minister of the United Kingdom on four separate occasions, 1868–1874, 1880–1885 1886 (February–July) & 1892–1894. Gladstone was generally opposed to increases in the naval estimates

²⁴ Sondhaus *Op. Cit.* p.141

²⁵ Such abilities, although much espoused in certain naval circles, and surprisingly even by Sir Nathaniel Barnaby, Chief Constructor / Director of Naval Construction 1872-1885 were never more than notional, and most particularly in poor weather conditions. See for example William White 'Notes on Recent Naval Manoeuvres' *TransINA* Volume XXXI (1890) pp.2-9 in which the practical sea-keeping, speed and fighting capabilities of various types of vessel were discussed at length. White's remarks on the inability of the low-freeboard coast-assault ram HMS *Hero* to fight her guns in a long, smooth 12ft – 15ft swell (p.7-8), are quite graphic. It should be noted in fairness that these were not conditions for which a coast-assault ram like *Hero* was designed, but by the time of her completion the operational environment had changed, leaving her without a role

accessible form than previous papers on the subject by strategists such as John and Philip Colomb.²⁶

Despite this, on an international level the strategy of the *guerre de course*, which had been enthusiastically incorporated into the Young School, did not dwindle to anything like the extent many of the other aspects did. It has been stated that France ‘resumed a battleship strategy’ from January 1889, with the laying down of the *Brennus*.²⁷ However, France continued building first-class cruisers specifically designed for commerce raiding into the first decade of the Twentieth Century, while interest in using converted merchant ships for commerce raiding continued.²⁸ In 1888, the laying down of the 6,676 ton *Dupuy de Lome* caused a major furore in certain naval circles.²⁹ The laying down of a first-class cruiser would not normally have been an especially noteworthy occurrence, but the *Dupuy de Lome* was notable, and is remembered for, the nature of her protective scheme. Uniquely for the era her hull had an extensive coverage of thin steel side-armour plate extending from 4ft 6in below the waterline to the upper deck. As a result, and possibly owing to the slow build-time which did not see her completed until 1895, she has been described as ‘revolutionary’ and effectively categorised with later side-armoured cruisers.³⁰ As is illustrated in the sections detailing contemporary protective schemes in first-class cruisers this is a severe overstatement of her capabilities, a point well appreciated by the Constructor’s Department and the Board, who declined to employ such an armour configuration in cruisers built for the Royal Navy.

Two years later in 1890, Russia apparently raised the bar even further by laying down the *Rurik*, a very large side-armoured cruiser of some 10,933 tons (as designed) that, like her predecessors, was intended specifically for commerce raiding.³¹ Russia had taken an early interest in commerce raiding, even before the rise to prominence of the *Jeune École*, and

²⁶ See for example J. Colomb (published anonymously) *The Protection of our Commerce and Distribution of our Naval Forces Considered* (London: Harrison, 1867), P. Colomb ‘Great Britain’s Maritime Power: How best developed...’ *JRUSI* Volume 22 (1878), ‘Blockades: Under existing conditions of warfare’ *JRUSI* Volume 31 (1887/1888)

²⁷ Parkinson *Op. Cit.* p.167

²⁸ TNA ADM 166 / 866b. Secret. ‘The Protection of Ocean Trade in Time of War’ 31 April 1905, p.45 Copy also available NA CAB 17/3

²⁹ R. Chesneau & E Kolesnik [eds.] *Conway’s All the World’s Fighting Ships 1860-1905* (London: Conway Maritime Press, 1979) p.303

³⁰ Parkinson *Op. Cit.* p.x; Sondhaus *Op. Cit.* p.167; B. Ireland *Cruisers* (London: Book Club Associates, 1981) p.29

³¹ Chesneau & Kolesnik *Op. Cit.* p.189

from the early – mid-1870s had been designing proto-armoured cruisers (essentially second-class masted ironclads) for the purpose of threatening British trade.³² The contemporary Russian navy as a result has garnered some interest, but despite the dire warnings that emanated from navalist agitators the dangers to British commerce were rather more latent than actual, given the limited number of these vessels, their poor speed and the fact that they would necessarily have to operate from Vladivostok, far from the most heavily travelled trade-routes.³³ The *Rurik* however had a considerably greater effect upon contemporaries, at least for a short period in the first half of the 1890s. Marder stresses this point, stating that early reports on the new Russian vessel nearly created an outright panic in the corridors of Whitehall, and

...awakened fear in English hearts, which imagined her as “a roaring sea-lion, going up and down the world devouring British traders, and slaughtering out of hand any British cruiser that might have the temerity to withstand her.” Well might there be alarm in England, for the Russian cruisers were intended to be superior in speed, armament and coal supply to all existing first-class cruisers in the British navy.³⁴

The size of the *Rurik* and the difficulties in ascertaining her exact features (which was rather less a matter of secrecy on the part of Russia, but rather the fact that her design was altered several times after being approved) all but mandated some kind of British response, which emerged in the form of the two enormous *Powerful* class cruisers considered below.³⁵ Thus, it is seen that the strategic necessity of countering both a ‘traditional’ *guerre d’escadre* and a *guerre de course* determined the nature of the contemporary Royal Navy’s fleet, with the newly reinstated (line-of) battleship forming the principal counter to the former, with the first-class cruiser forming the mainstay of the latter, with both being supported where necessary by smaller types.

Much of the Royal Navy’s strategic approach to countering a possible *guerre industrielle* can be traced back to Alexander Milne, as discussed in the previous chapter. Elements of this would be gradually modified in light of the re-established seagoing capability of the

³² See *Ibid* pp.186-188

³³ John Beeler *Birth of the Battleship: British Capital Ship Design 1870-1881* (London: Caxton, 2003) p.26

³⁴ Marder *Op. Cit.* p.164

³⁵ NMM Confidential memorandum ‘New First Class Cruisers Powerful and Terrible: Programme 1893-94’ 8 February 1893 p.1 Powerful class ship cover

battlefleet, which made blockade practical once again, superseding the coast-assault dominated approach of the mid-Victorian era. Outside the European theatre however, Milne's basic concept of focal area defence with cruisers stationed in regions of high shipping density remained intact. Convoy continued to be out of favour for much the same reasons as it had before: the disruption to trade, and the fact that most service cruisers lacked the speed and range of the fastest mercantile vessels was believed to preclude it as an effective means of protecting commerce. The other alternative system of patrolling trade routes was hardly entertained at all, being considered almost completely impractical. As noted though, some of the more perceptive naval strategists like Colomb (and Mahan) did not rule out the convoy system completely. Admiral Samuel Long was another who did not reject the convoy system outright, although he did assume that it would be used in conjunction with other means of trade defence.³⁶ Moreover, it is interesting to note that Long suggested that the convoying of merchant steamers could be a suitable role for 'the old battle-ships converted into armoured cruisers.'³⁷ Not content however with merely being a rare advocate of the convoy system, Long had controversial views on the use of the first-class cruiser away from its primary role in the contemporary service as a commerce protector, and he was not afraid to express them on a public forum.

Samuel Long, the guerre d'escadre, and the birth of the battle-cruiser

Rear-Admiral Samuel Long died on the morning of 25 April 1893 at his home, Blendworth-lodge, in Horndean, Hampshire, from head injuries sustained the previous day when he was thrown from his horse while riding on the Petersfield-road.³⁸ Although an almost forgotten figure today, there are strong indications that he was amongst the most forward-thinking officers of his generation. During the early 1880s, while holding the rank of Captain, Long contributed three papers to the United Services Institution, where he was a frequent participant in discussions, and his entry for the 1880 Naval Prize Essay, which that year dealt with 'Naval Tactics on the Open Sea, with the Existing Types of Vessels and Weapons' was honourably mentioned by the referees.³⁹ Two of his papers dealt with naval strategy and tactics, on the blockade and the utilisation of mercantile auxiliaries respectively, while the

³⁶ Long *Op. Cit.* p.2

³⁷ *Ibid* p.10 Long is here referring to the old masted broadside & centre-battery vessels, with their high-freeboard & ocean-going capabilities

³⁸ Obituary: Rear-Admiral Samuel Long, *The Times* Wednesday 26 April 1893 p.5

³⁹ The Gold Medal for that year was won by [then] Captain Edmund Fremantle

third strongly advocated the wider establishment of libraries in major British naval ports for the education of naval officers and men.⁴⁰ At this time like many of his fellow officers, Long was a supporter of the ram, in conjunction with artillery, and the growing though still limited use of the torpedo. Where he and some other relatively young reformers (with whom he appears to have been on good terms) such as Gerard Noel, Edmund Fremantle, Cyprian Bridge, Arthur Wilson, John Fisher and to an extent Philip Colomb differed was in the depth of thought they brought to tactical considerations, and how the new weapons of the machine age might best be used.⁴¹

Long's progressive views for the torpedo in particular provided a solid basis for later stages of his career. On 2 September 1884 he was appointed to the new 'coast defence' battleship HMS *Agamemnon*, and spent approximately the next 18 months lurking on the China Station, setting off from Colombo on the return journey to Malta on 9 March 1886.⁴² Long would be officially posted to the torpedo-school HMS *Vernon* from the 23 of that month, from thence to become Captain-Superintendent of Pembroke Dockyard on New Year's Eve, 1888.⁴³ At the time of the 1891 Naval Manoeuvres, during the second half of which he commanded the Red Squadron, he was naval ADC to Her Majesty, and he was promoted Rear-Admiral 7 September of that year.⁴⁴ During the late 1880s until the time of his death, he was a regular attendee at the meetings of the INA, and seems to have known the DNC reasonably well, occasionally supporting him in debates following various papers, and explaining the reason for his absence for a paper read by Lord Brassey.⁴⁵

⁴⁰ 'The Tactical Aspect of the Utilisation of Ocean Steamers for War Purposes' RUSI, Journal 24 (1881) pp.415-444; 'Study of the Tactics of Naval Blockade as Affected by Modern Weapons' RUSI, Journal 25 (1882) pp.316-349; 'On Libraries considered as Subsidiary to Education, and on the Best Means of Diffusing Information among the Officers and Men of Her Majesty's Navy' RUSI, Journal 28 (1885) pp.515-551

⁴¹ A useful handle is to loosely describe them as the 'Gun, Ram and Torpedo' school, after the title of the 1874 Junior Naval Professional Association prize essay, won by Gerard Noel's remarkable entry, printed in book form accompanied by another on the same subject by John Knox Laughton, and an intriguing shorter piece by Lt. Charles Campbell

⁴² The Times, Wednesday 3 September 1884, p.7 & Monday 6 March 1886, p.10 The *Agamemnon*, was well suited to the China station, since she drew relatively little water –a subject considered in greater detail in Chapter Four. Long, and *Agamemnon* did have a role in a minor diplomatic incident; shadowing the Russian cruiser *Vladimir Monomakh* she entered Yokohama on 15 May 1885 to find the Russian vessel readied for action, with guns tracking. See TNA ADM 1/6713 *Agamemnon* (Long) to C-in-C China Station

⁴³ The Times, Tuesday 23 March 1886, p.10 & Tuesday 1 January 1889, p.4

⁴⁴ The Times Monday 20 July 1891 p.11 & The London Gazette Tuesday 8 September 1891

⁴⁵ White had been called to Winsor

The 1891 Manoeuvres marked something of a turning point for the Royal Navy since in previous annual exercises ‘the contending fleets had been unavoidably made up of heterogeneous elements ; and their composition bore but a faint resemblance to that of the fleets likely to be organised in war.’⁴⁶ For 1891, it was appreciated that more homogenous force-structures needed to be employed, to better reflect the realities of a naval conflict. Moreover, methods of torpedo-boat warfare needed further exploration owing to the considerable emphasis laid upon such operations by France.⁴⁷ While the traditional concept of close blockade was waning, an ‘observational blockade’ variation on the theme, established via the use of cruisers and forward flotilla bases was being developed.⁴⁸ The Manoeuvres for 1891 comprised two separate sets of exercises examining the aforementioned areas. Long’s Red Squadron in the second set of Manoeuvres comprised the ironclad ram *Hotspur*, and the two early ‘armoured cruisers’ *Shannon* and *Northampton*, forming a ‘skeleton’ armoured fleet open to, and capable of defending itself against, assault from torpedo-boats. Since a major component of these exercises was to investigate the effect of offensive action against torpedo-boats themselves, to these three large armoured vessels were attached the new 3rd class cruiser *Barracouta*, and the torpedo-gunboats *Seagull*, *Spider*, *Skipjack*, *Gossamer* and *Rattlesnake*, acting as ‘torpedo-boat catchers.’

Long’s force, particularly the third ‘Detached Squadron’ of *Skipjack*, *Seagull* and *Gossamer* which was to take the war to the ‘enemy’s’ waters ran rampant through much of the exercise area, in both operations against vessels at sea and in harbour.⁴⁹ Grimes, in his summary of the exercises, states that they were a ‘clear demonstration of the potential ineffectiveness of the torpedo-boat when confronted by an offensive British response.’⁵⁰ This is true enough insofar as it goes: the value of taking the offensive against enemy torpedo-boats (under contemporary conditions) rather than relying on passive or local defences to handle them was indeed a major finding; however, it was also noted that deductions concerning the value of the boats should not be taken too far, and that under night-time conditions, torpedo-boats stood a better chance carrying out a successful assault, or at least emerging from one unscathed.⁵¹ From the

⁴⁶ TNA ADM 231/20 NID Report No.288 December 1891: *Report on the 1891 Manoeuvres* p.11

⁴⁷ *Ibid* pp.11-12

⁴⁸ See S. Grimes *Strategy and War Planning in the British Navy, 1887-1918* (Edinburgh: Boydell, 2012) pp.21-40

⁴⁹ *Report on the 1891 Manoeuvres* pp.31-42 provide a summary of Long’s Red Squadron activities during the exercises

⁵⁰ Grimes *Op. Cit.* p.24

⁵¹ ADM 231/20 Report on the 1891 Manoeuvres p.40

NID report on the 1891 Manoeuvres and his lectures to institutions like the RUSI and INA it is apparent that Long was an progressive thinker, an aggressive commander and an excellent tactician, but one who also valued and wished to encourage initiative in his subordinates: a flexibility reminiscent of Sir George Tryon. Although some of this in 1891 was necessarily enforced by the rules of the Manoeuvres and the division of the force he had under his command, the Red Squadron's success combined with the written evidence suggests it fell naturally to him, as a commander with an overly rigid approach to tactics and signalling procedures would be unlikely to have done as well, or, in all probability, be selected for this particular command. The following year, he was Umpire for the annual Manoeuvres, along with Admiral Sir Noel Salmon and Rear-Admiral Sir Walter Kerr.⁵²

Following his promotion, it appears that Long wished to recommence his literary activities, and it was in the brief period before his premature death that he would produce his two final papers. The first, again before the Royal United Services Institution, was a careful assessment on the impact of the new quick-firing gun on naval tactics and construction.⁵³ It is likely that Long's recent experiences operating with torpedo-boats provided considerable operational perspective on the use of such weapons by, and against, small-craft, but the paper's primary utility was the extension of the views into the probable use of them against larger vessels, especially cruisers and battleships. A study of the subsequent discussion on the paper is quite illuminating, since, though at first glance the reception appears to have been mixed, a closer examination reveals a basic agreement with Long's fundamental point: that the high rate of fire brought by QF guns was having a significant impact upon naval tactics, construction, and even wider strategy.⁵⁴ Some of the points raised by Long are considered later in this chapter, in the section on the rise of the Quick Firing gun.

The second of the two papers opened the spring 1893 session of the Institution of Naval Architects, just a month before his death. 'On the Present Position of Cruisers in Naval Warfare' was in part a historical study, evidently inspired by the works of Alfred Mahan, John Knox Laughton, and John and Philip Colomb.⁵⁵ The paper was also an extremely perceptive assessment of the genesis of the cruiser to date, how they might develop in future, and how

⁵² TNA ADM 231/22 NID Report No.332 March 1893. *Report on the 1892 Manoeuvres* p.13

⁵³ Rear Admiral Samuel Long 'An Attempt to Estimate the Probable Influence of the Introduction of QF Guns on Naval Tactics and Construction' Royal United Service Institution, Volume XXXVI (March 1892)

⁵⁴ See discussion on *Ibid*

⁵⁵ Rear Admiral Samuel Long 'On the Present Position of Cruisers in Naval Warfare' *TransINA* Volume XXXIV (1893), p.2

the roles and functions of different classes of cruisers were (or should be considered) distinct from each other. The three general categories of work Long suggested cruisers would undertake in wartime have already been quoted at the beginning of this chapter. It is his proposals for the use of the first-class cruiser with fleets that marks out Long's paper as one of the most forward thinking works of naval strategy of the late-Nineteenth Century.

Long assessed that, as of early 1893, the largest cruisers were no longer constrained by 'traditional' roles set out –the attack and protection of commerce, or functioning as scouts for a battlefleet- but were in fact usurping some of the roles of the battleship itself, a view also held by an increasing number of professional constructors and naval officers internationally. To that end, and in consequence of the wide range of dimensions and fighting capability, he proposed in the most significant passage of his paper that a new designation should be employed for such vessels:

Cruisers as a class comprehend a great variety of ships with displacements varying in our own navy from the *Blake* of 9,000 tons to the *Pearl* of 2,575... Such a conspicuous difference in the size and offensive powers of cruisers points to the necessity of carefully distinguishing between the parts allotted to them in war, and would, it appears, justify attaching the name of battle-cruisers to many of them, such an extension of classification appearing to meet the facts of the day, and to assist in an accurate distribution of the fleet.⁵⁶

Long's following remarks, which clearly set out the reasoning behind the new designation, contain an element of near-prophecy:

...it is possible first-class or battle-cruisers may be attached to fleets to play the part assigned by Lord Howe to his fast-sailing battle-ships on May 28, 1794, so well described by Captain Mahan. In fact, it seems not impossible that offensive power and speed may be developed in future battle-ships at the expense of armoured protection.⁵⁷

Similar views had been expressed before (both for and against) in debates on fleet manoeuvres and vessel design in the course of the previous decade, but had rarely been quite

⁵⁶ *Ibid* p.3

⁵⁷ *Ibid* p.5

so clearly stated in public.⁵⁸ Captain S. Eardley-Wilmot was one who had in print, and in reference to the large *Blake* class vessels, remarked that when cruisers were built of such large dimensions, and carrying such a quantity of offensive and defensive equipment, they were evidently not far removed from battleships.⁵⁹ Eardley-Wilmot's comment provides additional evidence that some forward-thinking senior officers in the Royal Navy were by the early 1890s already considering the first-class cruiser as an equal of (if not yet quite a replacement for) the line-of-battleship. Indeed, Eardley-Wilmot's remarks actually pre-date Long's INA paper, although whether the latter had read Eardley-Wilmot's book, or discussed the matter with him can only ever be a matter of speculation. On balance, it seems possible, if not probable, since Eardley-Wilmot had served as Assistant Director of Naval Intelligence, 1887-1890.⁶⁰ Similar ideas were also being mooted in other nations; in Italy, Insp. Eng. Benedetto Brin created the two remarkable *Italia* class vessels, often considered distant precursors of the dreadnought-battlecruisers.

There is little indication that such a capacity was investigated during the Royal Navy's annual Manoeuvres during the first years of the 1890s, primarily due to the relative lack of modern first-class cruisers (other than a handful of *Orlandos*, many of which were on foreign stations) than any unwillingness to explore vessel capabilities or their potential.⁶¹ As a result, the majority of cruisers employed during the exercises until the mid-1890s were second and third-class vessels, which aside from performing scouting and dispatch duties were occasionally deployed with light-craft, especially torpedo-boats to simulate attacks on fleets in their own harbours.⁶² The few first-class vessels available did however occasionally make a significant when operating against smaller types, notably *Blenheim* in 1893.⁶³

Long had been assisted by Fisher, then Third Naval Lord and Controller of the Navy, in the preparation of his 1893 INA paper. This was stated to have been purely on the technicalities of coal endurance and consumption of certain vessels, although given that both men had a considerable appreciation for the first-class cruiser, it is unclear whether their views were

⁵⁸ See for example Rear-Admiral Edmund Freemantle 'Speed as a Factor in Naval Warfare' RUSI, Journal 32 (1888/1889) pp.117-133. Also Captain [later Admiral] S. Eardley-Wilmot *The Development of Navies during the Last Half-Century* (London: Seeley & Co. Ltd., 1892) p.259

⁵⁹ Eardley-Wilmot *Ibid*

⁶⁰ The Times, Monday 14 February 1887, p.10

⁶¹ The *Blake* and *Edgar* classes were still under construction, and would not start to complete until 1892 onward.

⁶² See Grimes *Op. Cit.* p.24 Largely an emulation of contemporary French strategy and tactics (the continuing influence of the *Jeune Ecole*) and establishing the best means of countering such assaults

⁶³ Detailed in the subsection on the *Blake* class below

developed independent of each other, or if there was an influence in either direction or both.⁶⁴ The designation of 'battle-cruiser' and Long's concept of fleet operations for them did not meet with universal approval at the INA. The DNC in the discussion that followed expressed severe reservations with the term, remarking that the term 'battle-cruiser' seemed to him to be a self-destructive title unlikely to find favour, since contemporary cruisers, however large, were 'intended for detached and separate service, and to be more capable of single-ship action than action with a fleet, although they may assist in such actions.'⁶⁵ This was likely the first use of the term 'battle-cruiser', and it seems probable that the vessels referred to by this were, in addition to the two *Blake* class vessels cited, the *Edgar* class cruisers: reduced *Blakes* which had all been launched, and were completing at the time the paper was delivered.⁶⁶ Long concluded his paper with a summary of six key points worth stating in full:

- (1) There exists, in fact, a class of cruisers analogous to battle-ships. These might advantageously be termed "battle-cruisers."
- (2) That speed and coal endurance are qualities of primary importance in cruisers, and should be associated with high freeboard ; but that the fighting qualities should never be diminished below those of corresponding vessels of other nations, but, if necessary, resort should be had to increased displacement.
- (3) If a quantitative estimate may be hazarded, the minimum sea speed now acceptable should be 20 knots, and the coal supply sufficient to last a minimum of seven days, 20 hours each day, at 10 knots and four hours at chasing speed, besides enough to proceed to and from the base at 10 knots and fight an action.
- (4) That powerful cruisers at the end of a telegraph wire will be more conducive to sea power than numerous small ones, where ocean routes are concerned.
- (5) That subsidies should be given to steamship companies for all vessels maintaining a sea speed of 21 knots.
- (6) That the convoy of slow merchant steamers is likely to form an important feature of naval work in war, and would be a more effectual and economical means of

⁶⁴ Long *Op. Cit.* p.6

⁶⁵ William White, in discussion on *Ibid* p.34 White later revised his views on the use of cruisers, reflecting developments in armour that occurred in the mid-1890s. See Chapter 3

⁶⁶ Chesneau & Kolesnik *Op. Cit.* p.66

protecting trade, by ensuring the simultaneous presence of war-ship and merchantman, than any other at present contemplated.⁶⁷

Long's early death robbed the Royal Navy of a progressive thinker with a practical approach to naval strategy and tactics as well as material. Judging from the positions he held, had he lived, it is probable that he would have become at least a member of the Board and a more influential figure in the history of the Royal Navy as a result.

Sir William White –Director of Naval Construction 1885-1902

William Henry White was born at Drews Cottage in Devonport, Sunday 2 February 1845, the third and youngest son of Richard and Jane White.⁶⁸ Following a breakdown in his father's health he was nominated for the entrance examination at Devonport Dockyard by Mr. Miles, an alderman of Devonport and the owner of the private school for boys in Morrice Square the young William attended.⁶⁹ Passing this entrance examination in March 1859, White became a shipwright's apprentice, occupying 'the highest position on the list of a large number of competitors, and throughout the whole of his scholastic career he invariably occupied that position among students of his own seniority, and sometimes stood higher than students of longer service.'⁷⁰ In 1864 he entered the newly established Royal School of Naval Architecture as the most senior of the eight shipwright apprentices appointed in that initial year.⁷¹ Three years later, he was appointed to the Admiralty Staff under Chief Naval Constructor Sir Edward Reed.

White's early career was distinguished, and saw him working closely with both Reed and Reed's successor, Nathaniel (later Sir Nathaniel) Barnaby in the Constructor's Department, garnering a considerable reputation as an assistant, an inspector, a designer, and cemented the

⁶⁷ See Long *Op. Cit.* p.12

⁶⁸ Frederic Manning *The Life of Sir William White KCB, FRS, LLD, DSc* (London: John Murray, 1923) p.1

⁶⁹ *Ibid* pp.1-3

⁷⁰ 'Obituary Notice: Sir William Henry White, K.C.B., LL.D., Sc.D., F.R.S., D.Eng., Honorary Vice President' *TransINA* Vol. LV (1913) p.244 Manning *Op. Cit.* p.3 mentions that White was too slightly built to pass the mandatory medical examination that was part of the entrance examination, a situation his elder sister remedied by packing his boots with blotting paper to increase his height by the necessary fraction of an inch. Since such tales are by no means uncommon, and a medical examination might be reasonably supposed to take place sans footwear, the veracity of this story is questionable, although given White's relatively diminutive frame, it is at least theoretically possible.

⁷¹ David K. Brown *Warrior to Dreadnought: Warship Development 1860-1905* (London: Caxton, 2003) p.123

respect with which he was regarded by his extensive work on vessel stability. This was a comparatively new scientific field; the basic principles had been established by Atwood during the late 18th century, but owing to the difficulty involved in the calculations they were rarely employed until F. K. Barnes published ‘A new method of calculating the statical and dynamical stabilities of a ship’ at the Institution of Naval Architects in 1861, in which he introduced both a layer correction to compensate for differences in volume between the immersed and emerged wedges, and radial integration.⁷² Ten years later at the Spring 1871 meeting, White produced in conjunction with William John what would be the first of some twenty papers at the Institution, detailing the methods employed for calculating the curves of stability displayed in a preceding paper by Barnaby, and practical lessons to be derived from these.⁷³ He also published during 1877 his classic textbook *A Manual of Naval Architecture*, which was sporadically revised over time in order to remain up to date.⁷⁴ In 1882 however, he was lured away from public service by Lord Armstrong, joining his company as head of warship building at the Elswick shipyard on the Tyne.⁷⁵

At the time of White’s arrival, Armstrong’s had under construction what is often regarded as the first ‘modern’ (viz. sans sails) protected cruiser, the *Esmeralda*, designed by White’s predecessor George Rendel for the Chilean navy.⁷⁶ During his time at Elswick, as well as considerably expanding the yard and its facilities, White designed numerous examples of the famous Elswick cruisers for various foreign navies as diverse as Italy, Austria, China and

⁷² K. C. Barnaby *The Institution of Naval Architects 1860-1960: An Historical Survey of the Institution’s Transactions and Activities over 100 Years* (London: The Royal Institution of Naval Architects in Association with George Allan & Unwin, 1960) p.27

⁷³ See W. White & W. John ‘On the Calculation of the Stability of Ships and some matters of interested connected therewith’ *TransINA* Vol. XII (1871) pp.77-127 In essence, the significance of the work to this point by Reed, Barnes, Barnaby, White & John was to demonstrate that establishing the initial metacentric height, or calculating the righting force (GZ) at a single relatively small angle of inclination was not a sufficiently accurate guide to vessel stability. For that a GZ curve showing the full range of righting levers was necessary

⁷⁴ W. H. White *A Manual of Naval Architecture* (London: J. Murray, 1877)

⁷⁵ ‘Obituary Notice: Sir William White’ *TransINA* (Op. Cit.) p.247 Brown (Op. Cit.) also provides some comparative figures of White’s income; his total Admiralty salary had been £651, including £51 fees from the Royal Naval College. At Armstrong’s, this increased to £2,000, plus 2/-per ton of warship and 1/-per ton of mercantile vessels built. Both were of course supplemented by income from work he did in his own time, either in design terms, participation in committees, and literary work, most notable of the latter being his *Manual of Naval Architecture*, which remains a highly readable reference text

⁷⁶ Philip Watts ‘Elswick Cruisers’ *TransINA* Vol. XLI (1899) p.286 White was essentially headhunted for the position by Lord Armstrong following the departure of Rendel, who was widely respected as a naval architect. Rendel’s resignation from the company was primarily caused by Armstrong appointing Andrew Nobel, with whom Rendel had a mutual antipathy, sole manager of the Ordnance Department. Although rarely referenced by naval historians (likely because he was never in public service) Rendel was undoubtedly an excellent cruiser designer; the *Esmeralda* is ample testament to his capabilities and there seems no reason to suppose that he would not have continued to produce vessels of a high quality if he had remained at Elswick.

Japan.⁷⁷ It was at Elswick that White's talents as a designer were first given free reign since he had, within the obvious constraints of fulfilling the client's requirements, far fewer restrictions than was the case for public officials designing vessels to conditions laid down by the Board of Admiralty. Nevertheless, while employed by Armstrong, he maintained strong contact with and interest in Royal Navy vessels, and regularly analysed them both in light of his own views and for the purposes of comparison with vessels he and Armstrong's produced for their foreign naval clients. His opinion regarding the *Orlando* class of belted cruisers has been given in Chapter One. Further confirmation of this particular case is provided by his lengthy remarks in the discussion of John Biles's 1887 Institute of Naval Architects paper 'Comparative Effects of Belted and Internal Protection upon the Other Elements of Design of a Cruiser':

...I took the trouble to see what could be done on the dimensions of the *Orlando* class, provided that I passed from vertical armour to the other system. I found that a ship of exactly the same size, with the same armaments, the same engines –nothing changed, excepting the system of protection, might take on board 200 tons more coal, and would cost £20,000 less, than the belted ship.⁷⁸

This paper, and the subsequent discussion (White's contribution, as DNC, being particularly significant) is one of the most valuable primary sources from the era in which professional naval architects and naval officers discussed the offensive and defensive properties of cruisers and the methods thereof. The paper, the belted, and 'the other system' of protection are examined in detail later in this chapter.

Upon the retirement in 1885 of Sir Nathaniel Barnaby from the post of Director of Naval Construction, the First Lord, George Hamilton, decided to re-organise the Controller's departments and persuaded White to return as DNC in a complicated arrangement which included the release of Philip (later Sir Philip) Watts by the Admiralty to take White's place at Armstrong's.⁷⁹ The vast reorganisation proposed by White, and which was largely carried out

⁷⁷ These included the Dogali, Geovanni Bausan, Naniwa Kan, Takachiho Kan, Chih Yuan, Ching Yuan, Panther and Leopard See Watts *Ibid*.

⁷⁸ William White, in discussion of J. H. Biles 'Comparative Effects of Belted and Internal Protection Upon the Other Elements of Design of a Cruiser' *TransINA* Volume XXVII (1887) p.356

⁷⁹ Brown *Op. Cit*. White was however, not unreasonably expected to remain available for consultation on designs to which he had contributed for a five year period. It appears that he did not hesitate in returning to the Admiralty, despite the significant drop in salary that this entailed. Barnaby resigned

intact after being approved by the Ritchie Committee, transformed the Dockyards into the fastest builders of naval vessels in the world, testifying to his formidable managerial abilities.⁸⁰ It should be emphasised however that White had many advantages denied to his predecessor Barnaby: along with advances in material, he had the good fortune to work in a political climate that was willing to increase naval expenditure, a consequence of the popular navalist agitation already referred to.⁸¹ Without the increased levels of funding, provided most obviously through the Naval Defence Act and Spencer Programme, White would have been far more restricted in terms of what he was able to achieve with individual vessel types. As it was, he held, particularly during the first years of his tenure as DNC, a remarkably influential position, and he used it to encourage both British industry and experimentation.⁸² The scope of his authority was not dissimilar to that held by Reed during the 1860s, rather higher than his immediate predecessor Nathaniel Barnaby, who, notwithstanding claims to the contrary, was heavily circumscribed by Board requirements, and it would also seem substantially greater than that of his successor, Philip Watts. White however possessed a level of tact completely alien to Reed, ‘who relished controversy as most do food and sleep’, and with the benefit of new technologies unavailable to his predecessors and a good understanding of these was therefore in a rather stronger position to press his own views.⁸³

ostensibly on health grounds, although his grandson would later claim Sir Nathaniel was tired of constantly arguing with Sir Edward Reed, who was married to his sister, and who enjoyed nothing so much as attacking Admiralty vessels

⁸⁰ The reorganisation programme of 1885 itself is outside the purview of this thesis, but is covered in a generally even-handed fashion by Manning *Op. Cit.* Chapter XV pp.213-231 White’s return to the Admiralty, although widely welcomed, was not without a degree of controversy, mostly caused by the terms of his departure from Armstrong’s, and the clause of his being available to consult on vessels which he had designed during his time at Elswick. Armstrong’s surrendered their right to White’s advice on such matters in 1886 following representations that the somewhat ambiguous position made him vulnerable to attack from adversaries (despite the terms having been made clear by the First Lord in Parliament).

⁸¹ Marder *Op. Cit.* pp.24-29 Marder places significant stress on the role of the armament industry, and that of related trades in the big-navy movement, a point that later historians have not dwelt upon quite as much. However, the figures Marder provides for shareholder dividends and net profits over the period clearly demonstrate the level of commercial interest involved, and it would be naive to ignore this as a contributory factor in addition to other aspects already discussed

⁸² White assisted with the *Resistance* experiments, which are considered under vessel protective schemes later in this chapter. He also was active in encouraging British armament and related manufacturers, with a particular interest in the iron and steel industry, and those companies producing armour: see the discussion following the paper by Mons. J. Barba ‘Recent Improvements in Armour Plates for Ships’ *TransINA* Volume XXXII (1891) pp.160-161 Barba’s paper was not well received, being described, not without an element of justification by T. Vickers as ‘a trade puff’ *Ibid* p.151 However, it was the catalyst for an interesting debate on the merits of various types of contemporary armour, the tests performed, the companies involved, and the positions of particularly the British manufacturers, as well as the involvement of the Admiralty and Constructor’s Department

⁸³ John Beeler *Birth of the Battleship: British Capital Ship Design 1870-1881* (London: Caxton, 2003) p.127

In his Staff Monograph on cruiser development Commander Spencer King-Hall classified the period 1888-1902 as ‘The Period of Constructors materialism.’⁸⁴ The DNC’s department, he asserts, was extremely powerful under White, who had an excellent grasp of naval strategy and tactics, and did for the Board what the naval officers could not, or would not do for themselves.⁸⁵ An examination of the ship covers and Admiralty records though suggests this is an exaggeration. As well as being a superb designer and administrator, White certainly had an excellent understanding of the strategic and tactical contexts in which vessels would operate –at least as good as his naval colleagues. Since the Board were perfectly well aware of this, they were often happy to go along with him and reap the benefits of his expertise; nevertheless, he did not invariably get his way. Discussing the *Royal Sovereign* class battleships, he stated outright that while he was the responsible designer, they were ‘ships of the Board of Admiralty. It must not be supposed –and I want to emphasise this– that I personally approve of everything in these ships.’⁸⁶

Throughout his tenure, White strongly favoured first-class vessels, both in terms of battleships, and cruisers. Although it is often implied that he preferred small vessel types (Fisher in later years inaccurately remarked ‘Sir William White designed the County Class [sic.] but forgot the guns’), this was far from being the case.⁸⁷ White had no illusions at all about the limited value of second class types, and the rapid obsolescence often entailed in their construction. Equally however, he had no use for large dimensions purely for their own sake, and believed that balance in warship design was critical if they were to be effective vessels.⁸⁸ As Director of Naval Construction from 1885-1902, he was the responsible designer of no fewer than forty-seven first-class cruisers for the Royal Navy, these being

⁸⁴ TNA ADM 116/878 Commander S. King-Hall ‘The Evolution of the Cruiser’ Naval Staff Monograph, 1928. The period 1888-1902 was evidently selected to cover all of White’s first-class cruiser designs, from the *Blake* class (*ld.* 1888) to the *Devonshire* class (*ld.* 1902)

⁸⁵ *Ibid*

⁸⁶ William White in discussion following his paper ‘On the Designs for the New Battleships’ *TransINA* Volume XXX (1889) pp.209-210 The fact that White needed to say this though gives a good idea of the degree of influence he was believed to exert

⁸⁷ Robert K. Massie *Castles of Steel: Britain, Germany and the Winning of the Great War at Sea* (London: Jonathan Cape, 2004) p.203 Fisher was principally referring to the *Monmouth* class, and is inconsistent with his prior held gunnery views –equally, as referenced, and discussed later in the chapter, White designed the *Monmouths* to meet Board requirements, more or less on sufferance; they did not accurately reflect his own views

⁸⁸ Sir William White ‘Notes on the Armaments of Battleships’ *Transactions of the Society of Naval Architects and Marine Engineers* (henceforth *TransSNAME*) Volume XVIII (1910) p.15

2 x *Blake* class
 9 x *Edgar* class
 2 x *Powerful* class
 8 x *Diadem* class
 6 x *Cressy* class
 4 x *Drake* class
 10 x *Monmouth* class
 6 x *Devonshire* class

Arriving at the Admiralty to wide (though not universal) approbation, the later years of his incumbency saw increasing criticism of many of the vessels, and particularly the first-class cruisers, for which he was responsible. These criticisms, as demonstrated in this and following chapters were largely based on inaccurate premises, but they tarnished his reputation, which suffered a further blow when the new Royal yacht, *Victoria and Albert III* almost capsized after fitting out. The latter had been caused by excessive top-weight having been worked into her unbeknownst to the DNC, severely reducing her metacentric height.⁸⁹ White's health, which had been sporadic for several years, broke down and he requested early retirement. This was granted and he departed the Admiralty on 31 January 1902, according to Lady White's melodramatic assessment 'a broken-hearted, disappointed, and worn-out man.'⁹⁰

White almost certainly had suffered a nervous-breakdown, partly brought on by over-work and the increasing number of attacks made upon him and the designs for which he was responsible. However, after a few months recovering, it appears that his intellectual facilities were little diminished and he travelled extensively, maintaining the global network of contacts which he had established throughout his career. It is said that in retirement he strongly opposed the introduction of the all-big-gun types due to bitterness and resentment at the supposedly revolutionary new vessels that rendered his own work obsolete. This is not an accurate assessment of White's views however, and such simplistic assumptions do him considerable disservice. He was undoubtedly bitter about the end of his career in public service, and criticisms directed at him and the vessels he was responsible for based on

⁸⁹ Oscar Parkes *British Battleships: A History of Design, Construction and Armament* (London: Leo Cooper, 1990) p.347 This was compounded, as Parkes notes, by the fact that she had been floated out with almost empty bunkers and water in only three of her boilers

⁹⁰ Manning *Op Cit.* p.445

inaccurate premises. However, he was far from the retrogressive he is sometimes made out as being. He had no objection to the steam turbine, and had always kept abreast of the latest technological developments, encouraging them where it was practicable for him to do so. He was also, contrary to popular myth, happy to accept a greater number of heavy guns in first-class battleships and heartily endorsed the superimposed barbette configuration introduced by the Americans in the *Michigan* class battleships.⁹¹ Nonetheless, he also maintained that adding extra weapons without proper consideration given to their fields of fire, blast effects, restrictions on magazine and machinery layouts &c. was misguided, and that a powerful secondary battery of quick-firing guns was a valuable feature that should not be casually discarded.⁹² It is difficult to object to any of these points in principle, and when many of the early all-big-gun types are considered, it is apparent that White's criticisms often had considerable validity. Some examples of these are considered in Chapter Five. His private correspondence and contributions to various journals and societies continued to be voluminous until his death from a stroke.⁹³

With the benefit of historical perspective, Sir William Henry White played a critical role in the development of the Royal Navy for almost four decades. He helped advance the science of naval construction, assisted with ground-breaking scientific work on vessel stability, encouraged the British metallurgical and engineering industries, significantly improved the administration and efficiency of the Royal Dockyards, and produced some of the finest warships of the era, including, as covered in Chapter Three, what amounted to a new type which for a brief period nominally usurped the position of the battleship itself as the most powerful contemporary naval vessel.

The Blake and Blenheim

The two *Blakes* were the first major cruisers designed by White when he returned to the Admiralty as Director of Naval Construction. Laid down in 1888 they pre-dated the Naval

⁹¹ White Notes on the armaments of... pp.8-9

⁹² *Ibid* pp.3-7

⁹³ Although often dismissed as retrogressive, or blinkered thinking, driven by bitterness, White's objections were based upon rather more practical considerations of protection, fire-control, and wider strategy and tactics. These points are considered in more detail in Chapter Five

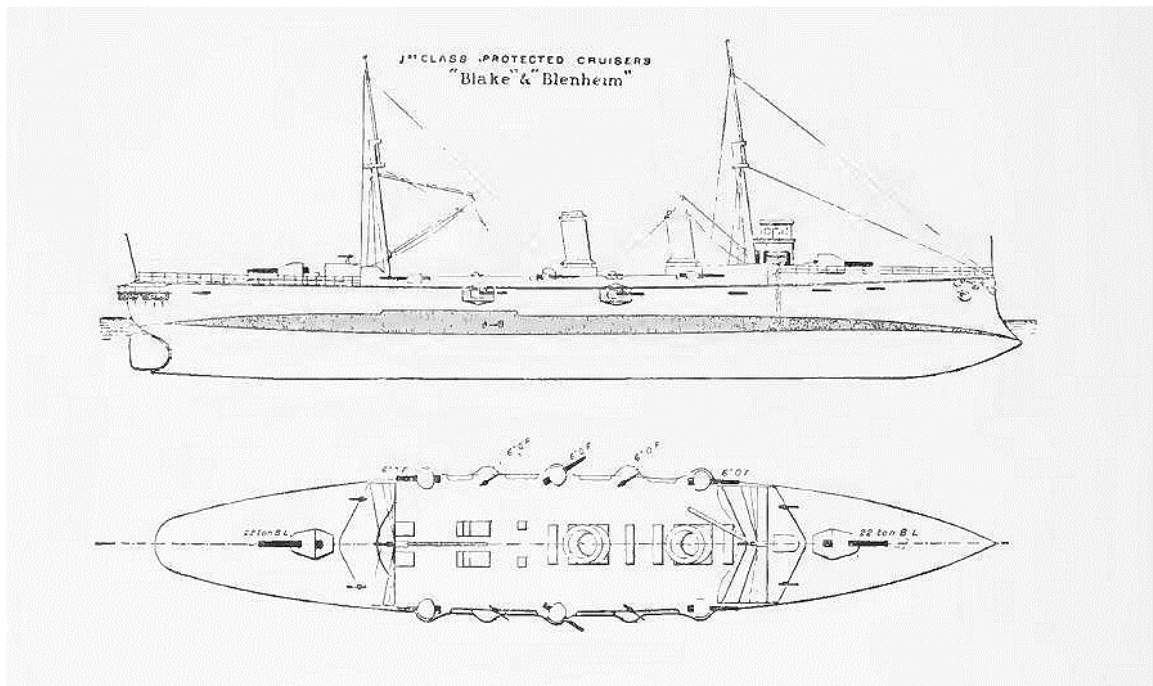
Defence Act, being a part of the proposed construction programme for 1888-1892 based upon the probable wastage of the Navy during those years.⁹⁴

The elegant *Blake* and *Blenheim* were the largest and fastest cruisers in the world at the time of their design, being 375ft between perpendiculars with a load displacement of 9,150 tons, and possessed remarkable range for contemporary naval vessels. Figure 2.1 shows the right elevation and deck plan of the class. It is probable that White and the First Lord saw them ‘as built-for-purpose (and hence more satisfactory) equivalents of liners converted into cruisers, capable of running down and killing foreign fast converted liners.’⁹⁵ These were, during the mid-late 1880s, considered a serious threat as commerce raiders owing to their possessing higher speed and greater range than most contemporary cruisers. It would not be until the Great War 1914 – ’18 that this was finally disproven.

⁹⁴ Manning *Op. Cit.* p.224

⁹⁵ N. Friedman *British Cruisers of the Victorian Era* (Barnsley: Seaforth, 2012) p.218

Figure 2.1
Blake class cruiser deck-plan and side-elevation



Source: T. A. Brassey [ed.] *The Naval Annual*, 1902 (Portsmouth: J. Griffin and Co., 1902)

Plate 4

The *Blakes* were the first examples of first-class cruisers designed for the Royal Navy employing the protective deck system, rather than external armour plate. The subject of the protection and armour of first-class cruisers during this period is of such significance that it is examined at length below. In the case of the *Blakes*, their internal curved armour deck was 3in thick on the flat and 6in on the slopes, the crown of the deck being 18in above the load-water-line, curving down at the sides to end 6ft 6in below the load-water-line, 12in armour being added to the Conning Tower (CT). The *Blakes* had a design maximum smooth-water speed of 22 knots with the objective of achieving a continuous sea-speed of 20 knots.⁹⁶ Nominal coal capacity was 1,500 tons, with a maximum of 1,800.⁹⁷ Coal ‘was to be provided for 6 ½ days at 20 knots or 80 days at 10 knots.’⁹⁸

Two sets of vertical triple-expansion reciprocating engines were provided in tandem on twin shafts, and like many vessels of the late 1880s, the *Blakes* were designed to exploit closed-stokehold forced-draught. By raising the air-pressure with a fan in a stokehold where the only means of exit for the air was through the grates, and thence to the uptakes, significantly higher furnace temperatures and power-outputs could be obtained.⁹⁹ The compromise was that the high temperatures also could result in the generation of steam within the boilers, lifting the water away from the surface of the tubes, with the result that the latter could quickly overheat and start to break down and leak.¹⁰⁰ Primarily owing to this, forced draught was regarded with deep suspicion by many in the Royal Navy, even being described ‘by a gallant officer as “an invention of the evil one”’.¹⁰¹ It was however supposed to be used only for short periods when maximum power was necessary; for example when chasing down a commerce raider. Initially neither vessel quite attained the target trials speed, mainly owing to problems attaining the maximum design power from the engines, but both proved capable of high sustained sea speeds and later exceeded 22 knots with forced draught fully employed.¹⁰²

⁹⁶ *Ibid*

⁹⁷ NMM Undated handwritten memorandum on new cruisers by White, pp.11-12 *Blake* class ship cover

⁹⁸ Brown *Op. Cit.* p.135 Also see *Ibid* for notes during design stages

⁹⁹ L. S. Robertson [trans. & ed.] *Marine Boilers: Their construction and working dealing more especially with tubulous boilers*. Based on the work by L. E. Bertin (New York: D. Van Nostrand Co., 1906) pp.72-72 & 75-76

¹⁰⁰ Chesneau & Kolesnik *Op. Cit.* p.66

¹⁰¹ Quoted by William White in ‘Notes on Recent Naval Manoeuvres’ *TransINA* Volume XXXI (1890) p.14

¹⁰² *Ibid* After 1892, the maximum permissible margin between natural and forced draught in service vessels was set to 25 per cent (the *Blakes*, had up to 60 per cent forcing available –see Friedman *British Cruisers of the Victorian Era* p.323)

On account of their size, the *Blakes* were described by some contemporaries as ‘monsters.’¹⁰³ Carrying two 9.2in guns in single turrets on forecastle and poop, they were originally intended to be fitted with eight 6in breech loading rifled (BLR) guns between-decks.¹⁰⁴ In light of early experiments on the old ironclad *Resistance*, this was changed during construction to ten 6in quick-firing (QF) guns, with four weapons being moved to the main-deck and provided with armoured casemates, ‘the first appearance of this feature which would become typical of White’s ships.’¹⁰⁵ Both ships completed in 1892, with *Blenheim* nominally being placed into reserve until May 1894.¹⁰⁶ Despite this status she participated in the 1893 Manoeuvres, and was in fact the first of the new generation of first-class cruisers designed under White to do so, forming part of Vice-Admiral Fairfax’s ‘Red Side’.¹⁰⁷ The overarching object of the Manoeuvres for that year was very simply stated as being

On the part of one side to obtain command of the sea between Great Britain and Ireland and on the other side to prevent it.¹⁰⁸

The terminology and general concept reflects Philip Colomb’s views on naval strategy, where ‘Command of the Sea’ is the dominant strategic concept or ‘aim of naval war’, and whose book, *Naval Warfare* had been published only weeks after Mahan’s in 1891.¹⁰⁹ Taking place in the relatively narrow seas allowed a junction of fleet divisions within range of opposing torpedo-boat flotillas to be simulated –a key factor in any projected conflict with France in particular.¹¹⁰ The stronger Red Side was to endeavour to bring the Blue to action, and to report when command of the sea had been gained ‘so that a large expedition may be sent across it.’¹¹¹ A component of ‘A’ Fleet’s primary ‘Group a’, *Blenheim* was highly regarded, Fairfax stating that

¹⁰³ Sir William White ‘Presidential Address’ *ProcICE* Volume 3 (1903) p.158

¹⁰⁴ Manning *Op. Cit.* p.224

¹⁰⁵ Chesneau & Kolesnik *Op. Cit.* p.66

¹⁰⁶ TNA ADM 8/172; see also the *Blake* class ship cover

¹⁰⁷ TNA ADM 231/23 Admiralty [nee ‘Naval’] Intelligence Department Report No.372 *Report on the 1893 Manoeuvres* February 1894 p.9

¹⁰⁸ *Ibid* p.24

¹⁰⁹ P. Colomb *Naval Warfare: Its Ruling Principles and Practices Historically Treated Volume I* (Annapolis: Naval Institute Press, 1990) p.47 Original publication by W. H. Allan & Co. of London, 1891

¹¹⁰ *Report on the 1893 Manoeuvres* February 1894 pp.7-9. See also Grimes *Op. Cit.* p.25

¹¹¹ ADM 231/23 *1893 Manoeuvres* p.25

It is hardly possible to speak too strongly of the value of this ship to a fleet. She was always ready for any service, with a great command of speed, large coal capacity, and power to make her presence felt immediately.¹¹²

During these exercises, which took place 27 July – 6 August, *Blenheim* was regularly detached as a heavy scout, using her speed and firepower to drive off and later overwhelm opposing smaller second and third-class class cruisers and torpedo-boats. When later operating with the main fleet, she was stationed ahead to provide cover and heavy support for the smaller second-class *Apollo* cruisers.¹¹³ These activities clearly fall within the classic first-class cruiser or battle-cruiser functions (the latter term having been largely coined for her and her sister), and are the first overt example of such operations with the new vessels. The opposing fleets did not meet during the Manoeuvres, and the lack of other first-class vessels (the only other modern first-class cruiser in Red fleet being *Narcissus* of the *Orlando* class, which was suffering from problems with her low-pressure pistons) evidently precluded any chance of using her as a fast wing. Three years later *Blenheim*, along with two second-class *Astraea* cruisers, was classified as a ‘battleship’ for the purposes of the 1896 Manoeuvres.¹¹⁴ This was to make up numbers though and not to explore possible uses in a fleet action; should such occur, the rules laid down that it would be decided purely on superiority in battleship (or simulated battleship) numbers, cruisers not affecting the issue.¹¹⁵ There was once again a considerable emphasis on smaller craft, particularly the latest types of destroyer then becoming available, and which were replacing the torpedo gunboats of the first half of the decade.¹¹⁶ The following year, she and her sister were heavily used in the annual Manoeuvres, this time in their proper ‘cruiser’ guise, functioning as heavy scouts for their battlefleet and supporting smaller second-class types.¹¹⁷

The Edgar class

Of the forty-two cruisers laid down under the Naval Defence Act, the backbone was formed by the nine first-class *Edgars*. In many essentials, they were cut-down versions of the

¹¹² *Ibid* p.58

¹¹³ *Ibid* pp.60-74 & 89-92 Her commander during the Manoeuvres was Captain William H. Hall, the previous (first) DNI.

¹¹⁴ TNA ADM 231/27 Admiralty Intelligence Department Report No. 474 *Report on the 1896 Manoeuvres* p.17

¹¹⁵ *Ibid* p.12

¹¹⁶ Grimes *Op. Cit.* pp.27-28

¹¹⁷ See Chapter Three

preceding *Blake* and *Blenheim*; a continuation of a recurring theme whereby the Board would tend to order a small number of a large type, and follow it with a larger number of somewhat smaller vessels. This was repeated over an extended period, the seven 5,600 ton *Orlandos* following two 8,500 ton *Imperieuse* class vessels, the nine 7,700 ton *Edgars* following the two 9,150 ton *Blakes*, and the eight 11,000 ton *Diadems* following the two 14,200 ton *Powerfuls*.¹¹⁸

The original concept for the design was to combine the hull, machinery and protection of the *Vulcan*, a torpedo-boat carrier and depot ship with many cruiser features of which White was exceedingly proud, with the armament of the *Blakes*.¹¹⁹ Ultimately, the hull needed to be slightly lengthened to 360ft between perpendiculars, 10ft more than the *Vulcan* to ensure the 20 knot design speed, but otherwise the basic design intentions were achieved. Figure 2.2 shows the elevation, deck plan and cross-section of the class. On 7,700 tons, they carried the same 9.2in and 6in armament as their larger predecessors, being the first RN first-class cruisers to be designed from the outset with casemate protection for the QF guns.¹²⁰ The class appear to have been considered good sea boats, particularly *Crescent* and *Royal Arthur*, which completed with a raised forecastle, and twin 6in QF in place of the single 9.2in of their sisters.¹²¹ All proved good steamers; running in 12 fathoms off Stokes Bay, *Edgar* achieved 20 ½ knots with 13,260 I.H.P. In deeper water off Falmouth, 21 knots was obtained with 12,550 I.H.P., confirming they amply exceeded the design requirements, and the resistance of shallow water.¹²²

¹¹⁸ Note that the displacement figure given for the *Edgars* is generalised to being that of the *Crescent* and *Royal Arthur*; the nominal load draught of the remaining seven vessels being 7,350 tons. See Chesneau & Kolesnik *Op. Cit.* pp.64-68

¹¹⁹ Friedman *British Cruisers of the Victorian Era* p.221

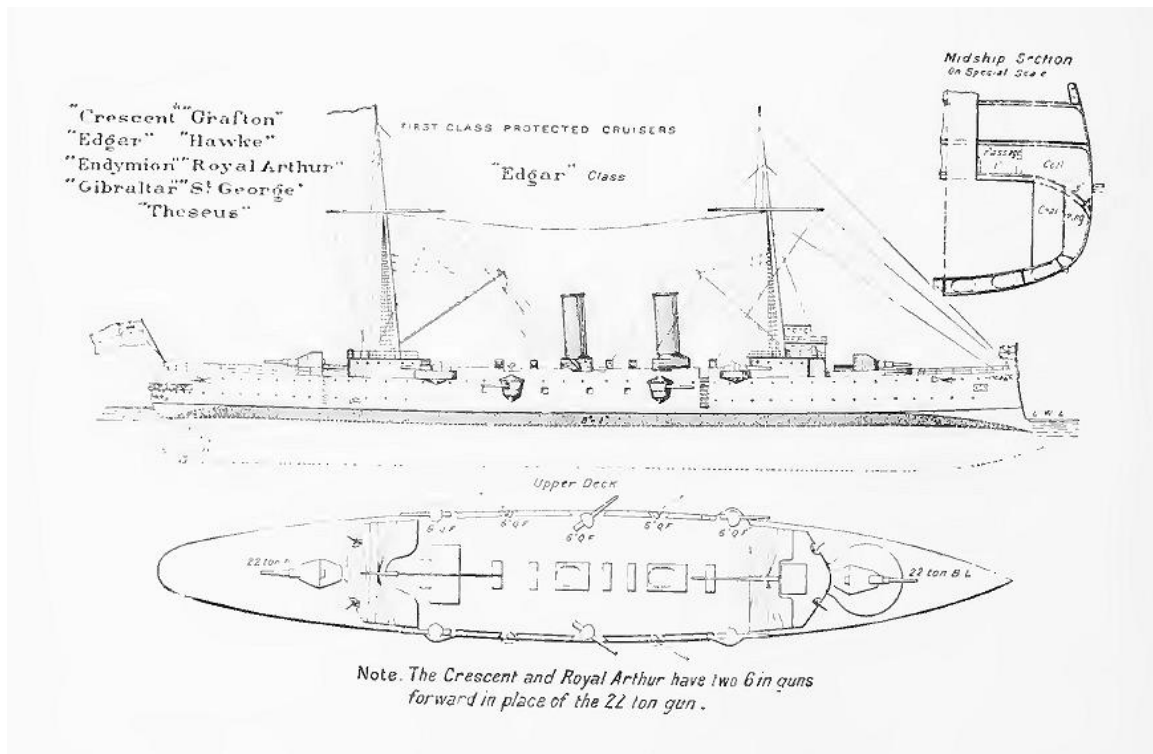
¹²⁰ NMM 'Improved "Mersey" or modified "Vulcan" –Outline design for' dated 7/88 *Edgar* class ship cover

¹²¹ Brown *Op. Cit.* p.135 The covers of successive classes at the NMM, and the Admiralty records at the NA confirm that White, as Brown notes, regularly used these two vessels as examples of the need for adequate freeboard, both during and after his time as DNC

¹²² Edward L. Attwood *War-ships: A textbook on the construction, protection, stability, turning etc. of war vessels* (London: Longmans, Green & Co., 1904) p.258

Figure 2.2

Edgar class cruiser deck-plan, side-elevation and cross-section



Source: T. A. Brassey [ed.] The Naval Annual, 1902 (Portsmouth: J. Griffin and Co., 1902)

Plate 4

Like the *Blakes*, and the successive *Powerful* and *Diadem* classes, the *Edgar* class were primarily intended for the trade protection role, although they too could realistically have been employed with fleets as heavy scouts and support for smaller cruisers if required. They continued the trend begun by White with the *Blakes* for British first-class cruisers to employ a complex protective deck system rather than a thick external waterline belt of steel or compound armour, or a more extensive coverage of thinner side-plating. The curved armoured deck was 2 ½in thick on the flat crown, and 5in on the slopes, 6in plating being added around the cylinder heads which protruded above the deck, while 12in steel was used for the CT, as it had been in the *Blakes*.¹²³ Several of the class saw extensive use early in the First World War, notably on the blockade north of Scotland, although the prevailing conditions indicated that even the raised forecastle vessels had inadequate freeboard for such duties.¹²⁴

Compared with roughly contemporary French cruisers, which they were principally intended to counter (such as the *Amiral Charner* class) they had approximately double the bunker capacity, were several knots faster, and carried a heavier armament easily capable of penetrating the soft steel armour plating of the French vessels.¹²⁵ Their protective scheme, was, in the context of the contemporary gunnery environment, and like all the British first-class cruisers of this period, far more effective than is often appreciated, covered in the following sections.

The age of the quick-firer

During the late 1880s, a revolution was taking place in naval artillery. The preceding decade had seen the final transition from muzzle to breech loading, and was largely dominated by the big gun. This tendency has been criticised owing to the inaccuracy and slow rate of fire of these weapons, but since the vessels were largely littoral combatants, and expected to engage at very short range, this would have been somewhat less of an issue than is often believed.¹²⁶ With the transition back toward engaging other vessels and the increasing perceived threat of the torpedo-boat, this tendency moderated, and there was a greater interest in providing an auxiliary armament in both battleships and cruisers. This went hand-in-hand with the

¹²³ Friedman *British Cruisers of the Victorian Era* p.221

¹²⁴ Brown *Op. Cit.* p.136

¹²⁵ Chesneau & Kolesnik *Op. Cit.* p.66 & p.304

¹²⁶ See Chapter 1, also the referenced works of John Beeler

development and introduction of new types of propellant, with slower, more predictable combustion. Cordite Mk I, composed of 58% nitro-glycerine, 37% guncotton and 5% Vaseline was adopted in 1889. Although not perfect, causing considerable wear in the gun bores, this was an acceptable compromise compared to the previous Prismatic powders and Slow Burning Cocoa (SBC).¹²⁷ A considerable improvement in the accuracy of guns of all calibres was the result.

The rise of the auxiliary armament and the quick-firing gun is often linked directly to countering small torpedo boats which were regarded in the *Jeune École* as a realistic and cheap means of countering (nee ‘destroying’) battleships.¹²⁸ Although this is partially true, it is far from a complete explanation of the contemporary gunnery environs. While the smaller QF guns remained primarily as a counter to torpedo-craft, the larger weapons had a different purpose, and initially arose out of the shrinkage of total armoured area in many major vessels over the previous decade.¹²⁹ While this matter was more or less successfully addressed by different naval constructors in new vessel designs, the QF batteries remained, as it had been recognised that in the gunnery conditions of the era, without any effective means of fire-control, the faster-firing guns were the only weapons that realistically stood a chance of hitting anything in the initial stages of an action, whether a fleet (as would be the likely case with battleships) or single-ship (for which first-class cruisers were intended) by virtue of their sheer volume of fire.¹³⁰ Rear-Admiral Samuel Long, in his paper of 29 January 1892 ‘An Attempt to Estimate the Probable Influence of the Introduction of QF Guns on Naval Tactics and Construction’ at the Royal United Service Institution, stated that in his view rapidity of fire was more important at sea, where moving bodies were concerned, than on land, the power to repeat a shot instantly before the vessels have much changed their position being likely to produce much more effective firing.¹³¹

Thus, rate of fire was directly related to the effective firepower of the vessel. This became even more marked following the development by Captain Percy Scott of HMS *Scylla* (later

¹²⁷ Parkinson *Op. Cit.* p.135-136

¹²⁸ *Ibid* p.142

¹²⁹ William White, in discussion on Captain C. C. Penrose FitzGerald ‘Side Armour Verses Armoured Decks, *from a Naval Point of View*’ Royal United Service Institution, Journal 29 (1885/1886) p.87

¹³⁰ Eric Grove *Fleet to Fleet Encounters* (London: Arms and Armour Press, 1991) p.14

¹³¹ Long An Attempt to Estimate... p.235

HMS *Terrible*) of continuous aim techniques.¹³² This reduced errors caused by the inevitable lag in reaction time by the gunner, and increased the rate of fire since there was no longer any delay while waiting for a set point in the roll.¹³³ In practice, a strong case can be made for the batteries of medium calibre weapons being the primary armament of contemporary first-class battleships and cruisers.¹³⁴ Long further remarked his belief that guns of this type would form an important feature in battleship armament, and the main armament of most cruisers, the significant increase in the rapidity of fire being likely,

...in the opinion of many Officers, to have more influence on sea fights than the increased power of the guns which has been so marked a feature in all navies since the Crimean war.¹³⁵

This view was concurred with in other nations. The Admiralty Intelligence Department summarised a criticism on the British Navy published in the spring of 1892, that the heavy guns were becoming the 'reserve' portion of the armament, to be used for their 'crushing effect when a favourable opportunity occurs.'¹³⁶ The value of rapidity of fire was if anything more significant for a first-class cruiser than it was for their battleship contemporaries, since they were more likely to be engaging in single-ship actions, at higher speed, with greater and less predictable manoeuvring on both parts.

From relatively small machine-guns, the QF gun rapidly grew in size and power; in Britain, this was primarily led by the armaments manufacturer Sir W. G. Armstrong and Company. Initial steps away from light types created a 4.7in weapon, which was quickly developed to a 45lb projectile from an initial 30lbs.¹³⁷ The nominal advantage with QF weapons was the much simpler loading arrangements. In the smallest types ammunition could be made up like a rifle cartridge, rather than with separate powder and projectile; in larger types, the projectile was separate, but loading arrangements were much eased by the use of a cartridge for

¹³² Norman Freidman *Naval Firepower: Battleship guns and gunnery in the dreadnought era* (Barnsley: Seaforth, 2008) p.19 See also Chapter Five

¹³³ *Ibid*

¹³⁴ It would remain so until it finally become possible to fire the big gun accurately at long range; it must be recalled that HMS *Dreadnought* herself did not really possess the fire-control facilities that would allow such until around 1909

¹³⁵ Long *An Attempt...* p.233

¹³⁶ TNA ADM 231/21 *Admiralty Intelligence Department* Report No.312 July 1892

¹³⁷ Eardley-Wilmot *Op. Cit.* pp.190-191 Also The Naval Annual by Lord Brassy (Portsmouth: Griffin & Co., 1887) p.453

carrying the propellant, and the 4.7in weapon was claimed to be capable of some ten aimed shots per minute.¹³⁸ In Admiralty trials at Shoeburyness in 1888 ‘an Armstrong 4.7-inch QF fired ten aimed rounds in 47.5 seconds, compared with 5 minutes 7 seconds for the current “issue” weapon.’¹³⁹ These 4.7in weapons were extensively employed in second-class cruisers, and replaced during the late construction stages the 5in BL weapons the *Trafalgar* class battleships were originally intended to be equipped with.¹⁴⁰ They were also employed in the two *Centurion* second-class battleships White designed as part of the provisions of the Naval Defence Act.

The last mentioned have some relevance to this thesis, since they were intended for duties not dissimilar from those of first-class cruisers, and they perfectly illustrate the QF dominated gunnery conditions of the era, where in the absence of effective fire-control, volume of fire was the dominant factor. The *Centurions* are little regarded today, on the principle that ‘time has shown that the construction of second-class ships merely to avoid expenditure is false economy.’¹⁴¹ White, as previously noted, did not care for second class vessels, and on balance they have been (somewhat grudgingly) justified by historians on the basis that they were intended for operations in the Far East, and while not capable of fighting first class battleships, they were an effective counter for the large and rather slow cruisers often stationed in the region (notably by Russia).¹⁴² However, many contemporaries saw the matter in a rather different light, with numerous naval officers preferring them to the first-class *Royal Sovereigns*.¹⁴³ Although the 4.7in may be thought relatively insignificant, the extremely high volume of fire they lent the *Centurions* (and any other vessel so equipped) would have been quite capable of devastating the unarmoured or lightly-armoured upper works of many contemporary opponents, particularly if employing powder-filled or high explosive (HE) shell. This then, was the principle use for the large batteries of QF guns carried by contemporary battleships and cruisers.

¹³⁸ *Ibid* p.190

¹³⁹ Bernard Ireland *Cruisers* (London: Book Club Associates, 1981) p.26 Under combat conditions the rate of fire would undoubtedly have been far lower, but the figures suffice to demonstrate the increased firepower the QF gun provided

¹⁴⁰ Chesneau & Kolesnik *Op. Cit.* p.31

¹⁴¹ Parkes *Op. Cit.* p.366

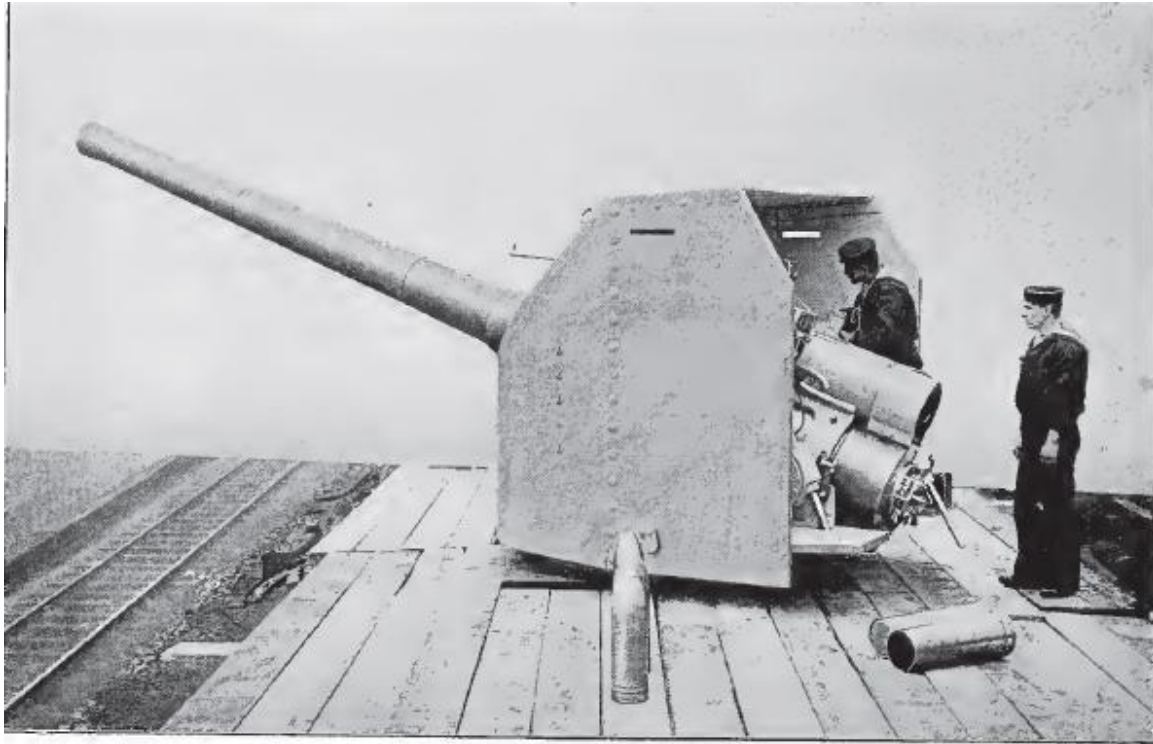
¹⁴² Brown *Op. Cit.* pp.131 –see also Chapter Four for a review of the China Station and cruiser operations in the region

¹⁴³ Manning *Op. Cit.* p.274

From 4.7in, a 6in QF weapon was developed, and this was the gun, in its three marks (the inevitable I, II, and III), which would come to dominate contemporary RN gunnery. Figure 2.3 shows an Armstrong's built 6in QF gun with shield, projectile and cartridge[s].

Figure 2.3

Armstrong-built 6in QF gun with shield, projectile and cartridges



Six-inch quick-firing gun and shield, designed by Sir W. Armstrong, Mitchell & Co.

Source: Captain S. Eardley-Wilmot *The Development of Navies During the Last Half-Century* (London: Seeley & Co. Ltd., 1892) pp.190-191

In principle akin to a scaled up 4.7in weapon, again with a separate projectile and brass cartridge which contained the propellant and primer in its base, the 6in QF had a rate of fire of some 5-7 aimed rounds per minute. In this weapon the zenith of the true QF piece was reached; although larger weapons could be fired with respectable rapidity, the 100lb projectile of the 6in was the practical limit of what could be physically loaded without the rate of fire rapidly falling off through crew-exhaustion.¹⁴⁴ On average, compared to previous breech-loaders, the new QF guns, when firing at a target were capable of discharging in a given time approximately six times the quantity of ammunition.¹⁴⁵ As Long, citing Sir Andrew Noble remarked:

“I need not impress upon you the significance of these facts, or the importance of quick-firing armaments, especially if firing shell, possibly charged with high explosives, against the unarmoured portions of cruisers or other vessels.”

Naval Officers will readily acknowledge the truth of this statement when the large area of unarmoured structure to be found even in armour-clad vessels is considered.¹⁴⁶

The vessels primarily under consideration in this chapter (viz. the *Blake*, *Edgar* and *Powerful* classes) were all equipped with the 6in QF as their ‘auxiliary’ armament, coupled with single 9.2in weapons fore and aft.¹⁴⁷ As in the battleships, the mixed calibre armament was generally favoured in first class cruisers as the 9.2in with its 380lb projectile and high velocity provided considerable extra destructive and armour piercing capacity. Their position, effectively as chase weapons of old, meant that slightly longer-range fire could be attempted, although range-finding would be difficult under such conditions. The real value of including the 9.2in guns was their utility in lengthy stern-chases, where the slow range-rate and bearing changes would allow for somewhat more accurate longer-range fire, while the additional punch would be useful closer in, finishing off crippled opponents. As illustrated in the section covering the *Powerful* class, this view of maintaining a mixed-calibre armament was not universally accepted though.

¹⁴⁴ Eardley-Wilmot *Op. Cit.* p.191

¹⁴⁵ Sir Andrew Noble writing in ‘Engineering’ (as Captain A. Noble) 12 September 1890 Also cited by Long, *An Attempt* pp.233-234

¹⁴⁶ Long *An Attempt* p.234. Long’s citation is from Noble, in ‘Engineering’ 19 September 1890

¹⁴⁷ With the exception of two of the Edgar class vessels, *Crescent* and *Royal Arthur*, which were equipped with a high[er] forecastle and carried two 6in in place of the fore 9.2in. See Chesneau & Kolesnik *Op. Cit.* p.66

Given the dominance of QF weapons, the armament of the first-class cruisers can be objectively assessed as little weaker than that of their battleship contemporaries since the Admiralty policy was to give these vessels a quick-firing armament identical with that adopted for first-class battleships of the same date.¹⁴⁸ Indeed, since the 9.2in gun was capable of penetrating most armour at sub-3,000yrd battle-ranges typical of the era, and was faster-firing, the armament of the first-class cruisers may be assessed as an equal or superior outfit under certain conditions. Table 2.1a & 2.1b give a simple breakdown of the numbers of QF weapons carried in Royal Naval 1st class vessels of the late 1880s – early 1890s.

¹⁴⁸ Sir William White 'The Principles and Methods of Armour Protection in Modern War-ships' in T. A. Brassey [ed.] *The Naval Annual 1904* (Portsmouth: J. Griffin and Co., 1904) p.121

Table 2.1a
Armament of British first-class cruisers 1888-1905

<i>Class</i>	<i>Chase / heavy guns –No. & Calibre</i>	<i>QF guns –No. & Calibre</i>
<i>Blake</i>	2 x 9.2in	10 x 6in
<i>Edgar</i>	2 x 9.2in*	10 x 6in
<i>Powerful</i>	2 x 9.2in	12 x 6in
<i>Diadem</i>	N/A	16 x 6in
<i>Cressy</i>	2 x 9.2in	12 x 6in
<i>Drake</i>	2 x 9.2in	16 x 6in
<i>Monmouth</i>	N/A	14 x 6in
<i>Devonshire</i>	4 x 7.5in	6 x 6in
<i>Duke of Edinburgh</i>	6 x 9.2in	10 x 6in
<i>Warrior</i>	6 x 9.2in	4 x 7.5in
<i>Minotaur</i>	4 x 9.2in	10 x 7.5in

*Note: *Crescent* & *Royal Arthur* = 1 x 9.2in & 12 x 6in QF

Table 2.1b
QF armament in British first-class battleships 1888-1905

<i>Class</i>	<i>Chase / heavy guns –No. & calibre</i>	<i>QF guns –No. & Calibre</i>
<i>Royal Sovereign</i>	4 x 13.5in	10 x 6in
<i>Renown</i> *	4 x 10in	10 x 6in
<i>Majestic</i>	4 x 12in	12 x 6in
<i>Canopus</i>	4 x 12in	12 x 6in
<i>Formidable</i>	4 x 12in	12 x 6in
<i>London</i>	4 x 12in	12 x 6in
<i>Duncan</i>	4 x 12in	12 x 6in
<i>King Edward VII</i>	4 x 12in, 4 x 9.2in	10 x 6in
<i>Swiftsure</i> **	4 x 10in	14 x 7.5in (B.L.)
<i>Lord Nelson</i>	4 x 12in	10 x 9.2in

*Note: *Renown* nominally 2nd class. Originally intended to have 4 x 12in

***Swiftsures* not designed for Royal Navy; nominally 2nd class

Projectiles

Projectiles of the era generally fell into two broad categories, armour-piercing (AP) shot, and explosive shell.

The most common form of AP shot was Palliser chilled-iron. Invented by Major Sir William Palliser, it was cast from wrought white-iron, with the head chilled by means of water-cooling in a differential mould.¹⁴⁹ It was cast with an internal hollow due to the difficulty of ensuring consistent casting with large solids. This could contain a bursting charge, lending it some notional armour-piercing shell qualities. However, the charge was too small to be of significant value, and was discontinued. Palliser shot was valuable for assaulting wrought-iron and thin steel armour, being quite capable of penetrating such defensive measures and causing heavy damage to internals.¹⁵⁰ Against compound armour and later face-hardened types of steel armour referred to in Chapter Three, Palliser was largely ineffective, and typically broke up on impact.¹⁵¹ By 1886 forged steel shot, with substantially superior armour penetrating capabilities was accepted into the Royal Navy when 400 Holtzer projectiles were purchased.¹⁵²

Common (explosive) shell was available in a variety of types, powder filled being the most common. New forms of high explosive were also being developed, and the period saw the gradual introduction of Lyddite (picric acid) as a filling. This latter was regarded as showing promise in testing, but was treated with caution since further development was needed to improve its stability.¹⁵³ Intended for use against unarmoured and lightly armoured structures, explosive shell was highly regarded for its blast and anti-personnel effects.¹⁵⁴ As noted below, the French naval architect M. de Bussy at this time had such a regard for the effects of shellfire that he designed the cruiser *Dupuy de Lome* with thin armour covering the majority of her hull above water specifically to defend against such attack. However, thin armour could suffer from considerable blast damage if insufficiently supported. A variety of shrapnel

¹⁴⁹ See Major William Palliser 'The Conversion and Rifling of Cast-Iron Ordnance and on Chilled White-Iron Projectiles' RUSI, Journal 11 (1868) pp.165-7.

¹⁵⁰ NMM Diadem class ship cover. See Confidential Submission of the Director of Naval Construction to the design of New First Class Cruisers ("Diadem" Class.)

¹⁵¹ War Office 'Treatise on Ammunition' (London: HMSO, 1905) p.103

¹⁵² Brown *Op. Cit.* p.79 Also see William Hovgaard *Modern History of Warships* (London: Taylor & Francis, 1920) p.426

¹⁵³ Brown *Op. Cit.* p.102

¹⁵⁴ See for example Sir Nathaniel Barnaby, K.C.B. 'The Protection of Buoyancy and Stability in Ships' *TransINA* Volume XXX (1889) p.226; also the remarks of Admiral Sir Vesey Hamilton on Long *On the Present Position...* p.24

shells remained available; primarily made to contain as many bullets as possible for anti-personnel effect, they were rarely employed on first class cruisers, and are therefore not discussed here.

Under-gunning in Royal Navy Cruisers under White

White's first-class cruiser designs were often accused of being under-gunned for their displacement, a subject largely covered under the respective types. More generally, it has been claimed that

...in most cases the British vessels were designed for more exacting requirements of seaworthiness and endurance which could not have been combined successfully with a heavier gun battery. However, this is a generalisation, and it is clear from the fact that several of White's cruisers were refitted with heavier or additional weapons that there was room for some improvement, although not on the scale suggested by some critics.¹⁵⁵

This is a question that is open to debate rather than being 'clear.' In comparison to some commercial designs such as the later Elswick cruisers designed under Philip Watts, which often packed a rather heavier battery into an equivalent or smaller hull, some of the vessels produced under White do seem to carry a relatively light armament, and this was increasingly remarked upon in the final years of the Nineteenth Century.¹⁵⁶ A handful of White's cruisers, notably the *Powerfuls* were indeed refitted with heavier or additional weapons, although more notable was the shifting of some of the casemate-mounted main-deck weapons to the upper deck (due to the main-deck guns being too close to the water for practical use in poor weather conditions). This however entailed a severe loss of protection to these weapons, their ammunition supply and their crews. During operations off the Dardanelles 15 August 1915, serious injuries aboard HMS *Edgar* were mostly amongst upper-deck crew –a clear demonstration of the risks entailed if weapons were located or repositioned to these locations, with only light shield-protection.¹⁵⁷

¹⁵⁵ Chesneau & Kolesnik *Op. Cit.* p.61

¹⁵⁶ See for example the discussion following Philip Watts 'Elswick Cruisers' *TransINA* Volume XLI (1899) pp.296-308; W. White 'A Note on "British Ships in Foreign Navies"' *The Nineteenth Century: A Monthly Review* May 1898 pp.866-868

¹⁵⁷ TNA ADM 1 / 8430 / 239 Official correspondence to Admiralty 17 August 1915

A major feature of all the first-class cruisers designed by White for the Royal Navy was the ensuring of an adequate (viz. ‘large’) ammunition supply. Ease of transport of this ammunition to the widely dispersed guns was also given considerable attention, particularly from the *Powerful* class onwards, with ammunition passages running below the protective decks to ensure rapid service of the guns from the magazines and shell-rooms. These passages have received severe criticism from historians and later naval architects as a major weakness and a severe threat to the safety of the ship, with their performance during the Great War 1914-’18 cited as evidence. This subject warrants separate assessment, and is so treated in Chapter Five.

Armour types and development

Armour was first added to ships specifically for the purpose of limiting the destructive effect of shell in and against the gun batteries: a point made by Sir Nathaniel Barnaby in a paper at the Royal Institution of Naval Architects in April 1889.¹⁵⁸ It was not the first time in that year that Barnaby had discussed the subject; in January he had prepared and read a paper before the Institution of Civil Engineers which also summarised his views on armour and the history of its use, as he saw it.¹⁵⁹ However, as Barnaby illustrated, in comparatively short order the primary function of armour shifted away from being solely for the defence of artillery and its crews, toward the protection of the ‘vitals’ –the engines, boilers and magazines. To a varying extent, it was also seen as a means of guarding buoyancy and stability, but, post the echelon coast-assault vessels like the *Inflexible* this was far from invariable.¹⁶⁰

In developing the physical properties of armour plate the principle was and indeed remains to balance the two fundamentally opposing properties of resistance to penetration (i.e. its

¹⁵⁸ Barnaby *The Protection of...* p.216

¹⁵⁹ Sir Nathaniel Barnaby ‘Armour for Ships ; its Uses and its Nature’ *Proceedings of the Institution of Civil Engineers [Henceforth ProcICE]* Volume 98 (1889) pp.1-24 Also see discussion on paper, pp.25-75 By way of diagram and explanation, Barnaby divided the historical use of armour into five ‘phases.’ In these, he suggested that at the commencement the portion of ship hull above water was completely clothed with armour; by degrees in the second through fourth phases the area covered by armour was gradually reduced, and in the fifth phase the cycle of change turned full-circle and the vessels were once again fully clothed in protective plating. Note that Barnaby was using French vessels from which to derive his ‘phases’

¹⁶⁰ Note that Barnaby, in his fifth ‘phase’ noted that the French, impressed with the results of high explosive shells, had reverted to the use of extensive thin side armour ‘to prevent the admission of such shells between the decks, under the guns and gunners’ *The Protection of...* pp.216-217 see below for a discussion on the various armour configurations employed during this period, including the use of extensive thin side-armour in cruisers

hardness), against its ability to resist shattering under assault (its toughness). Assuming a homogenous material, were too hard a plate created it would have a good chance of stopping a projectile, but being broken up in the process. Conversely a soft plate, although less likely to crack, shatter or otherwise break up under assault, was unlikely to prevent a projectile from penetrating to the other side and entering the vitals of the ship.¹⁶¹ There is however a more complicated and ultimately more effective approach whereby the resistive and elastic properties of the material vary by depth within the plate itself. The ideal is to combine a hard external face to break up incoming projectiles with a tough back which provides the requisite mechanical support. This was perfectly well appreciated during the latter half of the 19th century, but until the middle of the closing decade, metallurgical technology and manufacturing processes had not sufficiently advanced to allow the production of such plates.

During the period 1888-1894 there were two general types of armour available that had useful defensive capabilities: compound and homogenous steel / nickel-steel alloys. It must be emphasised that in comparison to the face-hardened types that would become available by the middle of the 1890s the performance of both these types was substantially inferior for a given thickness. This, and the weights involved in carrying sufficient thicknesses to effectively resist assault by contemporaneous weapons posed problems for both battleships and cruisers. It was however particularly marked for the latter, where speed and coal endurance necessarily took priority and could therefore not afford to give over as high a percentage of their displacement to protection as their battleship counterparts, which were specifically intended for close action and little else.

Wrought-iron had long since reached the limit of its practical value; although tough and possessing an impressive resistance to cracking (particularly when the iron was of a very pure grade) it was insufficiently resistant to penetration.¹⁶² Compound plates, which welded a hard steel face to a tough wrought-iron back proved to be a substantial improvement. Employees of two Sheffield firms, Cammell and John Brown, independently conceived the idea, although their respective modes of manufacture differed in detail. In the former case the plate was made by casting a steel face directly onto a rolled iron back, while in the latter, a thin steel plate was placed close to the wrought-iron backing, and steel cast in the gap between the

¹⁶¹ See Captain T. J. Tressider C.M.G. 'Modern Armour and its Attack' *TransINA* Volume L (1908) pp.25-27

¹⁶² Charles E. Ellis 'Armour For Ships (1860 to 1910)' *TransINA* Volume LIII Part II (1911) pp.338-339

two.¹⁶³ In each case, all the solid plates present were heated during the casting of the steel, and the entire resultant compound plate was then subjected to heavy rolling once casting was complete.¹⁶⁴

Trials indicated compound plates provided some 50% improvement over wrought-iron when attacked by chilled-iron (Palliser) shot, and 25% improvement against forged chrome-steel projectiles –figures of merit of 1.25 – 1.5.¹⁶⁵ Although variations in the comparative figures quoted by different authors have led some historians to question how effective the new armour really was, it seems probable that these differences were simply the result of the figure of merit varying depending on the type of projectile assumed, as indicated above (for e.g. Palliser, or forged chrome-steel).¹⁶⁶ Various proportions of steel and iron were tried, and ‘a proportion of about one to two [steel to wrought-iron] was found to give the best results.’¹⁶⁷

The alternative of homogenous steel armour was also available, and its capabilities were being slowly advanced. Steel armour in fact predated compound by approximately a year, but the earliest types were of questionable utility.¹⁶⁸ Prior to the development of effective face-hardening processes (see Chapter Three), steel armour was, as had been the case with wrought-iron, largely a matter of finely tailoring the homogenous hardness (or softness) of the plate, and typically a middle-ground between plates which were more resisting and less tough, and those which were less resisting and more tough was sort.¹⁶⁹ There was a view expressed during the early 1890s that creating a laminated structure within the steel itself was preferable, it being further suggested that this was a primary reason for the toughness of wrought-iron.¹⁷⁰ This was distinct from stacking multiple plates together to create a given thickness, which was experimentally demonstrated to be substantially inferior to a single plate of the same thickness in both hardness and toughness.¹⁷¹ In terms of general metallurgy there is much truth in this assertion, although there was some doubt expressed by other manufacturers, Thomas Vickers stating in the discussion on an 1891 INA paper by Mons. J.

¹⁶³ *Ibid* p.341

¹⁶⁴ *Ibid*

¹⁶⁵ Brown *Warrior to Dreadnought* p.77 The assumption / comparisons made are based upon British requirements / measures to provide a common baseline.

¹⁶⁶ Rodger Parkinson *The Late Victorian Navy: The Pre-Dreadnought Era and the Origins of the First World War* (Woodbridge: The Boydell Press, 2008) p.133

¹⁶⁷ Ellis *Op. Cit.* p.341

¹⁶⁸ Brown *Op. Cit.* p.77

¹⁶⁹ T. E. Vickers, in discussion on Barba *Op. Cit.* pp.151-152

¹⁷⁰ Barba *Op. Cit.* p.145

¹⁷¹ Charles Orde Browne *Armour, and its Attack by Artillery* (London: Messrs. Dulau & Co., 1887) p.5

Barba, Chief Engineer of Schneider's Creusot works, that there was no known process that could create such laminations (or fibrous properties) in cast plates.¹⁷²

The first significant advance in the capability of homogenous material armour occurred with the introduction of nickel-steel alloys. It has been stated that 'the advent of nickel-steel armour in 1888, which was superior to the compound armour that was then in service, allowed reductions in the thickness of plates, and thus in the weight of protection.'¹⁷³ This is not so. While the introduction of nickel-steel alloy was important to the development of armour, the contention that the introduction of nickel itself conferred substantial improvements is a severe misunderstanding of the historical development of armour plate, and the metallurgical realities involved. While the introduction of nickel was a step forward, it did not in itself bring such gains that a significantly thinner plate could be substituted for an equal level of protection.

The technical facts are these: a suitable low-alloy mix (such as introducing a small percentage of nickel) has the potential for superior mechanical properties in both hardenability and toughness over plain carbon steels, but this greatly depends upon the heat-treatment processes employed, viz. the details of what annealing, quenching and tempering were applied to the plate, and the lengths of time involved. These advantages were in some cases partially realised, but it is evident from the close relative performances in competitive trials between compound, solid steel, and nickel-steel plates that contemporary production methods did not allow this potential to be fully exploited. The advantages of low-alloy nickel steel (Schneider used approximately 4% nickel) over plain carbon steel for homogenous ship armour without additional face-hardening were in any event relatively small, at most in the order of approximately five per cent.¹⁷⁴ This is confirmed by the 1915 Gunnery Manual, which categorises 12in of all-steel armour as equivalent to 12in of compound.¹⁷⁵ It appears that armour producers at the start of the 1890s regarded the major benefit of adding nickel as a tendency to increase toughness and improve resistance to cracking compared to an equivalent

¹⁷² T. E. Vickers, in discussion of Barba *Op. Cit.* p.152 Whether heat-treating, face-hardening &c. can be considered to create a laminated structure within the material is another matter. Since these essentially post-date the period in question for armour technology, they are discussed in Chapter Three

¹⁷³ Sumida *Op. Cit.* p.12

¹⁷⁴ See *Naval Ordnance and Gunnery: Volume 1* (Washington DC: US Gov. Printing Office, 1957) pp.41-42

¹⁷⁵ Cited by Brown *Op. Cit.* p.150 In this case although 'all-steel' may be strictly read as 'mild-steel' rather than an alloy, it is clear that the reference is intended to describe non-face-hardened plates

mild-steel plate for a similar hardness level.¹⁷⁶ This was seen as requisite when the plate was unbacked, or generally unsupported.¹⁷⁷

Tests on HMS *Nettle* (ex-HMS *Thunderer* of 1831, hulked at a target ship in Portsmouth and renamed *Nettle* in 1870) assessed a variety of armour types, mostly privately submitted from commercial British firms. In armour trials throughout the 1880s and early 1890s there appeared to be very little to choose in practice between all-steel (and later also nickel-steel) and compound plate. Results varied slightly in favour of one or the other, but the variables in the tests did not always appear to be especially tightly controlled or consistent (an obvious example being the number of bolts holding the plates to the target), and since the criteria of different nations tended to vary with regard to the relative qualities of hardness and toughness, it is safe to assert that no dramatic differences existed between the various contemporary armour types.¹⁷⁸ As a rule of thumb, armour resistance to penetration for a given type of homogenous material, without any face-hardening or other processes applied, can be said to vary approximately at the square root of the cube of the thickness.¹⁷⁹

The Resistance experiments

From 1885 to 1889, the old ironclad HMS *Resistance* was used in a series of full-scale trials to test various protective schemes.¹⁸⁰ One historian has stated that the trials were largely created for White to test the validity of his theories.¹⁸¹ Although this is probably an overstatement, White was certainly deeply involved with, and took considerable interest in, the trials. Sometimes dismissed as having been abandoned before yielding useful data, such was far from being the case.¹⁸² These trials were conducted with a level of secrecy that was

¹⁷⁶ See Barba *Op. Cit.*

¹⁷⁷ Charles E. Ellis 'Recent Experiments in Armour' *TransINA* Volume XXXV (1894) p.216

¹⁷⁸ Brown *Op. Cit.* p.78 Based on the reports of various trials, it seems that some nations favoured a softer plate that exhibited no signs of cracking, accepting greater penetration as the trade-off, while others did not regard cracking (to a varying extent) as such a significant issue, and were willing to accept a degree of this in order to secure greater resistivity against penetration

¹⁷⁹ Lord William Armstrong, letter dated 12 April 1871, given in evidence to *Report of the Committee on Designs for Ships of War* NA ADM 1/6212 p.xxii

¹⁸⁰ Parkes *Op. Cit.* p.29 There may have been some deliberate irony in selecting her given her name. Her sister ship *Defence* would have been a credible alternative, but damage suffered in a collision in 1884 may have been sufficient for *Defence* to be favoured for the purposes of testing

¹⁸¹ Antony Preston 'The End of the Victorian Navy' *The Mariner's Mirror* Volume 60, No.4 (November 1974) p.374

¹⁸² Alan Cowpe 'The Royal Navy and the Whitehead Torpedo' in B. Ranft [ed.] *Technical Change and British Naval Policy 1860-1939* (London: Hodder & Stoughton, 1977) p.26 Cowpe's assessment is based on

extremely unusual in the Nineteenth Century; Brown cites an letter from the Admiralty to C-in-C Portsmouth which stated that ‘...every effort to be used to prevent unauthorised persons from witnessing the experiments, or gaining knowledge of the damage done when the ship is brought into harbour.’¹⁸³ That the Admiralty guarded the results and findings so carefully is a clear indication of the importance with which the Board and others regarded these experiments, and the fact that they were viewed as being important, if not vital, to national security.

The original tests were mostly concerned with assessing means of self-sealing small holes from light calibre strikes against unarmoured structures. A variety of possible methods were explored including the use of asbestos, cellulose and India-rubber, along with some patented products such as Woodite (which contained white and brown / grey asbestos along with other base materials). There was considerable interest in the use of such devices in the last years of the 1880s and first years of the 1890s, largely due to the rise of the light – medium calibre QF gun increasing the likelihood of multiple small perforations around unprotected waterlines, and potentially fatally affecting buoyancy and stability if other measures (such as effective internal protective schemes) had not been implemented.¹⁸⁴ In France cellulose was favoured: the armoured cruiser *Dupuy de Lome* famously employed the substance in cofferdams above the protective deck and behind the side-armour.¹⁸⁵ Captain C. C. Penrose-FitzGerald, in an 1888 paper before the INA ‘On Unarmoured Water-Lines In War-Ships’ (specifically referring to cruisers) argued for some form of additional substance to be used to help seal small holes from shot or splinters, and stated that he had in fact had carried out some small-scale experiments of his own with India-rubber, to such good effect that the Admiralty engaged in larger scale experiments on board the *Resistance*.¹⁸⁶ FitzGerald, although claiming

HMS *Vernon*’s Annual Report in NA ADM 189/7 & ADM 1/7687 which primarily focused upon torpedo experiments

¹⁸³ Brown *Op. Cit.* p.101 citing letter Admiralty to C-in-C Portsmouth 16 June 1888, Ordnance Board Minutes. The Bill that would create the Official Secrets Act (1889) was presented to Parliament by the Attorney General, Secretary Stanhope, and Lord George Hamilton -see Hansard 10 May 1888, Volume 325, c.1934

¹⁸⁴ It is easy to condemn previous vessels owing to perceived vulnerability to such conditions, but such assessments are short-sighted and fail to appreciate the extraordinary pace of technological development, and the fact that these vessels were designed for an era in which no such threat existed. There was a world of difference between the standard breach-loading weapons and the quick-firers starting to be introduced, as already discussed. The dramatic jump in rate of fire and thus overall firepower completely overset existing conditions

¹⁸⁵ R. Chesneau & E Kolesnik [eds.] *Conway’s All the World’s Fighting Ships 1860-1905* (London: Conway Maritime Press, 1979) p.303

¹⁸⁶ Captain C. C. Penrose-FitzGerald ‘On Unarmoured Water-lines in Warships’ *TransINA* Volume XXIX (1888) pp.172-173

that he was ‘by no means specially wedded to indiarubber in this connection’ seemed to be rather put out by the conclusion of the trials, which he felt may have been based upon erroneous placement or assumptions as to its use.¹⁸⁷ In the subsequent discussion, White refuted this, remarking that everyone who had been present at the *Resistance* trials ‘was well disposed to make the best use of indiarubber in those experiments, and I think everybody who saw the results was unanimous in disappointment.’¹⁸⁸ White further stated that he could not give the meeting additional particulars on the tests carried out on the *Resistance*, but often cited findings as influencing features of his ships.¹⁸⁹ Subsequent trials in 1887 focused upon defence against torpedo attack. Although the threat posed by torpedoes was taken seriously, the cellular construction and placement of coal-bunkers in the first-class cruisers of the era would have provided some protection against underwater attack during this period when warheads remained small, so particulars of the torpedo trials are not given here.

The 1888 trials once again turned to assault by artillery, this time with an eye upon testing various methods of defence against the new high explosive shells coming into vogue, along with solid armour-piercing shot. The *Resistance* was modified so that part of her hull represented the secondary battery of a modern battleship, with a casemate protected by 3in steel over 1in iron, and traverses of 1in – 1 ½in steel along with rope mantlets built between battery positions.¹⁹⁰ ‘Dummy men were arranged and “animals, if necessary, to be located in the battery”’. Old guns, a torpedo and filled cartridge cases were positioned in the battery to better gauge the damage results.¹⁹¹ Three photographs of these 1888 – 1889 trials against the aforementioned casemate are shown in Figures 2.4 and 2.5. Even today, the pictures are remarkably chilling.

¹⁸⁷ *Ibid*

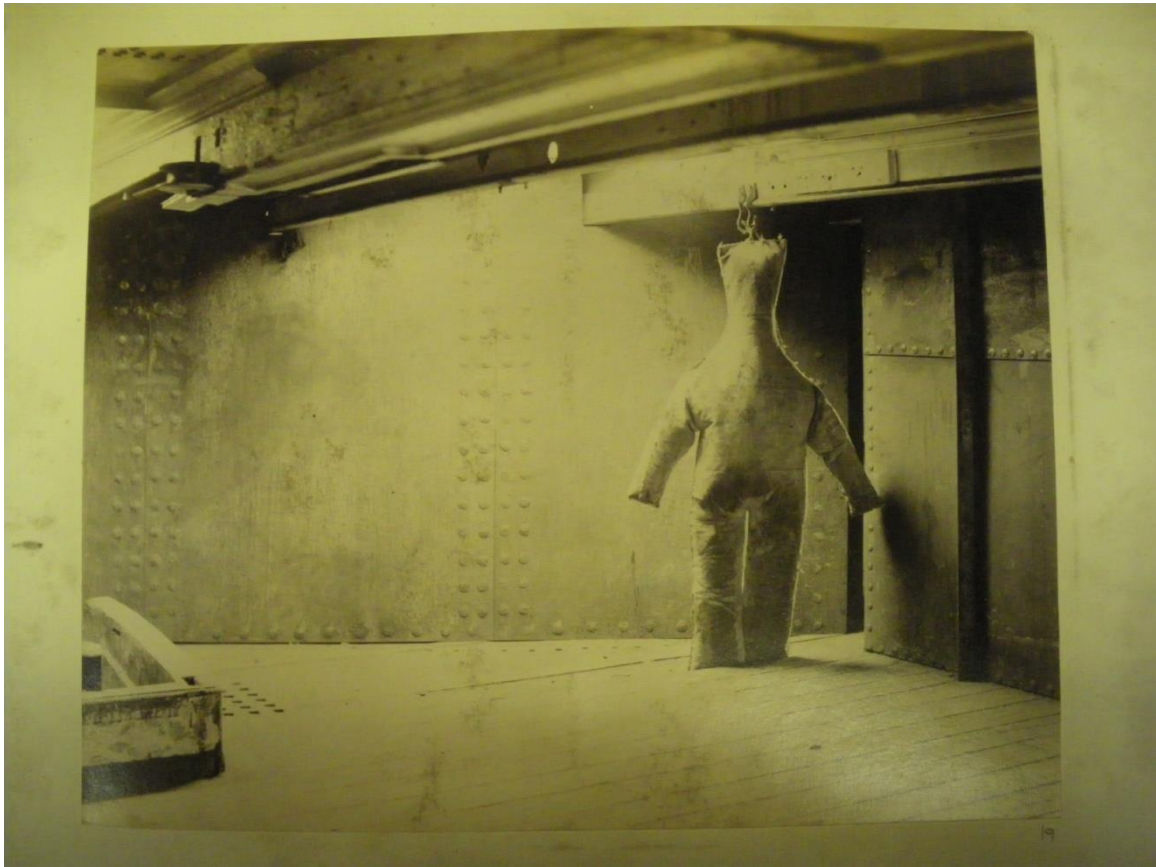
¹⁸⁸ *Ibid* p.200 Note that FitzGerald was on active duty out of the country at the time the experiments were held

¹⁸⁹ See for example his concluding remarks following the discussion on his near-legendary paper ‘On the Designs for the New Battle-Ships’ *TransINA* Volume XXX (1889) p.209 and *The Principles and Methods...* p.119

¹⁹⁰ Brown *Op. Cit.* p.102 Note that the results as far as casemates went applied equally to cruisers

¹⁹¹ *Ibid*

Figure 2.4



From album 'Resistance Experiments, 1889' held by the National Maritime Museum Historic Photographs and Ship Plans collection

Figure 2.5



From album 'Resistance Experiments, 1889' held by the National Maritime Museum Historic Photographs and Ship Plans collection

The findings of these trials on board *Resistance* are briefly summarised below, and give a clear insight into the reasons for specific design features in Royal Navy vessels at this time:

- Coal bunkers were very effective against HE shell, both in terms of absorbing blast, and preventing additional splinter damage
- A casemate similar to that employed in the test would defend against all HE common-shell up to 6in, while the armoured rear of the casemate would, along with traverses, effectively limit splinter-damage from nearby 6in HE shell detonations. The extensive use of *widely distributed* casemates by White can be traced back to the results from this particular trial
- 4 ½in armour would keep out all HE filled common-shell
- HE produced more splinters than powder-filled shell, but these tended to be smaller and less destructive. It was more likely to produce a large hole in thin plating due to its explosion on contact
- Palliser chilled iron shot was becoming less effective against the latest forms of armour, but cost eight times less than forged steel shot, and was retained for its value against older, less well protected opponents.¹⁹²

In general, it was found that a wide distribution of (particularly the auxiliary) armament was preferable, and that casemates offered much superior protection to armoured batteries or weapons protected by thin shields situated on upper decks, which experience in the Sino-Japanese war would later confirm to be useless or worse.¹⁹³ It was found that thin shields ‘only served to explode shells which might otherwise have passed the gun, sending a blast of splinters across the deck to the opposite gun; or if they passed the gun, might be caught and exploded by the shield on the far side instead of passing out of the ship.’¹⁹⁴ Thin side-armour was determined to be useful *if well supported* against HE or powder-filled shell but was valueless against AP shot. Cellular construction in conjunction with coal defence was found to be an effective means of protecting the buoyancy and stability of a vessel, and it was concluded that the logical limit of protection resided in the strength of the decks.¹⁹⁵ The latter

¹⁹² Summarised from the Ordnance Board Minutes by Brown, *Ibid*

¹⁹³ Parkes *Op. Cit.* p.359

¹⁹⁴ *Ibid*

¹⁹⁵ Manning *Op. Cit.* p.272

point especially would be repeated by White so frequently, in so many papers, letters and articles, that it may be considered his shibboleth.

The ascendancy of the protective deck system in first-class cruisers

By the latter half of the 1880s, the question of how best to dispose armour protection in first-class cruisers was provoking considerable (and highly animated) debate both within and outside of naval circles. The matter was by no means a simple one, since in the absence of conflict there was little practical evidence from which conclusions could be drawn, a point that was not always appreciated by the wider public, despite the best efforts of the Board, its officials, and a number of serving naval officers.¹⁹⁶ Moreover, the introduction of new armament technologies in the shape of the quick-firing gun and effective high explosive projectiles considered above presented designers with a raft of new challenges. There was not even agreement on whether armour should be employed to protect the buoyancy, stability and trim of a vessel, or whether it should be employed rather for the protection of the ‘vitals’ – machinery, boilers, magazines from shell fire.¹⁹⁷ Not without reason would Sir William White in later years write that ‘discussion on the defensive qualities of modern war-ships frequently disclose lack of knowledge of the history of the applications of armour, and a failure to appreciate the principles underlying its use.’¹⁹⁸

The principle question was to establish, for a given vessel displacement, the most effective means of protecting a certain region in the neighbourhood of the water-line, of very moderate breadth in relation to the total depth of the ship. There were two general armour configurations that could be practically employed in contemporary first-class cruisers: external, and internal. John Biles, in his 1887 Institution of Naval Architects paper ‘Comparative Effects of Belted and Internal Protection upon the Other Elements of Design of a Cruiser’ summarised the two configurations thus:

The belted type of protection may be described as a belt or strip of vertical armour, forming the side of the ship in the vicinity of the water-line, and surmounted by a flat

¹⁹⁶ For example, see Eardley-Wilmot *The Development of Navies...* p.157

¹⁹⁷ White, in discussion of Penrose-FitzGerald *Side Armour...* p.88

¹⁹⁸ Sir William White ‘The Principles and Methods of Armour Protection in Modern War-ships’ in T. A. Brassey [ed.] *The Naval Annual 1904* (London: J. Griffin, 1904) p.108

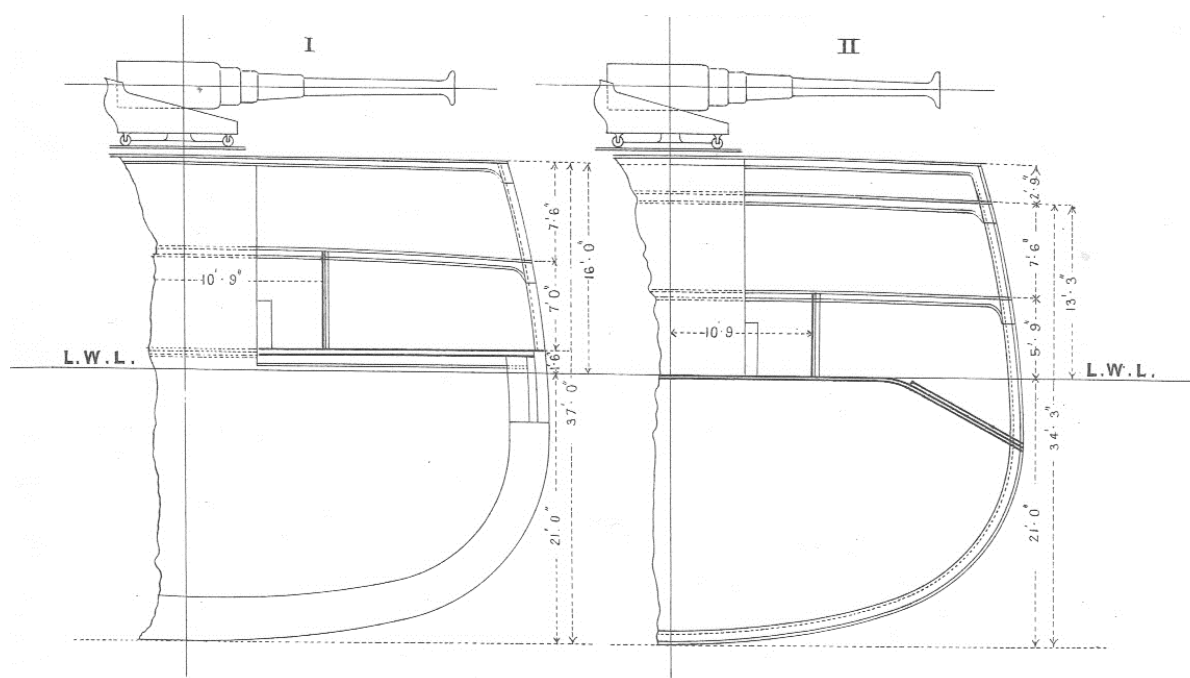
deck of about one-fifth of the thickness of the belt, forming with the belt a shield over the machinery and magazines...

The internal type of protection is usually represented by a steel deck extending from side to side of the ship, but, instead of ending with a belt of armour, it is sloped down at the side, joining the outside bottom at approximately the same point that the bottom of the armour does. The sloping part of the deck at the side of the ship is usually thicker than at the middle.¹⁹⁹

The two armour configurations described by Biles are depicted in Figure 2.6 with a section from a plate used to illustrate his INA paper.

¹⁹⁹ Biles *Op. Cit.* p.335

Figure 2.6 Belted and protected deck cruiser cross-sections, viewed from aft



Source: J. Biles 'On the Comparative Effects of side and internal Armoured Protection upon the other Elements of Design of Cruisers' Plate XXVIII *TransINA*, Vol.XXVIII (1887)²⁰⁰

²⁰⁰ To left is a belted cruiser design (Orlando class) with a thick, but shallow external belt of armour rising to just above the load waterline (L.W.L.), surmounted by a flat armoured deck of 1/5 the thickness. To right is a proposal by Biles for an alternative utilising an internal curved armoured deck rather than external armour plate. Note that in this particular design, Biles has placed the flat crown of the deck on the L.W.L., a point that received much criticism.

What may be justifiably termed the first modern first-class cruisers built for the Royal Navy, the *Imperieuse* and *Orlando* classes (designed during the first half of the 1880s) were protected by the external armour scheme of relatively thick, though shallow waterline armour belts.²⁰¹ The thick but shallow belt was, as detailed in the previous section, imposed by the limited resistivity of contemporary compound and steel armour. As previously noted, given the considerable weights involved it was not practical for a cruiser, where speed and coal-supply necessarily took priority, to carry armour capable of resisting assault from both common shell and AP shot over large areas of hull.²⁰² This type of belted protection as described by Biles would briefly be joined by an additional configuration of relatively thin armour plate covering a far greater area of the side, associated with a thin underwater armoured deck. Finding some favour in France, as considered below this scheme was specifically designed to counter explosive shell, but was largely ineffective against AP shot.

Owing to the weight problems involved with external armour, the alternative method of employing a curved, internal protective steel deck had been gaining traction for some years, and by the end of the decade, under the directorship of William White it entirely superseded belt armour in first-class cruisers designed for the Royal Navy. This configuration was far more complicated than is often realised, and the ‘protective deck’ scheme in fact described ‘an elaborate system of protection in which the deck itself was only one aspect, albeit the most important.’²⁰³ There is some question about who was the originator of the protective deck concept, but Sir Edward Reed and Lord Armstrong appear to have the best claims and should probably receive joint credit.²⁰⁴ In his letter to the 1871 Committee on Designs, Lord Armstrong had advocated reducing or entirely eradicating side or belt armour, on the grounds that the power of naval artillery was outstripping the resistive capacity of vertical armour, and the weight which would otherwise be devoted to it would be better employed elsewhere.²⁰⁵ The official report took a somewhat more moderate view, but the minority Design Committee

²⁰¹ The *Orlandos* were nominally developed as enlarged versions of the *Mersey* second-class cruisers. Although they were principally designed for trade protection, they are generally accounted as early examples of first-class cruisers (all being completed post the general fleet reclassification of 1887). Chesneau & Kolesnik *Op. Cit.* p.65

²⁰² A 1 in plate of iron or steel weighs approximately 40lbs to the square foot (or 195.3Kg to the square metre). See Norman Friedman *Battleship Design and Development, 1905-1945* (New York: Smithmark, 1979) p.68

²⁰³ Brown *Op. Cit.* pp.133-134

²⁰⁴ *Ibid* p.132

²⁰⁵ Lord Armstrong, letter dated 12 April 1871, given in evidence to the *Report of the Committee on Designs for Ships of War* NA ADM 1/6212 pp.xxv-xxvi

Report by Admiral Eliot and Rear-Admiral Ryder largely concurred with Armstrong's views, suggesting internal oblique armour only for all ship classes.

While this was not adopted by the service at the time, which favoured vertical armour allied to partial protective decks (introduced in HMS *Shannon*), or partial protective decks over machinery only in small corvettes and similar types (introduced in the *Comus* class) a decade later Lord Armstrong at his Elswick warship yard was in a stronger position to put his ideas into practice. Working with George Rendel he created the *Esmeralda*, the first modern cruiser devoid of side-armour, and instead relying on a curved internal underwater steel deck for the protection of engines, boilers and magazines, and minute subdivision of the waterline region associated with cork-filled cofferdams for the maintenance of buoyancy and stability. In Italy, Insp. Eng. Benedetto Brin also entirely abandoned side armour, trusting to a similar scheme of a curved internal armour deck and cellular construction around the waterline for his *Italia* class. The configuration of the full-length protective deck would be introduced into the Royal Navy by Nathaniel Barnaby in the *Mersey* class second class cruisers.

As Director, White would use a highly adapted version of the protective deck scheme for the *Blake*, *Edgar*, *Powerful* and *Diadem* first-class cruisers, and the basic philosophy would in fact be seen in all his first-class cruiser designs. This general approach to armour protection does not appear to be well understood by many historians, and vessels carrying internal oblique armour are frequently referred to as if they were devoid of any kind of protection at all. Possibly this is due to a tendency to focus upon armour belts and regard internal armoured decks as supplementary to vertical armour. However, as far as the contemporary Board of Admiralty, their professional advisers, and designers such as Biles, Watts and White were concerned, almost the reverse was the case:

So far as experience has gone... it is in favour of the view that in all classes of ships, the primary necessity in defence is the protection of the vitals by a steel deck.²⁰⁶

The focus of attention at the time was thus not upon external vertical armour, but the internal oblique armoured decks. Attention would only shift to vertical protection once the strength of this deck and the defence afforded by it to the vitals was deemed to be beyond reasonable question.

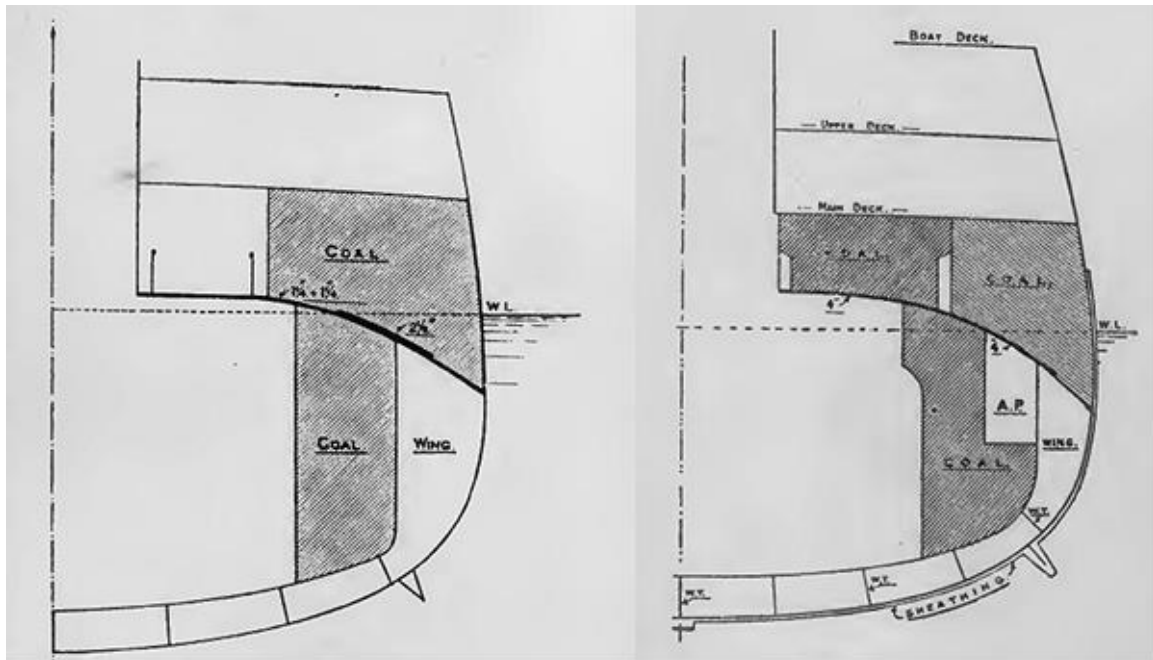
²⁰⁶ TNA ADM 116/446 Confidential Submission of the Director of Naval Construction to the design of New First Class Cruisers ("Diadem" Class.) S.10268, 1895.

In the protective deck configuration favoured by White, the flat crown of the armoured deck rose as high or higher above water as a typical contemporary thick armour belt, sloping down at the sides to a point below water roughly where the lower edge of such an armour belt would be, thus protecting engines, boilers and magazines. The angular spaces above the sloping internal armoured steel deck were then filled with heavily subdivided coal bunkers, which prevented the ingress of much water and also acted as a highly effective ‘stifler’ of many types of projectiles, thus forming an efficient protection of the vessel’s buoyancy and stability.²⁰⁷ Moreover, given the short battle ranges of the era and the almost flat trajectory of incoming projectiles, the curved sides of the armoured deck would result in the majority of strikes occurring at an oblique angle, further improving the effectiveness of the defensive scheme. Given these gunnery conditions, plunging fire was not regarded as a significant threat, particularly for cruisers. Penrose-FitzGerald pointed out in the discussion of Biles’s INA paper that the projectile from a modern 8in gun carried 1,100 yards with one degree of elevation, and at the time of writing in 1887 there was little to suggest that naval battles would be settled at much over 1,000 yards.²⁰⁸ Two example cross-sections of protective deck systems are depicted in Figure 2.7.

²⁰⁷ *Ibid* pp.355-356 See also Brown, *Op. Cit.* p.134 Since the coal occupied some 5/8 of the bunker space, there was little space left to be flooded. Brown also points out this also applied to loss of waterplane inertia which governs the height of the metacentre, so that coal reduced loss of stability on flooding.

²⁰⁸ Penrose-FitzGerald, in discussion on *Ibid* p.346

Figure 2.7: Protected cruiser cross sections showing internal curved protective deck configurations.



Source: E. L. Attwood *War-ships: A textbook on the construction, protection, stability, turning, Etc., of war vessels* (London: Longmans, Green & Co., 1904) pp.29-30.

Edgar class to left, *Diadem* class to right.²⁰⁹

²⁰⁹ Note the ammunition passage (labelled 'AP') clearly shown in the cross-section of the *Diadem*, under the protective deck, and coal bunkers

As a matter of basic principle White had little use for narrow armour belts located around the nominal waterline of a cruiser, considering their practical value to be at best minimal. His remarks on the matter were blunt:

For myself, I do not believe in any mystic charm in the 6 or 7 ft. of depth protected in a belted ship out of the 30 or 40 ft. of her total depth. The part above the water and above the armour, and the part below the armour and below the water, these two parts are essential to the floating, to the stability and to the behaviour of the ship. To talk as if 5 ft. of height below the still water-line, or 5 ft. depth below the still water-line, embraced the whole portions of the structure which need to be considered, or to assume that there is a mystic point below which no attack by artillery fire shall be considered to be likely to take effect, is to my mind absurd.²¹⁰

Since it is clear that with such a narrow belt (roughly representative of that fitted to the *Orlando* class vessels) only a very moderate degree of roll would expose the hull below the armour to gunfire, his point was clearly valid, particularly given the fact that this was also the era in which the light – medium calibre QF gun was rapidly rising to prominence. The hull would also be potentially exposed to such fire through the normal rise and fall of waves, and the wave-profile created by the vessel's passage if at moderate – high speed. Although it was unlikely to be deliberately attacked in this way, the gunnery environment of the era by nature increased the likelihood of such a hit, and it matters little whether the shot that causes crippling or fatal damage was deliberately aimed at this region or not.²¹¹ Worse still, as occurred in both the *Imperieuse* and *Orlando* classes, any growth in weight during the construction or service life of the vessels (or errors in the weight calculations during the design stages) could lead to their narrow belts being completely submerged.²¹² Rodger suggests that the effect of this on the ship's fighting capabilities was probably much exaggerated, but it seems clear that the potential dangers of this occurring were real enough, and more so since the belted type was rarely as well subdivided, nor employed such

²¹⁰ White, in discussion on Biles *Ibid.* p.354

²¹¹ Given these basic principles, it is clear (and may be demonstrated by calculation) that if external armour is to be employed with an object of protecting the buoyancy and stability of a vessel, then the longitudinal extension of a very narrow vertical belt would be substantially less effective than would be a shorter belt of similar thickness but greater vertical extension, associated with careful subdivision of 'soft' ends.

²¹² N. A. M. Rodger 'British Belted Cruisers' *The Mariner's Mirror* Vol.64 No.1 February 1978, p.33

comprehensive coal-protection as a vessel designed with the internal armoured deck scheme.²¹³

White held an equally withering view of the alternate approach of employing a more extensive coverage of thin side-armour if it was incapable of resisting penetration by medium-calibre QF guns (the 6in being the commonly-assumed default). Although there was a brief flurry of popular interest in this configuration following its employment in the French cruiser *Dupuy de Lome*, the approach never found favour in the Royal Navy, nor with private British firms.

There was an essential difference in philosophy between these two contemporary approaches to external armour that should be stressed. The object behind the thick, but narrow belt was, as described, primarily to protect the vitals and the buoyancy and stability of the vessel from assault by any type of projectile likely to be fired against it. Conversely, the principle behind the alternative approach of employing thin side-armour across a much larger area of the hull 'may be considered to be based upon the fundamental conception that the explosion of shells with large bursting charges of high explosives shall be made to occur on the sides of the ship.'²¹⁴ This focus upon protection against the high explosive shells then becoming available appeared reasonable, but there were severe caveats which were pointed out by White, Barnaby, Biles and others. Firstly, considerable risks were run when firing the new high explosive shells from rifled guns, and this questionable reliability, coupled with the possibility that the shell might cause more damage to the ship it was being fired from than the ship it was aimed at, could result in an overestimation of the value of these projectiles, at least for a time.²¹⁵ Another consideration, which would never be affected by such reliability issues, was that thin plates of the contemporary steel / nickel-steel armour, fitted with a specific view to defending against high explosives, were of little use against assault from armour-piercing projectiles. In the *Resistance* experiments cited above, it was found that enormous damage could be caused behind this armour by employing cheap Palliser chilled iron shot. Thus the net result of the fitting of thin side armour to defend against one form of

²¹³ *Ibid*

²¹⁴ TNA ADM 116/446

²¹⁵ Sir William H. White 'Cantor Lectures: Modern Warships, Lecture V' *Proceedings of the Society of Arts*, Vol. LIV (1906) p.880

attack would simply enable the assailant ‘to vary his form of attack and at less risk and cost to inflict very serious damage.’²¹⁶

Those who saw the results of the attack with Palliser projectiles on the decks behind the thin armour of the “Resistance” will realise how serious was this matter and to what distance from the point of impact the injuries done by mitraille and splinters extended. It was the consideration of these facts which led to the introduction of the system of the isolation of individual guns in separate casemates, and the danger seems to have been greatly overlooked in many foreign ships when the lighter QF guns are concentrated in batteries protected by thin armour.²¹⁷

A further issue with the fitting of thin side-armour, and possibly the most significant, was that it did not take into account the rapid pace of artillery development that was occurring in this time, particularly in terms of the light – medium calibre QF weapons that cruisers in particular would be expected to face. With the increasing power of these QF guns, the relatively thin steel / nickel steel armour available would have quickly become vulnerable, as indeed proved to be the case with the *Dupuy de Lome*, and this had been recognised by designers such as Biles, Watts and White. That fitted to the *Dupuy de Lome* and her successors, the smaller *Amiral Charner* class vessels (which had a rather smaller extent of their side plated with even thinner steel armour) was at best marginal even when constructed, and 6in HE would have produced considerable wrecking effect which would have all but destroyed the side armour.²¹⁸ Its defensive properties against AP shot, almost from the start, were minimal.

Considering that the first-class cruisers designed for the Royal Navy from ~1888-1894 were designed for traditional cruiser functions: commerce protection and scouting, the protective deck system employed appears to have been the best compromise given the gunnery environment of the era and the modest defensive capability of the armour plate available. The contention by the Admiralty and its officials that it was preferable to throw the weight of defensive material into internal oblique armoured decks combined with extensive coal-protection and subdivision thus appears to be well founded, and was supported by the results

²¹⁶ TNA ADM 116/446

²¹⁷ *Ibid*

²¹⁸ White The Principles... p.118

obtained at the battle of Yalu in the First Sino-Japanese war, which it was concluded demonstrated the value of protective decks in cruisers ‘and not the necessity of water-line belts.’²¹⁹

Fought 17 September 1894, the engagement took place in and off the Yalu river littoral. The Chinese was the numerically superior, possessing two *en echelon* battleships in addition to eight cruisers and a handful of smaller craft; the opposing Japanese fleet was composed of protected cruisers, with even fewer smaller or auxiliary vessels. Intercepting the Chinese fleet off the mouth of the river, the Japanese fleet in line astern was led by a flying squadron / fast division of four of their latest vessels (three of which were Armstrong built, two to designs by William White). By contrast, the Chinese fleet attempted to fight in an indented zigzag or wedge-shaped line-abreast formation, with two loose divisions, possibly with the intention of attempting to ram.²²⁰ The difference in tactics is marked, with the Japanese largely adopting contemporary British practice in this respect, while the Chinese approach appears to reflect those common to the earlier ‘ironclad’ era. The Japanese fleet was substantially faster (notably the four vessels of the fast division), and possessed a massive advantage in having a primary armament almost entirely comprised of QF guns with more reliable projectiles, and were better worked-up than their opposition.²²¹ It is possible that Chinese tactics would have proven somewhat more effective had their fleet been better trained or handled, but in action they struggled to keep formation, and were comprehensively out-maneuvred and out-fought.²²² Though Japanese tactics and ship handling were themselves far from perfect and would have been far riskier against better opposition, they were sufficient for the circumstances in question. Figure 2.8 shows the plan of the battle as drawn by Philo Norton McGiffin, the American born commander of the Chinese *en echelon* turret ship *Zhenyuan*.

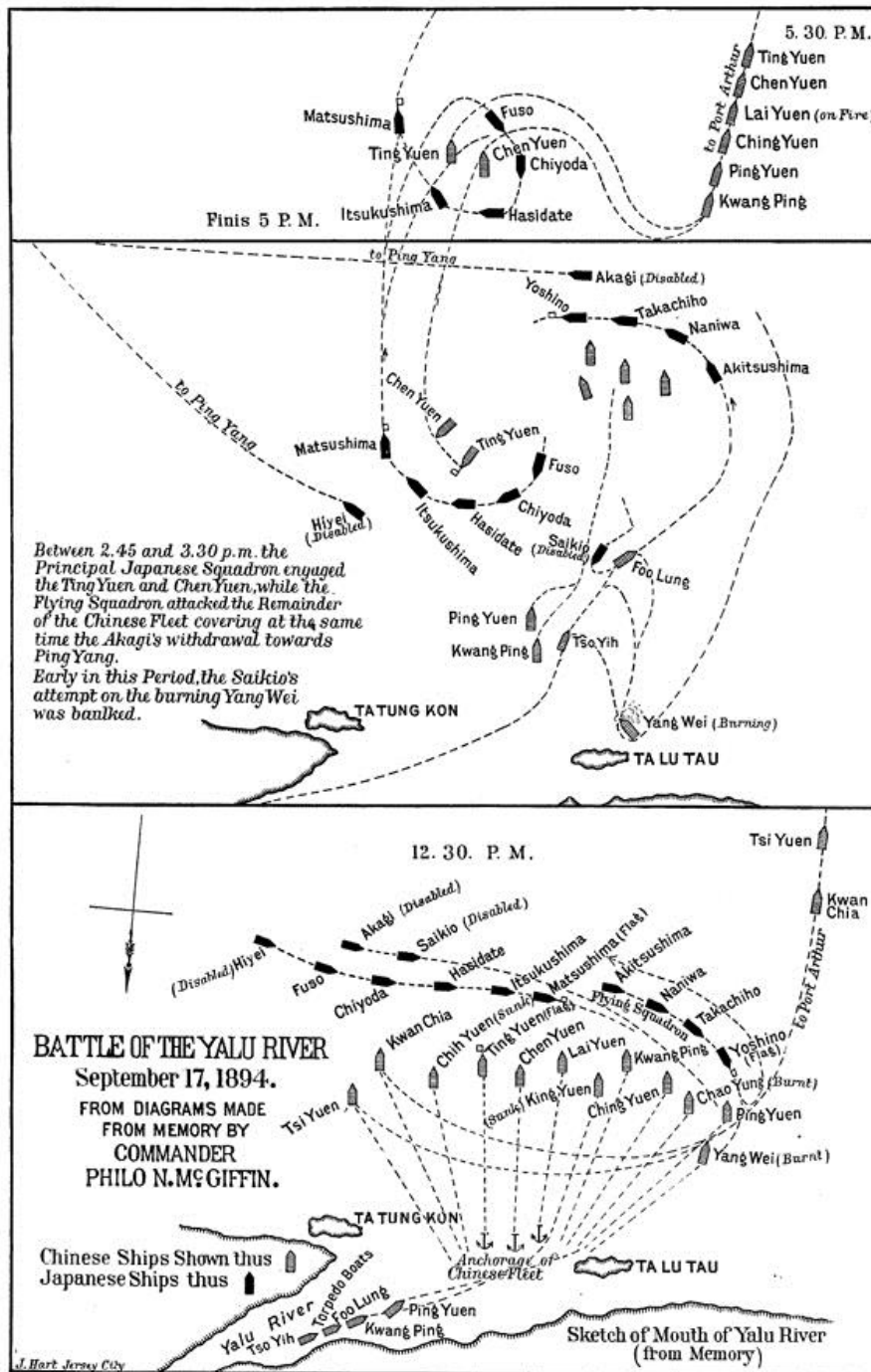
²¹⁹ Marder *Op. Cit.* p.284

²²⁰ See TNA ADM 1/7201 *Battle of the Yalu, 7 Sept. 1894: Report by Lt. Sir Robert Arbuthnot*

²²¹ See Philo N. McGiffin ‘The Battle of Yalu’ in *The Century; A Popular Quarterly* Vol.50 Issue 4 (Aug 1895) pp.588-589. Parkinson *Op. Cit.* p.226 gives the total of 66 as against 2

²²² S. Paine *The Sino-Japanese War of 1894-1895 : Perception, Power, and Primacy* (Cambridge: Cambridge University Press, 2003) The precise reasons for this remain a subject of conjecture and debate

Figure 2.8: Plan of Battle of Yalu, 17 September 1894



Source:, Philo N. McGiffin 'The Battle of Yalu' in
The Century; A Popular Quarterly Vol.50 Issue 4 (Aug 1895) p.592

The most significant aspect tactically speaking of the engagement was the contribution of the Japanese flying squadron. Following the initial pass across the front of the Chinese fleet, which itself allowed them to employ their broadside weapons, they were dispatched from the rest of the fleet to operate as a semi-independent body, covering the retreat of the gunboat *Akagi*, the converted liner *Saikyo* and the rather slow cruiser *Hiei*. The division forced the Chinese fleet to split its fire between two different groups, the circling flying squadron being able to pass the Chinese wing several times.²²³ The main body of the Japanese force turned approximately 16 points to starboard, cutting off two of the Chinese fleet's port wing ships and passing behind the main Chinese division, while the flying squadron circled approximately 2 ½ times in front of the remainder of the Chinese force (2nd detachment including the lighter vessels), and passing the right wing of the main Chinese squadron.²²⁴ The Chinese lost five ships with another three badly damaged, largely wiping out their naval capability. By contrast four Japanese vessels were badly damaged, two others lightly, with no losses.

The NID report on the Yalu engagement concluded that it emphasised the 'supreme value of gunfire... to the practical elimination of the ram and torpedo.'²²⁵ The decisive gunfire in question was from Japanese QF guns, the volume of fire at relatively close range doing the greatest damage. McGiffin reported that a 4.7in projectile pierced *Jiyuan's* conning tower from side to side 'shattering its inmates into a shapeless mass' and confirming that armoured control positions were vital.²²⁶ Shell from such weapons could also cause severe fires, and several of the Chinese vessels were lost primarily through its uncontrolled spread. While on some vessels fire-fighting was alleged to be good, the parties were rapidly overwhelmed, and hoses 'cut through and through' by the hail of QF projectiles.²²⁷ The battle was also regarded as being a useful demonstration of the tactical value to a fleet of possessing a fast division, and an excess of speed over an opponent more generally. The ability to turn a line, envelop an opponent, force him to divide his fire, and to strike from several directions could provide a significant advantage, while also conferring the strategical benefits of rapid dispatch and transit times. For its own part, the Constructors department, and especially the DNC found few surprises. While in France Yalu was largely taken as emphasising the value of thin side-

²²³ ADM 1/7201 *Report on Battle of Yalu*

²²⁴ *Ibid*

²²⁵ Cited in Marder *The Anatomy...* p.166

²²⁶ McGiffin *Op. Cit.* p.603

²²⁷ *Ibid*

armour, White's rather more cautious view was that the experience in that engagement was not worth much in forming an opinion on that point, particularly given the at best questionable state of repair of some of the Chinese vessels.²²⁸ Despite his apparently non-committal expression the remainder of White's report, written some ten months after the battle, made it clear that his own views had not changed in the slightest, and that he continued to favour internal oblique protective decks with the available armour, over narrow external waterline belts or extensive thin side-plating.²²⁹

The Chinese lost both belted and a protected cruiser at Yalu, but the seven most powerful Japanese vessels were protected types, none of which suffered serious injury. Certain qualifications were noted: the Chinese weapons and projectiles were not of a high quality and their fleet was poorly handled. Nevertheless, protective decks appeared to prove their worth and the QF gun was clearly effective, confirming the validity of contemporary Royal Navy practice. This may be extended further: Yalu points to the fact that, although not ideal for close action, first-class protected cruisers of this kind would have been quite capable of performing fleet tasks such as those outlined by Admiral Long and hinted at by Eardley-Wilmot, and could have formed an effective fast wing of a battlefleet, providing they were sensibly handled and not drawn into a protracted close-range gunnery duel with more heavily armoured battleships. Indeed, given the primacy of the QF gun during the 1890s, these early battle-cruisers, as Long unofficially termed them, would have been less vulnerable in a fleet role than the big-gun vessels of the early 20th century, since they actually carried protection capable of defending against the primary armament of the era.

White Elephants?

In October 1891, the British Naval Attaché at St. Petersburg, following up on Russian intentions regarding large first-class cruisers reported that 'I have been told the Government desire to have 10 of these cruisers, with the object of destroying the commerce of an enemy.'²³⁰ On the available evidence this was certainly a credible *communiqué*, since the *Rurik*, a large side-armoured vessel credited with exceptional performance had been laid

²²⁸ TNA ADM 116/446 *New First-class Cruisers* It was rather more useful from White's perspective of silencing critics of the so-called 'soft ends' of battleships employing a central armoured citadel, with subdivided fore and aft portions

²²⁹ *Ibid*

²³⁰ *Ibid*

down in the middle of the previous year, and it was known that two vessels of similar dimensions were about to be constructed.²³¹ The following month, the Controller, Admiral Sir John Hopkins, discussed the matter with White, and an investigation was made based on the available information regarding the likelihood of the *Rurik* achieving her design goals.²³² The conclusions were inevitably speculative, White being sceptical of the claimed coal-endurance, which was said to allow steaming from Cronstadt to Vladivostok without re-coaling, also believing *Rurik* would be considerably over-draught.²³³ He was subsequently proven correct. However, based on the weights devoted to machinery he also suspected that the sea-speed had been deliberately under-estimated in the official claims made for her.²³⁴ In this, and the desire to provide a counter to these Russian commerce-raiders, lay the origins for the two *Powerful* class cruisers. On 3 February 1893, 'White was ordered to design a new super-cruiser for the 1893-94 program specifically to be individually superior to the Russian ships.'²³⁵ The type was described to Parliament later that year, and laid down in 1894.²³⁶

The *Powerful* and *Terrible* were the largest cruisers and the longest warships of any type constructed to date, at some 14,200 tons and 500ft between perpendiculars (538ft overall).²³⁷ Figure 2.9 shows the elevation and deck plan of the class from the 1902 edition of The Naval Annual.

²³¹ *Ibid* The two vessels referred to were clearly the *Rossia* (ld.1894) and *Gromoboi* (ld.1897)

²³² Manning *Op. Cit.* p.306

²³³ Friedman British Cruisers of the Victorian Era p.226

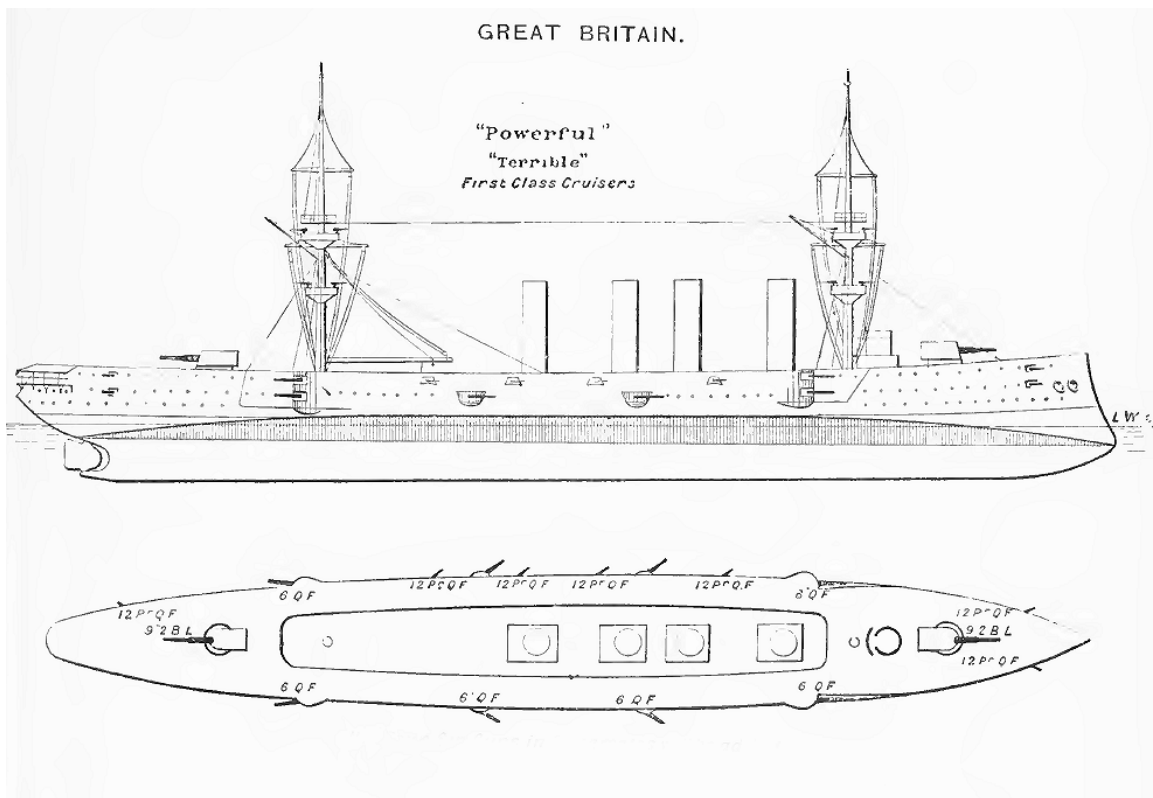
²³⁴ Manning *Op. Cit.* pp.306-307

²³⁵ Friedman British Cruisers of the Victorian Era p.228

²³⁶ HCPP 'Navy (Her Majesty's first class cruisers "Powerful" and "Terrible"). Copy of description of the first class cruisers "Powerful" and "Terrible," to be built by contract, and for the commencement of which provision is made in the navy estimates for 1893-4.' 1893-94 (387) LIV, 603

²³⁷ Chesneau & Kolesnik *Op. Cit.* p.67

Figure 2.9: Powerful class cruiser elevation and deck plan



Source: T. A. Brassey [ed.] The Naval Annual, 1902 (Portsmouth: J. Griffin & Co., 1902)

Plate 14

The substantial jump in dimensions over earlier first-class types was determined by the Admiralty's requirements that they should possess a more powerful armament, and have equal protection and radius of action to what was claimed or expected based on the available information of the Russian vessels, while also being capable of a minimum sustained sea-speed of 20 knots (22 knot maximum).²³⁸ Initial model trials were successfully carried out on 13 April 1893 (1/36 scale), indicating some 22 ¼ knots would be achievable on the anticipated power.²³⁹ These were followed by further trials in June and July of the following year.²⁴⁰ The *Powerfuls* were the first major RN vessels to employ Belleville water-tube boilers, 48 feeding 4-cylinder triple-expansion engines coupled to two shafts.²⁴¹ The vast boiler-array was required to obtain the necessary power outputs for sustained high-speeds without employing forcing.²⁴² The 4-cylinder TE engines were also a first, and would become a feature of all the Royal Navy's first-class cruisers until the introduction of the steam turbine. In such engines, the final (third) low-pressure expansion stage was split between two cylinders. This was largely due to size and weight considerations, but also had benefits in markedly reducing vibration and improving responsiveness.

Maximum coal-capacity in the *Powerful* class was 3,000 tons giving an enormous theoretical operational radius of 7,000nm at 14 knots, although in practice efficiency was not as good as expected, 2,200 tons being needed to carry them 4,400nm 'at 12 ½ to 14kts in relatively calm weather.'²⁴³ Defence was achieved by means of a comprehensive protective deck system, with 6in steel on the slopes and 2in steel on the flat, the crown of the deck being approximately 3ft 6in above the load-waterline. The angular space between the sloping deck and the side was topped with the usual heavily subdivided coal bunkers.²⁴⁴ The casemates and turrets had 6in steel armour. They were the first British cruisers to have an ammunition passage running below the protective deck, which circumvented the need for stowing ready-use ammunition in the casemates, and provided a well-protected route for carrying propellant and projectiles from magazines and shell-rooms to the widely dispersed QF battery.²⁴⁵

²³⁸ NMM 'New First Class Cruiser Powerful and Terrible' *Op. Cit.* p.2

²³⁹ TNA ADM 226/7 Letter from Superintendent, Admiralty Experimental Works, to Controller 14 April 1893 'On Design of HMS Powerful'

²⁴⁰ TNA ADM 226 / 8 –Note Froude to Controller 7 June 1894 & 4 July 1894 'Powerful No.2'

²⁴¹ Chesneau & Kolesnik *Op. Cit.* p.67

²⁴² Forced draught was theoretically available for short bursts, but was rarely if ever used

²⁴³ Friedman *British Cruisers of the Victorian Era* p.233

²⁴⁴ Brown *Op. Cit.* p.136

²⁴⁵ *Ibid*

The question of armament for the vessels provoked considerable discussion. In the initial design sketches, White provided for a uniform battery of 20 x 6in QF guns. It was contended that

The uniformity of calibre in the 20 –6-inch QF guns will be a distinct advantage [over the *Rurik*] in regard to the supply and use of ammunition ; and these guns will compare well with the 8-inch B.L.R. guns in the “*Rurik*,” while they can be much more rapidly handled...

In offensive power the new cruisers will compared favourably with many so-called battleships, when the character of the armament and its protection are taken into account.²⁴⁶

However, in a memorandum dated 23 March 1893 the DNO lobbied hard for a mixed battery of 14 x 6in QF in casemates with 4 x 8in chase guns mounted in pairs on the forecastle and poop.²⁴⁷ The debate continued for several months, with White contributing a lengthy memorandum on the 19th April complete with diagrams showing the various dispositions of armaments proposed for the new cruisers, along with that of recent major foreign vessels (USS *Brooklyn*, the *Rurik* and the *Dupuy de Lome*).²⁴⁸ The question was ultimately dealt with at a Board meeting on 8 June. The First Naval Lord Sir Frederick Richards offered a third proposal, in which twelve 6in guns would be carried in casemates, with two turret mounted 9.2in, protected by 6in armour, one on the forecastle and one on the poop.²⁴⁹ This was preferred to the option of 8in guns, which would have been an entirely new design, and owing to objections to mounting a pair of guns on the same turntable.²⁵⁰

Historians have had fun with the *Powerful* class, with them even featuring in a mischievous book on the world's worst warships.²⁵¹ They have often been arraigned as under-armed and under-protected for their size, and the best that is often said of them is that they were white elephants, since the capabilities of the *Rurik* (and the two later cruisers largely developed

²⁴⁶ NMM 'New First Class Cruiser Powerful and Terrible' *Op. Cit.* pp.5-6

²⁴⁷ NMM Memorandum: DNO on 'Armament of new cruisers Powerful and Terrible' 23 March 1893 Powerful class ship cover

²⁴⁸ NMM Confidential Memorandum by DNC on 'Armament of “*Powerful*” and “*Terrible*”' 19 April 1893 Powerful class ship cover

²⁴⁹ Admiral Sir Frederick Richards served as First Naval Lord from 1893-1899

²⁵⁰ Manning *Op. Cit.* pp.309-310

²⁵¹ Antony Preston *The World's Worst Warships* (London: Conway, 2000)

from her) had been greatly over-estimated. These criticisms however fail to appreciate the realities involved. It was not possible to give the *Powerfuls* a heavier armament without sacrificing protection, accepting a reduced ammunition supply or reduced range.²⁵² Since QF guns were the primary armament of the day, each weapon required a large quantity of ammunition, and Royal Navy practice was generally to carry substantially more than most foreign vessels. They also needed to be large in order to achieve their speed, sea-keeping and range goals. Although naturally less able to engage in extended close-action than later side-armoured types, the internal protective deck scheme, with coal-defence and elaborate subdivision was as illustrated above by no means as weak as is commonly believed, and was certainly superior to a narrow waterline belt or more extensive coverage of thin non-face-hardened side armour of the types available at the time of their design. The evidence of the Battle of Yalu on the effectiveness of the protective deck system indicates that, in a single-ship action, they could have disputed terms with later types such as the French *Gueydon* class with a good chance of success.

It is quite true to say that the Russian vessels the *Powerfuls* were designed to counter were certainly not as fast nor as well protected as had been initially believed. Their armour belt was narrow, of mediocre quality steel, and not highly thought of by contemporaries who were well versed in the subject. Captain Eardley-Wilmot, in his 1892 book *The Development of Navies* remarked that ‘it is curious to observe the fidelity with which Russia has adhered to external armour instead of relying upon protective decks as we have done.’²⁵³ As to their armament, Marder cites Theodore Ropp in commenting that the *Rurik*’s armament layout was so bad that the French thought it had been stuck on as an afterthought.²⁵⁴ While containing an obvious element of wry humour, it is difficult to argue with this assessment; the armament configuration of *Rurik* was thoroughly bad, with a bastardised broadside arrangement and very poor protection to the guns and ammunition supply routes.²⁵⁵

The *Powerfuls* should not be criticised because the vessel they were designed to counter proved less capable than was feared though. Although this to an extent did render them white elephants on account of their size and high running costs (both in terms of material and the large crews required), a vessel should be judged on whether it achieves its design goals, and

²⁵² Four extra weapons were added in 1902-04, with a reduction in ammunition supply

²⁵³ Eardley-Wilmot *Op. Cit.* p.259

²⁵⁴ Marder *The Anatomy* p.164

²⁵⁵ Chesneau & Kolesnik *Op. Cit.* p.189

if assessed in this light the *Powerfuls* were very successful. At the time of their completion, they were the most powerful cruisers in the world, having effective protection, a well-balanced armament with good ammunition supply, high speed and great range. They suffered from considerable problems with their boilers, but many of these issues were more a consequence of engineering officers and crews being unfamiliar with the type rather than with severe inherent problems with the Belleville itself.²⁵⁶ The design smooth-water speed of 22 knots was easily achieved (*Powerful* making 21.8 knots on trials in bad weather), as was the minimum 20 knot continuous sea-speed, both *Powerful* and *Terrible* maintaining almost 21 knots for 30 hours.²⁵⁷ They were considered excellent sea-boats, partly thanks to their enormous freeboard at mean draught.²⁵⁸ Both participated in the 1897 Manoeuvres as part of the Channel Squadron, and like the *Blakes* acquitted themselves well, their high sea-speed allowing them to serve as heavy scouts and support for smaller second-class vessels.²⁵⁹

With the benefit of hindsight the two *Powerful* class cruisers were strategically unnecessary, but to suggest that they should not have been built on these grounds implies that the Admiralty was possessed of a crystal ball. Although they have been called a knee-jerk reaction to a single vessel, the knowledge that Russia was building three large commerce-raiding cruisers and had expressed the intention of building ten should be factored into the equation. In the absence of comprehensive data, an assessment needed to be made on the information available. In this case, White may have been partially culpable in exacerbating the problem, since the design of the *Rurik* changed repeatedly, thus any early information he might have received from his private international network of correspondents (normally a great asset) would quickly become outdated. Since much of Sir William's private correspondence is no longer in existence this will likely remain a matter of speculation. Ultimately, since Britain had the capacity to create the *Powerfuls* nothing was lost, and a case can be made that they served a purpose by illustrating that the Royal Navy would respond to challenges in kind if required.

²⁵⁶ Brown *Op. Cit.* p.165 Brown points out that part of the problem was the substitution of Belleville's patent packing in the feed system, but the lack of experience, or even an operating handbook were the major issue; with these matters rectified, the Belleville became reliable and economical

²⁵⁷ Fred T. Jane [ed.] *Jane's Fighting Ships 1900* (Facsimile edition, Nimble Books) p.108

²⁵⁸ Manning *Op. Cit.* p.311 See also C. E. E. Bean *With the Flagship in the South* (London: T. Werner Laurie, 1913)

²⁵⁹ See Chapter Three

Conclusions

A significant factor to be borne in mind is that the period 1888-onwards in effect saw the continuation of a general construction policy that had existed to a large degree for several decades. Granted, the official designations changed in the fleet reclassification of October 1887, as detailed in Chapter One, but as far as first-class cruising vessels were concerned, the general functions of operating on the high seas and trade defence did not materially alter. If anything, the change in terminology simply underlined, or at least made more obvious, these basic functions. This inherent fact has been largely masked, initially by a basic misunderstanding about the nature of the mid-Victorian Navy, and latterly by a greater appreciation of the strategic objectives of the main battlefleet which has tended to divert the majority of scholarly attention away from cruising types. Where the former saw a fundamental transition from coast-assault back to a seagoing model, the latter had never lost their blue-water functions. What did start to change however was the notion of the use of cruisers with the battlefleet, and their potential duties.

The period saw the first use of the term ‘battle-cruiser’, a term normally associated with the big-gun era. On the face of it the soubriquet appears fraught with issues, several of which William White pointed out. It should also be emphasised that the phrase was entirely unofficial and was not adopted by the service. The British first-class protected cruisers of the period 1888-1894 were designed primarily for commerce protection and optimised for fighting single-ship actions, not close-quarter gunnery duels with more heavily armoured opponents. Nevertheless, Rear Admiral Samuel Long, Captain Sydney Marrow Eardley-Wilmot and a handful of other progressive thinkers made a fundamental point by noting the demarcation in capabilities between the first and smaller classes of cruisers, and the heavy scout and supporting role for smaller vessels was perfectly practical, as revealed in the annual Manoeuvres; equally they would have been useful in assisting finish off crippled enemy vessels. It is not unreasonable to suggest they could even have been employed as an effective fast wing for turning an opposing battle-line, providing they were handled with sense and not exposed to enemy fire for an extended time; a point demonstrated at the Battle of Yalu during the Sino-Japanese war (albeit against an inferior fleet).

These vessels, interestingly, have received relatively short-shrift from many historians, and are often compared negatively to ‘revolutionary’ cruisers such as the French *Dupuy de Lome*. The majority of the charges however, as illustrated above do not stand up under careful

assessment. The Admiralty and Constructor's department had access to a mass of data from the *Resistance* and other experiments (notably on the *Nettle*) far superior to any available to other nations, and based upon the results obtained, declined to employ thin side-armour on cruisers, while also rejecting thicker but narrow waterline armour belts. Later experiences in the Sino-Japanese war, most notably the Yalu engagement largely bears out their view that with the armour materials available, the internal protective deck scheme was the most effective means of securing protection for such vessels. Large size was necessary for range, effective sea keeping, and high continuous sea speed, without resorting to excessive forcing of boilers.

Overall, despite engine and especially boiler issues, the two *Blakes* were successful designs, and the following *Edgars* even more so. The two *Powerfuls* proved with the benefit of hindsight to be excessive, since the capabilities of the Russian cruisers they were intended to counter were highly over-stated. However, the fact remains that they were the most powerful cruisers in the world at the time of their completion, and it is not unreasonable that the Board should plan for a worst-case scenario. In strategic, tactical and material terms, the Royal Navy's first-class cruisers had a significant edge over any foreign rivals built or building from 1888-1894, and under the Spencer Programme, the protected-deck type would see a final refinement. The vessels themselves however would be, and to this day still are, little regarded in the face of changes that would occur in the operational paradigm, and it is those changes the following chapter addresses.

Chapter 3

Technological Change and the Battlefleet Paradigm Weakened

The previous chapters established the origins of the first-class cruiser in the Royal Navy and considered the development of the protected type, with its internal armour of a curved steel deck associated with close subdivision and coal-defence. Principally intended for the trade defence role, these were the first vessels to be termed ‘battle-cruisers’, albeit unofficially. As has been indicated these types were by no means as vulnerable in the contemporary gunnery environment as is often believed and while better adapted to single-ship actions, if well-handled they could have formed an effective heavy scouting force for, or even fast wing of, a contemporary battlefleet. In fact, given that the primary armament of the era was the QF gun, they should have proven somewhat less vulnerable in this role than the dreadnought battlecruisers that followed a decade later were within the contemporary big-gun dominated paradigm.

This chapter examines the presence and development of the first-class cruiser in the Royal Navy in the period 1894-1901. As in the previous chapter, throughout this period the principal naval rivals were regarded as being France and Russia, both of whom laid a considerable emphasis on developing new cruisers (and in the case of Russia, second-class battleships), although close attention continued to be paid to the naval activities of other Powers. It was a period which initially saw a consolidation of existing strategic views and a continuation of the general policy of splendid isolation (which would not formally end until the signing of the Anglo-Japanese Alliance in 1902). To this end naval expenditure would continue to rise, most notably during the middle years of the decade with the Spencer Programme. In addition to considering the general strategic environment and requirements upon the contemporary Royal Navy, the chapter also examines some of the material developments that occurred during the final years of the Nineteenth Century, most notably the emergence of new forms of armour plate. These would result in a dramatic advance in the capability of the first-class cruiser, allowing the type to move far beyond the trade-defence and even the heavy scout remit, as had been predicted by some of the more progressive thinkers like Samuel Long as early as 1893. The transition that occurred would profoundly

shake the ‘traditional’ battlefleet model and have a significant impact upon the future of the service.

Commerce protection

During the period 1894-1901, the strategy of focal-area defence as envisioned by Milne continued to be the preferred means of trade protection. With the battlefleet having regained its ocean-going capacity and Britain establishing an isolationist position for much of the period, coast-assault had almost entirely fallen by the wayside, the fleet’s primary focus shifting toward fighting at, rather than from, the sea. In 1894, as in 1893, the annual Manoeuvres concentrated upon simulating operations in the ‘narrow seas’, how to establish command of these seas, and how fleet divisions might best be joined if they were within range of torpedo-boat flotillas based upon the opposing shore.¹ Assuming such a command of the European waters could be obtained, which the Manoeuvres indicated was practicable, this would in itself severely hamper an opponent’s ability to attack British commerce.

Convoy continued to be regarded by the Board as impracticable, while the alternative method of constantly patrolling trade routes was completely out of the question owing to the enormous number of vessels required given the global reach and scale of British interests and shipping. Milne’s memoranda on the subject had, as noted in previous chapters, been supported by the FIC paper of 1885 ‘The Protection of Commerce by Patrolling the Ocean Highways and by Convoy’, which essentially refined and expanded on the general theme set out by Milne. The 18 focal points where shipping density was highest were reassessed, and the number of vessels expected to be, or permanently stationed in these locales adjusted according to the quantity of trade passing through. This would be further refined in a detail sense during this period, and the number of these focal areas increased as the French and Russians gained more bases across the globe.² This remained a relative concept though; the blockade strategy adopted by the main fleet in conjunction with focal area defence remained in place since there was little indication in the annual Manoeuvres that the strategy would prove ineffective. Focal area defence would be indorsed once again in a paper of November 1898 by Admiral Beaumont. Sanctioned by the Board in February 1900, it was printed with a

¹ S. Grimes *Strategy and War Planning in the British Navy, 1887-1918* (London: Boydell, 2012) p.25 The primary assumption being that Britain was at war with France

² N. Friedman *British Cruisers of the Victorian Era* (Barnsley: Seaforth, 2012) p.19

view to being distributed to merchant ships in time of war.³ This paper largely confirmed existing policy, and what mercantile vessels could expect during a period of maritime conflict. Protection would be available to them from British defended ports and coaling stations, and also from special protecting squadrons stationed at important convergences of trade routes –the focal areas identified by Milne and successors who refined his original concept.⁴ It was also emphasised that the Admiralty did not propose to employ the convoy system except under ‘special circumstances’, and that no British lights, navigation buoys or similar aids would be extinguished in wartime.⁵ The pamphlet, which was never distributed, also provided directions for approaching home and defended ports.

The concept of focal area defence would, given the nature of the contemporary threat, likely have proven very effective in practice. Its principle drawback was that shipping losses might initially be quite high until enemy raiders were hunted down and, along with their bases if possible, finished off. The question of what type of cruiser would allow this strategy to be most effectively executed though continued to be a matter of contention, particularly in terms of the perennial argument over quantity verses quality, and whether it would be better for the service to possess a small number of extremely capable cruisers (the primary means of protecting commerce) or a larger number of less individually powerful vessels. Second-class cruisers were seen as extremely useful for the majority of the period, and were constructed in large quantities, for general purpose duties ranging from scouting for the battlefleet, independent operations and commerce protection. In the first half of the 1890s in particular, the type appeared to be a reasonable compromise for a wide range of duties. They had a slight speed advantage over most contemporary battleship designs, which extended further when compared to earlier low-freeboard coast-assault types, were agile, could be constructed in large quantities relatively cheaply, and appeared to be well-able to dispatch smaller craft, notably the torpedo-boats common to the period, with their respectable QF armament. A noteworthy example took place during the 1896 Manoeuvres when HMS *Thesis* defeated six opposing torpedo-boats and a torpedo gunboat in an action lasting 1 hour and 1 minute, of which 23 sufficed to finish off the torpedo-boats themselves.⁶ The exercises for that year

³*Ibid* p.18

⁴ The National Archives (henceforth TNA) ADM 116/866b Secret. Memoranda / minutes of meeting at Admiralty on ‘The Protection of Ocean Trade in Time of War’ 31 April 1905

⁵ *Ibid* Friedman remarks that these ‘special circumstances’ were essentially for troop ships or similar cases where losses could not be tolerated under any circumstances, but that this was (unsurprisingly) not stated in the document itself

⁶ TNA ADM 231/27 NID Report 474 Report on the Naval Manoeuvres of 1896 pp.35-36

heavily exploited such vessels, its general object being for one side to employ them to watch an opposing fleet in port and communicate any movements to its own battle squadron, which was to be 'lying in readiness at a chosen anchorage, so that no opportunity may be lost of bringing the first Fleet to action'.⁷ Nevertheless, as alluded to in the previous Chapter, three years earlier *Blenheim* had illustrated the wider capabilities of the first-class type and during the second half of the decade, as France and Russia again turned their attentions toward commerce raiding, so it would become keystone to the focal defence strategy, while its potential fleet-employment began to receive greater consideration.

The Spencer Programme

As detailed in Chapter Two, by the late 1880s the *Jeune École* had largely given way in France to the reinvigorated *guerre d'escadre* – a situation which would essentially continue through the first half of the 1890s. Despite this, interest in the *guerre de course*, which had been incorporated into the overall *Jeune École* concept, continued on an international basis with Russia slowly developing the infamous *Rurik*, and France laying down the four small *Amiral Charner* class vessels between 1889 and 1890, and the one-off *Pothuau* in 1893, with a handful of large protected types known to be following.⁸ The Gervais programme had been the French reply to the 1889 Naval Defence Act, in principle undermining the stated deterrent purpose of the British policy, and at least in part confirming the contention that it was a major contributing factor in the initiation of a naval arms race.⁹

With relations between Britain, France and Russia deteriorating due to disagreements over colonial matters, there was increasing concern that British naval construction was not meeting the 'two-power' standard formalised under the provisions of the Naval Defence Act. In February 1892, the NID forwarded an empirical formula for required naval strength if faced by two powers: $B = F + R + X$. B represented the necessary British forces, F the total forces of one opposing power (France), R the total forces of the second opposing power (Russia), and X the number of additional British ships required to protect the much greater

⁷ *Ibid* p.5

⁸ R. Chesneau & E Kolesnik [eds.] *Conway's All the World's Fighting Ships 1860-1905* (London: Conway Maritime Press, 1979) p.304

⁹ See Chapter Two. It is probably excessive to state that the Naval Defence Act was the sole cause, since such events are generally the result of a complex series of interlinked factors involving wider national policies, but it is beyond doubt that it was a, and possibly the, primary reason. With that said, the British programme still left the RN with a significant practical advantage

maritime interests of the Empire.¹⁰ This appeared to become even more significant post the drafting of the Franco-Russian alliance 18 August 1892.¹¹

In fact, the situation was by no means as extreme as the bald figures appeared to suggest, and the Liberal government which had been elected in 1892 initially resisted demands for an increase in naval building.¹² Simple formulae such as that provided by the NID have been described as ‘an attempt to establish a clear basis for arriving at the required British naval strength.’¹³ This is rather dubious since the NID from its inception had a tendency to produce reports emphasising naval weakness even when having access to material that contradicted this.¹⁴ While naval officers and indeed officials and advisors regularly produced tables and formulae following the fashion of the era, it is not unreasonable to suppose that the NID, under Cyprian Bridge, would have well-appreciated that the value of such simple formulae depended on the quality of the data input, and that within certain broad trends the resulting figure could be manipulated to provide any desired outcome. In the case of NID’s formula, it was accepted that X was a floating value that varied with the magnitude of the interests requiring protection (i.e. that it fluctuated depending on how much British tonnage was actively engaged in trade during a given or projected period). But the values of F and R were also both subject to interpretation: specifically, what would be included. The term ‘total force’ in itself means nothing. It could be interpreted as all the vessels listed in a given service, but this takes no account of their age, state of maintenance and readiness, type, armament, protection, speed, range or a vast array of other factors too numerous to be sensibly listed.

If this is taken, as well it should be, as too broad a coverage, then it may be narrowed to what were sometimes termed ‘effective fighting vessels’, but this again is subject to interpretation: the majority of the factors referred to above are equally applicable, and the end product B is of little actual value. Similar formulaic methods had been created in an attempt to show the

¹⁰ The National Archives (TNA) ADM 231/21 Naval Intelligence Department (NID) report 297 ‘The Dangers to Which Maritime Trade would be Exposed in War and the Most Effective Measures for its Protection’

¹¹ Note that the Franco-Russian alliance did not become officially final / formal until 4 January 1894. Although the provisions of the text purely referred to, and the alliance itself was nominally intended to be a counter to the Triple Alliance, by extension it obviously had implications for Britain or other potential rival powers

¹² J. Sumida *In Defence of Naval Supremacy: Finance, Technology and British Naval Policy, 1889-1914* (London: Unwin Hyman, 1989) p.16

¹³ B. Ranft ‘The protection of British seaborne trade’ in B. Ranft [ed.] *Technical Change and British Naval Policy 1860-1939* (London: Hodder and Stoughton, 1977) p.9

¹⁴ R. Parkinson *The Late Victorian Navy: The Pre-Dreadnought Era and the Origins of the First World War* (Woodbridge: The Boydell Press, 2008) p.95

comparative fighting values of warships; Captain Gerard Noel had presented such an idea to the INA some years earlier, which was heavily criticised (albeit politely) for precisely these reasons in the subsequent discussion.¹⁵ Philip Colomb attempted something similar at the INA in 1895, albeit via the use of enormous tables, and Professor Francis Elgar read another example in 1897; while the latter was mildly qualified by the remark that the formula should not be applied across dissimilar vessel types it too was subject to the same problems, and was demolished in debate.¹⁶

Although the alleged weakness of the Royal Navy relative to France and Russia was based on dubious supporting evidence, as discussed in Chapter Two, George Hamilton urged a supplementary estimate to make up for the perceived shortfall in British construction. This proposal was rejected, Sir Ughtred Kay-Shuttleworth, Secretary to the Admiralty, supported by Sir William Harcourt, asserting that the superiority of the Royal Navy over the other navies of the world had never been so great as it was then.¹⁷ The latter, one of the great Liberal Statesmen of the era, was unquestionably somewhat predisposed to minimising expenditure on the navy, being largely focused upon domestic legislation. Be that as it may, with the advantage of historical hindsight, Kay-Shuttleworth and Harcourt appear to have been fundamentally correct in their belief that the Royal Navy was capable of handling any likely threat or combination of threats. Even Kennedy points out that while the British continued to be anxious over the combined Franco-Russian naval challenge until the annihilation of the latter's fleet at the hands of the Japanese at Tsushima in 1905, it seems that many contemporaries significantly overestimated the danger, concentrating only on weaknesses in the British fleet and forgetting those of its projected opponents.¹⁸ The French navy, though seemingly impressive on paper

suffered from constant political interference and strategical controversy, and its ineffectiveness was fully revealed during the confrontation at Fashoda in 1898, where the obvious superiority of the Royal Navy provided Salisbury with one of his

¹⁵ Captain G. Noel 'A Practical Measurement of the Comparative Fighting Efficiency of Ships of War' *TransINA* Vol. XXVI (1885) pp.1-29

¹⁶ Vice-Admiral P. H. Colomb 'The Elements of Force in a Warship' *TransINA XXXVI* (1895) pp.151-190; Professor F. Elgar 'The Classification and Relative Power of Warships' *TransINA* Volume XXXVIII (1897) pp.64-84

¹⁷ Arthur Marder *The Anatomy of British Sea Power: A History of British Naval Policy in the Pre-Dreadnought Era, 1880-1905* London: Frank Cass, 1964) p.175

¹⁸ P. Kennedy *The Rise and Fall of British Naval Mastery* (London: Classic Penguin, 2001) p.179

strongest trumps. The Russian navy was in an even worse state, its fleets lacking homogeneity in speed and size, and its sailors, confined for much of the year to land, lacking the necessary gunnery practice and even the elementary navigational skills to take on their British counterparts; its' pathetic performance in the war against Japan in 1904-5 showed how overrated it had been.¹⁹

Despite the rejection of Hamilton's proposals, the majority of senior naval officers and several prominent politicians continued calling for increased naval construction, a call which was also strongly supported in the press. Marder cites the *Times* of 6 November 1893, which vented its ire upon the perceived villainy of Gladstone, who was unyielding in his opposition to increased naval expenditure on both personal and political grounds, and Harcourt.²⁰ The leader in question was actually the first of a series on 'The Strength of the Navy and the Need for a New Programme', which denounced current policy and Gladstone and Harcourt in particular.²¹ This article and its successors would be partially supported by Admiral Sir Geoffrey Phipps-Hornby in a letter to the editor of 22 November, condemning the contemporary strength of the navy, albeit more upon the grounds of a lack of reserves (particularly of good seamen), than on any real want of vessels.²²

The primary serving naval voice demanding greater funds was Sir Frederick Richards, who in November 1893 succeeded Sir Anthony Hoskins as First Naval Lord. Richards was a superlative administrator, and his 'stern exterior, indomitable will, stolidity, and disdain for verbiage made him a standing terror to the Chancellor of the Exchequer and those politicians who had too much regard for fiscal considerations.'²³ On 21 November, the naval lords formulated two possible five-year construction programmes, a 'minimum', and a 'desirable',

¹⁹ *Ibid*

²⁰ Marder *Op. Cit.* p.190

²¹ 'The Strength of the Navy and the Need for a New Programme' *The Times* Monday 6 November 1893 p.7 Parts 2 – 4 would appear on 13, 17 and 20 November. There is little archival evidence to support it, but it is interesting to speculate that Fisher may have had some indirect involvement; while lacking the carefully manipulated data of the old 'Truth About the Navy' articles, there is an undeniable resemblance

²² Admiral Sir G. Phipps-Hornby 'The Navy' *The Times* –letters to the editor, Wednesday 22 November 1893. Hornby is generally perceived as one of the primary figures behind the 'big navy' movement. While to a large extent true such bald remarks also do him something of a disservice in historical terms, since Hornby possessed far more refined strategic views than measuring capability by simplistic vessel numbers, as his letter to the *Times* illustrates (which is not to say he was not above playing this card on occasion). His tenure as C-in-C Mediterranean fleet is regularly spoken of by historians in terms of his tactical activities, but his knowledge of administrative and logistical matters played just as crucial a role, even though he evidently took little pleasure in the routine slog of paperwork.

²³ Marder *Op. Cit.* p.176

based on numbers of first-class battleships, the former of which would give nominal parity with the combined forces of France and Russia, the latter providing a slight margin.²⁴ With the naval lords threatening mass resignation, the First Lord of the Admiralty, Earl John Poyntz Spencer, largely accepted the ‘minimum’ programme as far as battleship numbers were concerned, but the proposals for cruiser construction saw the greatest arguments since the numbers forwarded by the naval lords were considered completely excessive, most particularly in financial terms. Spencer can be commended in many respects for his navigating a fine political tightrope of conflicting financial, party, public relations, and personal interests –ironically, true strategic necessity was probably not the principal concern of the majority of interested parties. Notwithstanding predictably gloomy (if not doom-laden) NID reports on comparative fleet numbers and the supposedly intractable nature of Richards, the Board did not resign *en masse* when it was made clear that they would not get all of the vessels they had proposed: a strong indication that they were deliberately presenting excessive figures.

After much political acrimony, Gladstone resigned on 1 March 1894, retiring from public life forever.²⁵ With his departure, a new five-year construction programme (1894/95 through 1898/99 Estimates) was agreed by Cabinet on 8 March, authorising 7 new battleships, 20 cruisers of various rates, and more than 100 miscellaneous smaller craft at a total cost of £21,263,000.²⁶ The programme itself was named for Spencer, the immediate result sometimes being stated as a net increase of some 20 per cent in the Estimates for 1894/95 over the previous year.²⁷ In fact, the 1894/95 Estimates did not increase by quite that amount, but the 16.9 per cent rise was far from being insubstantial.²⁸ Spencer had not yet finished though, and drove through a new Naval Works Act, which provided separate funding for such constructions (harbour construction, maintenance and defences, barrack building &c.), thus freeing up monies in the Estimates for other use, particularly vessel construction.²⁹

²⁴ *Ibid* p.191

²⁵ P. Padfield *The Battleship Era* (London: Rupert Hart-Davis, 1972) p.147

²⁶ Sumida *Op. Cit.* p.16 The convoluted history of the Spencer Programme, as Sumida notes, is extensively covered by Marder *Op. Cit.* pp.174-205

²⁷ Sumida *Ibid*

²⁸ See House of Commons Parliamentary Papers (henceforth HCPP) ‘Navy Estimates for the Year 1893 – 94 with explanatory observations by the Financial Secretary, and explanation of differences’ 1893-94 (85) LIII 1 and HCPCP ‘Navy estimates for the year 1894-95, with explanatory observations by the financial secretary, and explanation of differences’ 1894 (5) LIV 1

²⁹ HCPCP ‘Naval works. A bill to make provision for the construction of works in the United Kingdom and elsewhere for the purpose of the Royal Navy, and to amend the law relating to the acquisition of land for naval purposes.’ 1895 (173) V 159

One major policy difference between the Naval Defence Act and the Spencer Programme, as noted by Sumida, was that the former allowed unexpected balances to be carried over to the next financial year; owing to the administrative difficulties entailed, this was not repeated, but since the funding authorised by Parliament in the yearly Estimates was never exceeded due to the yards being at the limit of their capacity, this was not a major hindrance to vessel production.³⁰ The programme was generally well received by the majority of the press. In its second effective year, post the 1895 election and victory of the Conservative / Unionist coalition under Salisbury, the *Times* remarked that the year's naval programme was of 'a very comprehensive and satisfactory character.'³¹ The paper did qualify its praise somewhat by adding that the new shipbuilding programme alone was not of the dimensions that would satisfy all critics of the Admiralty, but acknowledged that these should be judged alongside other complementary preparations, and the stated government policy of accelerating the construction of vessels in-hand rather than laying down

...a greater number which cannot be speedily completed. There are now under construction eight battleships, 21 cruisers, and 40 torpedo-boat destroyers. To these it is proposed to add :—Five battleships (improved Renowns), four first-class cruisers (Diadem class) three second class cruisers (Talbot class), six third-class cruisers (Pelorus class), and 28 torpedo-boat destroyers.

These vessels are to be laid down —three of the battleships, one first-class cruiser, and one third-class cruisers in the public yards as soon as slips become vacant, the remainder by contract.³²

The *Times* went on to note the intention that the 'whole of the ships, both of the new and old programmes, are to be completed for sea by July, 1899.'³³ This was an overly optimistic assessment, since of the five battleships provided in the 1896/97 Estimates (the first five *Canopus* class, the final unit, *Vengeance* being laid down under the 1897/98 Estimates) none completed by the summer of 1899, and only the name ship, *Canopus*, completed that year at all (in December).³⁴ Nonetheless, the effects of increased funding were being felt, with major

³⁰ Sumida *Op. Cit.* p.17

³¹ The *Times* 'Mr. Goschen's Proposals' Tuesday 3 March 1896, p.7

³² *Ibid*

³³ *Ibid*

³⁴ Chesneau & Kolesnik *Op. Cit.* p.35

new first-class vessels under construction, both of the battleship and cruiser [nee ‘battle-cruiser’ in Samuel Long’s parlance] type.

Cursed gems –the twilight of the protective era

Of all the first-class cruisers developed for the Royal Navy in the late Nineteenth Century, the eight-strong *Diadem* class are probably the least well-regarded. It must be acknowledged that this is a relative statement, since few of the first-class cruisers developed in the 1890s garner copious attention. However, the *Diadems* are interesting because their contemporary reception was extremely negative, scathing assessments frequently appearing in the press, journals and transactions of professional bodies, whereas their predecessors, though not without critics, had been mostly well-received.³⁵

The *Diadems* were designed, like all British first-class cruisers to date, primarily for the purpose of commerce protection and trade defence in general. As envisioned, their duties would have been to counter and overwhelm raiders such as the *Dupuy de Lome*, *Amiral Charner* class, and equivalent cruisers from other rival maritime powers. In addition to these vessels, the type was also needed as an effective counter (like the *Blakes* before them) to the swift, long-range converted liners which continued to be regarded as a significant potential threat. Like their predecessors, it was anticipated that they would usually operate singly or in small groups from focal areas in conjunction with smaller second-class types; they were not intended for operations with the battlefleet, although as indicated, if well-handled, they should have been able to perform such duties in the event of their being required. As they came into service however, there was a growing additional interest in how to utilise first-class cruisers (which would come to prominence during the Fisher era considered in Chapter Five): that of employing them in a dedicated hunting squadron attached to no specific fleet, but capable of being dispatched to different locations as required in time of conflict. It would also be potentially useful in peacetime for visiting foreign stations in the guise of showing the flag.

³⁵ See for example the negative comparisons raised by Admiral Sir Edmund Freemantle in the discussion on Philip Watt’s paper ‘Elswick Cruisers’ *TransINA* Volume XLI (1899) pp.297-298. For a more ‘popular’ publication, F. T. Jane [ed. A. Preston] *The British Battle-Fleet: Its Inception and Growth throughout the Centuries* (London: Conway, 1997) p.284

The eight vessels of the class were constructed in two batches of four units, the first under the 1895/96 Estimates, the second for the 1896/97 period.³⁶ The design stages mostly took place during 1894, with the initial steps taken during the final months of 1893. In a letter from the DNC to Mr Dunn dated 23 November 1893, he was asked to confer with the Engineer-in-Chief and have put in hand as soon as possible a sketch-design for a ‘Modified Blenheim’.³⁷ Throughout the development process and indeed during construction the *Diadem* class were regularly described in this way (and less regularly as ‘New *Blakes*’) and were required to be intermediate in size between the *Blake* and *Powerful* classes.³⁸ The considerable increase in length over the *Blakes* (some 60ft) was ‘the minimum that can be accepted in connection with the use of the water tube type of boiler and the provision of a single submerged torpedo room which will be forward of the boiler rooms.’³⁹ The first sketch design for the new type was submitted to the Board for their consideration in June 1894. A significant governing condition laid down in view of favourable reports from the *Crescent* and *Royal Arthur*, which had been modified from their Edgar class sisters with a higher forecastle, was that the new cruisers should have a similar long, high forecastle, rather than adopting a flush-deck arrangement.⁴⁰ In overall design terms, the *Diadems* can be loosely considered as reduced *Powerfuls*.⁴¹ Figure 3.1 shows the deck plan and side elevation from the 1902 edition of *The Naval Annual*.

³⁶ Friedman *British Cruisers of the Victorian Era* p.237

³⁷ NMM *Diadem* class ship cover, DNC to Mr Dunn, 23 November 1893

³⁸ NMM *Diadem* ship cover, S9454/94 ‘Design for a New First Class Cruiser: Modified “Blenheim”’ Since the *Powerful* class was designed for a specific role, the *Diadems* can be viewed as more realistically representing the service’s general desires / requirements for first-class cruisers at this time

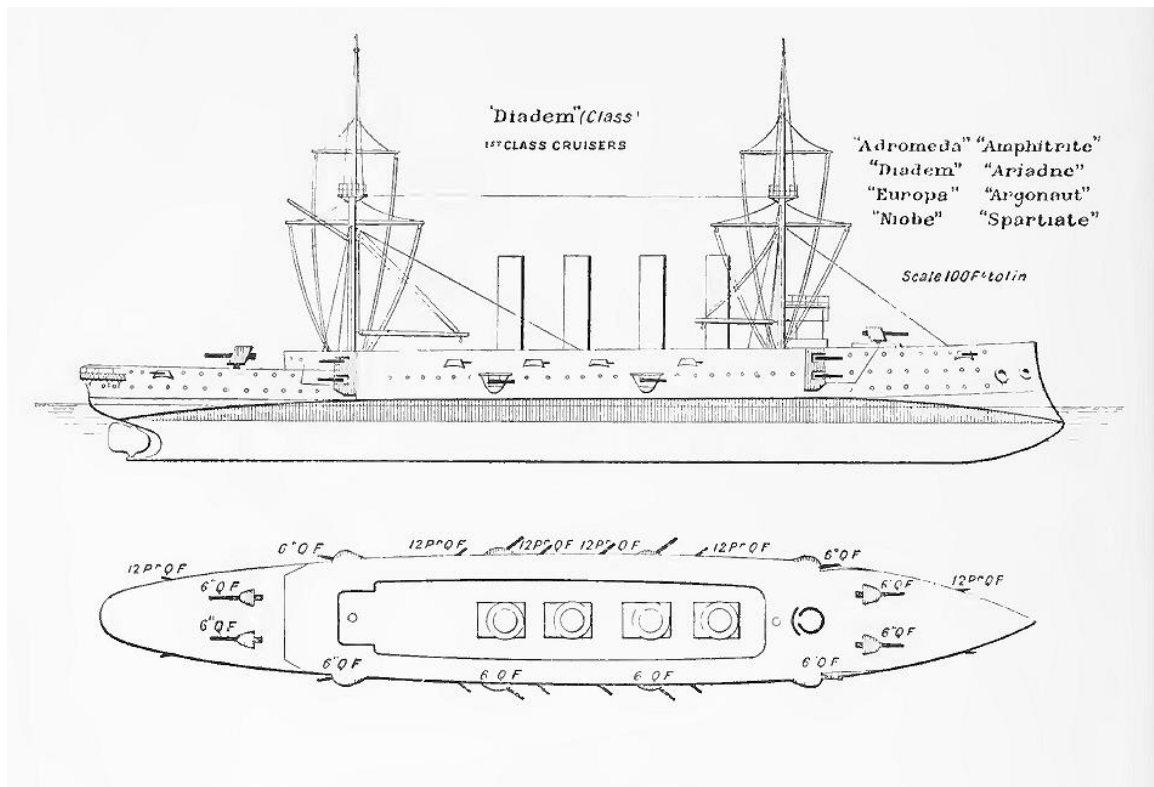
³⁹ *Ibid*

⁴⁰ NMM *Diadem* class ship cover: ‘Submission of the Director of Naval Construction to the design of New First Class Cruisers (“Diadem” Class)’ S.10268/1895 –A slightly edited version of this lengthy report is provided in Appendix II

⁴¹ The emphasis here is upon ‘loose’; the description serves for general illustrative purposes, just as it does when considering the *Edgars* as reduced versions of the preceding *Blenheims*. It should not be taken literally, since these types, while sharing obvious general similarities with their immediate predecessors, were dedicated designs rather than being scaled replicas of these vessels.

Figure 3.1

Diadem class cruiser deck-plan and side-elevation



Source: T. A. Brassey [ed.] *The Naval Annual*, 1902 (Portsmouth: J. Griffin & Co., 1902)

Plate 6

On a nominal 11,000 ton load displacement and 462ft 6in between extremities, the class averaged 20.5 knots on full-power trials with 30 Belleville water tube boilers serving two sets of 4 cylinder triple expansion engines.⁴² The design target was a continuous practical sea speed of some 19 knots, approximately 1 knot higher than the *Blakes*, although 19.72 knots was obtained in the name ship on a 30 hour trial at $\frac{3}{4}$ power.⁴³ After repeated debates of the various options, a uniform armament of sixteen 6in QF was eventually selected, this being favoured by the First Naval Lord.⁴⁴ These were disposed in mirror-imaged double-deck casemates fore and aft, two central main-deck casemates per side, and paired weapons on the forecastle and poop provided with shield protection.⁴⁵ Given the duties the vessels were intended for, White also favoured the uniform 6in QF armament, as did the Controller, John Fisher. Both had favoured such an armament for the previous *Powerful* class but been overruled; in the case of the *Diadems* they carried their argument.⁴⁶ Technically, the *Diadems* were the last British first-class cruisers to be equipped with the 6in QF gun proper, which had propellant charges loaded in brass cartridge cases. With improved breech mechanisms, it was possible to load and fire a 6in just as quickly with the propellant charge in silk bags rather than the bulky brass cartridge cases, and all later cruisers would be equipped with these new BL weapons rather than the QF. There was space for over 2,000 rounds of ammunition for the 6in in all, or more than 125 rounds per gun.⁴⁷

The *Diadems* were also the last British first-class cruisers where the primary defence was provided by a comprehensive protective deck system, the curved steel internal armour being 2 ½in on the flat and 4in on the slopes, the crown of the deck rising approximately 3 ½ feet above the design load-line with 1,000 tons of coal on board, the lower edge of the 4in slope being some 4 feet below the waterline.⁴⁸ The total weight of armour in the protective deck

⁴² Friedman *British Cruisers of the Victorian Era* p.237 The second batch of four vessels (*Ariadne*, *Argonaut*, *Amphitrite* and *Spartiate*) were given slightly higher power machinery to lift maximum (trials) speed to 20.75 knots

⁴³ NMM d'Eyncourt collection DEY/2 Tennyson d'Eyncourt, future DNC, appears to have collected data on cruiser trials as a matter of course, presumably because of the strong associations the Armstrong company, who he worked for at the time, had with such types

⁴⁴ Friedman *British Cruisers of the Victorian Era* p.237

⁴⁵ The original vessels were to have fifteen 6in QF, with only a single weapon on the quarterdeck; a second was added later. The second batch of vessels were intended from the outset to carry sixteen 6in

⁴⁶ In the light of which Fisher's oft-repeated comment regarding the uniform 6in armament of the later Monmouth class, cited in the previous chapter (viz. 'Sir William White designed the *County* class but forgot the guns') is hypocritical in the extreme, particularly given the trade defence nature of both types

⁴⁷ Friedman *British Cruisers of the Victorian Era* p.235

⁴⁸ NMM *Diadem* class ship cover S.10268/1895

was some 1,200 tons.⁴⁹ Protection was of similar scale on the casemates, 12in being provided on the conning tower. The total weight of protective material, excluding coal defence, was some 1,850 tons, or approximately 1/6 the total displacement.⁵⁰ Ammunition passages were provided below the protective deck and coal bunkers to provide a protected means of rapid transit from the shell rooms and magazines to the widely dispersed guns. This was a great improvement over the *Blake* and *Edgar* classes, where the ammunition had to be transported longitudinally above the protective deck, or along the gun deck.⁵¹ Total coal bunkering provided for was 2,000 tons, with a normal load of 1,250 tons.⁵² The bunkers above the protective deck were divided by a longitudinal cofferdam, the outer bunkers containing some 750 tons of coal, it being assumed that they would be the last to be consumed, and thus providing a significant addition to the total protection.⁵³ Assuming full bunkers, endurance from the remaining 1,250 tons was calculated to be 5,000 nautical miles at 10 knots.⁵⁴

The principle objections raised by the types detractors can be summarised as being:

- The lack of ‘heavy’ guns
- An apparently low speed compared to other vessels (be they of foreign construction, or by private firms such as Armstrong’s for foreign naval clients)
- Excessive size compared to rivals
- A high freeboard coupled with the use of the protective deck system rather than external armour.

These critiques appear to have been echoed for the most part by historians with little further consideration. A more careful assessment though indicates that many of the objections levelled at the type are at best over-simplistic, and largely based upon very basic assumptions and tabulations of general features which took little or no account of the less obvious, but critical aspects of vessel design. An example of the sort of table commonly seen is provided in Table 3.1. Sir William White, strongly defending the *Diadems* from attacks in the press, pointed out in the 1904 edition of Brassey’s Naval Annual that for the services they were

⁴⁹ *Ibid*

⁵⁰ *Ibid*

⁵¹ NMM *Diadem* class ship cover S9454/94

⁵² *Ibid*

⁵³ See Chapter Two for more on coal defence

⁵⁴ NMM *Diadem* class ship cover S9454/94

designed to fulfil, and when compared with foreign cruisers built or projected at the time of their design (1894), the *Diadem* and her sister ships were efficient protectors of commerce and communications.⁵⁵

White did acknowledge that several of the second batch of four vessels occupied an extraordinarily long period in construction, with the result that their entry into the service was severely delayed. But he also made the reasonable point that it was inappropriate to compare the type to vessels designed years later, embodying all the advances in technology that had occurred in the intervening time.⁵⁶ The main cause for the delay in completing several of the second batch of vessels was the late delivery of their machinery from the contractors.⁵⁷ Although White, as the responsible designer cannot be considered unbiased, his remarks appear as objective as can be expected and are perfectly logical. Nevertheless, however reasonable, they also appear almost an apology for the type, which is surprising since it is easy to demonstrate that the *Diadems* have been significantly underestimated by their many detractors, and were far more capable than was and is generally appreciated. A reanalysis of the class and the criticisms levelled at it is well worth making, since it also provides some background to design choices of subsequent classes, and the reasons behind these.

⁵⁵ Sir William White 'The Principles and Methods of Armour Protection in Modern War-ships' in T. A. Brassey [ed.] *The Naval Annual 1904* (London: J. Griffin, 1904) p.125 It is significant (and slightly ironic) that White's article appeared in *The Naval Annual*, which was itself the source of many of the tables that caused White and the Admiralty so many problems

⁵⁶ *Ibid*

⁵⁷ Chesneau & E Kolesnik *Op. Cit.* p.68 The most notable delays were in *Ariadne* and *Spartiate*, which did not complete until June 1902 and March 1903, respectively

Table 3.1

An example of a simplistic tabular comparison between the basic features of
five cruiser classes

	British.	French.	German.	Chilian.	Japanese.
	DIADEM.	MONTCALEM (6).	FURST BISMARCK.	O'HIGGINS.	AZUMA.
Displacement.	11,000	9,367	10,482	8,500	9,436
Length . . .	435	452 ft. 9 in.	393 ft. 6 in.	411 ft. 9 in.	445 ft. 10 in.
Beam . . .	65	63 ft. 8 in.	67	62 ft. 6 in.	59 ft. 6 in.
Draught aft .	26	24 ft. 7 in.	26 ft. 3 in.	..	28 ft.
I.H.P. . . .	16,500	19,600	14,000	16,500	17,000
Speed . . .	20½*	21	19	21½	20
Protection:—					
Belt	6"	7½"	7"	6"
Deck . . .	3"—6"	..	3"	2"	..
Gun positions	4½"	..	7½"	6"	..
Armament . .	{ 16 6 in.	{ 2 7·5 in.	4 9·6 in.	4 8 in.	4 8 in.
(all Q.F.)	{ 14 12 pr.	{ 8 6·3 in.	12 5·9 in.	10 6 in.	12 6 in.
	{ 3 3 pr.	{ 4 3·9 in.	10 3·6 in.	4 4·7 in.	12 3 in.
		{ 16 1·8 in.	10 1·6 in.	10 12 pr.	12 1·8 in.
		{ 6 1·4 in.	..	10 6 pr.	
Torpedo tubes	3	2	6	3	5
Coal supply .	$\frac{1,000}{1,900}$	$\frac{1,020}{1,600}$	1,000	1,200	

T. A. Brassey [ed.] *The Naval Annual, 1898* (Portsmouth: J. Griffin & Co.) 1898 p.4⁵⁸

⁵⁸ Note, for example, the simple statement of maximum armour thickness, with no consideration given to area covered (e.g. height and length of a belt), proportion of displacement given over to armour, protection given to guns, height of guns above the water, ammunition supply, conditions in which maximum speed was obtained (displacement at time, boiler forcing, period of run, location of run) etc.

Considering the main points of criticism referred to above, the uniform 6in armament was a Board decision made after a variety of armament configurations had been discussed at length, including options with 9.2in or 8in chase weapons.⁵⁹ Given the contemporary gunnery conditions where, as considered in Chapter Two, rapidity of fire counted above outright gun power, this can in many ways be considered an ideal configuration for the circumstances, while also possessing the advantages of a uniform calibre in terms of ease of supply and convenient logistics. Although heavier chase weapons, as had been fitted to other first-class vessels, would have been useful in providing extra punch in a close range engagement, the 6in could defeat most rival cruisers' protection at the time of their design, and was more than capable of completely demolishing unarmoured areas.⁶⁰ The fact that it was employed as the 'secondary' battery in RN battleships into the early years of the 20th century underlines this point. Thus the alleged weakness of a uniform 6in QF armament does not stand up, particularly for single-ship actions between cruisers operating in the trade defence role.

The two real issues with the armament configuration were that the paired 6in chase weapons fore and aft possessed only shield protection, and the main-deck guns were nominally too low to the water to be effectively worked in poor weather conditions. The former of these points was clearly less-than-ideal, above all in an environment dominated by the QF gun, where explosive shell and splinters could potentially cut down the weakly protected crew of the chase guns. Armoured gun-houses would undoubtedly have been preferable, but it would not have been possible to employ them on the 11,000 ton displacement without accepting compromises elsewhere. While the *Diadems* possessed good stiffness and a respectable range of stability, they could not have carried the additional top-weight without compromising this further than either White or the Board were willing to accept.⁶¹ This was clearly stressed by the DNC in the early design stages, pointing out that 'it must also be understood that in working out the designs it will be necessary to steadily resist any proposals for changes

⁵⁹ The full discussion was detailed in report G4441/94, the decisions also being summarised by the DNC in S10268/1895 contained in the ship cover. The possibility of a new design of 8in weapon based on the Elswick 8in/40-calibre was one that appeared several times during the 1890s, but never progressed beyond the concept stages, although the later 7.5in weapon could be loosely seen as the result of these debates.

⁶⁰ Although chase weapons might be expected to provide long range fire in a stern chase, given the lack of effective fire control during this period, this would have been rather more theoretical or optimistic than otherwise. As in the case of the battleships, the larger pieces of artillery would likely have been of greatest value as ranges dropped, and they could use their additional penetrative power and / or larger bursting charges to assault the vitals

⁶¹ Based on the weights of contemporary turrets and gunhouses, the extra top-weight would likely have been in the order of 150-180 tons

which would tend to further raise the centre of gravity and so diminish the stability.’⁶² Quite apart from being basic good sense, White’s reputation had been made by his ground-breaking work on stability in the early 1870s.⁶³ Moreover, few can have been better aware of the dangers of making additions to a vessel during the construction period. This had plagued many Royal Naval vessels built during the mid-Victorian era, and also adversely affected many contemporary French designs.⁶⁴

The matter of main deck guns being too close to the waterline is consistently raised regarding White’s cruisers from the *Powerfuls* onward, and this was indisputably a severe disadvantage to the configuration.⁶⁵ What the critics consistently fail to suggest though is any realistic alternative means of carrying the number of 6in guns required by the Board, while achieving equivalent protection for the weapons, their crews and ammunition supply routes. As was illustrated in the previous chapter, the decisions regarding the use of casemates were based upon data obtained from the *Resistance* experiments. A vessel could have been designed with weapons located on the upper deck. Since a box-battery would be the only realistic means of achieving this though, the protection would have been substantially weaker, as confirmed by the *Resistance* trials. The 6in guns would necessarily be grouped much closer together in such a configuration, reducing their independent defence and that of the ammunition supply routing. Owing to the significantly raised centre of gravity, stability would have been reduced for a given hull form with an upper deck battery, and it is highly probable that a larger vessel would have been necessary to obtain both equivalent stability and the required speed, it being accepted that the nominally increased level in offensive power came at the price of vessel

⁶² NMM Diadem class ship cover S10268/1895

⁶³ See Chapter Two

⁶⁴ See John Beeler *Birth of the Battleship: British Capital Ship Design 1870-1881* (London: Caxton, 2003) pp.211-212 The slow build times of the era were partly to blame, since this gave ample opportunity to modify vessels under construction to add the latest developments. One of the few types which actually benefited from this were the two *Trafalgar* class coast-assault vessels, which had their intended 5in BL replaced with the far superior 4.7in QF. This resulted in an increase in displacement & draught, but for their intended coast-assault role in the Mediterranean theatre this was considered rather a benefit than otherwise and made them better fighting ships than as originally designed. White was happy enough to pursue this, presumably because he was able to keep a close eye on the total weights to ensure they did not become excessive, and because the type, which he had inherited and had no enthusiasm for, marked the end of the coast-assault tactical (and strategic) paradigm. Had they been blue-water combatants, he may well have reduced the number of QF to ensure no reduction in buoyancy and stability; since the QF gun had a substantially greater rate of fire (and correspondingly required a greater quantity of ammunition) even a further reduction in the number of guns would have brought with it an increase in total firepower

⁶⁵ This also applied, to an even greater degree, to Watts’s two *Duke of Edinburgh* class vessels –see Chapter Five. It is strange that RN vessels should be criticised for this issue while many foreign vessels, which carried weapons no higher in practice above the waterline, rarely receive similar notice.

size, cost, and weakened defence. These points regarding the use of maindeck casemates, and the objections to them apply consistently to all of White's first-class cruisers from the *Diadems* to the *Devonshire* class. The two *Powerfuls* may have been an exception; little criticism has been directed toward them on this front, and they had a reputation of being both excellent sea boats and inherently dry.⁶⁶

The claim of apparently low speed in the *Diadems* (and to an extent the subsequent *Cressy* class) is also difficult to support if more than simple trials figures are considered. For comparative purposes, the baselines employed for the different vessels / types must be identical, and this was rarely if ever the case. Vessels built by private firms for foreign clients, and indeed much foreign construction seldom had to undergo trials as stringent or carefully conducted as those Royal Naval vessels were subjected to. Results could be subject to a considerable degree of creative interpretation, described as 'jockeying' by Sir Edward Reed, with highly exaggerated top speeds sometimes claimed.⁶⁷ The simplest example of such a numerical sleight of hand was to use the maximum figure obtained in favourable conditions on a short run, rather than an average value taken over an extended period or periods.⁶⁸ On a more technical level, forced draught was frequently employed in many foreign vessels and those built in Britain by private firms, and this itself could be disguised in many ways. The fashion for high boiler pressures had largely expended itself in the Royal Navy by the early 1890s, and following the introduction of the Belleville in the *Powerfuls* forced draught was largely discontinued in service first-class cruisers until White's final *Devonshire* class.⁶⁹ An example of a Belleville type of (large diameter) water-tube boiler is shown in Figure 3.2.

⁶⁶ See C. E. W. Bean *With the Flagship in the South* (London: T. Werner Laurie, 1909) pp.24-25, also Anthony Preston *The World's Worst Warships: The Failures and Repercussions of Naval Design and Construction, 1860-2000* (Annapolis: US Naval Institute Press, 2003) p.45

⁶⁷ E. Reed 'Trials of Steam-Ships at the Measured Mile' *TransINA* Volume VIII (1867) pp.100-110 Reed gave examples of methods by which artificially high top speeds might be claimed. See also K. C. Barnaby *The Institution of Naval Architects 1860-1960: An Historical Survey of the Institution's Transactions and Activities over 100 Years* (London: Royal Institution of Naval Architects, 1960) p.54 As dryly noted by Barnaby, Scott Russell, in the discussion on Reed's paper, generously offered to tell him a few more ways that he had not mentioned in his paper!

⁶⁸ By the turn of the century, one element of the RN standard trial was eight hours' trial at natural draught, and if applicable, three or four hours at forced draught. See discussion on Philip Watts 'Elswick Cruisers' *TransINA* Volume XLI (1899) p.306

⁶⁹ The true measure of what was extracted from the boilers, and the degree of stress they were subjected to, was horse-power developed per square foot of grate / per square foot of heating surface. In the Royal Navy, a fixed limit on horse-power compared to heating surface was applied, whether forcing was employed or not. This varied depending on the type of boiler, be it cylindrical, large diameter water-tube or small diameter water-tube. A further point of interest is that while forced draught is normally referred to in association with closed stoke holds, if openings were kept to a small size (and number) it was still possible to significantly increase power with fans without ever actually closing the stokeholds at all

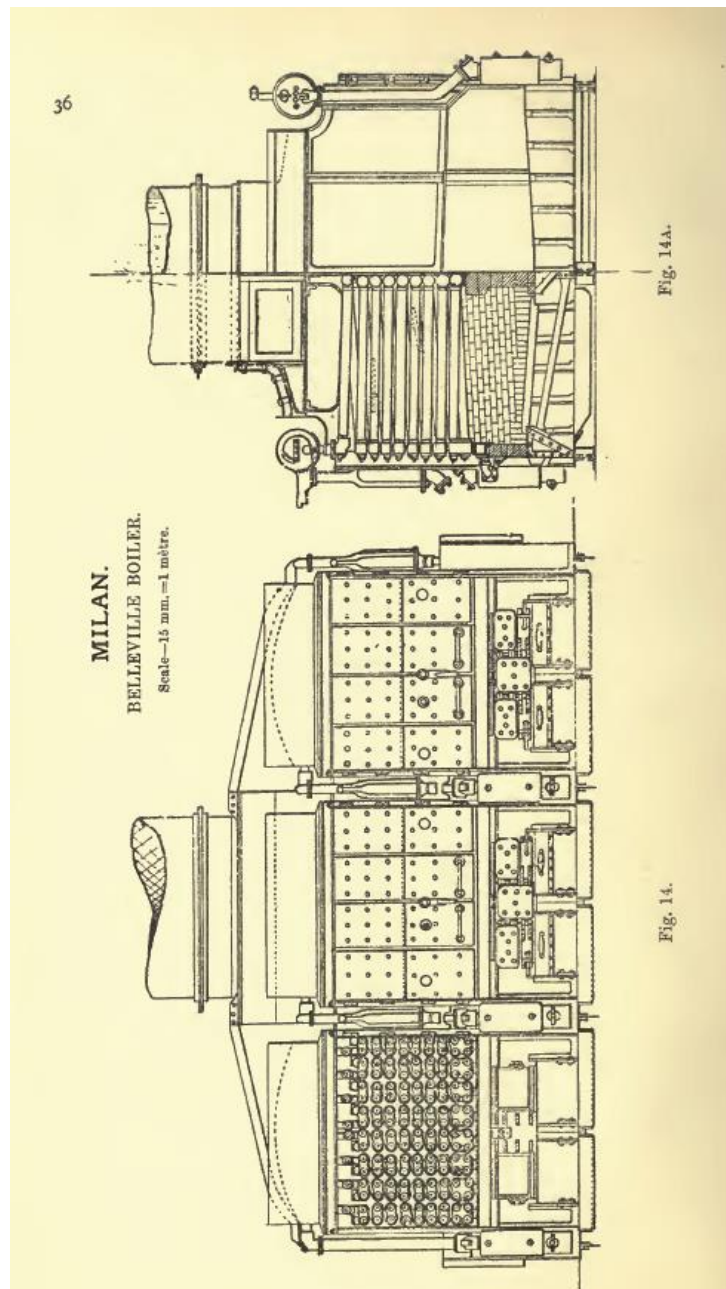
Although a very mild degree of forced draught was available in the *Diadems*, it was rarely employed in practice, and was essentially reserved as a redundancy for obtaining the design power even if one boiler room were to be disabled in action or otherwise rendered out of commission.⁷⁰ As a result stresses on the boilers in the *Diadems* (and their successors) were relatively low compared to many rivals, and they were able to maintain full power and high speed for longer than would have been possible with greater levels of forcing.⁷¹ The price was a greater number of boilers for a given output. Over any reasonably extended chase, this would have almost entirely offset any theoretically higher sprint capabilities of vessels employing considerable forced draught.⁷² Their size and high freeboard also made them superior sea boats to smaller vessels, further increasing their edge in terms of practical sea-speed, irrespective of what the modest figures obtained on trials might suggest.

⁷⁰ T. A. Brassey 'The Progress of the British Navy' in T. A. Brassey [ed.] *The Naval Annual, 1898* (Portsmouth: J. Griffin & Co., 1898) pp.3-4

⁷¹ NMM Diadem class cover S.10268/1895 'Enclosure to docket containing general description of the design'

⁷² It should though be noted that severe problems with the Belleville were initially encountered, although as described in Chapter Four, this had more to do with crew training than inherent flaws in the Bellevilles themselves

Figure 3.2
Belleville type water-tube boiler



Source: L. S. Robertson [trans. & ed.] *Marine Boilers: Their construction and working dealing more especially with tubulous boilers. Based on the work by L. E. Bertin* (New York: D. Van Nostrand Co., 1906) p.36

The greatest criticisms of the *Diadems* concerned their size and lack of external armour protection, coupled with a high freeboard which increased the target area for an opponent. Considering the former point first, this was a consequence of Board requirements for a coal capacity, seakeeping (i.e. freeboard), ammunition supply and protective arrangements, the details of which were often overlooked in basic comparisons between types. These all tended to be greater in service vessels than those built by, or for, foreign rivals, which naturally tended to result in greater dimensions, although they were also to an extent saddled with excessive equipment weights, which many officers would have been happy to see reduced.⁷³ Much the same would apply to their immediate successors, although criticisms by this point were fading.

On the subject of armour, the *Diadems*, as the last British first-class protected cruisers can be regarded as the victim of an unlucky combination of circumstances. In addition to being faced with the usual criticisms levelled at the protective deck system, the *Diadems* had the bad luck to be under construction at a time when great strides were being made in protective material, and, as White pointed out, to be repeatedly compared with slightly newer types incorporating the new armour technology. But at the time of the design in 1894 the internal armour scheme was considered by the Admiralty and the Controller's department to retain a slight edge in practice for cruisers. In the *Powerfuls* and *Diadems* the protective deck system reached its ultimate refinement, the main difference between the types being a matter of scale: the *Powerfuls*, being larger, had a thicker deck and casemate armour than the *Diadems*. In other respects, the protective schemes employed in the two types were very similar. This was as previously illustrated an excellent defensive arrangement for the mid-1890s, and even afterward would have provided capable protection against both explosive shell and AP shot fired from QF and medium-calibre guns in a single-ship action. The same could not be said for the alternative arrangements of external plate, given the armour technology available at the time of their design.

When all of these factors are considered, a very different and much more favourable picture of the *Diadem* class emerges, and it seems highly probable that they would have proved significantly superior fighting ships to any rival cruisers dating from the same design period or earlier. The soft steel belts of, for example, the *Dupuy de Lome*, *Amiral Charner* and

⁷³ See the remarks of Freemantle in the discussion on Watts 'Elswick Cruisers' *Op. Cit.*

Pothuau classes were very thin and would have been easily penetrated by 6in QF firing AP shot at typical battle-ranges.⁷⁴ Although the former had cofferdams to 4ft above water, their protective decks were quite thin to free up weight for their belts, rendering them vulnerable to AP shot from 6in QF. Likewise, the small Italian armoured cruisers of the early 1890s would not have posed formidable opposition, all being at most some 60% of the *Diadem*'s displacement. Equally, there seems no reason to suppose that a *Diadem* could not have successfully engaged the *Rurik* discussed in Chapter Two, given their efficient protective arrangements, armament and respectable practical sea-speed.⁷⁵

Possibly the most formidable contemporary opposition up to the time of the type's design would likely have proved the *New York* and *Brooklyn* of the slowly expanding United States Navy. These cruisers were somewhat closer in size to the British vessels than many other rival, were respectably armed, and possessed an unusual armour scheme that featured a reasonably thick protective deck associated with narrow strips of thin armour across the machinery and boiler spaces. Nominal speed and seakeeping were fair, though range was modest in relation to British vessels. The American cruisers also relied upon forcing to obtain high power from a small number of boilers, and employed two sets of three-cylinder TE engines coupled to twin shafts rather than the single set of smoother running 4-cylinder engines per shaft employed in the *Diadems*.⁷⁶ As such, they are realistically better compared to the *Blakes*, and notwithstanding the rhetoric from Secretary Tracy, would have at best equalled the earlier British types.⁷⁷

All British first-class cruisers employing this form of defence were subject to criticism from proponents of external (belt) armour. As a faintly despairing White remarked

It has been my painful lot to hear ships described as "unarmoured," which, to my knowledge as their designer, were carrying about the world enormous weights of

⁷⁴ Chesneau & E Kolesnik *Op. Cit.* pp.303-304

⁷⁵ Assuming a similar level of crew training and equally favourable conditions, the result of an engagement between a *Diadem* and *Rurik* as she was completed would likely have been a heavy defeat for the Russian vessel with a high casualty rate for the crew owing to the inadequate protective scheme employed. Realistically, the *Rurik* could neither run from, nor fight a *Diadem* on equal terms, despite possessing four nominally heavier weapons

⁷⁶ *Jane's Fighting Ships of World War I* (London: Studio Editions, 1990) p.54 & p.140

⁷⁷ Norman Friedman *US Cruisers: An Illustrated Design History* (Annapolis: Naval Institute Press, 1984) pp.36-37 Given the displacement, dimensions, engine and boiler configuration and nominal coal capacities of the US vessels, the ranges claimed for them at the time appear to be significantly exaggerated

protective material in decks, casemates, and other defence. On the other hand, ships which happen to carry a few hundred tons of thin plating (3 in. to 4 in.) on their sides are described as “armoured,” although their total weight of defensive material is much less than that of so-called “unarmoured” vessels with no armour on their sides.⁷⁸

Despite complaints from those who preferred external plating, until the development of face-hardened armour the Admiralty’s preference in cruisers for throwing the majority of available weight for defensive materials into protective decks appears to be entirely correct. In the absence of direct battle experience, conclusions were drawn from a mass of full-scale experimental data and tests, notably from the *Resistance* and oft-forgotten *Nettle* trials. It is instructive to note that later naval engagements demonstrated many of these conclusions to be correct. From the middle of the 1890s though, dramatic improvements were made to armour plate, which had a profound impact upon the design and development of first-class naval units, both of the battleship and cruiser types, and would ultimately result in a step-change in the strategic character of the Royal Navy and other naval services during the final years of the Nineteenth, and first years of the new century. The new types of armour and their major impact on the first-class cruiser type and their operations are considered below and in the following chapters.

The armour revolution: process developments and a paradigm shift

British first-class protected cruisers, from the *Blake* to the *Diadem* classes, all employed steel for their curved internal armour decks, and for vertical armour on or around the conning tower, funnel uptakes, ammunition hoists, casemates, gun shields and gun houses. As described in Chapter Two, the introduction of nickel-steel armour in the late 1880s-early 1890s is sometimes taken by naval historians as a revolutionary advance in protection. In reality, this was not the case. The introduction of nickel was significant but it was not in itself a major advance.⁷⁹ Compared to a homogenous solid steel plate the alloy under contemporary

⁷⁸ Sir William White, in discussion on Elgar *Op. Cit.* pp.82-83

⁷⁹ Note that although the armour trials at Annapolis in September 1890 are frequently stated to have been the first trial of a nickel-steel plate (from the Schneider / Creusot works) several much less publicised trials predate this. The first of these appears to have been a 2in plate produced by a Mr. Riley, that was shown at the Iron and Steel Institute Meeting in 1889, and had been fired at by a 3 or 6-pounder gun. On seeing the results, the DNC (William White) publically stated the Admiralty would be willing to fire at a similar plate if one were to be made available for trial. Mr. Hall of Messrs. William Jessop & Sons provided a 4in thick nickel-steel plate that was fired at on board the *Nettle* 16 April 1890. See the remarks made by William White in the discussion following Mons. J. Barba ‘Recent Improvements in

conditions had the potential for increasing both the resistance to cracking and penetration, but this was relative, being only a few percentage points of improvement, and tests indicated that neither solid steel, nor nickel-steel alloys were in themselves significantly superior to compound armour.⁸⁰ An equally important development, though one that is less frequently discussed, was the introduction of the Tressider process which provided a more effective means of chilling, and thereby hardening, the face of an armour plate.⁸¹

Traditional dipping methods were of limited effectiveness for face-hardening large armour plates. It was difficult to harden a single face using these processes, but more significantly there was a tendency for a steam envelope to form around the immersed article. The steam held the water away from the face of the plate and slowed both the rapidity and the uniformity of the chilling process. Tressider, working at the Atlas Steel Works in Sheffield patented a method in which a very high-pressure spray or douche of water (though oils were not excluded) was forced against a desired surface, eliminating the possibility of a build-up of steam, and thus improving both consistency and the rapidity of the cooling.⁸² In his 1894 INA paper 'Recent Experiments in Armour' Charles Ellis, the Managing Director of John Brown & Co. Ltd., stated that Tressider's initial experiments were on compound plate, since John Brown (and their Atlas Steel Works, where manufacturing was concentrated) was at the time primarily manufacturing armour of this type.⁸³ He also stated that 'it subsequently became apparent that the hardening process was more suitable to homogenous than to built-up or compound plates.'⁸⁴ Ellis did not provide any reasons for this in his paper, but the probable explanation is that the differential cooling rates stressed the weld between the iron back and steel face of a compound plate sufficiently for them to delaminate under attack. The test results were extremely interesting however, a trial at Shoeburyness 4 August 1892 being noted in particular:

Armour Plates for Ships' *TransINA* Volume XXXII (1891) p.160, and in the discussion on Mr. Charles Ellis 'Recent Experiments in Armour' *TransINA* Volume XXXV (1894) p.236

⁸⁰ See Barba *Ibid* and the subsequent discussion for further details.

⁸¹ For details on the metallurgical processes involved in face-hardening, see N. Okun *Table of Metallurgical Properties of Naval Armour and Construction Materials*
http://www.navweaps.com/index_nathan/metalprpsept2009.htm -accessed 4 January 2012

⁸² Tolmie John Tressider 'Manufacture of Armour Plates' US Patent No. 475,364 dated 24 May 1892, p.1 Note that Tressider also patented his invention in Italy (30,334 dated 30 September 1891) and France (215,886 dated 3 September 1891)

⁸³ Ellis *Op. Cit.* p.220

⁸⁴ *Ibid*

The dimensions of the plate were 8 ft. by 6 ft. by 10 in., and it was attacked by five 6-in. Holtzer projectiles, weighing 100 lbs. each, with a velocity of 1,976 ft. per second. Captain Orde Browne describes the result of the trial as follows :- “The whole of the projectiles broke up with very little penetration. The plate, after the trial, appeared to be nearly as stiff and strong as at first.”⁸⁵

The Tressider process alone was not frequently employed on homogenous mild-steel or nickel-steel plate before it became incorporated into more complex armour types which could better exploit its effectiveness through cementing the face of the armour plate, and thereby increasing the potential hardness that could be achieved. The first of these was what has come to be known as Harvey plate, named for its nominal inventor, American industrialist Hayward Augustus Harvey. A matter which should be stressed particularly from this point in the development of armour plate is that is that the names given really only define a general, or generic armour type. The details of the alloy employed and the hardening processes it was subjected to varied somewhat between manufacturers as much as they had previously, and as improvements were sought and made over time.

Harvey armour consisted of a steel or nickel-steel plate that was strongly carburised on one face by covering it with a thick layer of (usually animal or bone) charcoal, surrounding the rest of the plate with non-carbonaceous granular material, and heating to a high temperature, typically around the approximate 1,200 degrees C. melting point of cast iron.⁸⁶ This cementation process raised the carbon content in the face to between 1 and 1.1 per cent, which gradually decreased beneath the surface until the carburising effect finally vanished.⁸⁷ The length of time the plate was exposed to heat (for ship armour, typically between 2 – 3 weeks) was the primary factor in determining the depth of the carburisation within the plate.⁸⁸ When first developed the heated plate was uniformly oil quenched and then water quenched, resulting in a differential hardening: the highly carburised face was hardened to a Brinell value of 575 or higher while the non-carburised back was toughened, with a relatively

⁸⁵ *Ibid* Ellis does not state whether the plate in question was of a compound or homogenous steel / nickel-steel type, though the August 1892 date suggests that it was almost certainly a solid plate of steel

⁸⁶ Hayward A. Harvey US Patent 460,262 ‘Decrementally Hardened Armour-Plate’ Application date 1 April 1891, granted 29 September 1891. The process itself predated the patent application. It was necessary to surround the other sides with granular material since at the temperatures involved, were any part of the plate to be exposed to air, it would rapidly melt

⁸⁷ *Naval Ordnance and Gunnery* (Washington DC: US Govt. Printing Office, 1955) Chapter 12, 1206

⁸⁸ Harvey patent 460,262

gradual transition through the plate.⁸⁹ The majority of manufacturers quickly replaced the oil and water quenching procedure with the more effective Tressider process described above, and it was later discovered that if a plate were then annealed at a low temperature, the total thickness could be reduced by some 10 – 15 per cent without loss of strength.⁹⁰ The end result was a plate possessing an increase in resistivity of some 37.5 per cent over previous types of non-face-hardened steel or compound armour, and an ultimate figure of merit of some 2:1 over traditional wrought iron.⁹¹

In the United States, nickel-steel was the favoured material for the plate; when employed in Britain, mild steel was generally employed rather than a nickel-alloy, it being considered that ‘the value of the nickel alloy was not sufficiently proved by later experiments to make its adoption universal.’⁹² An interesting side-note to the history of armour development in the 1890s which is rarely noted is that there is some question about how much the specifics of the Harvey process owed to other parties. Sir William White, in a speech made at the Jubilee meeting of the Institution of Naval Architects in July 1911, stated

In regard to the use of Harveied armour, it has not been mentioned... but it is a fact, that a great deal had been done in that direction in this country before Mr. Harvey attained the success which he did in the United States –a success for which he deserves the greatest credit. When the Harvey process was introduced to us at the Admiralty it was in a state of development which left much to be desired, and its

⁸⁹ Okun *Op. Cit.*

⁹⁰ *Naval Ordnance and Gunnery* [revised derestricted edn.] (Washington DC: US Govt. Printing Office, 1957) p.42

⁹¹ Admiralty, *Manual of Gunnery for His Majesty's Fleet* (December 1915 edn.) Volume III. p.96 Also cited by Brown *Op. Cit.* p.150

⁹² Charles E. Ellis ‘Armour for Ships (1880 to 1910)’ *TransINA* Volume LIII (1911) p.343 There remains some speculation on this point. In theory, the nickel-steel should have been tougher, but contemporary practice was another matter, and the test results appear to show only a small difference, just as had been the case between earlier forms of non-face-hardened mild steel and nickel-steel. T. Vickers, in the discussion on Ellis’s previously quoted 1894 INA paper (p.239), remarked that in the course of trials his firm had found no advantage, the reason given being ‘that nickel steel is affected in its crystalline structure at a lower temperature than ordinary steel, and will harden at a much lower heat. Consequently the nickel steel is affected deleteriously by the long and continued heating in the “Harvey” furnace, and thus loses the advantage which nickel should afford.’ There appears to be some truth in this, but since later armour types employed nickel as an alloying agent, it seems more likely that in this case, the manufacturers were still learning how best to exploit new techniques. Nickel at the time was also relatively expensive, but since Vickers in the same remarks also stressed his belief that the use of nickel in non-Harveyized armour was desirable, it does not seem probable that economic considerations were driving this particular instance

further development was due to the work of British firms of armour plate makers aided by Admiralty grants for experimental purposes.⁹³

Although this statement is possibly controversial, it is a matter of fact that the Harvey process itself quickly adapted, the most obvious change being the general shift toward Tressider's method of rapidly chilling the face of a plate with numerous high-pressure water-jets, replacing earlier less effective dipping methods. While it was never employed for decks or belts in British first-class cruisers, Harvey plate was the first major advance in armour technology since the introduction of solid steel and compound plate.⁹⁴ It also was the first stage in a process of rapid development which would make it realistically possible for first-class cruisers to carry a useful quantity of vertical protection.⁹⁵ The next stage in the evolution of armour plate would be the Krupp Cement (KC) type.

Although Harvey plate had proven a significant advance (although it seems probable that a forged nickel-steel plate, face-hardened via the Tressider process, followed by a low temperature anneal would have been close in capability to early examples) it was quickly discovered that the back was not sufficiently tough to withstand racking effects when assaulted by forged steel shot.⁹⁶ During the 1880s several armour producers experimented with adding chromium into a low alloy of nickel-steel; the resultant nickel-chrome steel alloy when properly heat treated showed exceptional hardness potential, but proved extremely difficult to manufacture.⁹⁷ The Krupp Arms Works were the first to overcome these problems in 1893, and were able to consistently produce large ingots in which a low carbon steel was alloyed with 3 ½ - 4 per cent nickel and 1 ½ - 2 per cent chromium.⁹⁸ Brown notes that some manganese also featured, and that a small percentage of molybdenum may have been used.⁹⁹ This seems reasonable since molybdenum is often used in applications which involve extreme heat, either in use or manufacturing, since it does not significantly expand at high

⁹³ Sir William White, in discussion on Ellis 'Armour for Ships' p.347

⁹⁴ As is illustrated below, it was employed in several classes of French first-class cruisers

⁹⁵ The only major British vessels to carry Harvey armour were the 2nd class battleship HMS *Renown* (although like many swift 2nd class battleships, she was not far removed from being a 1st class cruiser) and the *Majestic* 1st class battleships

⁹⁶ Ellis 'Armour for Ships' p.343

⁹⁷ *Naval Ordnance and Gunnery* [1957 edn] p.42

⁹⁸ D. Brown *Warrior to Dreadnought: Warship Design 1860-190* (London: Caxton, 2003) p.151

⁹⁹ *Ibid*

temperatures. Another chemical analysis of a Krupp plate indicated that trace levels of silicon, phosphorus and sulphur were present.¹⁰⁰

The production process of Krupp Cement armour was refined and modified over time, and was considerably more involved than any prior type. Initially, Krupp used illuminating gas (methane) as the carburising agent rather than coating it with a solid hydrocarbon, the gas being continually blasted across the face of the plate while it was held at a constant temperature within the sealed oven.¹⁰¹ The majority of manufacturers continued with solid hydrocarbons though, presumably for cost reasons.¹⁰² Brown describes the typical production process in some detail: the low-alloy steel was cast into an ingot of up to 60 tons, and allowed to cool until solid enough to be lifted. It was then re-heated to a uniform temperature, and using a hydraulic press, formed into a slab which was passed through rolling mills until slightly thicker than the final intended size. After rolling, the plate was placed in a low temperature furnace, where it was softened by sprinkling with water, and planed flat. It would then be covered with a mixture of animal and vegetable charcoal to a depth of 6in, another plate would be laid on top, and the ensemble run into a furnace where it would be kept at high temperature for up to three weeks. Immediately on being withdrawn, it would be bent into the final shape and toughened by reheating and cooling in an oil bath, after which the edges were cut and holes for bolts plugged with clay.

The face was then heated to a higher temperature than the back by protecting the latter in the furnace and the plate was suddenly chilled on both sides by water jets. The face was now very hard whilst the back, which was not carburised, and was heated to a lower temperature, remained tough. The plate was checked and any adjustment made in the press with the plate nearly cold. Any final adjustments were made by grinding as the face was now too hard to be cut but holes in the back could still be drilled and tapped. The process was complicated, temperature control being vital, and took a considerable time, manufacturers quoting 9 months for delivery from receipt of orders. The hard face was deeper in Krupp plate than in Harvey and could not be varied independently of the hardness required.¹⁰³

¹⁰⁰ *Naval Ordnance and Gunnery* [1955 edn.] Chapter 12, 1208

¹⁰¹ N. Okun *Op. Cit.*

¹⁰² *Ibid*

¹⁰³ D. Brown, *Op. Cit.* p.151 The previous paragraph is based on text from this source

KC armour was initially some fifteen per cent more efficient than Harvey, and was gradually developed to bring a further ten per cent gain.¹⁰⁴ The much refined production and improved decremental hardening process allowed for an even harder face, with a more gradual, controlled transition to an extremely tough, 'fibrous' back.¹⁰⁵ Figure 3.3 shows the cross-section of a Krupp Cement plate. In comparing the resistance of various general types of armour plate to uncapped projectiles, the Admiralty Gunnery Manual of 1915 gives the following values

15in of wrought iron is the same as:

12in of compound

12in of all-steel

7 1/2in of Harvey

5 3/4in of Krupp¹⁰⁶

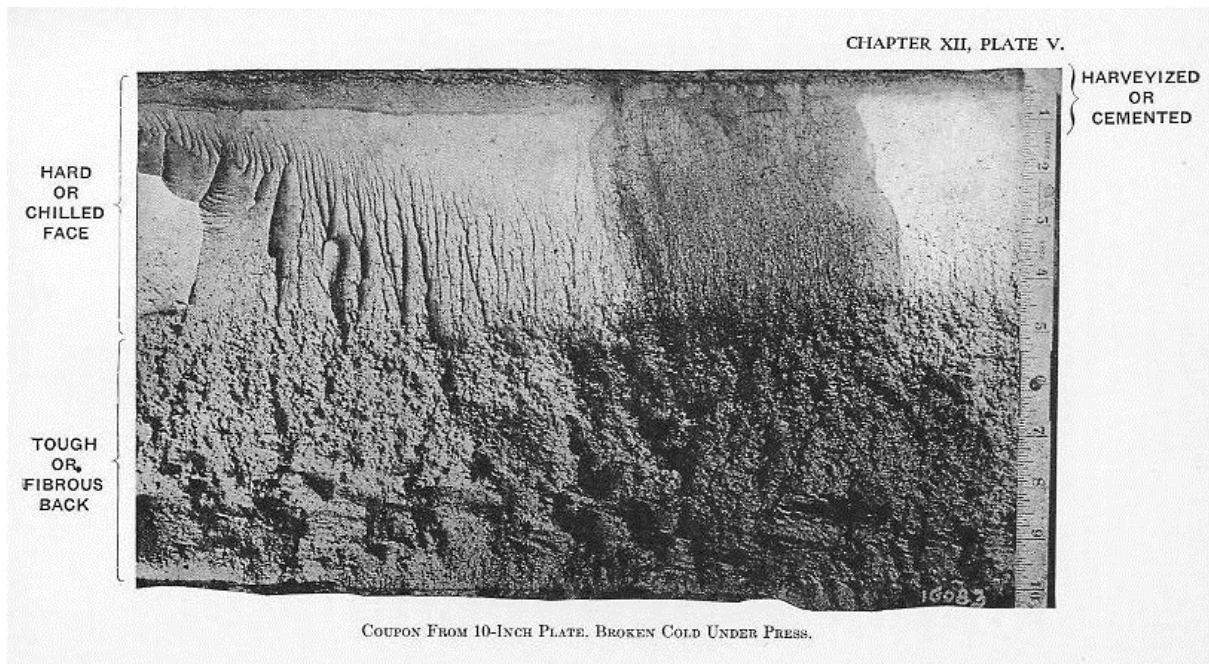
¹⁰⁴ *Naval Ordnance and Gunnery* [1955 edn.] Chapter 12, 1207

¹⁰⁵ *Ibid*

¹⁰⁶ *1915 Gunnery Manual* [Vol.III] p.96 & Brown *Op. Cit.* p.150

Figure 3.3

Cross Section of a Krupp Cement Armour Plate



Naval Ordnance and Gunnery (Washington DC: US Govt. Printing Office, 1955) Chapter XII, 1212: Plate V

Thus, with a figure of merit of 2.6:1 against wrought iron, and 2.087:1 against compound or all-steel, KC armour was a massive advance in passive protective capacity, and the balance between guns and protection clearly shifted slightly in favour of the new types of armour plate during the latter stages of the pre-fire-control era.¹⁰⁷ In 1895, the Naval Intelligence Department produced a lengthy report and assessment of armour manufacturing in the major industrial nations, including an assessment of the most recent foreign trials, and the Admiralty made the decision to switch from Harvey to KC plate.¹⁰⁸ By the end of 1896, three of the main British manufacturers of armour acquired licenses to produce plate using the KC process.¹⁰⁹

French developments

In the mid-1890s, French naval strategists once again turned their attention to the *guerre de course*, after a brief period during which the *guerre d'escadre* found favour following the decline of the wider *Jeune École*. By 1896, in light of the recent advances in material technology (most particularly, armour) Admiral Francois Fournier was strongly advocating the construction of large, moderately armed cruisers exploiting the new armour technology for operating against the commerce of 'perfidious Albion.'¹¹⁰ These, he stressed, must always strive to exploit their greater speed to avoid fighting with superior British forces. Fournier also argued that deliberately seeking combat with a more numerous enemy

made little sense when the opponent's vital interests could be more effectively attacked by other means. Rather than attempting to contest command of the sea,

¹⁰⁷ The figures of merit given are possibly slightly exaggerated given the 1915 date and the fact that KC armour was steadily, if incrementally improved from the time of its introduction, but serve as a general guideline and certainly do not detract from the huge step forward in protective ability that occurred during this period.

As a matter of academic speculation, one wonders what the respective figure of merit would be for a standard, non-cemented nickel-steel plate (or compound faced with the same), if face-hardened by the Tressider process. Using Orde Brown's description of such a plate, and comparing to the extensive tabulated contemporary test data provided by Ellis 'Recent Experiments in Armour' and Mons. L. Bertin 'Hardened Plates and Broken Projectiles' *TransINA* Volume XXXIX (1897) pp.1-25, it seems reasonable to infer such plate had an approximate improvement of 25% compared over the base material. This would equate to 9in offering the same level of protection as 15in of wrought iron, or a respectable figure of merit of 1.67:1. Whether the back would have been tough enough is another question, although Orde Brown did not indicate any issues even under assault from 6in Holtzer forged steel projectiles, and there seems no reason to suppose it would have been inferior to Harvey in this regard.

¹⁰⁸ TNA ADM 231/26 NID report no.427 Details of Harvey Armour Plate Trials

¹⁰⁹ Parkinson *Op. Cit.* p.225 –the manufacturers in question, referenced in Brassey's Naval Annual of 1897

¹¹⁰ N. Lambert *Sir John Fisher's Naval Revolution* (Columbia: University of South Carolina Press, 2002) p.25

Fournier believed that the easiest and cheapest way France could strike at Great Britain would be to wage a systematic *guerre industrielle*.¹¹¹

This style of naval force-structure largely rejected the strategic views of Mahan and Colomb, with Fournier and his fellow proponents of industrial warfare exerting a strong influence over French naval strategy for some years.¹¹² Between 1895 and the signing of the *Entente Cordiale* 8 April 1904, France laid down some 11 battleships in six classes, as against 15 large cruisers.¹¹³ The most notable early fruit of this shift in strategic direction back toward the *guerre industrielle* was the laying down of the *Jeanne d'Arc* in October 1896. Generally held as the first of a new breed of first-class cruisers, she was supposedly

a large, high-speed, long-range, armoured cruiser that was purposefully designed for raiding commerce on the high seas. In theory the great length of the hull coupled with a huge coal capacity would enable her to outpace and outdistance any more powerful adversary. But the most remarkable feature of this warship was the provision of an armoured belt along the complete length of the hull... this meant that the hull of the *Jeanne d'Arc*, and all subsequent French side-armoured cruisers, was virtually shot-proof against the armour-piercing shells fired from the 6-inch guns that composed the main batteries of the British cruisers with the speed to catch them.¹¹⁴

In terms of overall principle or objective this is a reasonably accurate statement, though there are certain significant caveats regarding the execution that are overlooked. The *Jeanne d'Arc*, with her face-hardened armour, was a significant advance over previous French cruisers, although in a broad sense the massive jump in dimensions was as much responsible for the increased capabilities as the production processes of her belt material. It should also be stated that she was not an unqualified success, missing her design speed by more than a knot and

¹¹¹ *Ibid*

¹¹² It is unfortunate that Colomb's writing should have been marginalised relative to that of Mahan, since, although it is easy to over-simplify Mahan, Colomb generally appears the more flexible strategist when the writings of both over an extended period are considered. Mahan, with his early lectures and *The Influence of Sea Power Upon History 1660-1783* was largely attempting to re-educate US naval officers in the general principles of blue-water naval warfare after years of littoral operations. Colomb, serving in the Royal Navy, with somewhat broader contemporary commitments, appears slightly less dogmatic in his views, particularly when considering combined operations

¹¹³ The *Dupleix* class were arguably second-class types, but since their displacement was roughly equivalent to the British *Edgars* they are included here

¹¹⁴ N. Lambert *Ibid* p.21

being extraordinarily unhandy, with a miserable 2,200yrd tactical (turning) diameter.¹¹⁵ In comparison, the *Diadems*, of similar displacement, had a tactical diameter of some 1,000yds for which relative unhandiness compared to other British first-class cruisers they were regularly criticised.¹¹⁶ Perhaps most notably though, care must be taken when assessing the true value of the French vessels' armour protection. It was not until the *Leon Gamberetta* class, laid down from January 1901, that French armoured cruisers would carry KC plate. The *Jeanne d'Arc*, the three *Gueydon*, three *Dupleix* and five *Gloire* class vessels all were protected by Harvey nickel-steel.¹¹⁷ While as detailed above a significant improvement on previous types, 6in Harvey would have been borderline against assault from Holtzer or equivalent forged-steel armour-piercing shot from the latest models of 6in gun.¹¹⁸ Lambert cites remarks by White in a minute dated 22 January 1897 'Type of Battleship to be Contemplated in 1897 – 98' which acknowledge the protective capacity of 6in Harvey against then-current 6in AP projectiles.¹¹⁹ However KC armour rather than Harvey was ultimately employed for the 6in belt of vessels in question (the *Canopus* class). The only major combatants built for the Royal Navy with Harvey armour were the one-off *Renown* and nine units of the preceding *Majestic* class battleships –in the latter case 9in thick, and in all vessels associated with a strong protective deck.¹²⁰ The extent of the *Jeanne d'Arc's* belt is also susceptible to exaggeration. Nominally 14ft 2in deep, the upper strake was of 4in (tapering to 1.6in at the ends), while only the lower 8ft 2in were of 6in, and this also reduced to 2in at the

¹¹⁵ Chesneau & E Kolesnik *Op. Cit.* p.304

¹¹⁶ *Jane's Fighting Ships of World War I* (London: Studio Editions, 1990) p.54

¹¹⁷ It seems that there were several causes for this; partly it was due to the (expensive) purchase of production rights to the patented Harvey process, and the somewhat smaller number of heavy engineering firms manufacturing armour for warships. A similar situation had been claimed some years before, when the French government encouraged armour manufacturers to purchase the rights to produce compound plate and gear their plants toward its production –a highly expensive proposition. This was done, and compound was extensively used, rather than homogenous steel. Although these allegations were particularly strongly made by representatives of the Schneider firm, which produced steel rather than compound plate, and cannot be considered neutral, Schneider generally still produced to capacity, and there is some evidence to support the contention.

¹¹⁸ See TNA ADM 116/446, Sir William White S.11584, 10 June 1897. Memorandum / notes on *Cressy* Class design. Copy also held in *Cressy* Class ship cover at NMM. A slightly edited version of this paper / notes is included in Appendix II. Also see previous sections on armour protection in this chapter, and Chapter Two. The baseline assessment was taken as 100lb Holtzer projectiles (6in) at a striking velocity of 2,000 ft. / sec.

¹¹⁹ Lambert *Op. Cit.* p.21 & pp.314-315

¹²⁰ Per the Admiralty figures cited above, the *Majestics* should have had a slight edge, 6in of KC being roughly equivalent to 7.826in of Harvey. The *Canopus* type was intended as a fast battleship for use in the far east though rather than for the European theatre, and, while not quite a second-class design, they were smaller and faster ships than the *Majestics*, and in concept could be regarded as a marginally enlarged *Renown* with a heavier armament –an additional pair of 6in QF, and 12in, rather than 10in guns, White arguing that 12in was the minimum required to penetrate the thick (albeit narrow) belts of Harvey armour then being fitted to contemporary French battleships. See TNA ADM 116/878 DNC 'The Characteristics and Dimensions of Battleships' 13 December 1895

bottom edge.¹²¹ Thus, despite being coupled with two thin armoured decks, the space between the two being heavily subdivided into the cellular layer that would become a feature in several French designs, the passive defensive abilities of the *Jeanne d'Arc* and the following three classes of French armoured cruisers can be somewhat overstated.

The assumption that the *Jeanne d'Arc* and her immediate successors, with their Harvey vertical protection, were 'big and fast enough to outclass Britain's most powerful protected cruisers' is also a more questionable proposition than is often assumed, since the effectiveness of the protective deck system is typically underrated.¹²² With their high sustained sea speed and large batteries of QF weapons, it is far from certain that a *Powerful* or *Diadem* would have been as comprehensively outclassed by the French vessel as is popularly believed.

Fleet cruisers and a new breed of capital ship

It has recently been stated that 'the true function and purpose of these big armoured cruisers [viz. the *Jeanne d'Arc*] extended considerably beyond mere commerce raiding and independent operations in distant seas.'¹²³ As evidence, the 1899 edition of *The Naval Annual* is cited as mooted another function:

The role proposed for the *Jeanne D'Arc* is that of an advanced guard to a fleet of battleships, seeking for and maintaining touch with the enemy. Cruisers of this type... should be able to fight a battleship for a short time.¹²⁴

This is at best a questionable statement given the timings involved; the *Jeanne d'Arc* was laid down in October 1896, and such roles do not appear to be consistent with the strategic philosophy that ostensibly created her, while her immediate successors (the *Dupleix* class) were smaller, more lightly armed and quite weakly protected. Therefore it seems likely that

¹²¹ Tapered armour cost substantially more than uniformly thick plate due to the more complex production processes involved

¹²² Sumida *Op. Cit.* p.19

¹²³ Parkinson *Op. Cit.* p.221 There is a certain ambiguity in the phrase from Brassey's that Parkinson quotes, viz. 'should be able.' This could be taken to mean that they were capable as a matter of course, or that they should be designed to have this capacity

¹²⁴ Parkinson *Op. Cit.* p.221 There is a certain ambiguity in the phrase from Brassey's that Parkinson quotes, viz. 'should be able.' This could be taken to mean that they were capable as a matter of course, or that they should be designed to have this capacity

the potential for fleet operations was only seriously considered in France sometime after the *Jeanne d'Arc*'s design.

In Britain, the DNC had also been paying considerable attention to the developments being made in face-hardened armour, and its application to first-class cruisers. On 29 April 1897, White instructed assistant-constructor W. E. Smith to prepare a preliminary design for such a vessel.¹²⁵ The first memorandum of significance outside the constructor's department followed on 10 June, and as far as the wider Royal Navy is concerned, it is in this report that a major shift in vessel capability, and general duties, is first indicated

The fundamental ideas on which this design is based are as follows:-

Special adaptation for service with the Channel & Mediterranean Fleets; & the performance of all duties hitherto devolving on First Class Cruisers attached to Fleets.

1. Capacity for close action, as adjuncts to battleships
2. Suitability for employment on detached services; if required to be used for the protection of shipping, commerce & communications.
3. Armament, protection, speed & coal endurance to be such that the new cruisers should be formidable rivals to the best cruisers built or building for foreign Navies.¹²⁶

It is the phrase 'the capacity for close action' that provides the clearest signals of the increased fighting capability of the first-class cruiser brought by the introduction of face-hardened, and particularly KC plate. Of no less interest though is the remark '*if required* to be used for the protection of shipping, commerce & communications.' This does not appear to fit satisfactorily with the idea of the vessels being a response to the new French cruisers, as was stated by the First Lord (Goschen) to the Chancellor of the Exchequer (Hicks-Beech) on 23 July 1897:

"In view of the extra exertions made by France specially in respect of very fast cruisers" the navy required money to lay down immediately four (later increased to

¹²⁵ NMM Cressy Class ship cover. White to Smith 29 April 1897

¹²⁶ NMM Cressy class cover Notes on *Cressy* Class design. Original underlining

six) large cruisers with the necessary speed to run down the French vessels. Three days later the House of Commons voted the necessary sum.¹²⁷

The reason for the apparent discrepancy seems to be that the new designs owed substantially more to recent developments in Italian, not French, cruiser construction. Owing to financial restrictions in the latter half of the 1890s, the Italian naval authorities were unable to pursue the construction of a traditional style of battlefleet, and were instead forced to adopt a fleet structure based around large cruisers, with sufficient levels of protection and firepower to enable them to operate with existing battleships. White had spent some time with the Italian naval constructors in 1896, while travelling on account of his health (although his visit to the Ministry of Marine was of a semi-official nature), and became very familiar with the *Carlo Alberto* and *Garibaldi* classes which embodied these principles, and which he regarded as exceedingly well designed.¹²⁸ Although they were over-gunned for their displacement, and the armament itself was over-complicated, with three major calibres in the *Garibaldis* (10in, 8in and 6in), they were respectably well protected, reasonably (though not overly) fast, and probably the ideal type of vessels for the Italian navy given their circumstances. White stated that his personal inspection of the vessels

...confirmed the opinion I had previously entertained: viz., that the time had arrived when it had become necessary to construct cruisers for fleet-work, which should be capable of taking part in fleet-actions as adjuncts to battle-ships.¹²⁹

Thus there appears to have existed an interesting divergence of views regarding the function of the new vessels. The constructor's department evidently viewed the type as having a primary emphasis on fleet work, while the First Lord appeared to view them at this time as a counter to a possible cruiser *guerre de course*. Whether Goschen genuinely believed this or whether it was a case of the Board determining what would be the most convincing case to present to Parliament in order to obtain funding is more open to question. Goschen appears to have revised his views in later speeches before Parliament, apparently in reflection of the

¹²⁷ N. Lambert *Op. Cit.* p.22

¹²⁸ F. Manning *The Life of Sir William White* (London: J. Murray, 1923) p.349

¹²⁹ TNA ADM 116/446 Notes on *Cressy* class design

modest speed of the *Cressys* (although their sea speed in many practical conditions would have been at least as high, or higher, than many commerce-raiding types).¹³⁰

This idea of cruisers not just operating with battleships, but acting as fleet units has been called a ‘dangerous concept,’ and the whole idea of cruisers engaged with the battlefleet ‘incorrect.’¹³¹ But the introduction of KC armour significantly altered the balance between guns and protection to the extent where it was quite practical for a first-class cruiser, in tactical conditions dominated by intermediate-calibre artillery, to operate in such a fashion. Previous protected types could, as discussed, have held their own for short periods against many rival battleships, particularly older or second-class types, but they were not designed for such activities, being largely meant to fight single-ship rather than fleet actions. A similar but not quite identical situation existed with the later big-gun first-class cruisers, as is illustrated in Chapter Five.

The six *Cressy* class cruisers laid down under the 1897/98 programme are often described as belted editions of the *Diadem* type, and while this is an exaggeration, they were of generally similar appearance. Figure 3.4 shows the deck-plan and side-elevation of the class from the 1902 edition of the Naval Annual. On 12,000 tons and 472ft between extremities they carried single 9.2in chase weapons fore and aft, with 12 x 6in in the same casemate arrangement as the *Diadem* class. Length was modestly restricted in order to ensure they could easily manoeuvre with battleships if called to do so.¹³² The 9.2in made a return, according to White, due to their intended fleet role and the more widespread use of face-hardened armour plate.¹³³ Both the 9.2in and 6in were of new marks (the Mk X and Mk VII, respectively), which caused a short delay in issuing contracts for their construction.¹³⁴ The 45 calibre 6in BL Mk VII was particularly significant in that it, along with the Mk VIII, it would form the primary armament of all British first-class cruisers until the *Duke of Edinburgh* class.

¹³⁰ Hansard, Supplementary Navy Estimates 1898-99 H.C Deb., 22 July 1898, vol. 62 cc854-967

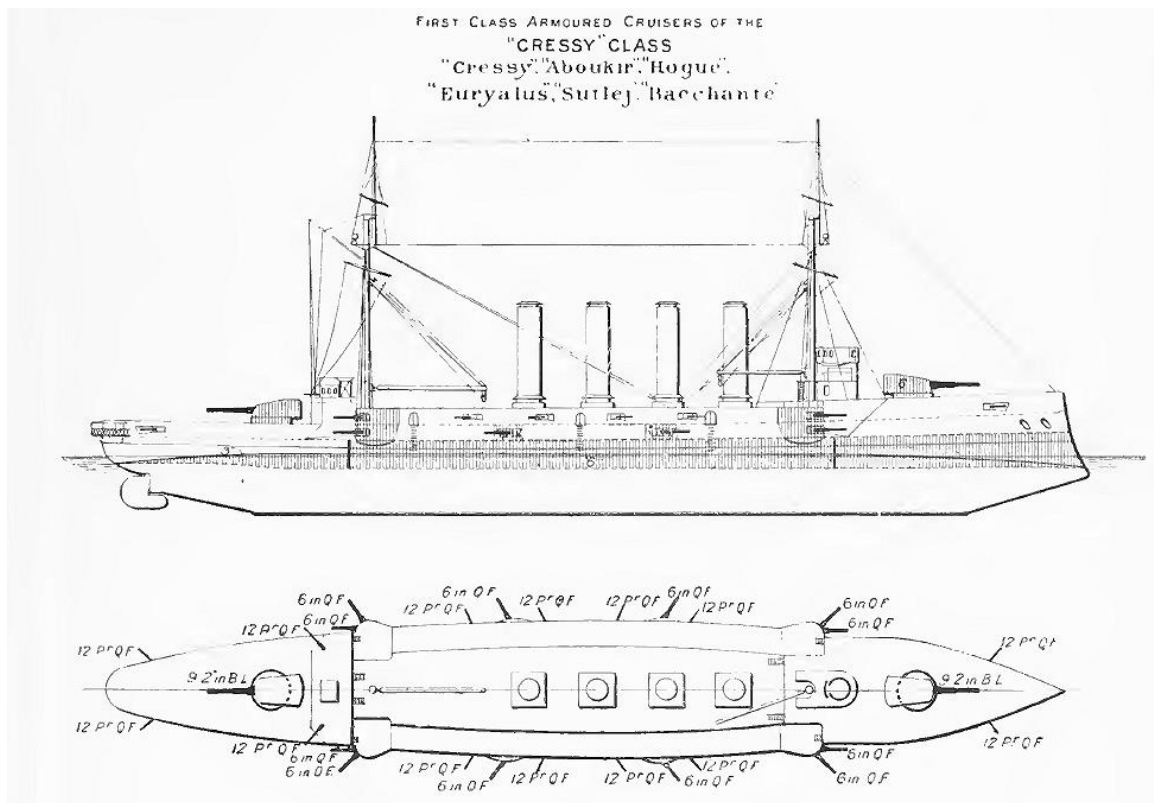
¹³¹ Chesneau & E Kolesnik *Op. Cit.* p.62

¹³² Friedman *British Cruisers of the Victorian Era* p.239

¹³³ TNA ADM 116/446 Notes on *Cressy* class design

¹³⁴ The Naval Annual 1898, p.12

Figure 3.4 *Cressy* class cruiser deck-plan and side-elevation



Source: T. A. Brassy [ed.] *The Naval Annual, 1902* (Portsmouth: J. Griffin & Co., 1902)

Plate 7

4 cylinder TE engines were again employed with twin shafts, fed by 30 Bellevilles with natural draught, for a design smooth water speed of 21 – 21 ½ knots, which would have provided a continuous sea speed of almost 20 knots: in service the class had a reputation for being good steamers.¹³⁵ Freeboard was over 30ft, and their hull form similar to the *Diadems*, albeit slightly fuller with finer ends to compensate for the additional weights, and they had a respectable GZ curve, with maximum righting lever occurring at 35 degrees.¹³⁶ Cressy's first captain (Tudor) is reported to have been pleased with his new ship, which he regarded as a good sea boat, albeit rather wet:

‘the waves in a very slight seaway, dash against the projections – casemates, shoots etc. – and squirt up the side coming down in sheets of spray over the boat-deck.’¹³⁷

The armour scheme employed was closely analogous to the *Canopus* class battleships primarily designed for the China Station and use in the Far East.¹³⁸ Slightly more than 230 feet amidships were protected by 6in KC plate over a depth of 11 ½ft, from the main deck to 5ft below the normal waterline, being sealed with 5in bulkheads at each end, 2in steel armour extending to the bow to provide splinter protection.¹³⁹ Two protective decks were fitted, the upper being the main deck itself, 1in thick; the lower, 1 ½ in thick, curved down to meet the bottom edge of the vertical armour, the space between the decks being largely given over to heavily subdivided coal bunkers.¹⁴⁰ Before and aft the central armoured citadel, which almost completely protected buoyancy and stability, the lower protective deck extended to the extremities, increasing to 2 ¼ in thick abaft the belt and 3in over the steering gear.¹⁴¹ In comparison to the *Diadems* the thinner armoured lower deck was less heavily curved.¹⁴² Barbettes and gun-houses had 6in KC, the casemates 5in, and CT 12in.¹⁴³

By any contemporary measure the *Cressys* were formidable combat vessels and could have formed an extremely effective fast wing to a main battlefleet, rather than being simply a modern counterpart to the frigate from the sailing era, serving purely as scouts for the

¹³⁵ Jane's Fighting Ships of World War I *Op. Cit.* p.52

¹³⁶ Brown *Op. Cit.* p.158

¹³⁷ Cited in *Ibid*

¹³⁸ Cressy class cover, White to Smith *Op. Cit.*

¹³⁹ TNA ADM 116/446 *Op. Cit.*

¹⁴⁰ *Ibid*

¹⁴¹ *Ibid*, see also Chesneau & E Kolesnik *Op. Cit.* p.68

¹⁴² NMM *Cressy* class ship cover, White to Smith *Op. Cit.*

¹⁴³ Janes Fighting Ships of World War I *Op. Cit.* p.52

battlefleet and for detached service protecting commerce and communications.¹⁴⁴ The development of KC armour had blurred the distinction between ship types, and the *Cressys* may be regarded as the first vessels in the Royal Navy which the term ‘battle-cruiser’ accurately described, if the usual assumptions are set aside and the term is simply taken to describe a cruiser that possessed the ability to fight with and against first-class battleships.¹⁴⁵ White’s memorandum is sometimes even taken to be the genesis of the big-gun battlecruiser type, although the preliminary details had as shown actually been worked out somewhat earlier.¹⁴⁶

The annual Manoeuvres for 1897 saw the first major use by the RN of first-class cruisers with the battlefleet, albeit in the scouting role and to provide heavy-support for smaller types rather than as a fast division. This was in part a result of the large number of battleships and cruisers having been assembled at Spithead for the Diamond Jubilee Naval Review, which allowed more extensive operations than usual; the exercises of the Channel and Reserve Fleets were entirely distinct, a division of each manoeuvring against each other.¹⁴⁷ The Channel Fleet operations are of particular interest, with numerous modern front-line vessels, including *Blake*, *Blenheim*, *Powerful* and *Terrible*. Cruisers attached to one division were tasked primarily with screening ‘their Battle Squadron from observations, and, on the other side, to get touch with that Battle Squadron in spite of its Cruisers, and communicate with their own Admiral.’¹⁴⁸ The exercise area was ‘within a circle of 350 miles radius drawn from Blacksod Bay, and bounded by the 52nd parallel of latitude and the 7th meridian of longitude, ‘war’ being declared at midnight on 7 July.¹⁴⁹ The general idea for the exercises was that

In anticipation of war a Squadron (Second Division) puts to sea from Blacksod Bay, leaving one Cruiser behind to bring on the news that war has been declared.

This cruiser, under orders to proceed direct to a rendezvous at a fixed speed, is followed some hours after she has started by two Cruisers of an opposing Squadron (First Division) with the object of discovering the position of the enemy-squadron and

¹⁴⁴ Marder *Op. Cit.* p.285

¹⁴⁵ See also remarks by Friedman *British Cruisers of the Victorian Era* p.243

¹⁴⁶ Marder *Op. Cit.* p.285

¹⁴⁷ HCCP ‘Naval Manoeuvres, 1897’ 1898 (c.8803) LVI, 605 p.5 Also ADM 1/7376b

¹⁴⁸ *Ibid* p.6 & 9 Grimes *Op. Cit.* p.29 mentions the 1897 Manoeuvres in a footnote, which notes the emphasis on cruisers but does not go into further detail

¹⁴⁹ *Ibid* p.9

informing their own Admiral, who has put to sea from Lough Swilly, so as to enable him to prevent the return of the Squadron to Blacksod Bay by intercepting it at sea.¹⁵⁰

The fleet-scouting role of cruisers and their integration with battleships and torpedo-boats into a cohesive, recognisably ‘modern’ fleet largely dated to Sir Geoffrey Hornby, and their scouting duties in particular was a matter that had received considerable attention from Captain [later admiral Sir] Arthur Wilson during his time in the Mediterranean in 1893, where he worked on their searching formations and signalling.¹⁵¹ The 1897 Manoeuvres appear to have extended some of Wilson’s work, giving an extensive trial to ‘curves of search’ that had been worked out.¹⁵² Figure 3.5 shows an example of a search curve employed during the Manoeuvres. The ‘intercepting’ First Division’s movements, including those of the *Powerful* and *Terrible*, which operated as this Division’s two independent heavy scouts, are shown in Figure 3.6. As may be anticipated, the Second Division’s dispatch cruiser was *Blenheim*, *Blake* being attached to their battle-squadron’s (second-class) cruisers as heavy-support.¹⁵³

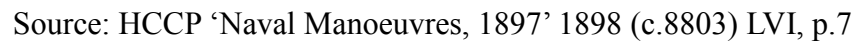
¹⁵⁰ *Ibid*

¹⁵¹ Lambert *Admirals: The Naval Commanders Who Made Britain Great* (London: Faber and Faber, 2008) pp.279-280; Bradford *Life of Admiral of the Fleet Sir Arthur Knyvet Wilson* (London: John Murray, 1923) p.126 Wilson’s contribution is considered in slightly greater detail below

¹⁵² Naval Manoeuvres, 1897 p.11

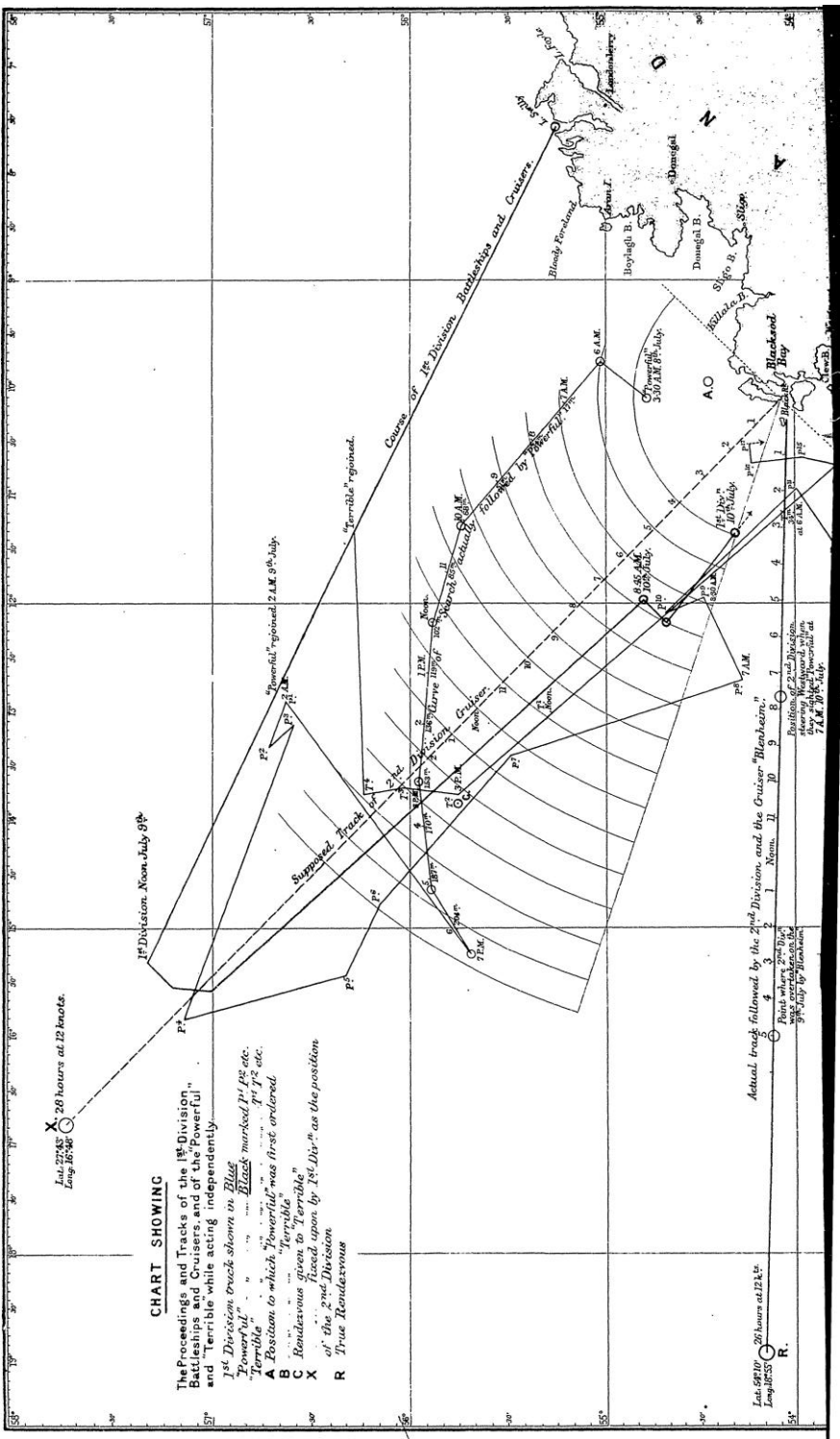
¹⁵³ *Ibid*

EXAMPLE.—The enemy's Squadron leave port, and our Squadron at another port hear of their departure by telegram.



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Figure 3.6: Movement of First Division battleships & Scouts
(including *Powerful* & *Terrible*)



Source: HCCP 'Naval Manoeuvres, 1897' 1898 (c.8803) LVI, p.21

The *Powerful* and *Terrible* were unsuccessful in their first independent search for the *Blenheim* and re-joined their division; the latter would later locate the Second Division battlefleet and used her high sea-speed to report to her Flag while avoiding interception; an error in relaying her sighting information by the *Terpsichore* resulted in a severe delay, and *Powerful* was obliged to repeat her sister's performance. The Second Division disregarded several of the rules of the exercise, deliberately dispatching most of the main cruiser force before the official commencement of hostilities to convoy the *Blenheim*, while also 'being calculated to deprive the Chasing Cruisers of the First Division of any chance of identifying [*Blenheim*]... from which the position of the rendezvous was to be obtained.'¹⁵⁴ The tactic was successful, helped in part by the *Blenheim's* somewhat creative interpretation of the location of the entrance to Blacksod Bay. After joining her Division without being intercepted, she and her sister were employed as detached heavy scouts.¹⁵⁵ Despite the problems, largely caused by the Second Division ignoring the rules of the exercise the Channel Fleet Manoeuvres were valuable in that they confirmed the value of first-class cruisers to a battlefleet, primarily due to their high sustained sea-speed which allowed them to locate or evade an enemy force without significant fear of interception.

The annual RN Manoeuvres of 1898 were cancelled on June 18 owing to a continuing strike in South Wales collieries and a concern that they would deplete reserves at a time of diplomatic uncertainty.¹⁵⁶ This is usually linked to concern over Russian naval expansion, which was indubitably a factor (certainly as far as navalist agitators were concerned), though as Seligmann points out that British naval attaché's dispatches on the state of Russia's naval infrastructure at this time were 'far from complimentary'.¹⁵⁷ As much a factor behind the cancelling of that year's Manoeuvres was likely the outbreak of the Spanish-American war. This provided the first examples of cruisers being used as capital ships in combat since the Yalu engagement four years earlier. In the Far East the United States would employ their cruisers as their battlefleet itself. Under Commodore George Dewey, the Asiatic Squadron gained considerable fame at the Battle of Manila Bay on 1 May in which the Spanish Pacific Squadron, also comprised of cruisers was largely wiped out. Dewey's cruisers would subsequently lend land forces artillery support, assisting in the taking of Manila itself. The

¹⁵⁴ Naval Manoeuvres, 1897 p.11

¹⁵⁵ *Ibid*

¹⁵⁶ Grimes *Op. Cit.* p.29; see also Marder *Op. Cit.* pp.312-316

¹⁵⁷ M. Seligmann 'Britain's Great Security Mirage: The Royal Navy and the Franco-Russian Naval Threat, 1898-1906' *Journal of Strategic Studies*, 35:6 p.866

Caribbean campaign would see a similar role and importance attached to such types. The Spanish Caribbean Squadron under Admiral Pascual Cervera y Topete comprised four first-class cruisers supported by two destroyers. Though at first glance the use of cruisers in the combined US North Atlantic Squadron under Rear-Admiral William Sampson and the Flying Squadron under Winfield Schley was less significant, a closer inspection reveals anything but. Both US flagships, the *New York* and *Brooklyn* were first-class cruisers, while the *Oregon*, notwithstanding the myriad design-faults of the type, approached being a crossover type vessel.¹⁵⁸ Irrespective of the later controversy that erupted between supporters of the two US senior officers the Battle of Santiago de Cuba, which saw the complete destruction of the Spanish Navy's Caribbean Squadron again underlined the value of possessing high speed first-class vessels to chase down opponents and provide greater tactical manoeuvring options.¹⁵⁹ With the Spanish fleet emerging in file from harbour, the *Brooklyn* in particular performed the fast-wing / fast-unit role later demonstrated to even more emphatic effect by the Japanese armoured-cruisers during the Russo-Japanese war. The engagement also largely confirmed the relative importance of the QF gun that many naval officers and constructors believed, and which had been illustrated at Yalu.¹⁶⁰

The Santiago action was naturally of interest to the Royal Navy and was studied in Britain, but it appears the prevailing attitude in the service was one of mild ambivalence, at least as far as vessel design and seagoing tactics were concerned. From that perspective, other than confirmation of the two aforementioned general points neither side especially distinguished itself at the battle, despite some worthy individual examples. The defensive capabilities of the three Spanish *Infanta Maria Teresa* class cruisers was poor, with a partial narrow waterline belt associated with a thin protective deck, and only shield protection to their heavy weapons and essentially none to the main battery of 5.5in guns sited on the exposed upper deck. Little of particular value could be learned in this quarter, or from the *Cristóbal Colón* since her protective scheme was not put to the test; given the poor performance of Spanish projectiles, much the same may be said for the USS *Brooklyn* while the *New York*, like the *Cristóbal*

¹⁵⁸ *New York* and *Brooklyn* are better regarded as protected cruisers with thin strakes of side-armour added –see previous remarks on the type.

¹⁵⁹ A point well-appreciated in America –see Freidman *US Cruisers...* p.41 & 43

¹⁶⁰ A considerable emphasis is often made that the Spanish cruiser *Cristóbal Colón* did not have the single 10in gun that was supposed to carry in addition to 2 8in and 14 6in, and that this severely reduced her firepower. In reality, the single 10in was unlikely to hit anything except at point-blank range, the 6in weapons being her primary armament, thus her most effective armament was not materially affected. When coupled to the poor performance of Spanish ammunition, the argument for a substantial reduction in her firepower does not stand up

Colón, was not struck. Of slightly more interest was the use of first-class cruisers as capital ships, both in the Caribbean and the Pacific. This would in fact set a pattern for the United States, which would subsequently give State names to their largest first-class cruisers, underlining their capital-ship status. From 1902, the US Caribbean Squadron consisted entirely of cruisers; the American South Atlantic and European Squadrons were also envisioned to be cruiser-based; over time they would also become the primary US capital ships employed in the Pacific, as the battleships were concentrated in the North Atlantic.¹⁶¹ More broadly, it did confirm the value of an amphibious force invading an enemy's territory with the intent of attacking a fleet at its home base; a matter that continued to be worth 'serious consideration'.¹⁶²

Back in Britain, rather than committing to a new cruiser class for 1898/99, the Board decided in August 1897 to expedite the vessels already under construction or confirmed as far as was possible, while paying close attention to rival programmes abroad, since in addition to France and Russia, Argentina, Chile, Germany and Japan were all constructing such types.¹⁶³ With eight *Diadems* building and the six *Cressys* about to be laid down the Board's decision to wait made strategic sense, as well as ensuring that materials and funding were not dissipated.¹⁶⁴ A reconsideration of the programme for the following year would occur just a few weeks later when further information became available on foreign cruiser construction, particularly new vessels projected by France, which cut back on first-class battleship construction in order to continue building armoured cruisers in large numbers.¹⁶⁵ These were the *Dupleix* and *Gueydon* classes; smaller and substantially less capable than the *Jeanne d'Arc*, with little real capacity for fleet action. Nevertheless, over the course of two intelligence meetings on 10 December 1897 and 7 January 1898 with the Naval Lords, DNC

¹⁶¹ Friedman, *US Cruisers...* p.57

¹⁶² Grimes *Op. Cit.* citing Ballard pp.49-50 Ballard's view was that such operations were more likely against an enemy's outlying dependencies, but did not entirely rule it out against a continental Power's main territory. This appears to echo Colomb, who placed some emphasis on the value of combined operations

¹⁶³ *Ibid*

¹⁶⁴ This would be somewhat hampered though by the late delivery of *Spartiate*'s machinery from the contractors, and a series of accidents that beset the construction of the *Cressy* class *Euryalus* and delayed her commissioning by two years. Some of the reports of damage caused by test firings of the 9.2in guns on *Euryalus* appear to have been exaggerated though -Messrs. Vickers, Sons & Maxim (Ltd.) who built *Euryalus* wrote to the *Times* refuting a statement that severe blast damage had recently occurred, and that the Admiralty had informed them that no gun had been fired on the vessel for some six months. See the *Times* 'Naval & Military Intelligence' Saturday 25 July 1903, p.12

¹⁶⁵ Sumida *Op. Cit.* p.19. Marder *Op. Cit.* p.286 notes that the French programme at this time appeared to represent a compromise between the *Conseil Supérieur* of admirals who wanted more battleships and the Lockroy party who favoured cruisers

and DNI, it was decided that steps should be taken to develop a new type.¹⁶⁶ On 17 February 1898, in the usual yearly paper to Cabinet summarising the Navy Estimates for the coming twelve months, Goschen remarked to his colleagues that

The French, so far as their policy can be gauged, have begun to recognise that it is by cruisers rather than battle-ships that they can damage us most... With our immense commerce, we naturally require a very much larger number of cruisers than any other Power. But during the last three or four years the efforts of the French, who are building first-class armoured and protected cruisers of extraordinary speed, specially designed to prey upon commerce, have made the Spencer programme quite insufficient...¹⁶⁷

Goschen acknowledged that little could be done that year, particularly since the designs were still in a preparatory stage and required considerable discussion, but bluntly added

We cannot possibly afford to fall behind in the fastest class of powerful cruisers. The escape of one or two of these with 23 knot speed would be disastrous if we could not catch them. It is absolutely essential therefore to strengthen ourselves in this direction, and I propose to commence the construction of four first-class armoured cruisers to be so built as to realise 23 knots speed.¹⁶⁸

The 23 knot vessels Goschen referred to would become the *Drake* class, and are sometimes described as being the Royal Navy's direct response to the *Jeanne d'Arc* and similar large high speed armoured cruisers.¹⁶⁹ This assessment is true enough as far as it goes, but it is not the whole picture for in addition to rival cruisers, the Board had other targets for the new vessels in mind. The latter half of the 1890s saw an resurgence of interest in the second-class battleship, or those approaching such status, with a reasonable number of these vessels being built by the navies of Russia and Germany, while even some of the smaller French vessels

¹⁶⁶ *Ibid*

¹⁶⁷ TNA CAB 37/46/20 'Navy Estimates and Ship-building Programme, 1898-99' 17 February 1898 pp.4-5

¹⁶⁸ *Ibid* p.5 Note that while Goschen referred to '23 knot cruisers', of the side-armoured French vessels then building or projected, only the *Jeanne d'Arc* was designed for this speed, the smaller *Dupleix* and *Gueydon* classes for around 21-22 knots, although the protected corsair cruisers were nominally capable of this pace or higher on trials

¹⁶⁹ D. Brown *Op. Cit.* p.158

were bordering upon such types.¹⁷⁰ The German vessels were for general purpose use, but those built elsewhere, most significantly the Russian *Peresviet* class, were intended for service on foreign stations, especially in the Far East. Like the earlier British *Centurions* and *Renown*, they typically had a slightly higher speed than first-class battleships, with a lighter ‘main’ armament and the usual QF battery, which in principle was rather well adapted for the gunnery conditions of the 1890s. There is no direct evidence in the *Drake* ship cover to suggest countering these vessels was a specific design consideration, references to opponents focusing upon cruisers. Nevertheless, the new type would retain the same armour and capacity for close-action as their *Cressy* class predecessors, and were thus well adapted for overwhelming second-class battleships like the *Peresviets*, which were far inferior in speed, comparatively poorly protected with a shallow, tapered waterline belt of Harvey topped by a flat armour deck, and possessed a less-numerous QF battery. The steady increase of Russian naval power in the Far East during the latter half of the 1890s and first years of the Twentieth Century would become an increasingly significant aspect to British policy (naval and broader) though, and is considered in more detail in Chapter Four.

With speed a priority and a heavy preference for natural rather than forced draught to the boilers, dimensions increased back to approximately the size of the *Powerfuls* to attain 23 knots under the relatively stringent Royal Naval standards, although the DNC suggested that it might be preferable to have less length and accept the necessity of higher engine power in order to economise on the weight and cost of armour plating.¹⁷¹ This proposal was not met with enthusiasm by the naval lords, although the First Lord would certainly not have objected, since while he was in favour of responding to the French construction, he was alarmed at the rapidly escalating costs involved. Goschen in fact held out as late as 31 March for one of the smaller of the four sketch designs worked up by the Constructor’s department in response to the Board requirements.¹⁷² The question was not so much that of the vessel size itself, but rather the severe strain on manning resources such cruisers entailed, which Goschen believed the service could ill spare, and

¹⁷⁰ The most notable examples are the five *Kaisers* and five *Wittelsbachs* in Germany and three *Peresviets* in Russia

¹⁷¹ NMM *Drake* class ship cover S.9873/98 ‘Report on the Designs for the New First-Class Cruisers by the Assistant Controller and Director of Naval Construction’ 23 May 1898

¹⁷² Marder *Op. Cit.* p.287 The designs in question were No.3 and No.4 which used slightly forced Bellevilles, and moderately forced small tube boilers, respectively. See Appendix III for an edited version of White’s report

which [would] have to be furnished by heavy sacrifices in the direction of largely reducing the number of ships which we could send to sea.¹⁷³

In contrast to their political master, the naval lords were strongly in favour of a return to the dimensions of the *Powerful* class, arguing that the new vessels should be able to fight any possible opponent, existing or projected, at the time of their design.¹⁷⁴ Carrying their point, the type became known as ‘Lord Goschen’s mighty cruisers’ on account of their dimensions – a soubriquet Goschen was unlikely to have relished given the circumstances.¹⁷⁵ The four *Drakes* were White’s statement first-class cruisers, since the final two types for which he was responsible designer would, as is shown below, be significantly compromised by requirements for reduced dimensions. There was far greater debate over the design characteristics of the new cruisers than had been the case with previous vessels, one of the more interesting memoranda being ‘Tactics of new armoured cruisers as affecting their design’ produced by the then-Controller (Arthur Wilson) in early 1898.¹⁷⁶

Wilson is an interesting figure in the history of the Royal Navy’s first-class cruiser. An austere man, albeit a frequently generous one, he played an important role in assisting develop fleet tactics and cruiser formations in the early-mid 1890s. Although known as ‘Old ’Ard ’Art for his refusal to consider the cares and comforts of his men’, Wilson was not immune to common feeling.¹⁷⁷ He was attached to John Jellicoe who served briefly as Commander of his battleship HMS *Sans Pareil* in the Mediterranean, and helped look after him while he was recovering from the effects of ‘Malta fever’ (Brucellosis), and the immersion he received following the accidental sinking of HMS *Victoria*.¹⁷⁸ During his time in the Mediterranean under Sir Michael Culme-Seymore, he devoted special attention to the establishing of specific tactical principles for cruisers serving as scouts for the main battle-squadron, and also designed a new form of mast-head semaphore to facilitate communications at longer visual distances.¹⁷⁹ A torpedo specialist, during the 1870s he was

¹⁷³ *Ibid*

¹⁷⁴ *Ibid*

¹⁷⁵ O. Parkes *British Battleships 1860 - 1960: A History of Design, Construction and Armament* (London: Leo Cooper, 1990) p.443

¹⁷⁶ TNA ADM 1/7377 Memorandum from Controller 21 March 1898 ‘Tactics of new armoured cruisers as affecting their design’

¹⁷⁷ Lambert *Admirals* p.343

¹⁷⁸ Bradford *Life of Wilson* p.126 Wilson had been less-than-amused at the C-in-C, Vice Admiral Sir George Tryon, poaching Jellicoe for his flagship

¹⁷⁹ *Ibid* p.128

closely involved in the early development of the Whitehead torpedo and mines, a role he would reprise in the late 1880s when he assisted develop submarine torpedo tubes, new twin-launchers for torpedo-boats and net-cutting apparatus.¹⁸⁰ Promoted Rear-Admiral in 1895 Wilson was given command of an experimental Torpedo Squadron, flying his flag in the second-class cruiser *Hermione* and tasked with assessing the capabilities of the new torpedo-boat-destroyers then being commissioned.¹⁸¹ These would be instrumental in the supersession of the traditional small torpedo-boat by the new, somewhat larger destroyer type.

From 1897-1901 Wilson would serve as Controller. He inherited a substantial building programme including the eight *Diadems* that had been established during the tenure of his predecessor (Fisher). He established a reasonably effective working relationship with the DNC, and while his reluctance to delegate may be reasonably said to have been a limiting factor, his excellent technical and practical backgrounds meant he possessed a depth of material understanding and how they would be used that few of his service contemporaries could match. Wilson was extremely wary of attempts to restrict vessel displacement, correctly regarding attempts to do too much on a limited size as the primary cause of many prior failures.¹⁸² This extended from attempts to save weight in machinery and fittings, limiting their reliability, through to the impact lack of space could have on efficient working.¹⁸³ His prior experience was evidently reflected in some of his preferences, including his desire to introduce an 8in gun for cruisers to match those employed in many Elswick vessels and others built abroad (e.g. *Rurik*, *Brooklyn* etc.).¹⁸⁴ In this he was partially supported by the DNO, but both gave way to the rest of the Board and the DNC in face of the valid point that it would unnecessarily introduce another calibre into the service.¹⁸⁵ Accepting their views, the annotations he made in red ink on a handwritten memorandum by White, who was deeply wary about judging a vessel's firepower on the basis of total energy per minute delivered on a given bearing, demonstrated his thinking on the matter.¹⁸⁶ Wilson largely agreed with the DNC, with certain qualifications, specifically that in his view 'total energy per minute is a

¹⁸⁰ A. Lambert, 'Wilson, Sir Arthur Knyvet, third baronet (1842–1921)', Oxford Dictionary of National Biography, Oxford University Press, 2004; online edn, Jan 2008
[<http://www.oxforddnb.com/view/article/36946> accessed 29 June 2013]

¹⁸¹ Bradford *Op. Cit.* p.134

¹⁸² Marder *Op. Cit.* p.115

¹⁸³ *Ibid*

¹⁸⁴ Ballard *Op. Cit.* p.144

¹⁸⁵ See fn.59 re the 8in

¹⁸⁶ NMM *Drake* class cover Handwritten memorandum by DNC to Controller dated 29 June 1898

good guide as long as the structure attacked can be penetrated.’¹⁸⁷ In the absence of his favoured twin 8in chasers for cruisers, he was happy to accept the 9.2in with the heaviest 6in QF battery consistent with proper fields of fire, ammunition supply, and achieving the design speed, range and overall protection remits.¹⁸⁸

White’s memorandum had been written largely in response to the aforementioned minute by Wilson on the ‘Tactics of new armoured cruisers...’ With a 23 knot trials speed required for the new *Drake* class (based on the design speed of the *Jeanne d’Arc*) and a 21 knot continuous sea speed anticipated based on previous practical and experimental experience, Wilson had raised the question of whether it may be advantageous to make some sacrifice of stern fire in the new cruisers in order to obtain superior fire ahead and on the broadside.

The paper was essentially predicated upon the assumption of independent operations for the new vessels against enemy commerce raiders, arguing, undoubtedly correctly, that it would be ‘profoundly to their [viz. enemy commerce raiders] interest to avoid action unless they can fight on terms very advantageous to themselves.’¹⁸⁹ The truth of this view would be repeatedly demonstrated during the two World Wars, perhaps most notably with the errors of judgement that ultimately led to the loss of Von Spee’s squadron at the Battle of the Falkland Islands, 8 December 1914, and Kapitän zur See Langsdorff’s decision in 1939 to ignore Admiral Erich Raeder’s orders not to engage enemy warships.¹⁹⁰ Under these conditions, Wilson suggested, enemy raiders would almost invariably attempt to flee from British cruisers rather than stand and fight. The latter, with a higher projected sea speed, would likely be able to outstrip the raiders, but since a stern chase was almost inevitable, this would take time. On this basis, in Wilson’s view, the new cruisers would require ‘good protection to the bows, good and well protected ahead fire, good and well protected broadside fire and moderate astern fire with much less protection than is necessary for the bow.’¹⁹¹ The emphasis on protection to the bow and ahead fire would be advantageous for obvious reasons in a protracted stern chase, while similarly strong broadside protection and fire would become

¹⁸⁷ *Ibid* p.2 The weapons in question were Maxim guns (rifle calibre machineguns) but the principal applies to all calibres

¹⁸⁸ *Ibid* p.5

¹⁸⁹ Wilson *Tactics of New Armoured Cruisers...*

¹⁹⁰ E. Grove *The Price of Disobedience: The Battle of the River Plate Reconsidered* (Annapolis: Naval Institute Press, 2000) pp. 37-39 The vessel being named for Admiral Graf von Spee, and the fact that both commanders made similarly catastrophic mistakes (albeit in the former case the mistake was as much a lack of anticipation) is one of the great ironies of naval warfare

¹⁹¹ TNA ADM 1/7377 ‘Tactics of new armoured cruisers...’

valuable when the range had closed and the opposing vessel was forced to stand and fight. Within this remit, Wilson's views make a great deal of sense, although they would have had greater utility to the earlier protected cruiser types, where the overriding design remit was for commerce protection and single-ship actions. Despite his preference for an emphasis upon end-on fire and protection for the new vessels, which was ultimately rejected, Wilson was however largely responsible 'for establishing the foundations of the fleet handling systems used in both world wars; his success in the 1901 annual manoeuvres established the system of cruising in columns and deploying into line just before battle that was used by his disciple Jellicoe at Jutland.'¹⁹²

While the *Drake* class were largely an answer to the big French commerce raiders, their protective scheme was essentially similar to that employed in the *Canopus* and *Cressy* classes (though on a larger scale), and an important consideration was that they should have the same capacity for close-action as the *Cressys*. This was emphasised in the written discussion that resulted from Wilson's paper, the Junior Naval Lord (Captain Arthur Moore) remarking that

Personally I should deprecate any sacrifice of stern fire, believing that powerful armoured cruisers would prove on occasions most valuable auxiliaries to the Battle-Fleet, and that on such occasions with constant manoeuvring the want of sufficient stern fire would be felt –at the same time this class of vessels should necessarily have a more than usually powerful ahead fire –but I would rather gain this by arrangement of guns that would admit of 5 firing ahead and 3 astern.¹⁹³

The First Naval Lord concurred with Moore, adding a preference, as had been the case with the *Cressys*, for a mixed 9.2in and 6in armament, a configuration that was generally supported over a uniform 6in given the introduction of face-hardened armour in rival cruisers, the fleet use potential of the new vessels, and the fact that they may reasonably be expected to fight second-class battleships on foreign stations.¹⁹⁴ The *Drakes* eventually, on 14,150 tons nominal displacement and 500ft between points (533ft 6in between extremities), carried two 9.2in Mk X guns as chase weapons in single turrets fore and aft, and sixteen 6in Mk VII on the broadside in four double-decked casemates per side. Draught was set to enable them to

¹⁹² Lambert Wilson, *Sir Arthur Knyvet, third baronet*

¹⁹³ Captain Arthur Moore, in remarks upon TNA ADM 1/7377 'Tactics of new armoured cruisers...' 15 April 1898

¹⁹⁴ Admiral Sir Frederick Richards, in remarks upon *Ibid* 19 April 1898

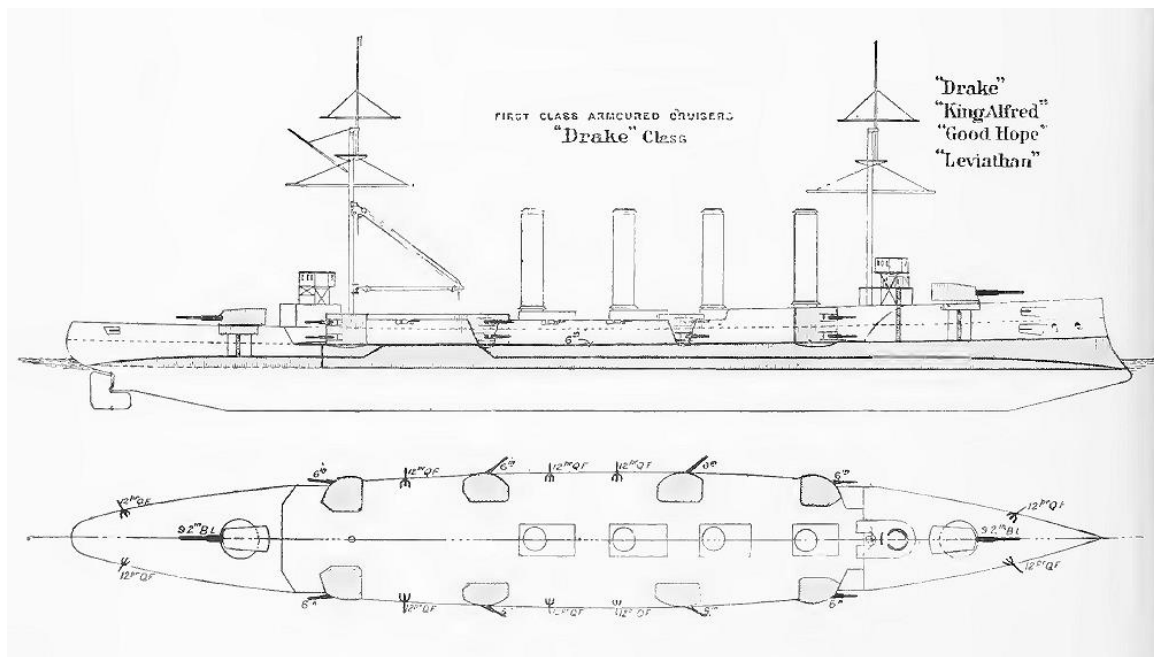
transit the Suez canal.¹⁹⁵ Figure 3.7 shows the deck-plan and side-elevation of the type from the 1902 edition of *The Naval Annual*. Making over 31,000ihp with natural draught they had the most powerful reciprocating engines ever fitted to Royal Naval vessels, 43 Belleville boilers feeding two sets of 4 cylinder TE engines.¹⁹⁶ The continued use of the Belleville reflected a useful compromise in total weights for a given power, the less efficient cylindrical types being substantially heavier, even if a high level of forcing were used, while the smaller tube types, though lighter, were not yet sufficiently reliable nor capable of sustaining the necessary output over extended periods.¹⁹⁷

¹⁹⁵ Friedman *British Cruisers of the Victorian Era* pp.247-248

¹⁹⁶ Brown *Op. Cit.* p.165

¹⁹⁷ *Ibid* p.159

Figure 3.7 *Drake* class cruiser deck plan and side elevation



Source: T. A. Brassey [ed.] *The Naval Annual*, 1902 (Portsmouth: J. Griffin & Co., 1902)

Plate 6

Sir William White guaranteed the trials speed of 23 knots laid down by the board, while privately anticipating they would exceed this –a practice that he had regularly employed at Elswick.¹⁹⁸ This proved to be the case; *Drake* made 23 knots on her original progressive trials, but it was felt that there was excessive slip at high speed and she could give more with increased propeller blade area. According to White's Presidential Address to the Institute of Civil Engineers, the original screws were 19 feet in diameter, 24 ½ feet pitch, and each screw had 76 square feet of blade-area.

...with 116 revolutions per minute and 30,860 HP. a speed of 23.05 knots was reached. The new screws were of the same diameter, pitch 23 feet and blade-area 105 square feet. With 122.4 revolutions and 31,450 HP. a speed of 24.11 knots was attained –a gain of fully 1 knot in speed. From the progressive trials it was found that with 116 revolutions and 26,000 HP. the new screws gave a speed of 23 knots, or a saving of 4,860 HP., as compared with the first screws.¹⁹⁹

Effectively the *Drakes* were 24 knot or higher vessels, the name ship making 24.28 knots on 31 October 1906, and all allegedly exceeded their trials speeds on a regular basis in service.²⁰⁰ Their 30ft of freeboard forward also allowed them to easily achieve or exceed the intended continuous sea speed.²⁰¹ This high sustained speed capacity was underlined by the transatlantic race between the vessels of the Second Cruiser Squadron in late November 1906. *Drake* (Flag) and the *Monmouth* class HMS *Berwick* made a record for the Atlantic of 3,327 miles (between Sandy Hook barrier split, New York Bay, and Gibraltar) in 7 days, 7 hours and 10 minutes, at an average 18.504 knots.²⁰² This was over half a knot faster than the previous record for naval vessels; *Drake* herself would likely have set an even faster time, but was hampered by using American rather than the more efficient Welsh coal, and the need to repair a steam leak from around the port high-pressure piston rod where some of the packing had been squeezed out during poor weather.²⁰³ Although in itself largely a showpiece, the transatlantic race served a useful purpose in demonstrating that high speeds could be

¹⁹⁸ Sir William White 'Presidential Address' *ProcICE* Volume 3 (1903) p.78

¹⁹⁹ *Ibid*

²⁰⁰ M. Kerr *Prince Louis of Battenberg: Admiral of the Fleet* (London: Longmans Green & Co., 1934) p.197.

²⁰¹ Chesneau & E Kolesnik *Op. Cit.* p.69

²⁰² Kerr, *Op. Cit.* pp.211-212

²⁰³ *Ibid* Kerr states that in its visit to the United States the Squadron had consumed more coal than expected, and the collier sent from England only had sufficient for five vessels. Battenberg allowed this to go to the other vessels of the squadron, placing his flagship at a minor disadvantage. Despite this she was leading by a considerable margin until the packing failure

sustained over extended periods, and the strategic value of such a capacity for rapid transits, along with the tactical value for chasing down possible commerce raiders.

Although largely derived from the protective scheme of the *Canopus* and *Cressy* classes, some changes were introduced in the *Drakes*, which Wilson approved of. The vertical armour was 6in KC for 257ft amidships over a similar height to the *Cressys*, but instead of terminating in a bulkhead, it was tapered to 2in and extended to the bow. Significantly, the thicknesses of the two protective decks were reversed, with the main deck at the top of the belt becoming the thicker of the two. Both changes provided greater protection at longer ranges, and were of particular value in a stern chase, when the constant bearings and relatively slow range rate made longer range gunnery slightly more practicable. The additional thin vertical plating gave useful protection against raking fire and splinters, which could reduce the speed of the ship through flooding, while using a thicker upper protective deck increased the defended height of buoyancy and stability against higher trajectory projectiles which were likely to be encountered in such chase conditions.²⁰⁴ The lower protective deck remained as a splinter deck to further reduce the possibility of debris penetrating the vitals.²⁰⁵

It is surprising that later first-class vessels designed during Sir Philip Watts' tenure as DNC should be regularly praised for their uncluttered upper works, which reduced target area, since considerable effort went into the *Drakes* to reduce unnecessary superstructure, and having a largely casemate based armament their upper-decks were clear of the extra gun-houses found in many later types. Later vessels admittedly had the advantage of reductions in Board requirements for ancillary equipment on the upper decks, but White's cruisers, post the *Cressys*, were not especially badly off in this regard, and are in fact quite impressive for their stark upper works. Given the QF dominated gunnery environment this was significant, since the risk of fire was potentially high and anything that could be done to reduce the target area and flammable upper works within the Board requirements was valuable.

The annual Manoeuvres from 1899-1901 continued to place some emphasis upon cruiser operations, with particular reference to their use with fleets. Until the new side-armoured types became available these continued the trend of employing first-class types as heavy

²⁰⁴ NMM *Drake* class ship cover 'Report on the Designs for the New First-Class Cruisers...'

²⁰⁵ Brown *Op. Cit.* p.152 & 158

scouts and support for smaller cruisers. For 1899 the principal object was 'to obtain information as to the most advantageous method of employing a considerable body of Cruisers in conjunction with a fleet.'²⁰⁶ A subsidiary object was 'to throw some light on the relative advantages and disadvantages of speed and fighting strength.'²⁰⁷ The general idea behind the exercises for that year was the simulated attack by a hostile squadron of fast ships ('A') upon a slow convoy escorted by a single fast cruiser ('C') on passage from Halifax to Milford Haven; after an interval a superior British Squadron of slower ships ('B') was to be sent to a pre-arranged rendezvous protect the convoy and bring it into Milford.²⁰⁸ The exercises saw the first use of the *Diadems*, five being present, with a single *Edgar* and *Orlando* class vessel also employed.²⁰⁹ Grimes notes the contribution of destroyers in the exercises, which again illustrated their effectiveness against torpedo-boats.²¹⁰ Unfortunately the primary object of assessing cruiser operations and functions was almost entirely negated by the poor conditions in the exercise area off the west coast of Ireland, dense fog and later, heavy weather, impeding 'A' fleet's search for the convoy for the first three days of the Manoeuvres. While 'B' fleet's cruisers were sighted several times, the latter successfully brought convoy 'C' to Milford Haven without any major engagement occurring.²¹¹

The following year's exercises were more successful, both *Blakes* participating, along with a number of *Diadems*, *Edgars* and *Orlandos*.²¹² A renewed emphasis in France in a cruiser *guerre de course* combined with torpedo-craft resulted in the NID shifting the emphasis in the manoeuvres toward an assessment of the observational blockade system that had first been integrated with broader commerce protection by Commander [later Admiral] George Ballard in his 1897 Gold Medal Prize Essay 'The Protection of Commerce During War'.²¹³ This was not the first time such an integrated approach had existed; Milne had created something similar quarter of a century before, albeit with a battlefleet focus upon coast-assault rather than blockade. Ballard would have a substantial influence on RN strategy in the first years of the Twentieth Century, and laid some emphasis on large cruisers to handle contemporary Franco-Russian vessels that evaded the main fleet's blockade of their ports, for

²⁰⁶ HCCP 'Naval Manoeuvres, 1899' 1900 [cd.92] LI, 599 p.9

²⁰⁷ *Ibid*

²⁰⁸ *Ibid*

²⁰⁹ *Ibid* p.6 Several of the *Diadems* were completing and had yet to be officially commissioned

²¹⁰ Grimes *Op. Cit.* p.29

²¹¹ Naval Manoeuvres 1899 p.12 A considerable number of in-shore clashes between lighter craft occurred, the coast of Ireland being assumed hostile territory for the purposes of the Manoeuvres

²¹² HCCP 'Naval Manoeuvres, 1900' [103] LXI, 311 p.4

²¹³ Grimes *Op. Cit.* p.32

which he advocated employing advance-bases.²¹⁴ As a result the Manoeuvres for 1900 and especially 1901 were designed to include such scenarios in addition to the main object of obtain information on the working of a fleet comprised of vessels of all classes, fighting for command of the sea.²¹⁵ While this itself was not achieved, the cruisers again proved their value in shadowing the opposing Fleets.²¹⁶

Some of the Umpire's recommendations regarding coaling and especially the suggestion that the respective C-in-C's should not be informed in advance about the date and time of the commencement of hostilities were adopted for the 1901 Manoeuvres. These were the first exercises where no rules governing the conditions under which ships would be put out of action were laid down, the Umpires for that year judging each case based on what was probable in wartime conditions.²¹⁷ Although noted for Arthur Wilson's introduction of cruising a battle-squadron in columns, deploying into line immediately prior to battle, the cruiser operations were also significant, seeing one of the first major clashes between predominantly first-class types in the annual Manoeuvres.²¹⁸ This took place between the opposing 'X' and 'B' cruiser squadrons shortly after the commencement of hostilities on the morning of 29 July off the Scilly Isles, the dispositions being shown in Figure 3.8. Two small second-class cruisers from 'B', having been dispatched to reconnoitre the Scillies were chased down by almost the full 'X' cruiser squadron, standing to the NW from its rendezvous 35' south of the Lizard.²¹⁹ An hour-long gunnery duel in misty conditions between the two main bodies ensued, three 'X' and a further four 'B' squadron vessels later being judged out of action.²²⁰ Throughout the exercises, the first-class cruisers were regularly employed independently of the main fleets by both sides, either as large squadrons, or (usually) in pairs as heavy scouts, *Edgar* and *Amphitrite* of 'B' fleet being utilised several times in this role ahead of the main battle-squadron, largely on account of their high sea-speed, and later independently to investigate 'X' vessels in the Scillies.²²¹

²¹⁴ G. Ballard 'The Protection of Commerce During War' *JRUSI* vol. XLII (April 1898) p.368

²¹⁵ Naval Manoeuvres, 1900 p.7; see also Grimes *Op. Cit.* p.32

²¹⁶ *Ibid* p.11

²¹⁷ HCCP 'Naval Manoeuvres, 1901' 1902 [104] LXI, 329 p.7

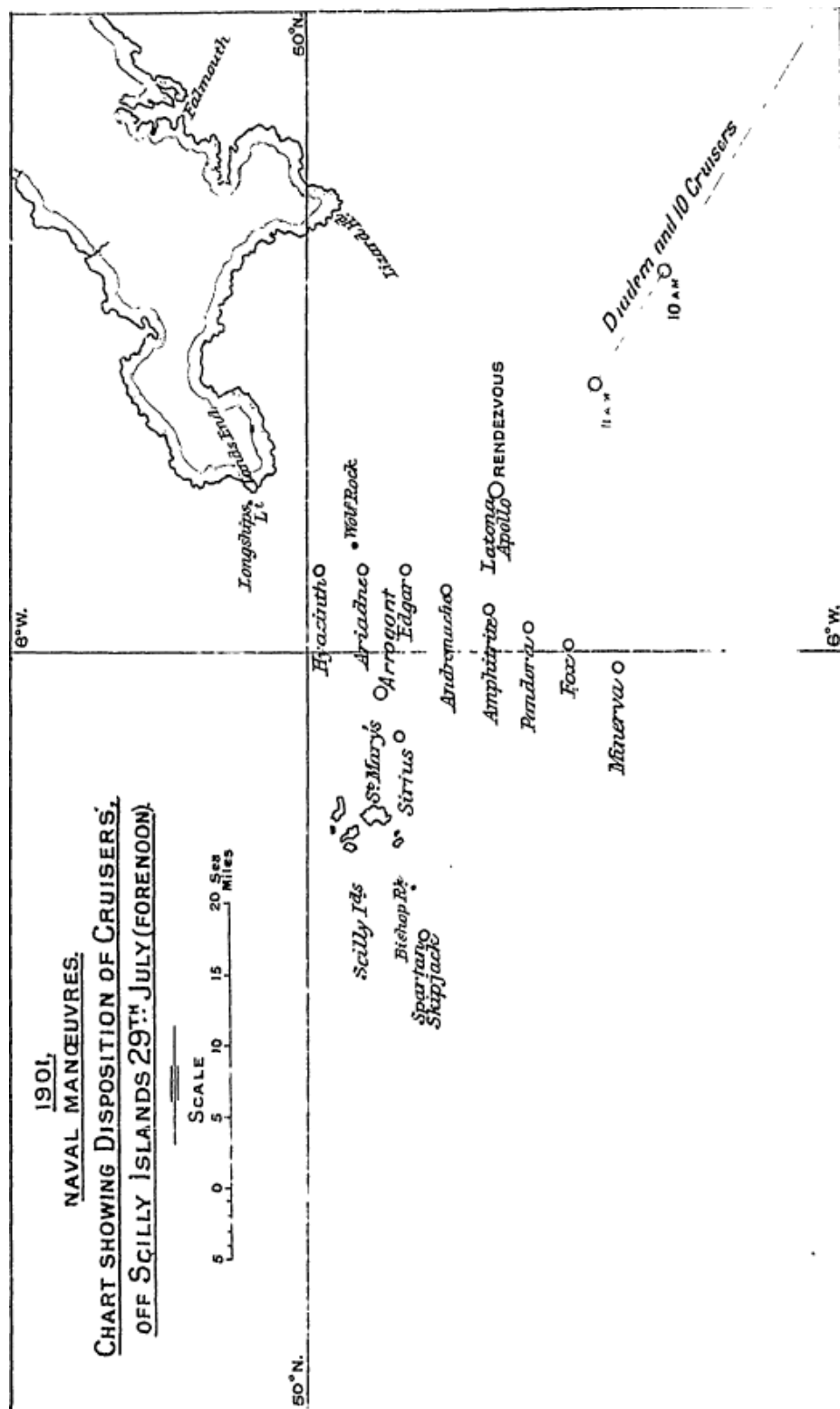
²¹⁸ A. Lambert 'Wilson, Sir Arthur Knyvet' *Op. Cit.*

²¹⁹ Naval Manoeuvres, 1901 p.10

²²⁰ *Ibid* p.12

²²¹ *Ibid* p.17

Figure 3.8: Disposition of cruisers in action of Scilly Isles 29 July 1901 Manoeuvres



Source: HCCP 'Naval Manoeuvres, 1901' 1902 [104] LXI, 507 Plate I

The Manoeuvres in the latter half of the 1890s and first years of the Twentieth Century generally appeared to confirm the value of first-class cruisers to a fleet, as they had when the *Blenheim* first became available. There seems to have been little hesitation about their employment with the Royal Navy's fleets, while the Yalu engagement and those of the Spanish-American war provided confirmation in combat of their utility. The introduction of the new breed of side-armoured fleet-cruisers would only enhance this capacity, and an argument can be made that they rendered the 'traditional' line-of-battleship slightly moot, if not quite obsolescent, at this time. Although never officially applied, the 'battle-cruiser' designation is a highly accurate one within the context of the *Cressys* and *Drakes* design and operational milieu, since they were as capable of dealing with many contemporary or older foreign battleships as they were operating independently.²²² This would have been particularly apposite in the case of the four *Drake* class ships, since they were specifically designed with an excess of speed, range and fighting power to completely overwhelm contemporary rival types, while also possessing the ability to fight as part of a main battlefleet if required. Strategically speaking such vessels were probably more useful to, and better met the British Empire's global requirements than battleships, until such a time as there was a significant direct challenge to the Royal Navy via the *guerre d'escadre*. Goschen acknowledged this when presenting the 1898/99 Estimates to the House, asserting

...at present the general tendency in shipbuilding of some of our rivals—I do not know by what other name to call them, and I certainly do not call them foes—for power on the sea has been transferred rather to cruisers than to battleships, and it is to cruisers accordingly that we are directing our main attention.²²³

It is a little ironic that it was accepted that 'for the Royal Navy there could be no question of the substitution of cruisers for battle-ships' since theoretically, the new type of armoured cruiser endowed the service with much greater operational flexibility. Although slightly more lightly built than their battleship contemporaries, they typically possessed longer range, greater speed and a similar number of QF weapons (although in cruisers the necessity of

²²² NA ADM 116/878 Commander S. King-Hall 'The Evolution of the Cruiser' Naval Staff Monograph, 1928; see also the discussion on Wilson's paper 'Tactics of the New Armoured Cruisers' *Op. Cit.*

²²³ Hansard 10 March 1898 vol. 54 cc.1252-342

employing main-deck casemates severely reduced the effectiveness of some of these weapons owing to their proximity to the water).²²⁴

While abandoning battleship construction was clearly a step too far for the contemporary service it was certainly not an entirely original idea for contemporaries, given the rise of the *Jeune École* in the 1880s, the gradual re-emergence of the *guerre de course* in the mid-late 1890s, the latest cruiser developments in Italy and Japan, and the fact that throughout the mid-Victorian period, alternatives to heavily armoured battleships had been advocated in response to the material limitations of the era. The fact that White should even mention the idea demonstrates that, while rejected, it had garnered some consideration. As it was, the introduction of the first-class armoured cruiser marked the start of a period in which the Royal Navy can realistically be said to have possessed two distinct types of capital ship. Whether fundamentally necessary or not, the growing importance of the type cannot be denied or underestimated, above all given the enormous increase in spending on such vessels along with their battle-ship counterparts; a policy which would have severe financial implications for the service, and the nation as a whole.

The quest for modest dimensions

Strategically speaking, there had since the mid-Victorian period been an argument over whether it was better to possess a modest number of individually powerful ships, or a larger number of less capable fighting vessels. The argument never really went away, and while most commonly associated with battle-ships, it applied to an similar, and arguably greater extent, to cruiser types.

The case was by no means a simple one, since while there existed first and second classes of both types of vessel, the vessels that comprised these classes were not created equal. The case against dedicated second-class battleships was fairly clear-cut, and notwithstanding occasional extremist ideas, there was little interest in pursuing the type after HMS *Renown*. Second class battleships were provided by a natural process when older, less capable types

²²⁴ TNA ADM 116/446 Notes on *Cressy* class design. It is interesting to see though that the 11ft height of the maindeck guns above the nominal waterline was considered ‘very considerable and compares well to other classes’ The latter point was true enough; the former completely erroneous. This is surprising since White had been on manoeuvres and presented papers on seakeeping and the value of freeboard in fighting the guns effectively –a point made in the same section of the memorandum in question

that could no longer realistically form part of a battle-line could be profitably employed in lower-risk roles; building new ones generally resulted in vessels of limited capability, with a short practical life. The case was less obvious when it came to cruisers; with their rather different duties spanning the globe, the second-class type was regarded as valuable.²²⁵ A similar situation existed within the remit of the first-class vessel types, since size, design objectives and fighting capability varied within this generalised classification. The same arguments tended to be made both in favour, and against more numerous vessels of lesser fighting power.

With concerns over the strength of the navy fanned by navalists in the light of increased construction abroad, on 17 June 1898 Goschen indicated that a supplementary building programme later in that Parliamentary Session would be introduced; it was presented only a few weeks later, on 22 July.²²⁶ Goschen's statement was remarkable in that it specified outright that the Supplementary Estimate for the year was a response to Russian construction:

In stating the supplemental Estimate, I regret that it should be my misfortune to have to introduce the name of any foreign Power, but it is impossible to conceal the fact that it is the action of Russia, and the programme on which she has entered, which is the reason for our strengthening our fleet, and taking parallel action with her.

...From the latest information the new Russian programme provides for four cruisers to be commenced this year, and we propose to commence an equal number of cruisers: that is to say, four cruisers in addition to those provided for already.²²⁷

The First Lord in his speech to the House claimed that the British response was not 'aggressive in the slightest degree', and that the action of Russia was not 'simply taken as a menace to this country or is directed against us.'²²⁸ The verisimilitude of this claim may be assessed against the fact that it was included in a speech before Parliament proposing a supplementary Estimate of some £7,000,000 additional funding to construct four additional battleships and four additional first-class cruisers over the original programme for that year. Goschen was evidently attempting to be as tactful as possible under the circumstances – a point emphasised later in the debate, when an unnamed Member enquired 'what waters' he

²²⁵ Brown *Op. Cit.* p.163

²²⁶ Marder *Op. Cit.* p.315

²²⁷ Hansard, Supplementary Navy Estimates 1898-99 H.C Deb., 22 July 1898, vol. 62 cc.854-967

²²⁸ *Ibid*

was referring to in his remarks upon the battleships, which were of shallow draught in order to allow them to pass through the Suez canal: the First Lord's frigid response was that he 'should have thought that the honourable Member would read between the lines.'²²⁹

The new Russian *Bogatyr* class were modestly sized 6,000-7,000 ton, 6in armed protected cruisers, continuing from the *Pallada* class of 1895, and the one-off *Variag* and *Askold* types, while a new class of medium-sized side-armoured vessels were also planned.²³⁰ For its part, following the *Jeanne d'Arc* France embarked upon building six smaller armoured cruisers of modest speed intended for the commerce raiding role (the previously mentioned *Dupleix* and *Gueydon* classes) with another five (the *Gloire* class) planned. In addition to these, the Admiralty also needed to counter dedicated commerce-raising types. In 1890 the United States Navy had laid down two very lightly armed, swift protected cruisers. Commissioned in 1894, the *Columbia* and *Minneapolis* were sufficiently admired for similar types to be developed elsewhere. The best known of these, and the vessels that most closely followed the American model were the French *Guichen* and *Chateaurenault*, displacing around 8,000 tons and with the benefit of water-tube-boilers, were designed for a higher trials speeds of 23 knots.²³¹ The latter was designed to present 'a silhouette somewhat like that of an Atlantic liner, so that she could approach her victims without unduly alarming them.'²³² A slightly smaller and more heavily armed third vessel, *Jurien de la Graviere* was also designed for commerce raiding, although she carried a much reduced coal supply.²³³ Various high-speed types existed in the navies of other powers, albeit in smaller numbers, two apiece in the navies of Japan, Argentina, Chile and China, although it was believed that the majority relied upon short-period forcing to obtain the speeds with which they were credited.²³⁴

The *Monmouth* class was the British response, the Russian programme providing the initial impetus, at least as far as the First Lord and the Supplementary Estimate that paid for them were concerned. Wider factors were clearly at work though. The large number of moderately sized armoured cruisers under construction by foreign powers caused little real anxiety in the Admiralty: performances were often exaggerated, and there was considerable doubt about

²²⁹ *Ibid* The battleships referred to were the *Duncan* class

²³⁰ The *Bayan* class

²³¹ Manning *Op. Cit.* p.397

²³² Friedman *British Cruisers of the Victorian Era* p.252

²³³ *Ibid*

²³⁴ TNA ADM 116/446 Notes on *Cressy* class design. White's assessment was largely correct

whether many of the French and Russian vessels would be completed on time.²³⁵ However it did cause a shift in the Board's approach away from fleet cruisers toward a smaller 23 knot type with a sustained sea speed of 21 knots, which could be built in greater numbers for a given budget. The reasoning forwarded by the DNI, Beaumont, was that providing the Royal Navy could wield vessels 'at least equal to those of the enemy in speed and fighting power, and we have sufficient numbers, it is believed that the opportunities for successfully attacking... commerce are no greater now – if so great – than they were in the past.'²³⁶ The Board were also evidently hoping to address the wants of Station Commanders, who had regularly been requesting faster cruisers, as economically as possible. A Confidential letter to Sir Evan MacGregor, Permanent Secretary to the Board of Admiralty dated 27 January 1898 from Admiral Sir John Hopkins, C-in-C Mediterranean Fleet, is typical of such communications:

...Be pleased to inform their Lordships that it appears to me desirable to draw their attention to the advisability of providing on this station faster Cruisers than we have (either built or building), in order that the Trade Route in the Mediterranean may be more efficiently protected in time of War.

The French Coast on the Algerian shore... has several harbours which fast vessels could use as a base, and thus be in a position to give us a great deal of trouble from our inability to bring them to action when at Sea.²³⁷

The DNC, who also had an excellent grasp of the strategic and tactical environment of the day, did not care for this change in direction, and following his retirement he stated categorically that he was simply fulfilling the requirements of the Board, and that his personal opinion was always in favour of thicker armour and a powerful armament, accepting the corresponding increase in size and cost.²³⁸ The ten *Monmouth* class vessels were provided over a three year period, the first two under the supplementary estimate of 1898/99, a second pair under the 1899/1900 Estimates, with the remaining six following in the 1900/01 programme.²³⁹ Figure 3.9 shows the deck-plan and side-elevation of the class from the 1912

²³⁵ Seligmann *Op. Cit.* p.874

²³⁶ Cited in *Ibid* p.872

²³⁷ TNA ADM 1/7376B Confidential letter, Hopkins to MacGregor, 27 January 1898

²³⁸ Sir William White 'Cantor Lectures: Modern Warships, Lecture V' *Proceedings of the Society of Arts* Vol. LIV (1906) p.881

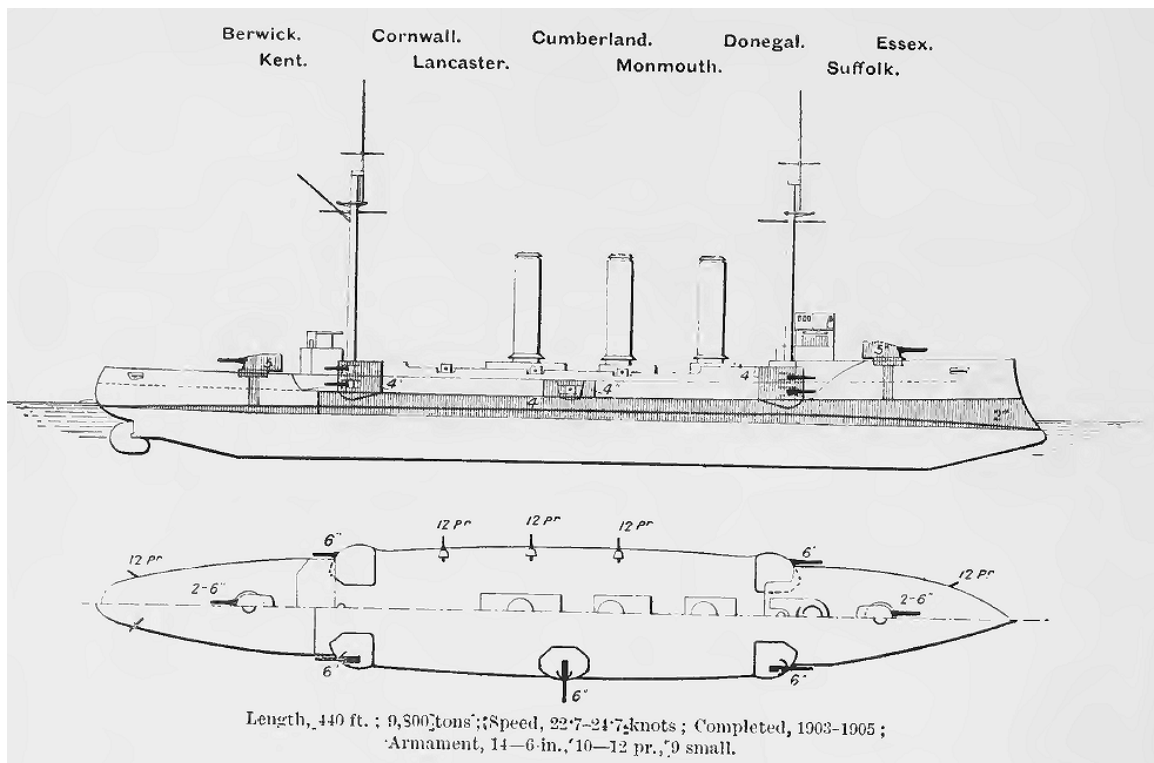
²³⁹ Friedman *British Cruisers of the Victorian Era* p.253 The first two *Drakes* were provided under the regular 1898/99 Estimate

edition of *The Naval Annual*. Far larger than the *Bogatyr*s that had nominally instigated them, on a nominal 9,800 ton displacement and 463ft 6in between extremities carrying fourteen 6in, disposed in twin turrets fore and aft as chase weapons, with the remainder being in casemates, double-decked abreast the fore and main masts, and single (main) deck amidships.²⁴⁰ The turrets were of a new electrically powered design but suffered from reliability problems, while the gun-houses themselves were cramped and the guns proved difficult to align as they shared a cradle.²⁴¹

²⁴⁰ Chesneau & E Kolesnik *Op. Cit.* p.70 Of all the modest-sized first-class cruisers laid down in this period, only the French Gloire class were of equivalent size

²⁴¹ Brown *Op. Cit.* p.159 It might be thought that the Admiralty would be put off electrical gear, but it was experimented with again on a larger scale in the *Invincible*, with disastrous results. See Chapter Five

Figure 3.9 *Monmouth* class cruiser deck-plan and side-elevation



Source: Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin & Co., 1912)

Plate 12

As was the case with the *Diadems*, the 6in armament is one of the most heavily criticised aspects of the *Monmouth* design. For their trade defence role though, little had changed and the 6in would have been quite adequate for fighting the vessels they were intended to counter. The performance of the *Kent* at the Falklands in 1914 confirms that the 6in was acceptable, though when faced with heavier opponents, a *Monmouth* or any deliberately under-sized cruiser should avoid action.

31 Belleville boilers were used in the majority of the class, though Niclausse and Babcock boilers were employed in three of the vessels, feeding the usual pair of 4 cylinder triple expansion engines, coupled to twin screws, for a design 22,000ihp.²⁴² They were the only first-class cruisers to be designed under White to have three funnels. As in the *Drakes*, the DNC had guaranteed a 23 knot speed, which would have enabled them to easily outstrip their equivalently sized armoured cruiser rivals and as a minimum match smaller protected commerce raiders like the *Guichen*.²⁴³ With the original propellers this was missed by three tenths of a knot, at 22,500ihp and 147 revolutions. Based on experience with the *Drakes*, new propellers with fifty per cent greater blade area and slightly less pitch had already been ordered for the class, and on new trials, 23.6 knots was attained for 22,700ihp and 140 revolutions, with a sustained 21.64 knots, up from 20.5, over 30 hours at 16,500ihp.²⁴⁴

Passive defence in the class was provided by 4in non-cemented Krupp for the amidships belt, which was extended, as in the *Drakes*, to the bows with 2in plating.²⁴⁵ In the sketch designs, this was intended to be 11ft tall, rising to 6 ½ feet above the nominal waterline, and 225 feet long, terminating with a 3in bulkhead aft.²⁴⁶ The vessels as finalised had an extra 6in of height to the belt, which was also lengthened to 242ft, and the bulkhead aft thickened to 5in.²⁴⁷ Protective decks were arranged in a similar fashion to the *Drake*, with a 1 ¼in main deck and ¾in lower splinter deck.²⁴⁸ Barbettes and turrets were also protected by 5in, the casemates and ammunition hoists with 4in – 2in, and the CT with 10in. This armour was sufficient to

²⁴² Chesneau & E Kolesnik *Op. Cit.* p.70

²⁴³ In practice, since displacement was on their side, the *Monmouths* practical sea-speed would have been higher, especially over extended periods

²⁴⁴ White 'Presidential Address' *ProcICE* p.79

²⁴⁵ Brown *Op. Cit.* p.159

²⁴⁶ NMM *Kent* class ship cover confidential memorandum S.19531/38 'Design for new Cruisers –Supplemental Programme, 1898-99' 27 September 1898

²⁴⁷ Chesneau & E Kolesnik *Op. Cit.* p.70

²⁴⁸ NMM *Kent* class cover 'Design for new cruisers...' Note that the *Monmouth* cover employs the alternate *Kent* class designation. The reason for the class name change is unclear

defend against explosive shell from < 6in calibres, and in performance terms was roughly akin to 5in of Harvey.²⁴⁹ AP shot or the new AP shells that were being developed from 6in or near equivalents were a much greater threat, and the armour lacked capability against any projectiles from heavier weapons; a situation confirmed during trials in early 1902, and emphasised at the Battle of Coronel in 1914, although *Monmouth* survived a respectably long time in the face of overwhelming odds.²⁵⁰

The *Monmouth* class were, like the *Diadems*, subject to considerable acid comment in the press and from some areas of the service, being compared with foreign or privately built vessels of similar or lesser displacement that appeared on paper to exhibit superiority over them in a variety of areas; principally speed, gun-power and armour protection. In his speech before the House presenting the supplementary programme, Goschen insisted that the Board was acting on its own convictions, and that he could

...honestly say that we have not added a single ship or a single man to the Navy in consequence of any outside pressure, from whatever quarter it has come. We have followed our own system from the first, and I strongly hope that that may continue to be the policy of successive Boards of Admiralty, and that they will be sustained by the authority of the House of Commons.²⁵¹

The First Lord's statement appears at best contentious, since the Board had in the past yielded to outside pressure on various matters. Along with the increased size and improved armour of the latest French cruisers (the *Gloire* and *Léon Gambetta* classes) the criticisms directed at the *Monmouth* class both from within and outside the service evidently had some effect, since major changes were made for the six first-class cruisers provided under the 1901/02 programme.

The six *Devonshires* of the 1901/02 programme saw a modest increase in size over the *Monmouths*. From the surviving documentation in the class ship cover, the DNC was no more enthusiastic about the type than he was about its immediate predecessor, although at this time

²⁴⁹ Exact comparisons are difficult to ascertain, but based on contemporary experimental data this is a good practical rule of thumb

²⁵⁰ The *Monmouth's* damage control appears to have been sufficient to prevent fire from reaching her magazines, refuting the oft-stated contention that the ammunition passages in British first-class cruisers were a significant threat to the ship. See Chapter Five for a fuller consideration of this matter

²⁵¹ Hansard, Supplementary Navy Estimates 1898-99 H.C Deb., 22 July 1898, vol. 62 cc.854-967

White was suffering from a nervous breakdown following the debacle over the near-capsizing of the new Royal Yacht, and was unable to contribute as much as when he was in his prime. It is notable that his usual assessment of foreign construction is conspicuous by its absence in his preliminary notes on the design, the majority of the general requirements being stipulated by the Board without contributions from the Constructor's department. Had White's health been better, it is possible he would have fought harder for a larger type, although this is by no means certain as he did not appear to make any stubborn efforts to influence the Board at the time the requirements for the *Monmouths* were being discussed, despite the fact that he did not approve of the type. Nevertheless, four general sketches were worked up for that year's cruiser programme. Of these, Design No.3, of which there were two variations, was the most interesting: the first featured eight 7.5in guns in twins fore and aft with eight 6in in maindeck casemates, while the second would have carried six 9.2in in single turrets at the ends and twins amidships with the same eight maindeck 6in. These designs were thought too expensive.²⁵² It would appear that Design No.4 had been largely settled upon by November 1901.²⁵³

1,000 tons larger than the *Monmouths*, the length and beam of the *Devonshires* were greater by 10 feet and 2 ½ feet respectively. Although often said to be purely enlarged versions of the previous class, the design was in fact worked out independently of its immediate predecessor.²⁵⁴ Figure 3.10 shows the deck-plan and side-elevation of the type from the 1912 edition of *The Naval Annual*. All had six cylindrical boilers in the aft boiler room; the forward boilers rooms of the six vessels were outfitted with a variety of different water-tube boilers, this following a recommendation from the Committee on Naval Boilers that had been set up in the wake of initial reliability issues with the *Belleville*.²⁵⁵ With roughly similar power outputs to the *Monmouths* the type was marginally slower, with an advertised design trials speed of 22 knots, making for a practical sea speed of 20 knots or higher.²⁵⁶

²⁵² Brown *Op. Cit.* p.160

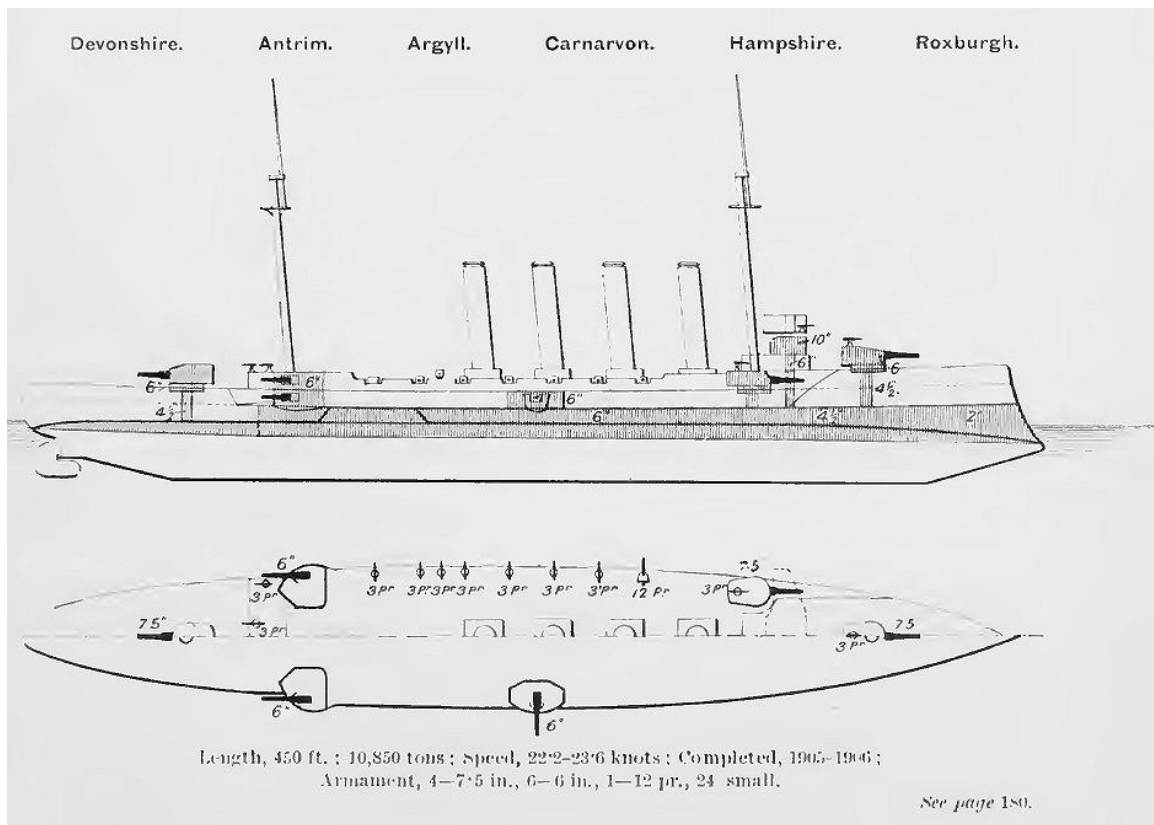
²⁵³ NMM *Devonshire* class ship cover 'New First Class Cruisers: Design of' November 1901 p.34

²⁵⁴ *Ibid* p.36

²⁵⁵ Goschen announced the composition of the Committee in the House of Commons on 7 August 1900. See Hansard Vol.87, 7 August 1900 cc.922-925

²⁵⁶ All but *Argyll* exceeded their design power and achieved over 23 knots on trials. It seems that although White had all but retired, the department had picked up on his general procedure of designing for, and anticipating, a higher speed than advertised / required.

Figure 3.10 *Devonshire* class cruiser deck-plan and side-elevation



Source: Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin & Co., 1912)

A note dated 19 March 1902 from the new DNC (Philip Watts, who took over the design) to the Controller (Rear-Admiral Sir William May) regarding the ‘new *Monmouths*’ states that the results of firing trials at a target of the *Monmouth* indicated that the protection was overmatched by 6in AP projectiles, and that the new cruisers should be better protected.²⁵⁷ The matter was discussed in the First Lord’s room on the 17th & 18th instant, and it was decided to replace the 4in armour with 6in armour on the new design.²⁵⁸ To compensate for the additional weight, the belt was reduced in height by a foot. The protective scheme otherwise generally resembled that of the *Monmouths*. There was some debate over whether cemented armour should be employed.²⁵⁹ The return to the 6in belt was a marked improvement over their immediate predecessors, but the reduced vertical height partially offset these gains. The newly developed 7.5in Mk I were carried in single turrets as chase weapons fore and aft, and the forward double-deck 6in casemates were replaced by single wing 7.5in gunhouses on the upper deck while building.²⁶⁰ They were the only vessels to carry the 7.5in Mk I, subsequent types being equipped with the 50 calibre Mk II. Six 6in Mk VII were also carried in single maindeck casemates amidships, and double deck casemates abreast the mainmast.

The *Monmouth* and *Devonshires* were the last time, at least until the post-war years, that a serious attempt was made to limit the size of first-class cruisers in the Royal Navy. Following the introduction of the *I*-class big-gun battlecruisers, preliminary sketch designs would be made for a reduced type with 9.2in artillery, but these did not proceed further than the design offices and general discussions.

Viewing the two classes in perspective, taken as trade defence vessels specifically intended to counter ‘corsair cruisers’ and modestly sized armoured cruisers designed to prey on British shipping, the *Monmouths* were reasonable. They had the speed to chase down commerce

²⁵⁷ NMM *Devonshire* class ship cover. Memorandum Watts to May, 19 March 1902 The remarks are unlikely to have come as a great surprise, and it should be emphasised that the *Monmouth* type was intended, in the words of the DNC, to deal with ‘swift [contemporaneous] French and Russian armoured cruisers up to about 8,000 tons displacement’ NMM *Kent* class ship cover ‘Design for new Cruisers...’

²⁵⁸ *Ibid*

²⁵⁹ NMM *Devonshire* class ship cover ‘New First Class Cruisers...’ p.40 Given the relatively minor extra cost of between £5,000 - £10,000 per vessel estimated by the DNC, cemented would appear to have been the better choice

²⁶⁰ Brown *Op. Cit.* p.160 The decision was taken at the same time as it was determined that the last four *Duke of Edinburgh* class vessels considered in Chapter Five should be modified with four single 7.5in upper-deck barbettes and gunhouses replacing their maindeck 6in battery. See Friedman *British Cruisers of the Victorian Era* p.262

raiders, while their uniform 6in armament (plus assorted light weapons) was as adequate for the duties they were designed to perform as it had been for the *Diadems* before them. For use in focal areas, they served the purpose, providing a larger and more powerful type did not appear, in which case they would have had greater problems unless a small group operated together, rather negating one of the arguments in favour of a larger number of vessels, viz. that they could cover more ground.

Objections were raised about their hollow waterlines forward potentially increasing pitching, Admiral FitzGerald claiming that when he viewed them in dock ‘you could nearly have got a dinghy inside the hollow,’ but there appear to be few significant complaints about their performance in service.²⁶¹ The greatest compromises that had been made in the class was in their protection. The extent of the coverage and its configuration were good, but on the restricted dimensions it was not possible to provide them with thicker armour while also providing for the speed and coal endurance mandatory for their role.²⁶² Although like their armament this was acceptable enough for the trade-defence role at the time of their design, it rendered them vulnerable to heavier weapons should such be encountered: the problem with passive defence, as White was fond of pointing out, is that once designed and built into a vessel, it is essentially fixed and very difficult to improve upon, whereas the powers of attack would steadily improve over a typical operational lifespan.

In comparing the proposed cruisers to foreign vessels White assessed them as superior to ‘corsair cruisers’, medium-sized armoured cruisers up to the *Dupleix* class, and that they would be capable of fighting the French *Gueydots* or forthcoming Russian *Bayans* on a roughly equal or slightly advantageous footing, but added the strong caveat that there were already built or building types of similar displacement which possessed superior fighting efficiency obtained by making sacrifices elsewhere. In particular, he was thinking of the Japanese (Elswick built) *Asama* class, which traded speed and range for a heavier armament and, in certain respects, greater protection. Evidently increasingly irritated by criticisms of Service vessels, he also addressed the subject of two more Elswick-built vessels then being widely praised. On the subject of the *O’Higgins*, he pointed out the limited extent of the protection, with a partial belt only that was nearly awash when the bunkers were filled, dryly adding that ‘there is little doubt this vessel will be treated herewith as a more powerful

²⁶¹ Admiral C. C. Penrose FitzGerald ‘On the “Lines” of Fast Cruisers’ *TransINA* Vol. XLV (1903) p.32

²⁶² NMM *Kent* class ship cover ‘Design for new Cruisers...’

fighting machine than the new cruiser, and her weak points left unnoticed.’²⁶³ Regarding the *Esmeralda*, he noted that she would on paper also appear a formidable rival to the *Monmouths*,

...with her reputed speed of 23 knots, partial belt of 6in armour, and armament including 2-8in, 16-6in and other guns. But this speed is not one realised except for short periods, and her sustained sea speed would undoubtedly be much lower than that of our cruisers, probably 2-3 knots less. Her partial armour belt is a fictitious protection, and there is only shield protection to the guns.²⁶⁴

The *Monmouth* class achieved the objectives set by the Board, and by those criteria, they were a highly successful design. They also appear to have been as Brown remarks, somewhat better fighting ships than they are generally given credit for.²⁶⁵ However, the basic requirements were flawed. From the perspective of technical design, a larger trade defence cruiser employing the protective deck system (for example, an improved *Diadem*) could have been produced for the same cost, offering higher speed, greater range and / or greater gun-power, while possessing equivalent or superior qualitative protection to the thin belt and deck of the *Monmouths*. Alternatively, a vessel of similar size, speed, protection and gun-power could have been produced following the protective deck system at a lesser cost. If a trade-defence cruiser was demanded then either of these options appear preferable to the compromise that was ultimately chosen, and indeed Sir William evidently held this view.²⁶⁶ The greatest drawback though was demanding a medium-sized cruiser in the first place. Corbett would strongly argue some years later that the true role of cruising vessels was to exercise the command of the sea gained by main battle forces, and given the extent of the Imperial requirements and the Royal Navy’s global commitments, the favouring of a more numerous class of individually less powerful vessels is understandable.²⁶⁷

Particularly in light of the greater number of potentially vulnerable regions as the number of bases available to commerce-raiders increased relative to the 1880s and early 1890s, and the growing interest of naval rivals in the *guerre industrielle*, the favouring of a greater number

²⁶³ *Ibid*

²⁶⁴ *Ibid*

²⁶⁵ Brown *Op. Cit.* p.161

²⁶⁶ NMM *Kent* class ship cover ‘Design for new Cruisers...’

²⁶⁷ Sir Julian Stafford Corbett *Some Principles of Maritime Strategy* (Annapolis: Naval Institute Press, 1988) pp.112-113

of vessels makes sense if the focal area-defence strategy was to be continued. However, by deliberately restricting the dimensions of first-class cruisers, outright capability was sacrificed, which inevitably resulted in rapid obsolescence.²⁶⁸ This was a point well appreciated by the DNC and the Controller, who wrote a memo on White's paper listing the strategic and tactical disadvantages of building a larger number of smaller vessels.²⁶⁹ Wilson calculated that approximately ten *Monmouths* could be built for the same price as seven *Drakes*, would cost substantially more to man and run, possess inferior protection, gun power, and radius of action, in the order of 8:7.²⁷⁰ Many of the arguments raised a few years later for the all-big-gun types and their increased in size and power over earlier vessels were presaged by Wilson's comments. Wilson indeed strongly argued that all four vessels of the Supplementary Estimate should be *Drakes*; ultimately, the Supplementary Estimate was split, providing two *Drakes* in addition to the pair that had been ordered under the normal yearly Estimate, and two of the new cruisers.

Assessing the *Devonshire* type is slightly harder than that of the *Monmouths* since while an obvious improvement on the earlier type in terms of outright fighting capability, they were inherently as much of a compromise as their predecessors of the *Monmouth* class were. With the *Devonshires* the Board attempted to counter the latest French vessels, without a substantial increase in size or cost. Although having a reasonable edge over the *Glories*, the *Léon Gambetta* class had similar speed and armour to the *Devonshires*, but a greater number of lighter weapons and were around 1,500 tons heavier. Thus it seems the Board had fallen into a trap that periodically occurs in warship design: that of trying to achieve too much on a restricted displacement. This had occurred with the *Orlando* class of the early-1880s, and regularly cropped up in the battleship designs of the mid-Victorian era, when attempts were made in types such as the *Ajax*, *Colossus* and *Admirals* to cram first-class capabilities into a restricted tonnage.²⁷¹ While the *Devonshires* were well designed vessels for their dimensions, the Royal Navy would have been far better served by abandoning attempts to restrict the size of first-class cruisers, particularly since more powerful vessels were already in existence, with more projected.

²⁶⁸ Friedman *British Cruisers of the Victorian Era* p.253

²⁶⁹ TNA ADM 1/8724/93 Remarks of Admiral Wilson on White 'Report on the Design for New Cruisers, Supplementary Programme 1898-99' in appendix of Commander S. King-Hall 'The Evolution of the Cruiser'

²⁷⁰ *Ibid*

²⁷¹ Beeler *Op. Cit.* p.204

A *Monmouth*, encountering the *Jeanne d'Arc* or a *Leon Gambetta* could be reasonably expected to avoid action and if possible fall back upon, or request support from, a larger first-class cruiser. A marginally larger, more heavily armed and protected *Devonshire* would quite likely have been obliged to force an action. While strategically the advantage lay with the British vessel, since even a minor amount of damage could potentially curtail a commerce raider's activities, and even using up a large quantity of its ammunition would severely hamper its effectiveness, the risks involved would also have been quite high. Worse, although the *Devonshires* possessed greater armour and gun power over the *Monmouths*, the gains were insufficient to enable them to operate practically as fleet cruisers, while the loss of half a knot of speed would have reduced their ability to chase down commerce-raiders.²⁷² The question of quantity *verses* quality is always a difficult balance, but in the *Devonshires*, the Royal Navy had a vessel that was arguably less capable of catching commerce-raiders than the *Monmouths* but also lacked any real fleet capability.

With that said, it is significant that, while the class were under construction, they were modified with two additional 7.5in gunhouses were substituted for the foremost 6in double-deck casemates, bringing the total number of 7.5in guns to four. This was partly due to the unsatisfactory nature of these casemates in the *Monmouths*, but it was also a response to the heavier armament of contemporary foreign construction, most notably the latest French cruisers, which were matched in possessing four heavier weapons, but had a significant numerical advantage over the British vessels in lighter weapons (sixteen 6.4in). Furthermore, it was appreciated that as the armour of foreign vessels improved, something heavier than the 6in gun would be needed, and a greater number of these heavier weapons would be necessary. The 7.5in fired a 200lb projectile as against the 100lb of the 6in and thus represented a useful advance over the smaller weapon. Table 3.2 gives penetration values of the three intermediate gun calibres employed in the contemporary Royal Navy firing common pointed capped (CPC) shell. Thus, the *Devonshires* were the first British first-class cruisers completed which reflected the gradual decline of the evergreen 6in as a primary armament for large naval vessels.

²⁷² This point should be considered against their greater size and displacement, which may have offset the reduction in effective trials speed and resulted in similar practical sea-speeds, particularly in poor conditions. It is probable that the *Devonshire's* stability was reduced by replacing the foremost casemates with upper-deck turrets, just as occurred with the *Warriors* (see Chapter Five), making them superior gun-platforms

Table 3.2

Penetration of Krupp Cement (KC) plate by common pointed capped (CPC) shell at 5,000yds
and 30° impact

<i>Gun (calibre inches)</i>	<i>Mark</i>	<i>SVel (ft/sec)</i>	<i>Penetration (in)</i>
9.2	X	1826	6.5
	XI	1928	7.0
7.5	I	1640	4.5
	II	1683	4.5
6	VII	1321	2.0
	XI	1502	3.0

D. K. Brown *The Grand Fleet: Warship Design and Development 1906-1922* (London:
Caxton, 2003) p.33

Conclusions and status at the turn of the century

Through the period covered by this chapter, first-class cruisers, in addition to their 'traditional' role in protecting commerce increasingly came to be viewed as practical fleet-units. Their fighting capacity had been demonstrated at Yalu, and additional confirmation was provided during the Spanish-American war of 1898. The Royal Navy's annual Manoeuvres regularly explored scenarios in which the type had a major role, and in general the exercises, especially from 1897 onward, tended to illustrate the value of such vessels to a battlefleet, supporting smaller types and functioning as heavy scouts. The new side-armoured type would increasingly blur boundaries between types however around the turn of the century. Although the idea of cruisers joining a battle-line is still often dismissed as a 'fallacy', the truth was that during the few short years around the turn of the 19th into the 20th century, the first-class armoured cruiser was not just an addition, but a genuine alternative to the battleship. While it was a step too far for most contemporaries to advocate ceasing battleship construction in favour of the new large cruisers, the genesis of a navy based around first-class armoured cruisers as the principle capital ship had begun. The fighting capability and overall versatility of the first-class cruiser had increased steadily thanks to the advances that had taken place in protective materials, and careful consideration given to armour configurations. Harvey plate had paved the way in foreign services, particularly in France, but the introduction of Krupp Cemented armour was the single most important material advance for first-class cruisers since the introduction of the triple-expansion steam engine.

This increase in capability had been clearly recognised by the Admiralty, and was starting to be exploited, first with the *Cressy* class fleet-cruisers, and then with the even larger *Drake* class. It must be stressed though that this new-found fighting capacity against battleships was a result of the contemporary gunnery environment being dominated by rapid-firing intermediate-calibre weapons like the 6in. The Admiralty and their professional advisers as of 1897 could not anticipate the rapid advances that would occur in fire-control, the improved long-range accuracy, and the rise of the big-gun. Granted, it was increasingly apparent that as armour continued to improve, so heavier weapons would be needed to penetrate it, and that battle-ranges would increase (particularly in fleet actions) due to concerns over the threat posed by torpedoes. With the *Devonshires*, the first moves toward providing first-class cruisers with a heavier battery were made, reflecting the slowly changing gunnery conditions, and the gradual decline of the 6in as the primary armament. This was also reflected in their

King Edward VII battleship contemporaries, in which the 6in gun was supported by the addition of four 9.2in in single wing turrets.²⁷³

Having established fleet-cruisers, the Board could be assessed as having made a mistake in creating two more modestly-sized types in reaction to French and Russian cruiser programmes. A smaller number of more powerful vessels of the *Drake* class would have been a more versatile and cheaper solution over the longer term, and the *Monmouth* and *Devonshires* were ultimately a false economy. Yet this to an extent followed the pattern of the past decade, in which large types were followed by more numerous smaller vessels. With the global nature of the Royal Navy's commitments and the gigantic nature of Imperial shipping, the choice in favour of numbers was understandable, most especially in light of the preferred strategy of trade-protection, which continued along the lines established by Milne of focal-area defence. The strategic position was not entirely clear-cut. As foreign powers gained more bases globally from which potential commerce-raiders could operate, and as France in particular began to place a heavy emphasis upon the strategy of the *guerre industrielle* so more vulnerable focal zones would be identified, and more vessels required. Thus the two 'County' classes were created.²⁷⁴ This approach was fine providing more powerful vessels were not encountered, but since there were more powerful vessels in existence and more were projected it was unlikely that it could continue for an extended period. That the Admiralty also recognised this fact is demonstrated by the abandoning of attempts to restrict the displacement of first-class types following the *Devonshires* –although the practice would rear its head again some years later, in the big-gun era. Chapter Five considers this period, and how the first-class cruiser would become the basis for all of the Royal Navy's capital-ships of the big-gun era.

Before assessing this transition though it is necessary to examine the practical operations and roles of the first-class cruiser in its heyday, during the first years of the 20th Century. Chapter Four provides a case-study of these in the Far East, which owing to its scale, locale, varied

²⁷³ The introduction of the 9.2in gun in the *KEVII* class battleships also forced the abandonment of casemate protection for the 6in in the class since there was insufficient space available for independent casemates, a central battery being used instead. With its armoured walls and bulkheads this effectively raised the height of the protection by another deck, the trade-off being the increased likelihood of a single hit disabling multiple weapons and their crews. The introduction of the 9.2in gun in the *KEVII*s was not a success since fire-control quickly became impossible at longer ranges, although at the somewhat shorter fighting ranges still contemplated at the time of their design, this would have been less of an issue

²⁷⁴ An entirely unofficial term

geographical nature and complex political and trade interests was one of the most important regions covered by the service. Owing to these factors, the first-class cruiser was a vital component in the Royal Navy's East Indies and China Squadrons, making the region an ideal exemplar of their contemporary operations.

Chapter 4

The First-Class cruiser in the Far East 1901-1904:

A case-study

Chapters Two and Three charted the growing role of the first-class cruiser during the late Victorian era. The purpose of this chapter is to consider their presence on the Royal Navy's foreign stations, their operations and the administrative and logistical issues that arose from these, with the situation in the Far East used as a case-study. Outside Europe, this was one of the most critical areas of deployment for the service, with a complex political and economic situation resulting from a wide variety of rival commercial, colonial and local interests. The situation in China between 1894-1905 has been described as 'overshadowing all other international issues', since it was widely anticipated that the Chinese Empire would collapse, presaging 'an Armageddon between the European Powers struggling for [its] ruins.'¹ While it is possible to argue that such an assessment contains a degree of hyperbole, the 'China Question' and the colonial rivalries engendered were of sufficient importance for it to seem permissible given the circumstances. Considering the Far East on a purely naval basis, many of the vessels British first-class cruisers were designed to counter were stationed there, and thus they necessarily formed a major part of the British squadrons in China and the East Indies. They were also a significant component in the Japanese fleet, which was largely British built and followed RN practices and tactical thinking. Following the conclusion of the Russo-Japanese war, first-class cruisers would become the Royal Navy's sole capital ships in the region and as such, it is clearly worth careful study.

The Sino-Japanese war, and China's defeat in the conflict was a major driving factor in the Russian expansion in the region. Using the post-conflict situation to its advantage, Russia was able to establish an advantageous economic position and considerable political clout over the Chinese government from spring 1895, in part through loaning China the capital to pay a significant part of the indemnity owed to Japan.² A further Russian object was to obtain a railway concession to build part of the Trans-Siberian track inside Chinese borders in

¹ T. Otte *The China Question: Great Power Rivalry and British Isolation 1894-1905* (Oxford: OUP, 2007) pp.1-2 –latter Rosebery cited by Otte

² N. Papastratigakis *Russian Imperialism and Naval Power: Military Strategy and the Build-Up to the Russo-Japanese War* (London: Tauris, 2011) p.125

northern Manchuria, which was granted in return for a defensive alliance against Japan, in the event the latter attacked either nation, or Korea, where both had significant interests.³ This further heightened colonial rivalries, particularly with Britain for whom the region remained a major trading centre and trade route. At the turn of the Nineteenth Century the British Empire's once highly profitable opium trade was in decline, partly due to an increase in the general income of the Indian government which meant it was no longer the bulwark against bankruptcy that it had been in the past.⁴ The closing of Indian mints to the free coinage of silver and the consequent appreciation of the Rupee caused further damage to this aspect of trade, and the period 1894-1905 saw revenue from it drop to an approximate annual average of £3 million, sterling: just 60% of what it had been for the previous 14 years.⁵ Despite the dwindling profits from this area of trade though, the Far East continued to be of considerable economic value to the British Empire, and given the fiscal difficulties Britain began to experience during the early Twentieth Century, its importance should not be underestimated. Table 4.1 shows the latest figures of foreign trade in China available to the British Government at the time of the Boxer Uprising, and demonstrates the significant economic value of the area to the UK economy.

³ *Ibid*

⁴ D. Owen *British Opium Policy in China and India* (New Haven: Yale University Press, 1934) p.330

⁵ *Ibid*

Table 4.1:
Foreign Trade of China 1899

<i>Country</i>	<i>Total Trade</i> (in pounds sterling)	
Great Britain	8,118,549 (direct)	
Hong Kong	28,491,264 (including trade of all countries through Hong Kong)	
Germany	3,598,200	
France	9,292,206	
U.S.A.	6,596,169	
Russia	1,286,508 (by sea)	
	1,498,115 (by Kiakhta)	
Japan	7,972,183	
	In percentages (for British control of the shipping trade)	
	<i>1898</i>	<i>1899</i>
British	65%	61%
Foreign	35%	39%
	(For values of goods carried)	
British	54%	53%
Foreign	46%	47%

Source: L. K. Young *British Policy in China 1895–1902*
(Oxford: Clarendon Press, 1970)

From 1897 the Boxer Uprising led to an escalation of colonial rivalries, despite the notional cooperative nature of the Eight Nation Alliance in the summer of 1900. While Russia and Britain had reached an agreement in 1899 regarding spheres of influence and railway concessions in China, this did not eradicate their mutual antagonism over Far Eastern interests.⁶ A similar situation applied in the case of Russo-Japanese relations. In April 1895 the Treaty of Maguan ceded the Liaotung peninsula to Japan, but the formal retrocession of this, and Russia's subsequent leasing of the area and the strategically significant Port Arthur, which provided them the warm-water port on the Pacific Ocean they desired, caused considerable resentment in Tokyo. As a result, a degree of Russian retrenchment in Korea was made from 1898, in an attempt to appease Japan.⁷ In the post-Boxer climate at the end of 1900 though much of this would be reversed, when

the apparent implosion of all central authority in China led to a renewed Russian expansionist drive in the northernmost provinces of the Chinese Empire. The resulting Manchurian crisis marked the nadir of Anglo-Russian relations.⁸

The shift in policy, from one of at least professing to support the increasingly rickety framework of the Chinese Empire into something that appeared to be an attempt at hastening its collapse in order to facilitate a total annexing and absorption of Manchuria, would become the primary cause of the Russo-Japanese war of 8 February 1904 – 5 September 1905.

The concomitant, inevitable growth of Russian naval power in the Far East would also become an increasingly significant component in British policy, most notably from the spring of 1901 onward, when it was thought that a notionally combined Franco-Russian fleet in Far Eastern waters 'of seven modern and two older battleships and twenty cruisers would greatly outnumber the RN's China Squadron of four battleships and sixteen cruisers.'⁹ This can be overstated. The litany of difficulties with such a course (ranging from physical matters of differences in material, signalling systems, command structures, dissimilar languages, tactics, lack of combined practice and even more abstract matters of culture) were well known,

⁶ Papastratigakis *Op. Cit.* pp.159-160

⁷ *Ibid*

⁸ Otte *Op. Cit.* p.216

⁹ Papastratigakis *Op. Cit.* p.199

rendering joint operations more a matter of fantasy than a realistic possibility.¹⁰ This view is confirmed by a strategic war game held at the Royal Naval College in early 1903, when even if such a combined fleet was assembled, a smaller RN squadron was adjudged the superior.¹¹ Indeed, recently several scholars, notably Papastratigakis and Seligmann have begun to reassess whether the Franco-Russian naval challenge in general around the turn of the Nineteenth Century was as serious a threat to British interests as has often been assumed. While these nations were indubitably Britain's principle political rivals, on a purely military level it is argued that from 1900, as better intelligence on particularly the Russian fleet became available the Admiralty 'was less convinced about the quality of the naval challenge posed by their fleets.'¹² There is certainly much to be said for this view, and the previous chapters have, within the context of the first-class cruiser, the RN was generally ahead of rivals both strategically and in terms of material. Nevertheless, while the Admiralty considered the naval challenge of the Dual Alliance to be rather weaker than many contemporary and later observers believed, they remained the primary focus of the annual Manoeuvres, fleet exercises and academic debates until 1905.¹³ Nor were the independent forces in the region and especially the growth of the Russian Far Eastern fleet regarded with complacency either, since countering it necessarily further dispersed the Royal Navy's total strength, weakening it in the Mediterranean and home waters.¹⁴ Though the actual dangers of such an eventuality can be considerably overstated, it remained a consideration that Selborne, the First Lord of the Admiralty took seriously.¹⁵

William Waldegrave Palmer, Second Earl of Selborne, was sworn of Her Majesty's most Honourable Privy Council on 12 November 1900.¹⁶ He was made First Lord of the Admiralty by his father-in-law, Lord Salisbury, in a Cabinet reshuffle, and retained the position until he left to become High Commissioner to South Africa in March 1905.¹⁷ A capable First Lord, he

¹⁰ Seligmann 'Britain's Great Security Mirage: The Royal Navy and the Franco-Russian Naval Threat, 1898–1906' *Journal of Strategic Studies*, 35:6, p.865

¹¹ TNA ADM 231/38 'Précis of Strategical War Game carried out at the Royal Naval College, Greenwich, in the early part of 1903' NID Report 706 October 1903 p.7

¹² *Ibid* p.863

¹³ S. Grimes *Strategy and War Planning in the British Navy, 1887-1918* (London: Boydell, 2012) p.41

¹⁴ *Otte Op. Cit.* pp.292-293

¹⁵ *Ibid*

¹⁶ *The London Gazette* No.27246 (13 November 1900) p.1.

¹⁷ R. Massie *Dreadnought: Britain, Germany and the Coming of the Great War* (London: Pimlico, 2004) p.289 & 498

is generally viewed in a positive light by naval historians.¹⁸ Well aware of the need to cut naval expenditure, he pursued economies when possible.¹⁹ However, with the support of the experienced Hugh Arnold-Forster, whom the Prime Minister had insisted he take as his Parliamentary Secretary, he was prepared to fight for the service and undaunted by complaints of fellow Ministers.²⁰ His political shrewdness and attention to detail were impressive, and he was a key participant in advocating the Anglo-Japanese Alliance, signed 30 January 1902, which he believed would ‘diminish the probability of a naval war with France or Russia singly or in combination.’²¹

For its part, France had by the turn of the century established French Indochina, while also gaining a lease of Guangzhouwan on the southern Chinese coast from where squadrons might operate, and typically a number of commerce-raiding cruisers were present. There was also a move to make a number of more permanent bases on the Cape to Far-East route from which cruisers might be based. The Anglo-Japanese Alliance effectively marked the end of British attempts to maintain an isolationist stance, a policy which had begun to weaken with a proposal for an Anglo-German declaration of support for Japan by the Foreign Secretary, Henry Petty-Fitzmaurice, 5th Marquis of Lansdowne, and which in the medium-term would yield multiple strategic benefits.²² The potential was noted almost immediately, not least by the C-in-C China Station [Admiral Sir Cyprian Bridge] who in a private letter of April 1902, written while returning from a northern cruise remarked on the strategic implications for the Far Eastern commands, and the ripple-effect for the wider naval environment:

...I presume to think that the Anglo-Japanese alliance is a good thing. Anyone who knows anything of Japan must have seen that she was determined to range herself on

¹⁸ See A. Marder *The Anatomy of British Sea Power: A History of British Naval Policy in the Pre-Dreadnought Era, 1880 – 1905* (London: Frank Cass & Co., 1964) pp.425-426; also Nicolas Lambert *Sir John Fisher's Naval Revolution* (Columbia: University of South Carolina Press, 2002) pp.32-33 Lambert's remarks on Selborne refusing to be hurried into making a decision until he had researched it to his own satisfaction appear to be reflected in his quoted remarks to Bridge.

¹⁹ N. Lambert *Sir John Fisher's Naval Revolution* pp.36-37

²⁰ E. Grove *The Royal Navy Since 1815: A New Short History* (Houndmills: Palgrave Macmillan, 2005) p. 86

²¹ TNA CAB 37/58/81 Memo Selborne 'Balance of Naval Power in the Far East' See also Otte *Op. Cit.* p.293

²² Otte *Op. Cit.* p.255 Lansdowne's proposal came to nothing, and as Otte points out, notwithstanding established scholarly consensus, even if it had been adopted it was rather more subtly nuanced than an outright abandoning of Salisbury's previously assumed policy of isolation. Nevertheless, it marked a weakening of the British stance

the side of some Power, and it would be deplorable has she been left to range herself with those who are against us.²³

The Alliance substantially reduced, though did not eradicate, the likelihood of problems in the Far East between Britain and Japan. It hampered Russian expansion in the region and safeguarded British interests in that quarter without Britain needing to become directly involved in a European alignment against Russia, while mildly steadying Japan's colonial enthusiasm.²⁴ In the Alliance, the foundations were established that allowed the withdrawal of RN battleships from the China Station, and though they would be retained for several years, the intent to recall them for use elsewhere was very quickly raised.²⁵ Following the extermination of the Russian Second and Third Pacific Squadrons at Tsushima in 1905 they were withdrawn to strengthen the quality of the battle squadrons in home waters and the Atlantic. This left the first-class cruiser as the Royal Navy's sole capital ship in the Far East, which were well adapted for the role given that the French squadrons were largely cruiser-based. There are suggestions that that the withdrawal of the battleships owed much to the similarity of views between Admiral Lord Fisher and Prince Louis of Battenberg, with the latter's favouring of the armoured cruiser shedding

...important new light on his attempts as DNI to bring home the battleships from China... when he first made this suggestion he had not envisaged increasing the number of battleships in home waters; he had wanted to substitute them for two *Royal Sovereigns* which he thought belonged in reserve.²⁶

Whilst Fisher and Battenberg certainly favoured armoured cruisers, such assertions appear to overlook the rather more significant matter of the drastically altered naval situation in the Far East, which allowed the adoption of such a policy in the first place.²⁷

²³ NMM BRI 15 pt.4 Draft letter from Bridge dated Hong Kong (24 April 1902)

²⁴ Young *British Policy in China* p.318

²⁵ Grove *The Royal Navy* p.130

²⁶ Lambert *Sir John Fisher's Naval Revolution* p.109

²⁷ *Ibid* pp.108-9

Far Eastern Station characteristics and requirements

From 1831–1844, Chinese waters were a subordinate division of the wider East Indies and China Station.²⁸ Following the Opium War 1839–’42 and the establishing of the Hong Kong colony, the status of the East Indies and China divisions was reversed, with the former becoming a subordinate command under a captain holding the rank of commodore, second class.²⁹ In 1865 the station was divided into two entirely separate commands, the East Indies Station under a Rear-Admiral, and the more senior China Station under a Vice-Admiral.³⁰ From this point until the early Twentieth Century the China Station was regularly the largest area of deployment for the Royal Navy outside European waters, and even briefly exceeded the size of the prestigious Mediterranean Squadron in terms of the number of vessels deployed.³¹ Map 4.1 shows the vast littoral zone of the Chinese coast, which included two of the longest rivers in the world, both of which were navigable by vessels of considerable size, along with neighbouring Powers.³²

²⁸ TNA FO 17/12 Backhouse to Wood, draft memorandum, (23 March 1836)

²⁹ Gerald S. Graham *The China Station: War and Diplomacy 1830–1860* (Oxford: Clarendon Press, 1978) p.267

³⁰ The station C-in-C could be promoted during his period in command, which occurred on the China Station during the 1901-1904 period

³¹ E. Grove ‘The Century of the China Station: the Royal Navy in Chinese Waters, 1842-1942’ in Harding, Jarvis and Kennerley [eds.] *British Ships in China Seas: 1700 to the Present Day* (Liverpool: National Museums Liverpool, 2004) pp.7-8 See also the Confidential List[s] of Her / His Majesty’s Ships in Commission covering the mid-Victorian through Edwardian eras held by the National Archives (ADM8/139-174). ADM 8/166 for example indicates that during October 1887, the China Squadron comprised 20 ships, being followed by the North America and West Indies Squadron with 13, and the East Indies Squadron with 12.

³² The Yangtze and Yellow Rivers, being respectively the third, and sixth longest in the world. The West River was also extremely substantial, at some 1,350 miles, although as a nominal tributary of the Pearl, the stated length varies dependent upon the sections employed in the classification

Map 4.1



Source: Gerald S. Graham *The China Station: War and Diplomacy 1830–1860* (Oxford: Clarendon Press, 1978)

The 1903 Standing Orders issued by the Admiralty for the guidance of the Commander-in-Chief (C-in-C) China Station stated the boundaries as being

N. –On the *North* from the meridian of 95° of east longitude, in 10° north latitude, along that parallel to the West Coast of the Malay Peninsula ; thence by the shores of Asia, as far as the meridian of 180°

W. –On the *West* from the latitude of 10° north, by the meridian of 95° east longitude, to 10° of south latitude.

S. –On the *South* from the meridian of 95° east longitude by the parallel of 10° south latitude to 130° east longitude ; thence north to 2° north latitude and along that parallel to 136° east parallel to the meridian of 180°

E. –On the *East* by the meridian of 180° from 12° north latitude to the point where that meridian reaches the shores of Asia.³³

Unlike several other foreign stations, these boundaries were unaffected by a significant rearrangement of station limits that came into effect on 1 August 1903.³⁴ This was a notable event in itself, though seldom referred to: most significantly, the rearrangement saw the creation of a new South Atlantic Station, while of particular interest to this chapter, the East Indies Station was (further) reduced in size, the northerly limit of the Cape of Good Hope Station being extended to include the islands of Madagascar, Mauritius, the Seychelles and their dependencies. The East Indies Station did however continue to encompass the northern Indian Ocean, as well as retaining responsibility for the Red Sea, and thus the southern entrance to the Suez Canal.³⁵ As such, the scale of the East Indies Station, though reduced, should not be underestimated either: although reduced as the boundaries were shifted and new Stations created to better adapt to the needs of protecting British interests and commerce, it still covered a vast region, including India and the Persian Gulf. Map 4.2 shows the new southerly limit of the East Indies Station, post the August 1903 rearrangement; the extreme Western boundary of the China Station may be seen to the right. Map 4.3 shows the

³³ TNA ADM 116/967 *Standing Orders for the Guidance of the Commander-In-Chief on the China Station*, Confidential Memorandum (15 August 1903), p.3

³⁴ TNA ADM 125/56 Evan MacGregor, circular letter for information of Commanders-in-Chief at home and abroad M.062, (28 February 1903).

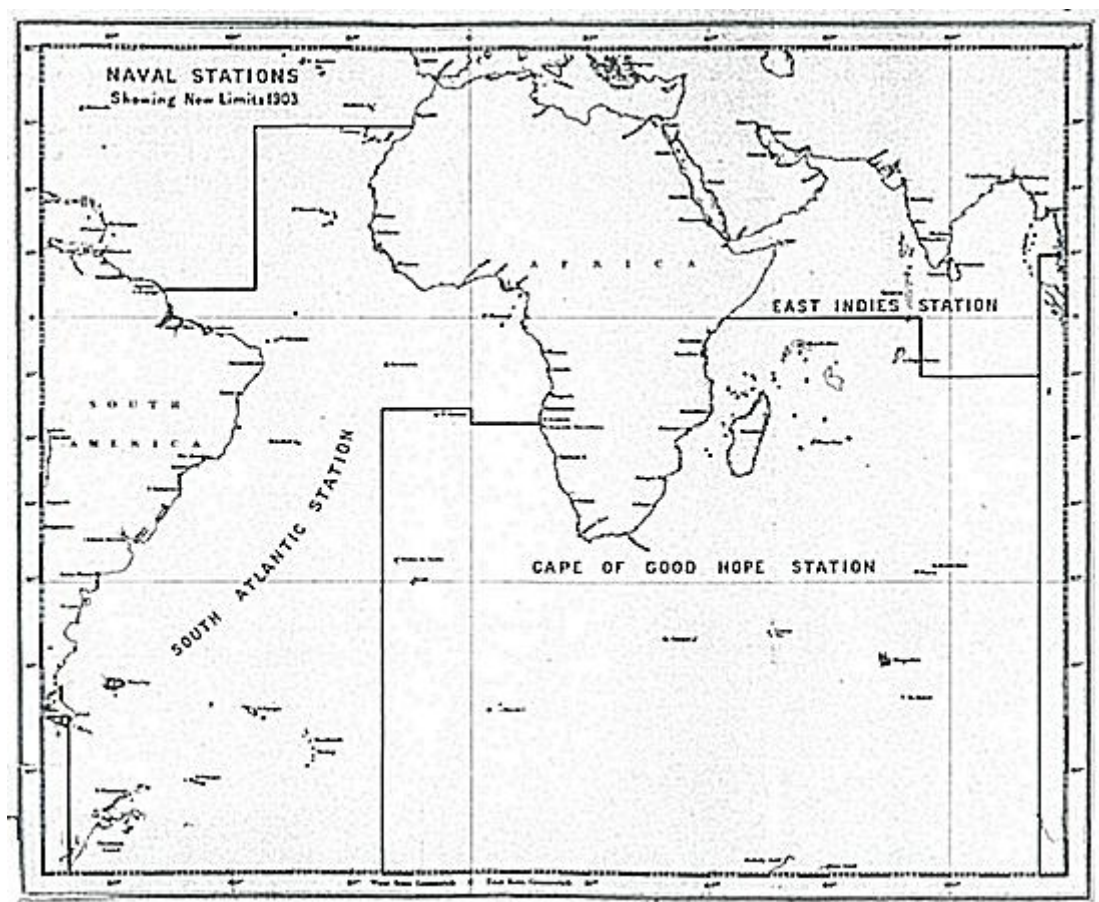
³⁵ *Ibid*

boundaries of all the Royal Navy's foreign stations from this date, and the lines of submarine and land telegraph cables as drawn by the NID.³⁶

³⁶ TNA ADM 231/42 NID Report No.746 British Colonies China Station. Resources and Coast Defences 1905

Map 4.2

Naval Stations Showing New Limits 1903

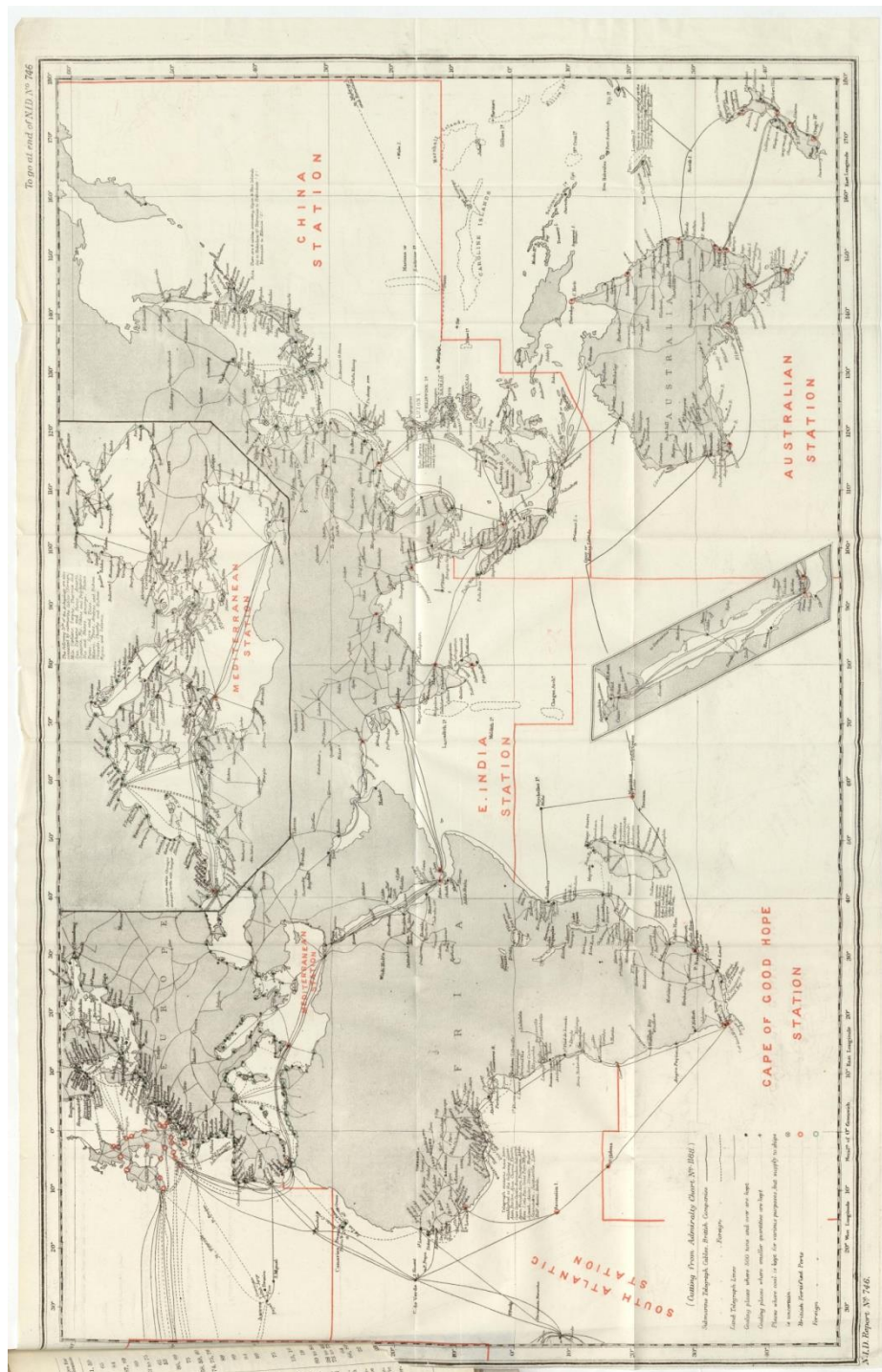


Source: TNA ADM 125/56 Circular Letter from Evan MacGregor (Permanent Secretary to the Admiralty) to Commanders-in-Chief and Senior Officers at Home and abroad

28 February 1903

Map 4.3

Naval Station boundaries from August 1903 including submarine and overland telegraph cables



Source: TNA ADM 231/42 NID Report No.746 British Colonies China Station. Resources and Coast Defences 1905

Owing to their varied geography, the presence of colonial and trade rivals, and the strained nature of local and internal politics, the Royal Navy's Far Eastern stations posed an interesting series of operational requirements for vessels and crews alike. Chinese waters are particularly notable in this regard, since the provisions of the 1889 Naval Defence Act included two second-class battleships specifically designed for use in this region (and on the Pacific stations).³⁷ As reduced versions of the *Royal Sovereigns* these modestly sized vessels were intended to counter big Russian cruisers stationed in the region, and designed with a shallow 26ft draught specifically to allow operations on Chinese rivers.³⁸ During the 1890s they formed the backbone of British naval power in the Far East, *Centurion* commissioning as Flag of the China Squadron in February 1894, and *Barfleur* as R/A Flag China Squadron September 1898, supporting the smaller cruisers and gunboats that comprised the bulk of the vessels on the station.³⁹

By the middle of the decade however thoughts were already turning toward the employment of something more formidable, largely due, at least in the opinion of the DNC, to the reinforcement of the Japanese fleet by Chinese vessels captured during the Sino-Japanese war, 'which obviously must have a bearing in the types and numbers of ships of the Royal Navy required for the defence of our interests in Eastern Seas.'⁴⁰ The resultant *Canopus* class battleships, like the two *Centurions* were thus specifically intended for use in the Far East, with a shallow draught to allow transit through the Suez Canal and operations on the major Chinese rivers.⁴¹ These ships would also be supported by the cruisers, dispatch vessels and gunboats typically employed on foreign stations.⁴² Yet the new century brought further developments, and by 1902, views on the composition of the station were changing once again.

In March 1901 Vice-Admiral Sir Cyprian Arthur George Bridge was appointed C-in-C China Station, and instructed to hoist his Flag aboard the *Canopus* class battleship HMS *Glory*, which was to be sent to meet him at Nagasaki.⁴³ He held the position until he was succeeded

³⁷ D. Brown *Warrior to Dreadnought: Warship Development 1860 – 1905* (London: Caxton, 2003) p.131

Although never employed there, they were of course also well suited for use on the East Indies Station

³⁸ *Ibid* pp.131-132 The shallow draught also made transit through the Suez Canal easier

³⁹ O. Parkes *British Battleships: A History of Design, Construction and Armament 1860 – 1950* (London: Leo Cooper, 1990) p.370

⁴⁰ White, cited in Parkes *British Battleships* p.392

⁴¹ Brown, *Warrior to Dreadnought* p.144

⁴² The *Centurions* would also still be found on the station, supporting the larger vessels, until mid-1905.

⁴³ NMM BRI 15 pt.6 Letter, Evan MacGregor to Cyprian Bridge (25 March 1901)

on his retirement in March 1904 by Vice Admiral Sir Gerard Noel.⁴⁴ Cyprian Bridge came from a naval background, one of his great-uncles having fought under Rodney, and he was nominated as a naval cadet by Admiral Sir Thomas Cochrane, to whom his father had been Chaplain.⁴⁵ An intellectual with a keen interest in naval and wider history his career was distinguished; he had been an able Director of Naval Intelligence (DNI) 1889-1894, and upon his promotion to Rear-Admiral, appointed C-in-C Australia station. Bridge was a founding member of the Navy Records Society and was, with John Laughton, Reginald Custance and Philip Colomb, largely responsible for the development of scholarly study of Britain's naval past and strategic doctrine during the 1890s.⁴⁶ A measure of his standing may be seen in a message from the King, who had served under him during his time in the Royal Navy, expressing his sympathy to Lady Bridge upon the Admiral's death in 1924, and perhaps more significantly, a similar message from Japanese naval officers who remembered him from his time in China, these including Admirals Togo and Yamamoto.⁴⁷

Bridge published widely on naval strategy and tactics, many of his texts being well received by contemporaries and remain of considerable interest.⁴⁸ His views on the value of the convoy system in particular were rather more measured than many of his contemporaries, and while he noted the potential economic and strategic pitfalls, like Samuel Long and Philip Colomb he did not rule it out entirely.⁴⁹ He was also a firm believer in the value of reducing administration, which he saw as frequently wasteful and diverting the attention of officers from more important professional issues. An example of this may be found in the records of the East Indies Station, where the C-in-C, with considerable exasperation, was obliged to become embroiled in 'the question of stationary required by the Engineer Officer of the Torpedo Sub-Depot at Bombay.'⁵⁰ Bridge's dryly expressed view upon such matters was 'it is

⁴⁴ NMM BRI 15 pt.2 Letter, Evan MacGregor to Cyprian Bridge (14 May 1904)

⁴⁵ The Times *Obituary, Admiral Sir C. Bridge: Long and Varied Service* (August 18 1924) p.12

⁴⁶ Grimes *Op. Cit.* p.12

⁴⁷ The Times *The Late Sir Cyprian Bridge: Message from the King* (August 20, 1924) p.13

⁴⁸ Of particular note are 'Naval Strategy and Tactics at the Time of Trafalgar' *TransINA*, Volume XLVII (1905); *The Art of Naval Warfare: Introductory Observations* (London: Smith, Elder & Co., 1907); *Seapower and other Studies* (London: Smith, Elder & Co., 1910) –the last is a collection of some of Bridge's many published essays, including the INA paper mentioned. In general, Bridge's views lack the strategic depth of understanding that Corbett in particular brought (Bridge was anti-Corbett's approach), nor did they always keep pace with the latest Admiralty thinking, such as on Economic Warfare. Despite their somewhat more simplistic approach however, they also contain much sound common sense, and Bridge had a gift for putting concepts across in a clear and concise fashion

⁴⁹ Bridge *The Art of Naval Warfare* pp.145-153

⁵⁰ TNA ADM 127/23 Letter Admiralty to Rear-Admiral Bosanquet, 7 September 1901. A century later, one still feels for Bosanquet; while no phoenix as a naval commander, he certainly had little desire to be faced with such nonsense

not remembered as often as it should be that if the packet carrying to headquarters all the returns and reports of exercises in a particular fleet or squadron were to go to the bottom with her mail bags, the efficiency of the fleet or squadron concerned would not be affected one way or the other.⁵¹

On 14 December 1901, during his private correspondence with Selborne, Bridge remarked on there being two general functions that the China Squadron was expected to undertake.⁵² The First Lord picked up on this point with aplomb; the initial remarks in his lengthy response, dated 11 February 1902 dealt with the Admiral's concern regarding the new extended dockyard at Hong Kong not being large enough (although requesting the C-in-C's fuller views on this subject 'when the news which will be published today have reached you, news which will not make it necessary for us to retain as large a fleet on the China Station as we should otherwise have had to do.')⁵³ Moving to Bridge's more theoretical views, he continued:

What you write as to the China Station, that two Naval questions of totally different character have to be solved upon it, is absolutely true. Two squadrons composed of two totally different classes of ships have to be maintained there. One is maintained for political purposes vis-à-vis the Chinese and the commercial rivalry of foreign nations, the other is maintained strictly for naval purposes... Can or cannot the squadron of ships which will be practically useless in Naval war be reduced in number? I am prepared to take nothing for granted without such an examination. We are so conservative in our habits and ideas that we clothe with all the merit of profound policy what is often the hoary result of sheer accident. All the ships which we maintain for political purposes in China may be necessary; but I am not prepared to believe it merely because the Foreign Office, who dislike our diminishing the number says so, or because I am told at the Admiralty that "it has always been considered necessary to maintain these ships." It may be necessary but I want to know why it was necessary and whether it still is necessary.⁵⁴

⁵¹ Bridge *The Art of Naval Warfare* pp.27-28

⁵² NMM BRI 15 pt.3 Letter, Bridge to Selborne, (14 December 1901) p.2

⁵³ NMM BRI 15 pt.3 Selborne to Bridge (11 February 1902) p.2 A clear reference to the Anglo-Japanese Alliance, publically announced on the 12th February 1902

⁵⁴ *Ibid* pp.2-4

Although the need to make economies was well-known to Selborne (see Chapter Five), and his query in part rather suggests a man actively in search of savings, there is also much of merit in terms of his strategic appreciation, and his refusal to accept anything on blind faith. The remarks about vessels maintained for ‘political purposes’ is evidently referring to small types such as the gunboats used in littoral zones throughout the Far East, about which he rightly had severe reservations. Bridge’s reply to Selborne’s letter of 11 February took the form of an official memorandum, ‘Duties and Classes of Ships on the China Station’, in which he addressed the various questions Selborne had raised in a semi-official capacity, including reviewing the major roles of the China Squadron.

The First Lord has asked for an answer to questions as to the proportionate number of ships on the station maintained for what may be called local political reasons and as to the suitability of different classes in Chinese waters. The Following is submitted in reply.

The First Lord has drawn attention to the fact that the British fleet in China has two ends in view. One is the “local political” object above indicated, which is to show the Flag at the ports and in the rivers of China so as to intimate to the Chinese the constant availability of the power behind it and to serve, in emergent cases, as a direct protection to our fellow-subjects residing at different places in the Chinese Empire. The second object is more purely naval. It is to keep an adequate force of effective cruising ships in a sphere in which other naval nations are strongly represented on the sea and in which it would be a grievous strategic error on our part to allow ourselves to be outnumbered by any important rival or union of rivals.⁵⁵

Although slightly pre-empting events, these two semi-formal letters between the First Lord and the C-in-C may be said to mark the initial step toward a change in the composition of the China Squadron, toward a more unified force structure in which the first-class cruiser would come to play an increasingly dominant role.

⁵⁵ NMM BRI 15 pt.4, *Duties and Classes of Ships on the China Station* (March 1902) para.2

The first-class cruiser in the Far East: functions and operations

In time of war the principal military role of the first-class cruisers attached to the China Squadron would have been commerce protection, heavy scouting for the battlefleet (while the battleships remained on-station), support for smaller cruisers and, per the Royal Navy's general strategic approach of the time, the protection of trade routes and communications to other parts of the Empire, notably to the UK mainland, India and, perhaps less obviously, but still profitably, Australia.⁵⁶ A major reason for their presence was of course thus to counter the threat by rival powers of a *guerre de course* in this region. Russia in particular had stationed dedicated commerce-raiding vessels at their own possessions, in line with the general policy of *guerre industrielle*. Included amongst these was the infamous *Rurik* referred to in the previous chapters, forming with her immediate successors *Rossia* and *Gromoboi* the backbone of the Russian Pacific cruiser squadron, with varying support from smaller second-class protected types like the *Bogatyr*. Further to these, two of the *Peresviet* second-class battleships, which had been heavily influenced by the British *Centurions* were also in the Far East.

Somewhat ironically Cyprian Bridge was not particularly well-disposed toward large first-class cruisers in principle, favouring greater numbers of modestly sized vessels over a small number of larger and militarily speaking more powerful ones. Following his retirement, he would summarise his views on such vessels as a preference for constructing the smallest and least costly ships that could play their part in war, 'rather than the biggest that the naval architects and engineers were able to design and build.'⁵⁷ This opinion is operationally confirmed by his reply to Selborne's letter of 11 February, in which the First Lord had also enquired 'whether you [Bridge] consider that big cruisers like the *Terrible*, *Argonaut* or *Blenheim* are the right type for the China Station.'⁵⁸ In answering this, Bridge stated that

...In the question put, the First Lord was pleased to refer specially to cruisers of great size –the "*Terrible*", "*Argonaut*," and "*Blenheim*". In my opinion ships of these classes are not the best for the China station. I think this even whilst remembering the kind of cruisers which the Russians, for example, have in these seas. Strategic and

⁵⁶ For the latter, see TNA ADM 1/6862 NID Report No.140, Vice-Admiral Vesey Hamilton *The Protection of British Trade between China and Australia* (6 May 1887)

⁵⁷ Cyprian Bridge 'American and British Naval Preparations' in *Current History: A Monthly Magazine of The New York Times* Volume XIII, Part II, No.3 (March, 1921) p.380

⁵⁸ NMM BRI 15 pt.3, Selborne to Bridge (11 February 1902) p.4

tactical reasons, together with experience, as recorded in President Roosevelt's very valuable naval history of the war of 1812, make it highly probable that 8 cruisers of the "*Eclipse*" class with an aggregate displacement of 22,000 tons would be more likely to frustrate the activity of the "*Rurik*" and 2 similar ships than the "*Terrible*", "*Argonaut*", "*Amphitrite*", and "*Blenheim*" displacing together 45,000 tons.⁵⁹

Bridge's assessment shows a consistency of opinion from his time as DNI a decade before, when during the naval manoeuvres he was largely responsible for planning, second-class cruiser types had featured heavily.⁶⁰ His analysis of the War of 1812 is somewhat unusual, since the naval engagements of the conflict are more usually assessed as demonstrating the value of possessing vessels more powerful than those of an opponent. Since the *Powerful* class in particular had been specifically intended to counter the *Rurik* and her immediate successors, and were naturally attached to the China Squadron, this placed Bridge almost completely at odds with Board policy regarding commerce protection, although he was not alone in holding such views. He did, however, appear to take a marginally more positive view of some of the new side-armoured types, commenting that he counted the *Cressy*, which had recently been dispatched to the Far East, as being attached to, 'if not actually one of, the battleships.'⁶¹ This at least matched the intentions for this class of first-class fleet-cruiser (along with the subsequent *Drakes*), and is a perfect illustration of the crossover in capabilities between battleships and first-class armoured cruisers that occurred during the first years of the Twentieth Century, and how this was reflected operationally.⁶²

Cruiser operations formed a significant part of the station exercises held during the early months of 1903. Little of the documentation appears to have survived, but it is possible to piece together some details from wider correspondence. Selborne noted them briefly in a private letter dated 29 June 1903, commenting that he had read the account of the exercises 'with great pleasure and interest.'⁶³ He dwelt upon these at greater length in a further letter of 11 October 1903. During these exercises, it appears that Bridge had deliberately kept his

⁵⁹ NMM BRI 15 pt.4 *Duties and Classes of Ships* para.16-17

⁶⁰ See Chapter Two

⁶¹ NMM BRI 14 pt.3 *Bridge to Admiralty: Memorandum on the value of large cruisers* (5 July 1902) p.2

⁶² F. Manning *The Life of Sir William White* (London: John Murray, 1923) p.366 As noted in Chapter 3, *Cressy* had armour protection roughly equivalent to Bridge's *Canopus* class battleships. Quite what he would have made of the *Monmouth* and *Devonshire* classes in his guise as C-in-C China Station is somewhat more open to question, although since they were roughly akin to the *Blake* and *Diadem* classes in size, it is improbable that his preference for second-class cruisers would have altered significantly

⁶³ NMM BRI 15 pt.1 *Selborne to Bridge* (19 June 1903) p.4

vessels at sea for as long as possible, something he had already written to the First Lord about, shortly after taking command of the China Squadron. Selborne noted in this regard that

Nothing can be worse economy in my mind or more mischievous in tendency than your fleet should not be able to keep the sea, and I would rather you curtailed every other duty which consumes coal rather than curtail or diminish by a single day the combined exercises of the squadrons under your direction to which the Board attach the highest value and without which the proper training of your officers and crews cannot be carried out. It would also be deplorable if it were true that our ships keep the sea less than the French, or Germans or Russians...⁶⁴

It appears that for these exercises Bridge concentrated upon the role of trade defence, grouping cruisers together into hunting elements, while occasionally detaching the largest protected types to operate singly, retaining side-armoured vessels to operate with the battleships. He also appears to have paid some attention to the use of torpedoes and submarine mines, both in terms of the deploying of, and defending against, these weapons, just as he had when planning the annual Manoeuvres during the early 1890s.⁶⁵ Much of this was done within the context of small-scale blockade and assault on enemy harbours, for which the cruisers would be employed along with the battleships. This last was mirrored by plans on the East Indies Station for similar assaults on enemy harbours in time of war, notably Diego-Suarez.⁶⁶ That both blockade and amphibious and coast-assault were under contemplation ties closely to the contemporary NID's views, the echoes of which may be traced back to the 1860s and earlier.⁶⁷

Outside of the exercises, the first-class cruisers stationed in the Far East on both the East Indies and the China stations engaged in regular patrols of major commerce routes and ports kept an eye on various ports, even if they were not themselves visiting at that time. Showing the Flag was one of the primary peacetime functions of the Royal Navy's foreign squadrons. This was equally directed at the indigenous populations and rival colonial powers. As may be anticipated, this could progress into more coercive forms of gunboat diplomacy as a natural

⁶⁴ NMM BRI 15 pt.3 *Selborne to Bridge* (11 February 1902)

⁶⁵ NMM BRI 15 pt.1 *Selborne to Bridge* (11 October 1903)

⁶⁶ TNA ADM 116/1228B

⁶⁷ A. Lambert 'Economic Power, Technological Advantage, and Imperial Strength: Britain as a Unique Global Power, 1860 – 1890' *International Journal of Naval History*, Vol.5 No.2 p.26 See also Grimes *Op. Cit.* p.32

policy progression if required. Thus, in the Far East during the period 1901–04, there were two major requirements. The first of these was to demonstrate a military presence to local powers, and if necessary to prevent any possible civil disturbances on the part of the local population against British possessions or interests. Equally, the second was to intimate to rival colonial powers that the self-same British possessions and the trade from and through the region were carefully guarded.

Considering such operations for the ‘local political object’ (viz. dealings with indigenous powers and populations), except at the major coastal ports, these duties had traditionally been carried out by small gunboats and sloops such as the *Woodcock* class. On the China Station, typically, these vessels were based at Hong Kong, Singapore, or Hankow, and patrolled the various tributaries, or, frequently, remained in place at a particular river port or anchorage for a season at the request of a local Consul. By the early 1900s the merit of this policy was beginning to be questioned, as Selborne’s letter to Bridge indicated. The C-in-C’s reply confirmed the suspicions of the First Lord, stating he was of the opinion that there was no real necessity for such, since the Chinese population following the Boxer uprising did not have any deliberate intention to attack British subjects living in the area, and that any acts of aggression toward them would be less a matter of reasoned decision and more of unpremeditated impulse, which would not note the presence of such small gunboats.⁶⁸ In this he was almost certainly correct, and in truth the majority of these small vessels, rarely over 1,000 tons displacement and very lightly armed, were valueless for military purposes, while draining resources.

In the “low river” season on the Yangtze they cannot go above Wuhu, they are sure to be neaped: they cannot get to and leave Foochow at will: reaching Tientsin is quite beyond them: and they can only get to Wuchow, if at all, when the West River is high. They are quite unfitted for the reception for a considerable number of refugee foreigners. The “*Algerine*” took a brilliant part in the attack of the Taku Forts; but no-one will contend that it was her 4 inch guns alone which forced the abandonment of those works or that guns of that nature – more especially in very small numbers – are the right weapons to use for cannonading coast fortifications.⁶⁹

⁶⁸ NMM BRI 15 pt.4 *Duties and Classes of Ships* para.4

⁶⁹ *Ibid* para.6 ‘Neaped’ here referring to the probability of the vessels being grounded until the next cycle of (high) spring tides when they would hopefully be able to float off. The attack referred to in which HMS

As such, there was little wonder that Bridge adopted a different policy as far as he was able at a station level, which objectively speaking was less wasteful of resources. As referred to above, the *Canopus* and *Centurion* class battleships had both deliberately been developed with an eye to operations on the Chinese rivers, and also for passing through the Suez canal, though in the case of the former, as their load-draught was some 26ft 2in, and the maximum draught for the Canal, until 1902 was 25ft 4in, they had to transit light.⁷⁰ Significantly the same shallow draught requirement to allow passage through the Canal (and for other reasons of hydrodynamic efficiency) meant that many of the first-class cruisers, particularly the slightly earlier and smaller units such as the *Edgar* class were also capable of similar operations on the major rivers of China, despite no such operational requirement having been specified by the Board.⁷¹ While such first-class cruisers drew substantially more water than the small river gunboats, in many cases the latter as referred to above also struggled to reach upriver ports and were they to do so, were liable to being neaped in the low-river season, rendering them incapable of withdrawal and erasing their already minimal military value. Thus, despite appearances larger types were often at less of a disadvantage relatively speaking than might be initially believed, and during the first years of the Twentieth Century there was an increasing move toward using first-class cruisers for such duties when possible.

If used in short visits to those ports they could reach on a regular basis, while the smaller craft were employed in a like fashion for ports further upriver during the seasons they could be easily attained, this resulted in a far more effective demonstration of British naval presence, and one which was more likely to be capable of taking coercive action should the need arise. The far heavier armament of these cruisers was also clearly a huge improvement over the small ships, even though their batteries of flat-trajectory QF or rapid-firing breech-loaders were far from ideal weapons for use in shore bombardment. Sub-optimal though they were for such a role, they certainly would have been a rather marked improvement as compared to the handful of 4in or lighter weapons typically carried by gunboats. As a further bonus, their size also would have enabled the embarking of numerous refugees if necessary, while their high speed meant relatively rapid seagoing transit times were they to be called from other parts of the Station.

Algerine, a *Phoenix* class (steel) screw-sloop, participated, took place during June 1900 in the latter stages of the Boxer Uprising.

⁷⁰ Brown *Warrior to Dreadnought* p.144

⁷¹ S. Morse [ed.] *War Machine Issue 90* (London: Aerospace Publishing Ltd., 1985) p.1794

This new policy of visiting ports rather than constantly patrolling and / or having a vessel almost permanently in place also tended to wean Consuls at British colonial (rather than Treaty) ports of the habit of expecting the presence of an R.N. vessel.⁷² The visit of HMS *Endymion* to Hankow is one of the best examples of the use of first-class cruisers on the Chinese rivers:

Endymion is the heaviest man-of-war that has ever been to Hankow... and I think the ship's presence had a good effect. We found no difficulties of navigation, and you could take your flagship [*Canopus* class battleship HMS *Glory*] up without risk. I have a mass of statistics about the forts, which I will condense shortly, also I have had taken a number of photographs –these must go down to Shanghai to be enlarged...⁷³

The visit of a major combatant like *Endymion* to a city so far upriver, indicating that the China Squadron was capable of, and prepared for operations hundreds of miles up the Yangtze was of great significance.⁷⁴ *Endymion* herself was a well-known vessel since she had taken part in the suppressing of the Boxer uprising a short time before, and the psychological impact of seeing a reasonably large cruiser (some 7,700 tons in the case of the *Edgar* class) so far upriver should not be underestimated.⁷⁵

During the early years of the Twentieth Century, the threat of local disturbances in the Far East necessitated the presence of major units on several occasions. Whilst these were nowhere near the scale of the Boxer uprising of 1900 in China, with its massive implications for European economic and political interests, they were still taken seriously.⁷⁶ Generally, a first-class cruiser was the preferred vessel for dispatch in China, and when possible on the East Indies Station, usually for the reasons discussed above, and because their speed enabled them to reach troubled areas more quickly than the full battle-squadron, which would join it should this prove to be necessary.⁷⁷ For example, a cruiser was almost invariably stationed at Hong Kong specifically 'for prompt dispatch to a treaty port or elsewhere in the event of a

⁷² NMM BRI15 pt.4 *Duties and Classes of Ships* para.6 Bridge further pointed out that Consuls at Colonial ports did not in fact have any right to ask for the presence of a Royal Navy vessel.

⁷³ NMM BRI 14 Letter from Paget to Bridge dated *Endymion*, Nanking, (10 September 1902) p.1

⁷⁴ *Ibid* typed clipping attached to p.2

⁷⁵ *Jane's Fighting Ships of World War I* (London: Studio Editions, 1990) p.54

⁷⁶ *Young British Policy in China* p.267 Russia had committed over 1.5 billion Roubles to the Far Eastern region, and particularly to their Chinese possessions and aspirations, since 1896 alone

⁷⁷ NMM BRI 15 pt.1 Private letter Selborne to Bridge (11 October 1903) p.3

sudden emergency.⁷⁸ This was as much, as hinted in the cited remarks, a question of perception on the a diplomatic and political levels as it was a military question; the use of large vessels, independent of their fighting capacity sent a clear message of intent to rivals.⁷⁹ Such vessels brought with them prestige, and this was of exceptional utility in projecting a suitable image in the international arena. Just as the battlecruisers of the dreadnought era, their pre-dreadnought equivalents were rather more ‘glamorous’ than other vessels in the fleet, it can be argued that they also exemplified the Royal Navy’s characteristically offensive stance / image. It is notable that cruisers frequently gained the highest scores in gunnery competitions, possibly assisted by their often having slightly younger and technologically minded officers than their battleship counterparts. For example, it was by no means uncommon for over 70 per cent of rounds fired to register as hits in the China Squadron at typical contemporary battle ranges and in competition, as officers adopted Percy Scott’s methods (notably continuous aim techniques), which had been partly developed and refined during his time as Captain of the *Terrible* in the Far East.⁸⁰

The Royal Navy’s Far Eastern squadrons had been instrumental during 1901 in assisting at a local level the Anglo-Japanese Alliance, and unsurprisingly Cyprian Bridge of the China Station in particular was later thanked upon his retirement and the transfer of his command to Vice Admiral Gerard Noel for ‘the admirable manner in which you so successfully carried out the various detailed Naval arrangements consequent on the Japanese Alliance, requiring both tact and judgement.’⁸¹ Since he had been C-in-C Australia, and had also spent time as a captain some years earlier on the station, serving as Deputy Commissioner for the Western Pacific, he was rather more familiar with the Far East, and the wider area than many other senior officers from his time, which undoubtedly helped him in his task.⁸² It is quite possible that this was a factor in his being given the command. Two years later, the Russo-Japanese War would see the most dramatic instances of first-class cruiser operations to date.

⁷⁸ TNA ADM 116/967 China Station Standing Orders, Article V, p.59

⁷⁹ Grove *The Royal Navy* pp.81-2

⁸⁰ Brown *Warrior to Dreadnought* p.155 This was post the reforms which corrected the appallingly badly adjusted Barr and Stroud rangefinders, and caused a considerable scandal both within and outside the service. See NA ADM 125/56 (10 July 1902) which lists the error reported against a measured distance. The error of 2,300yds against a measured distance of 5,000rds by the *Talbot’s* range finder is the most spectacular example.

⁸¹ NMM BRI 15 pt.6 Copy of letter from Evan Macgregor to Bridge, dated Admiralty, (14 May 1904

⁸² H. W. Richmond, Paul G. Halpern, ‘Bridge, Sir Cyprian Arthur George (1839–1924)’, rev. Paul G. Halpern, *Oxford Dictionary of National Biography*, Oxford University Press, 2004 [<http://www.oxforddnb.com/view/article/32058>, accessed 10 Oct 2010]

The conflict was of particular interest to Britain since, notwithstanding the alliance with Japan and the fact that the Japanese navy was largely British built and had adopted much of the RN's tactical thinking, the geographical relationships involved between Japan and the Asian continent were almost identical to those of Great Britain and Europe.⁸³ Thus, strategy, tactics and material all bore close relations to British practice and were tested operationally against one of the main rivals envisioned, albeit one that the service did not regard especially highly.⁸⁴ First-class cruisers would play a considerable role in the maritime conflict on both sides, especially the Japanese, where they would be a major component in both the major fleet-actions of the conflict, as well as an engagement with their counterparts. At the Battle of the Yellow Sea on 10 August 1904, the two small Italian-built Japanese armoured cruisers *Nisshin* and *Kasuga* joined the rear of Admiral Togo's battle-line before the action, and during the early stages would in fact lead the Japanese line, which, following Togo's initial manoeuvring, was in reverse-order.⁸⁵ The remaining Japanese cruisers under Admiral Dewa performed respectably, but the rather poor cohesion of the Japanese force arguably hampered their ultimate effectiveness.⁸⁶ Four days later off Ulsan however, cruisers of the belligerents would engage in a second action, the three large Russian commerce-raiding vessels *Rurik*, *Rossia* and *Gromoboi* of the Pacific cruiser squadron based at Vladivostok meeting with four Japanese armoured cruisers and two smaller second-class protected types.⁸⁷ The intention had been to attempt a rendezvous between the two Russian fleets, though owing to a delay in the cruisers sailing there was little likelihood of their being in time to assist the Port Arthur squadron at the critical passage of the Tsushima straits, assuming the latter had been able to break the Japanese blockade.⁸⁸ Having escaped under cover of darkness the Russian force found itself cut off from Vladivostok by the Japanese cruisers and over the course of an action that lasted some four hours, the *Rurik* was sunk from a combination of shellfire and scuttling, and the *Rossia* and *Gromoboi* severely damaged. The action was a relatively one-sided affair, the Japanese force breaking off the chase when it was believed (incorrectly) that their ammunition supply was almost expended, the surviving Russians making a similar conjecture that such an eventuality had saved them from destruction.⁸⁹

⁸³ J. Corbett *Maritime Operations in the Russo-Japanese War 1904-5* Admiralty War Staff, Intelligence Division No.944 (January 1914) p.1

⁸⁴ Seligmann *Op. Cit.* p.863

⁸⁵ Corbett *Op. Cit.* p.374 & pp.380-381

⁸⁶ *Ibid* p.390

⁸⁷ Five of the Japanese vessels were of Armstrong design and construction

⁸⁸ Corbett *Op. Cit.* p.432

⁸⁹ *Ibid* pp.447-448

Nine months later at Tsushima, the Japanese cruisers would play the most significant part such vessels would ever have in a fleet engagement, two-thirds of the twelve Japanese capital ships being such types, two being attached to Admiral Togo's four battleships to form the First Division, the remaining six operating as the Second Division fast wing of the fleet under Vice-Admiral Kamimura, who had commanded the Japanese cruisers at Ulsan. Tactically the Japanese followed typical RN preferences for placing the most powerful vessels at the ends of the line, maximising flexibility since the division could turn together and retain the same fighting power.⁹⁰ Kamimura's division performed the classic fast-division role, exploiting its speed to gain advantageous tactical positioning and support the battleships, almost precisely the objectives held for the RN's *Cressys* when designed in 1897. Under the medium-close range combat conditions of the battle, the cruisers had much the same striking power as the battleships since their 8in weapons had a much higher rate of fire than the 12in and adequate armour-piercing capacity.⁹¹

The Russian cruisers were quite easily defeated in the Ulsan action by the Armstrong-designed Japanese vessels, which were themselves inferior to Royal Navy types, having a lower sustained sea-speed, a smaller armament and far inferior protection than either the *Cressy* or *Drake* classes. The protected-deck *Powerfuls* and *Diadems* would also likely have fared well, given their well-protected armament, conning tower and vitals –much of the heavy loss of life on the Russian vessels was due to the lack of armour around their artillery, though despite the mediocre quality of their belts, the Russian cruisers stood up quite well to QF fire, which remained a ship-disabling rather than sinking weapon. As far as the Royal Navy was concerned, the Yellow Sea engagement ultimately had the greatest impact of any of the engagements in terms of information and lessons that could be gleaned, and this was largely a matter of determining the future lay with the big gun, since at the Yellow Sea, fire took place at several points at extraordinary ranges for the period of over 14,000 yds.⁹² Tsushima pointed to a rather different conclusion, suggesting the primacy of the QF gun remained, especially at short-medium range, but the former was preferred by gunnery specialists like Bacon and others, who were set to begin exploiting the latest technological developments in fire-control.

⁹⁰ E. Grove *Fleet to Fleet Encounters: Tsushima, Jutland, Philippine Sea* (London: Arms & Armour, 1991) p.19

⁹¹ *Ibid* pp.20-21

⁹² Corbett *Op. Cit.* pp.380-381

Far Eastern logistics and the first-class cruiser

The Royal Navy's global strategic capacity through the late Nineteenth and early years of Twentieth Centuries hinged on two critical areas of infrastructure: communications and a global network of not just coaling stations, but dry docks.⁹³

As noted in Chapter One, the globe-spanning electric telegraph network provided the cornerstone to the former. The advances wrought in long-distance communications during the Nineteenth Century, 'although essentially commercial, were aided, directed and influenced by the application of Government funds.'⁹⁴ The development of this, the first global high-speed communications network, the reliability, speed and breadth of which were continually enhanced over time provided the means by which the British Empire could be welded into a single strategic entity, allowing easy reinforcement of threatened areas.⁹⁵ British control over the majority of the submarine telegraph network was a critical advantage over colonial rivals, and while the advent of wireless telegraphy and improvements by rivals in their own networks began to erode this somewhat, Britain still retained an edge. The advantage this brought was not lost on contemporary RN senior commanders, both in the Admiralty and on foreign stations, and were continually exploited. Some breakdowns did occur however, and were taken seriously, an example occurring between Cyprian Bridge and Day Bosanquet's successor as C-in-C East Indies Station, Charles Drury. During early spring 1903, the C-in-C China Station expressed considerable displeasure in a bluntly-phrased letter to the Secretary, complaining that several 'foreign men-of-war have reached the China station, without having been reported between the Suez canal and some port on this station.'⁹⁶ He cited the instance of the French *Gueydon* class armoured cruiser *Montcalm*, which was reported on leaving Port Said and was then largely ignored until a chance sighting of her passing Singapore on the way to Saigon.⁹⁷ The Admiralty concurred in this view, drawing the attention of the C-in-C East Indies

...to the failure to report movements of foreign ships of war to or from China Station, and Colonial Office has also been approached for the purpose of instructing the

⁹³ Lambert *Economic Power, Technological Advance...*

⁹⁴ *Ibid* p.10

⁹⁵ *Ibid* pp.10-11

⁹⁶ ADM 125/56 *China Station Records Volume XLII* pp.115-116 Letter from Bridge to Admiralty (2 April 1902)

⁹⁷ *Ibid*

Master Attendant at Colombo to report such movements to you direct as well as to the C-in-C East Indies, and the Admiralty.⁹⁸

The ability to centralise control and divert resources where required to deter possible challengers or threats to the empire had resulted in the 1860s in the establishing of the Flying Squadron under Geoffrey Hornby, and while largely an economy measure introduced under the Liberals, was also relatively practical given the contemporary near-stranglehold on the global telegraph system.⁹⁹ The dedicated cruiser squadrons of the 1890s and later were effectively its direct descendent. Bridge was a strong supporter of the concept, commenting in July 1902 that the largest first-class cruiser types could be usefully organised into such squadrons attached to no individual station ‘but visiting in succession each of several stations.’¹⁰⁰ Assuming that foreign stations maintained a number of smaller, but ‘moderately large’ cruisers on a permanent basis, it was suggested that two or three visits from such flying squadrons of large first-class vessels would increase its strategic and tactical effectiveness, and demonstrate that reductions were not contemplated –an echo of the arguments that created Hornby’s original Flying Squadron.¹⁰¹ The late modification of certain French naval squadrons, it was submitted, was ‘...in reality nothing but the partial adoption of the ‘flying squadron’ principal. Our reply to it, I submit, ought to be adoption of the same principal, not partially, but in full.’¹⁰²

Closely linked, and key to the success of the strategy was the establishing and maintaining of bases capable of servicing vessels properly, since this was the only way a fleet or squadron could realistically operate in distant waters for any length of time. This was far more than a question of simple coaling-stations or harbours though; the steam-age brought with it an increasing requirement for dry-docking, primarily for ensuring hulls were kept clean, but also for more general maintenance requirements. Even for the world’s dominant sea power, the establishing of a global network of such bases took time, which had itself been a factor in the service retaining sail as long as it did for some classes of vessel. It was also an extremely expensive process, particularly since future size requirements needed to be taken into account

⁹⁸ *Ibid* Ref M-0590, No.309 During 1902 It is possible that the transfer of command of the East Indies Station in 1902 from Rear-Admiral Day Bosanquet to Rear Admiral Charles Drury may have caused a certain amount of administrative disruption

⁹⁹ A. Lambert *Admirals: Naval Commanders Who Made Britain Great* (London: Faber and Faber, 2008) p.260

¹⁰⁰ NMM BRI 14 pt.3 *Memorandum on the value of large cruisers* pp.2-3

¹⁰¹ *Ibid* p.3

¹⁰² *Ibid*

when designing and constructing the stone docks themselves, while suitable areas needed to be surveyed and if required purchased since such structures required substantial foundations, even with suitable underpinning geology.¹⁰³ The general Admiralty policy until around 1890 had been to encourage commercial dock construction which would be available to service vessels, and provide facilities in key areas where the seaborne economic activity was inadequate to support them.¹⁰⁴ As a result, the number of dry-dock facilities available to the RN was far greater than those available to most other colonial powers, and steadily expanded over time as a key component in the service's ability to operate, and if required, fight, on a global scale. Ultimately this allowed Britain to maintain its position as the dominant world-wide seapower, which, though it could not destroy a major rival power, could 'exhaust their military and economic resources and ultimately break their political will.'¹⁰⁵

Since the largest types of first class cruiser were typically rather longer than their battleship contemporaries, they would not physically fit many existing installations. This naturally had significant implications for many of the foreign stations, and the Far East was no exception to this. Although capable of visiting numerous ports, providing they required little in the way of care and maintenance, there were relatively few places throughout the world where full docking facilities were available for their use. To an extent, the limited number of global support-facilities for the largest first-class cruiser types was responsible for the reinvigoration of the visiting flying-squadron principal, which reduced the requirements for permanent installations capable of maintaining such types. In the Middle and Far East Aden and Bombay could handle such types, albeit not without some difficulties, the long-planned Trincomalee was not fully developed at this stage, and while the HQ bases of Singapore and Hong Kong could accept them, the latter was also borderline for some of the largest types (such as the *Powerfuls*). It was planned to effect a considerable reconstruction and extension of the latter's naval base, but these plans were overtaken by wider events and not put into effect.¹⁰⁶ Outside of local British colonial possessions, Japan provided by far the best facilities in the Far East, though the charges for their docking facilities were high.¹⁰⁷ The various C-in-Cs of both the East Indies and the China stations sporadically requested senior Captains and Commodores to furnish comparative reports regarding docking charges: those of one Japanese facility are

¹⁰³ Lambert *Economic Power, Technological Advance...* p.12

¹⁰⁴ *Ibid* p.13

¹⁰⁵ *Ibid* p.30

¹⁰⁶ NMM BRI 15 pt.3 *Selborne to Bridge* p.2

¹⁰⁷ TNA ADM 125/56 China Station Records Volume XLII *Japanese Admiralty Docking Charges: Mitsubishi Granite Dock*, as of 1902 p.148

shown in Table 4.2. With several cruisers such as the *Diadems* displacing over 11,000 tons, the high cost involved in using these facilities can be easily appreciated, when considered in addition to the battleships.¹⁰⁸ The 12,000 ton *Cressys* and 14,200 ton *Powerfuls* made this even more of a problem.¹⁰⁹ As a result, the largest types would only employ foreign docking facilities as a last resort, and it was rare that these were used.¹¹⁰

¹⁰⁸ *Jane's Fighting Ships of World War 1* p.54

¹⁰⁹ *Ibid* pp. 52-53

¹¹⁰ TNA ADM116/967 *China Station Standing Orders* IX These further referenced Admiralty Letters M.0211 and M.0767 13 March 1902 and 9 October 1902 regarding the [limited] use of Japanese ports

Table 4.2:

Japanese Admiralty Docking Charges -Mitsubishi Granite Dock, as of 1902

<i>Size in tons</i>	<i>Charges 1st 3 days: Yen</i>	<i>Daily Charge 4th day & after: Yen</i>
Below 300	500	50
300-400	520	55
400-500	540	60
500-600	560	65
600-700	580	70
700-800	610	77.5
800-900	640	85
900-1000	670	92.5
1000-1200	700	100
For a vessel over 1200 tons for every 0.050 additional ton	00.50	0.05

Source: TNA ADM 125/56 China Station Records Volume XLII

Hull condition and cleaning was the primary routine requirement for dry-docking throughout the globe, especially in warmer climes, since operations in tepid waters resulted in the rapid fouling of hulls, despite the use of sheathing or the early forms of anti-fouling paints then emerging, such as Holtzapfel's 'International' and 'Moravia'.¹¹¹ Most of the vessels stationed in the Middle and Far East were so-equipped, although cleaning requirements naturally varied with conditions and duties; following a largely fresh-water cruise on the Yangtze, the captain of *Endymion* commented that the bottom was in perfect condition, 2 ½ months after she had last been dry-docked.¹¹²

Dry-docking aside, engine and boiler refits and repairs were as might be expected the most significant maintenance issues experienced by first-class cruisers in the Far East. This was a general problem irrespective of type in this region, where the high relative humidity increased corrosion levels compared to other localities. The introductory problems with the Belleville type boilers, discussed in the previous two chapters, were exacerbated under such environmental conditions. While this applied to all vessels, the first-class cruisers were particularly affected owing to their sheer number of boilers and the somewhat higher pressures often involved. It should be noted that this applied to both the Belleville and the traditional cylindrical types. Leaving aside construction issues described in previous chapters such as the replacement of the patent packing of the Belleville with an inferior type, which did nothing for its reliability, the latter scored somewhat over the former in greater ease of maintenance owing to its simpler construction and physical configuration, and, equally significantly, as described in earlier chapters, greater familiarity on the part of engineering officers and crews. As a result of these combinations of factors, the Belleville boilers, regarded with considerable suspicion by many upon their introduction, were especially unpopular in the Far East. HMS *Terrible* was out of commission for several months while serving in China when being refitted and re-boilered, provoking acid comment from the C-in-C.¹¹³ Complaints regarding protracted maintenance periods of first-class cruisers and the costs involved would continue, most notably in the case of the *Cressy*, arguably the most

¹¹¹ Brown *Warrior to Dreadnought* p.158 Brown dryly comments that these substances, which contained copper, mercury salts and arsenic, probably killed a large number of painters as well as the unfortunate barnacles. They also happened to be extremely expensive.

¹¹² NMM BRI/14 *Letter Paget to Bridge* (10 September 1902) p.1

¹¹³ NMM BRI 15 pt.5 *Memorandum, Bridge to Selborne* (22 April 1903) p.1 With 48 Bellevilles, this was never going to be a cheap or quick process, and it must be admitted that the protestations do not sit easily with the C-in-C's dislike of very large protected cruisers, although in fairness few commanders of foreign station were likely to be pleased at one of their main units being unavailable for extended periods, whatever their personal views regarding the merits of the type

formidable capital ship to be found in the Far East, with it being suggested that she should revert to the cylindrical boiler type owing to the increasingly dark views of many commanders about the Belleville, and water-tube boilers in general. Selborne ultimately (though politely) rejected the majority of such complaints on a matter of general principle, and especially notably on the basis that as crews gained experience with how best to use and maintain the boilers, so the repair bills decreased.¹¹⁴

The issue of fuel and its supply in the Middle and Far East would also become problematic around the turn of the century. While it affected all vessels present, the first-class cruisers exacerbated the problem, given their large bunkering, high speed coal consumption and the high level of deterioration in the fuel itself in the more southerly latitudes. The problems of supplying such vessels, along with the rest of the squadron in times of conflict seemed to be relatively easily addressed on the East Indies station, where stockpiles in India and Ceylon were available, and supplies in the western regions were anticipated to be reasonably practical through the Suez canal, even during time of conflict. The China Station was another matter however, and a lengthy argument between the C-in-C and the DNI developed during 1902-'03. Bridge, as previously noted, had been C-in-C Australia Station some years earlier, a post he had taken following his stint as DNI. During this time, he had recommended that the China Squadron adopt West Port coal from New Zealand, as it was relatively cheap, appeared to be of equal (or near equal) quality to Welsh coal, and considerably simplified logistics, as well as reduced the risk of possible interception.¹¹⁵ Since these arguments were clearly persuasive, the Board had been happy to adopt West Port coal for this use, once its quality had been proved to their satisfaction. However, when C-in-C China Station, Bridge was extremely dissatisfied with the quality of the coal the squadron received and requested that they revert to using the Welsh mineral. The reason for his dissatisfaction with the New Zealand coal stemmed from the inferior power and economy it provided compared to Welsh, the large pall of smoke vessels burning this fuel produced, and the critical problem this would cause his cruisers in hunting commerce raiders.¹¹⁶ This would of course been most notable in the first-class types, and particularly the largest of these, such as the *Powerfuls* and *Diadems*,

¹¹⁴ NMM BRI 15 pt.1 *Private letter Selborne to Bridge* (29 June 1903) p.2 Experience proved Selborne to be correct in this view

¹¹⁵ NMM BRI 15 pt.1

¹¹⁶ NMM BRI/15 pt.5 *Memorandum, Bridge to Selborne* (22 April 1903) p.4

with no less than 48, and 30 Bellevilles, respectively.¹¹⁷ He further intimated that, partly owing to the poor economy this coal provided, his ships could not keep the sea as much as the French or Russian vessels in the area did.

The Admiralty rejected his initial proposal outright, understandably having little wish to revert to the Welsh product for use in the Far East unless no other practical alternative were available.¹¹⁸ Bridge, evidently attempting to barter with the Board, subsequently sent a more modest suggestion for a supply of such fuel to be made available for use in wartime only.¹¹⁹ If he was employing the strategy of deliberately making an outrageous request with an eye to getting a more modest one accepted, the C-in-C was to be disappointed in his intention, for this proposal was also rejected by the Admiralty, primarily due to the extreme distances such fuel would need to travel and the potential for deterioration in the quality over the journey, to say nothing of the possible disruption to such supply in wartime and the additional costs involved. The First Lord did attempt to smooth relations in his private correspondence, politely expressing that it was

...a matter of very sincere regard to me that on the subject of coal supply for the China Station the Admiralty have taken a different view from yourself. Believe me that when we have differed from you it has been most unwillingly and only because, after giving as much pains to the question as I know you have, the facts seem to us to lead us to a different conclusion to that to which they have led you...

It is very disagreeable to me to have to decide between two such opinions as yours and Lord Walter's, but I am not prepared to suggest to the Board to put aside the views of Lord Walter and the D.N.I.¹²⁰

In fact the matter was not exaggerated, and many of the issues were later traced to an incorrect, inferior quality of coal to that recommended by Bridge when he was C-in-C Australia Station being sent to the China Squadron.¹²¹ The mines and suppliers also lacked a similar level of quality control to those of the Welsh producers. Some of these were resolved

¹¹⁷ Robert Gardiner [Ed. Dir.] *Conway's All the World's Fighting Ships 1860-1905* (London: Conway Maritime Press, 1979) pp.67-68

¹¹⁸ NMM BRI 15 pt.1 *Memo Selborne to Bridge* (4 January 1902) p.6

¹¹⁹ *Ibid*

¹²⁰ NMM BRI15 pt.1 *Letter, Selborne to Bridge* (June 29 1903) pp.1-4 Lord Walter referring to the First Naval Lord, Admiral of the Fleet Lord Walter Kerr

¹²¹ *Ibid* p.3

by the time Gerard Noel became C-in-C China Station in 1904, and the rest Noel addressed in extremely short order. With a heavy force comprised entirely of first-class cruisers, Noel was understandably keen to eliminate any problems of this kind. It is noteworthy that Selborne exhibited a keen eye for the wider strategic situation when he remarked that the vessels of rival squadrons in the area would be in an even worse position for fuel supply, both in terms of quantity and quality during a conflict with Britain. Thus the relative loss in performance and efficiency experienced by the vessels of the China Squadron would be cancelled out, since even the questionable New Zealand coal was ‘much superior to anything the enemy could continuously burn in time of war.’¹²²

The final major logistical matter of direct relevance to the first-class cruisers in the Far East was related to gunnery. The principal issue that needed to be addressed was that of magazine and shell storage facilities on shore. Once again, it seems that the East Indies was somewhat better off than the China Station, although the later expansion of the base at Trincomalee suggests that things were still not optimal. The facilities at Hong Kong in particular left much to be desired, and the question of magazine capacity for the China Station became an even more involved and long-running debate than that of coal quality and supply. Naturally, as with the matters of coal supply and general maintenance this affected all vessels attached to the China fleet. Nevertheless, the presence in the Far East of some of the latest, very large first-class cruisers such as the *Terribles*, *Diadems* and *Cressys*, with their large batteries of QF guns equal to their battleship contemporaries, resulted in severe problems of ammunition and propellant accommodation.¹²³ A memorandum from G. E. Woodward to the Commodore appointed to oversee the proposed developments of magazine and projectile capacity drew attention to this, pointing out that the introduction of the 6in B.L. Mk VII and VIII guns, using silk-cloth rather than the brass cartridges of the earlier 6in QF, had the effect

...of increasing the magazine accommodation required for the former, and diminishing the ammunition store accommodation required for the latter. This effect is already felt at this dept. since the “*Leviathan*”, “*Centurion*” and “*Cressy*” joined the squadron.¹²⁴

¹²² *Ibid*

¹²³ TNA ADM 116/939B *Report of Committee 26-08-1901* from “Goliath”

¹²⁴ TNA ADM 116/939B *Letter: Woodward to Commodore, China Station* (21 September 1904) [original underlining] The brand-new *Leviathan*, of the latest *Drake* class was possibly the most formidable

Even with access to the less-suitable locations of Singapore, and the modern, but small Kellets Island store, 'Group 1, Division 1' of the China squadron alone had a deficit of some 15,309 cubic feet of storage space.¹²⁵ The situation was even worse in Hong Kong; while storage space itself was less of an issue, although still insufficient to meet the requirements of the China Fleet, the arsenal itself was totally unsuitable. Less-than-conveniently, live ammunition needed to be wheeled across the busy Queen's Road (which was subject to a plan for widening!) to reach the loading areas.¹²⁶ Unsurprisingly, this situation was seen by most parties as being 'a favourable opportunity to separate Naval and Military Ordnance stores in this place.'¹²⁷ More bluntly, it was a major problem, and a potential disaster waiting to happen. Regrettably (if unsurprisingly, given the less-than-stellar record of co-operation between the services), these proposals met considerable difficulty and arguments between the Admiralty and the War Office, which owned a very suitable piece of land but refused a direct transfer unless replacements were provided elsewhere at the Admiralty's expense.¹²⁸

The withdrawal of the battleships following the victory of the Japanese over the Russians at Tsushima in May 1905 eventually resulted in the abandoning of the various proposals for the China Station, since the storage problems for the first-class cruisers and other remaining vessels eased, though were not fully resolved, given the out-dated nature of many of the facilities and the possibly lethal need to haul propellant and projectiles across a thoroughfare in Hong Kong. In the East Indies, as noted, these would in the medium-term be partly addressed by the expansion of the base at Trincomalee, and somewhat less drastic alterations at other major facilities, especially in India. By this time however, a new order was emerging under Sir John Fisher; a matter considered in the following chapter.

Conclusions

The Middle and particularly the Far East were key strategic deployment regions for the Royal Navy at the end of the Nineteenth and beginning of the Twentieth Centuries. The first-class

fighting ship in the world at the time of her completion, possessing 2 x 9.2in and no less than 16 x 6in, plus a large number of miscellaneous 3in and 3-pounder quick-firing guns

¹²⁵ *Ibid*

¹²⁶ TNA ADM 116/939B *Letter Stanley Bank, Supervisor, to Admiralty*, (21 September 1904)

¹²⁷ TNA ADM 116/939B *Letter, Under Secretary of State for War* (12 May 1902)

¹²⁸ TNA ADM 116/939B *Minutes of Conference on proposed separation of Ordnance Establishment, Hong Kong* (27 July 1905)

cruiser was a major component of both the squadrons, and operations on the China Station in particular illustrate the considerable flexibility of the type.

The usual functions of patrolling focal areas, sections of trade routes, and the visits to various ports around the station in the classical peacetime role of showing the flag are all as may be expected, although littoral regions do not automatically come to mind when considering such vessels. Nevertheless, they were extensively used for this role, and it is particularly notable that a first-class vessel should be employed for a visit of this nature several hundred miles upriver. While a single instance like *Endymion's* visit to Hankow is far from definitive, a gradual move away from gunboats and similar types in favour of more viable combat types began from around this time, somewhat in advance of the change customarily attributed to Fisher's reforms largely set out in *Naval Necessities*. The two *Centurions* had been built to be able to carry out similar functions, but, though somewhat more capable than they are often given credit for, first-class cruisers like the *Edgars* were ultimately a more flexible and useful vessel type.

The presence of the *Powerfuls* in the Far East is understandable since they were intended to counter the *Rurik*, a task they would have had little difficulty in performing in the event of an encounter; it is interesting though not surprising to note the *odium theologicum* with which Cyprian Bridge when C-in-C China Station regarded the largest first-class protected vessels, since his strategic views were largely grounded in a preference for numerical rather than qualitative superiority for cruiser types. While having distinct limitations insofar as their size significantly restricted where they were able to put in, let alone dock, the presence of these enormous, essentially rather luxury items on the station will have automatically lent a certain prestige, and their fighting capabilities within their design remit, as discussed in Chapters Two and Three was high. Stationing a cruiser at Hong Kong, as a one-vessel flying squadron capable of rapid dispatch around the Station follows wider RN strategy of having at least one first-class cruiser at a focal point, which could be contacted via telegraph or wireless telegraphy. This was itself a local illustration of wider grand-strategy; while the RN did not write its strategic doctrine down in the Nineteenth Century, this does not mean it lacked one, a point also made in the first chapter.¹²⁹ With its dominance of the global undersea telegraph network eroded but not eradicated, and greater access to dry docking facilities the service was

¹²⁹ See too A. Lambert *Economic Power...* p.30

able to exploit its position to maintain a policy of deterrence, a major component of which would become squadrons capable of rapid deployment to locales requiring reinforcement. The strategic value of speed, dramatically demonstrated by the race of the second-cruiser squadron between New York and Gibraltar referred to in the previous Chapter was also critical in the success of this approach –a strategy that inherently worked, since Britain did not become embroiled in a war with any major rival until 1914, which post-dated a change in strategic direction toward a continental approach for Britain that contravened all precedent, and ultimately the national interest.¹³⁰ The grouping of cruisers into flying squadrons was a matter of considerable interest to many in the service, and was strongly advocated by Cyprian Bridge, a former director of the NID, while on the China Station.¹³¹

While the battleships remained on-station, the employing of *Cressy* with them and the counting of her as their equivalent exactly matches the intentions for the type, and since her armour scheme was almost a precise equivalent of the *Canopus* class vessels this will have been little hardship. With the withdrawal of the battleships following the Japanese victory over Russia at Tsushima in 1905, under Noel the backbone of the China Squadron would become side-armoured cruisers.¹³² Although reduced, the East Indies station already heavily exploited such types, though with no rival local powers, the deploying of a battle-squadron had been unnecessary in any event.

Logistically, the presence of first-class cruisers on foreign stations clearly caused difficulties, some of which were foreseen, others less immediately obvious but still telling. The maintenance requirements, especially of Belleville water-tube boilers are clearly shown to have caused problems, although as noted many of these could be traced back to lack of experience on the part of crews, officers and engineers.¹³³ Irrespective of the precise reasons, the fact was that re-boiling and maintenance time was difficult, especially given the number of these involved in the largest types. Somewhat more of an issue was the fact that they didn't fit many installations, the majority of which in the region were commercial and unused to the

¹³⁰ See A. Lambert 'Wilson, Sir Arthur Knyvet, third baronet (1842–1921)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004

¹³¹ A rare event when a C-in-C was arguing for fewer rather than a greater number of ships permanently attached to his command

¹³² A rather sad irony for the new C-in-C since Noel's personal strategic views generally favoured battleships over cruisers

¹³³ As well as moving away from the originally intended patent packing in the feed system –see Chapter Two

largest (particularly the longest) types. Coal consumption, and the necessity of sufficient supplies for these large vessels with their considerable fuel requirements meant supply routes and sources needed to be carefully established and, significantly, quality maintained. The difficulties that could arise are clearly shown from experiences on the China Station described above, and while the East Indies station could be seen as somewhat better off in this regard, it was not a matter that could be taken lightly. Any magazine storage issues on shore could also potentially be exacerbated by these vessels with their large armament of rapid-firing intermediate-calibre weapons, particularly when the true 6in QF with its brass cartridge case was superseded by the equally fast-firing later 6in models, which reverted to silk bags. While more convenient in manufacturing and cost terms, the latter posed some problems ashore, since they needed more careful storage and handling, all of which ate into available storage space.

In general however, the Royal Navy's grand strategy was working well during this time. The cruisers would increasingly become the main heavy naval vessels employed on foreign stations, and the Middle and Far East were no exception, especially following Tsushima when the Russian Navy was, in practical terms, wiped out as a global force for the immediate future. The Japanese fleet, closely aligned in tactical thinking and to an extent material with the Royal Navy demonstrated their value to even greater effect than had been the case ten years before at Yalu, or during the Spanish-American war of 1898, largely confirming views that had been held by an increasing number of designers and officers in Britain, and these would be heavily exploited by the service in the following years.

Chapter 5

Fear God and dread nought:

Sir John Fisher and the drive for a cruiser-based navy

Chapters One to Three considered the origins and development of the first-class cruiser in the Royal Navy from 1884-1901, and the paradigm shift in capability brought by the introduction of face-hardened armour within a tactical environment dominated by rapid-firing intermediate-calibre guns. Chapter Four provided a case study of these vessels' operations during what may be considered their zenith, the first years of the Twentieth Century, and demonstrated how the global strategic requirements of the Royal Navy increasingly tended to rely upon these types.

From a vessel intended principally for the trade-defence and heavy-scouting role, the largest first-class cruisers had gained a genuine capacity for close-action roughly equivalent to several classes of contemporary battleship. Indeed, the *Cressy* class were specifically designed for this role, and though never referred to as 'battle-cruisers', officially or otherwise, they and their *Drake* class successors may be realistically considered the first type in the Royal Navy where the term could be employed as a literal description of their abilities. Their predecessors, with passive-defence provided by the protective deck system were also rather more capable than is often appreciated, and were repeatedly employed during the annual Manoeuvres as heavy-scouts, while at Yalu they proved that, well-handled, they could face side-armoured opponents. However, with the *Cressys* and *Drakes* the Royal Navy had vessels that could close with and fight battleship contemporaries if required. Within a gunnery environment dominated by quick-firing intermediate-calibre weapons, large first-class armoured cruisers were substantially less vulnerable in a fleet action than the officially entitled battlecruisers were a decade later when operating under very different conditions dominated by heavy naval ordnance.

Following the introduction of these large types, two more moderately-sized classes of armoured cruisers had been developed specifically for the trade-defence role, in response to contemporary French and Russian construction, which for a time favoured more modestly

sized vessels.¹ Built in large numbers (ten *Monmouths* and six *Devonshires*) they were of much more limited capability than the *Cressys* and *Drakes*, and while equalling their foreign rivals, did not exhibit any marked superiority either. They also lacked capacity for fleet operations (other than some scouting duties, or possibly finishing off crippled vessels) that had been gained following the introduction of face-hardened armour types, especially KC plate. The *Devonshires*, with their heavier though slightly less extensive protection would have been more able in such duties than the *Monmouths*, but their armament fell into an unfortunate middle-ground of being both too light and insufficiently numerous to make them the equal of the heavier *Cressys* for such work.

This chapter examines how the first-class cruiser would develop in the period 1902-1909, and become the generic basis for all of the Royal Navy's first big-gun capital ships. This was the era frequently referred to as the 'Dreadnought revolution', but it was rather more a transitional period on both the strategical and material fronts. In this time, the service began a gradual move away from countering the traditional French and Russian rivals as the German naval challenge became more significant, while the intermediate-calibre guns that had dominated naval tactics for some fifteen years were gradually marginalised as the focus shifted toward long-range fire with heavy weapons; a change largely permitted by advances in fire-control technology and procedures. It was also a time which was largely dominated by Admiral Sir John Fisher and his vision for a new Royal Navy that would be equipped and operate in a different fashion to what had gone before, but heavily relied upon the groundwork established over the previous two decades. In Fisher's eyes, variations on the first-class cruiser would be the capital-ships the Royal Navy required in order to continue the strategic doctrine of deterrence that the service had employed since the 1860s, and he would do everything he could to ensure that this vision would be carried through.

Financial consequences of a cruiser-battleship navy

From 1889, naval expansion, both in terms of number of vessels and their size and cost, was unprecedented in the mechanised era. The yearly Navy Estimates presented to Parliament

¹ Note that this was in terms of displacement. The *Monmouths*, at 9,800 tons, were some 2,200 tons lighter than the *Cressys*, but were the same length between points, albeit 10ft shorter at the waterline, and of 3 ½ft. less beam. Conversely, the *Devonshires*, though at 10,850 tons some 1,150 tons lighter than the *Cressys*, were actually slightly longer, albeit of 1ft less beam.

increased between 1889-90 and 1896-97 by some 58.5 per cent.² Economic conditions were reasonably good, in part owing to a lack of major conflicts around the globe which also coincided with a period of relative colonial calm. The increased tax yield that resulted, and the introduction of graduated death-duties had allowed this to be achieved without greatly adding to the burden of National Debt. However, the increasing cost of building large numbers of battleships and first-class cruisers, along with expense of the Second Boer War, would as demonstrated by Sumida, precipitate a crisis in naval finance.³

The first-class cruisers, which saw a greater relative increase in dimensions across this period than did their battle-ship counterparts, played a significant part in the rising expenditure, as did the steady introduction of new technologies, particularly face-hardened armour, which for all its merits, was also time-consuming, difficult and expensive to produce. As a result, the *Cressys* cost an average of some 37.4 per cent more than their protected-deck *Diadem* predecessors, at a mean of £762,678 compared to the earlier vessels at £554,747.⁴ The *Drake* class perhaps more than any other underlined the financial consequences of building two distinct types of capital ship (whether necessary or not). The four *Drakes*, with a further 15.2 per cent increase in displacement over the *Cressys*, saw the mean cost per vessel rise again, to £996,205, with two of the class (*Drake* and *Leviathan*) costing over a million apiece, a 23.5 per cent increase over the *Cressys*, and 44.4 per cent over the *Diadems*.⁵ This placed them at virtually the same cost per unit as the *London* class battleships that had been ordered in the same programme.⁶ Table 5.1 and Figures 5.1 and 5.2 provide a breakdown of mean costs per vessel and class costs for first-class cruisers built between 1888-1905.⁷

² See House of Commons Parliamentary Papers 'Navy Estimates for the Year 1889 – 90 with explanatory observations by the Financial Secretary, and explanation of the differences' 1889 (50) L, 1 and 'Navy Estimates for the Year 1896 – 97 with explanatory observations by the Financial Secretary, and explanation of the differences' 1896 (LIII), 1

³ *Ibid*

⁴ Based on the vessel costs listed in J. Leyland & T. Brassey [eds.] *The Naval Annual, 1906* (Portsmouth: J. Griffin and Co., 1906). Figures in 1906 were generally revised slightly down from those given in previous editions. Note that HMS *Spartiate* of the *Diadem* class cost significantly more than her sisters, at £654,661 – the mean figure for the class given in the text is given excluding her to provide a more representative value

⁵ Costs derived from *Ibid*. In previous editions of the Naval Annual, the *Drake* class were listed as costing slightly more than £1 million apiece

⁶ N. Lambert *Sir John Fisher's Naval Revolution* (Columbia: University of South Carolina Press, 1999) p.23

⁷ Note that the later figures (from the *Dukes* onward) are inclusive of armament. This does not significantly affect the general upward trend in the cost however

Table 5.1 First-class cruiser mean costs per vessel and class costs 1888-1905

<i>Class Name</i>	<i>No. vessels in class</i>	<i>Mean cost per vessel</i>	<i>Cost per class</i>
<i>Blake</i>	2	£433,031	£866,062
<i>Edgar</i>	9	£388,517.5	£3,496,658
<i>Powerful</i>	2	£706,977	£1,413,954
<i>Diadem</i>	8	£567,236	£4,537,891
<i>Cressy</i>	6	£762,678.67	£4,576,072
<i>Drake</i>	4	£996,205	£3,984,820
<i>Monmouth</i>	10	£751,936.3	£7,519,363
<i>Devonshire</i>	6	£847,777.33	£5,086,664
<i>Duke of Edinburgh</i>	2	£1,197,550.5	£2,395,101
<i>Warrior</i>	4	£1,196,965.75	£4,787,463
<i>Minotaur</i>	3	£1,415,073	£4,245,219

Costs derived from:

Blake class:

T. Brassey [ed.] *The Naval Annual* (Portsmouth: J. Griffin and Co., 1902)

Edgar, Powerful, Diadem, Cressy, Drake, Monmouth & Devonshire classes:

J. Leyland & T. Brassey [eds.] *The Naval Annual* (Portsmouth: J. Griffin and Co., 1906)

Duke of Edinburgh, Warrior & Minotaur classes:

Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin and Co., 1912)⁸

⁸ Note: costs given to *Devonshire* class excluding guns & stores. From *Dukes* onward the costs given include guns. An approximate guide figure of £100,000 per vessel may provide a guideline. The *Devonshires* appear mediocre value for money in comparison to the larger first-class types

Figure 5.1 Mean vessel cost by class 1888-1905 Pounds sterling

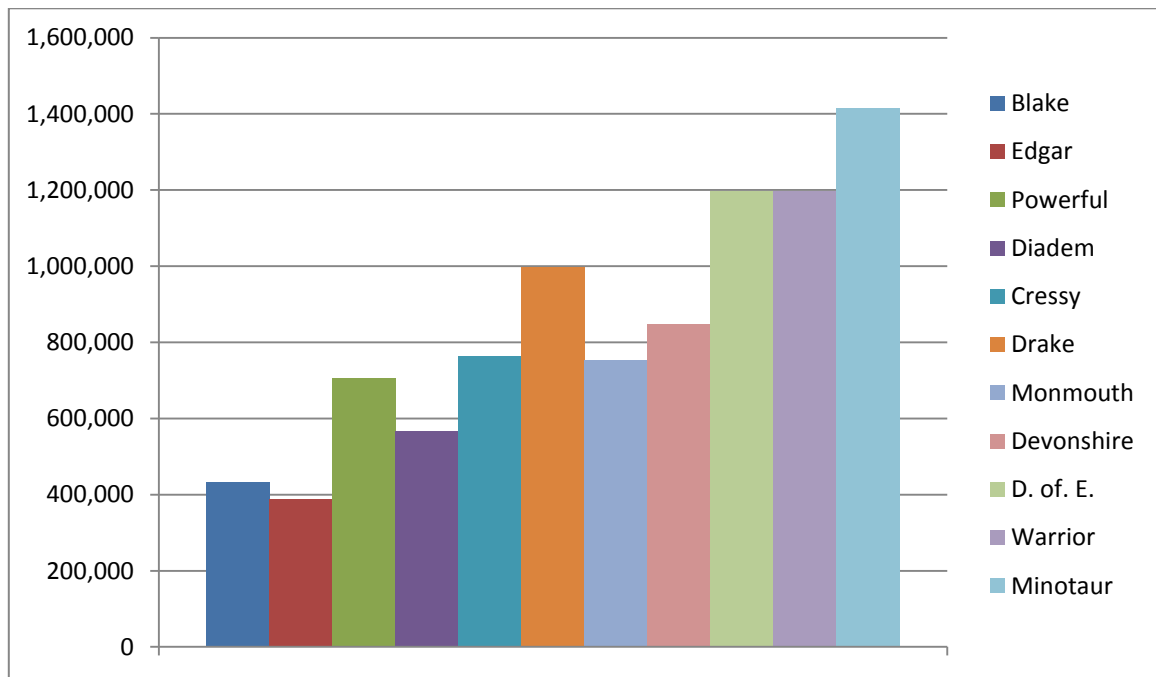
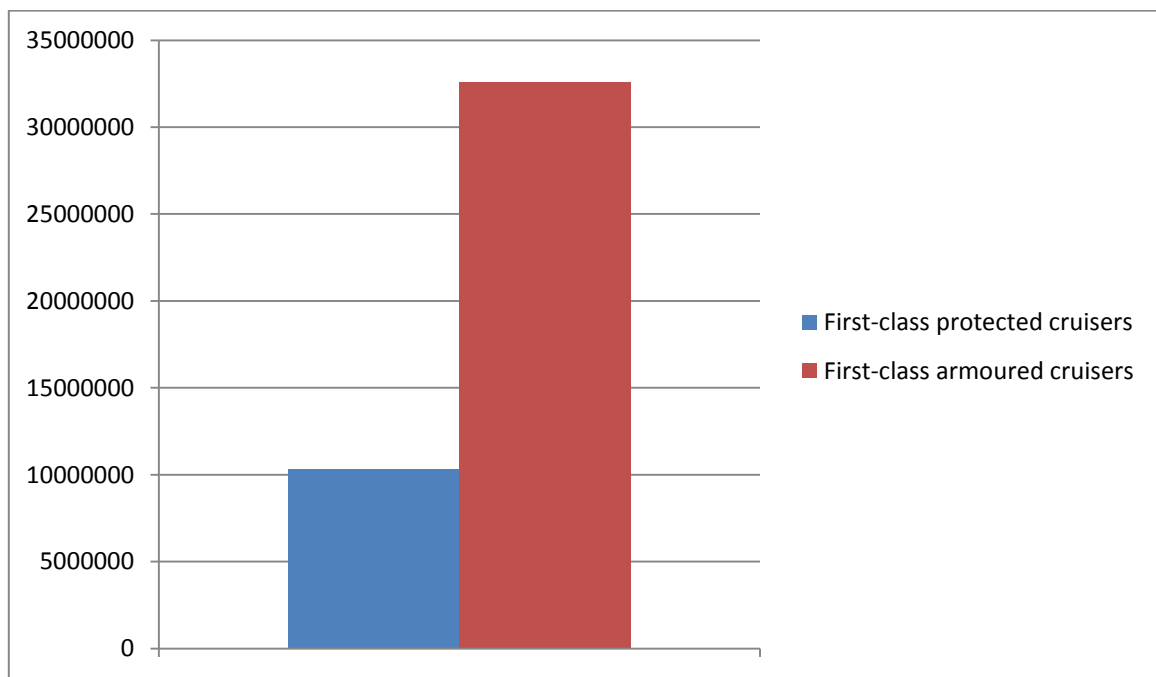


Figure 5.2 Cost of first-class protected and armoured cruisers in millions sterling



Just as significant as the construction costs of these new first-class types was the cost of running, maintaining and particularly manning them. The vast boiler rooms necessitated by their high speed (and the requirement for relatively under-stressed engines with boilers utilising natural rather than forced-draught) in turn mandated a very large crew: some seven hundred and sixty men in the case of the *Cressys*, and no less than nine hundred in the *Drakes* –the latter being almost two hundred greater than a *London* class battleship, prompting First Naval Lord Frederick Richards to dub them ‘man eating’ vessels upon being presented with the initial compliment figures.⁹ Given the massive expenditure some form of financial retrenchment was almost inevitable. The *Monmouths* were in part driven by this financial consideration, although in comparison to the *Diadems*, which had also been designed for the trade-defence role, cost was some 24.5 per cent higher, despite their lesser displacement.¹⁰ The extra engine-power was a minor contribution to this (an extra boiler and slightly more advanced TE engines) but the most significant factor was the use of side-armour. Although the *Monmouths*’ Krupp armour was non-cemented, it was considerably more expensive than the non-face-hardened steel armour used for the *Diadems* protective deck.

As shown in Chapter Three the DNC did not like or approve of the *Monmouth* class, regarding them as simply a case of giving the Board what they asked for, when in his view a protected deck type would have been just as effective for trade-defence purposes as well as being substantially cheaper. In this he was undoubtedly correct, and it would have echoes for later vessels too, as is suggested later in this chapter. A cruiser employing the protective deck system would certainly have been cheaper, and although the area covered by side-armour in the *Monmouths* was good and their general armour scheme superior to most of their foreign rivals, 4in non-cemented Krupp armour with thin protective decks was not fundamentally superior to, and in many ways less effective than, a well-implemented protective deck system such as that employed in the *Diadems*. Thus while certainly cheaper than the *Drake* class, savings were by no means especially extensive, especially when coupled with the large number of the class (10) that were built over a three year period. The real argument for building the *Monmouths* had been a desire to have more vessels for the available money in order to counter the threat of a French and / or Russian *guerre de course* by means of fast

⁹ TNA ADM 116/878 Richards ‘Shipbuilding Programme 1898-99’ 4 February 1898 Natural draught conditions ensured stress on the boilers was minimised, but as noted in previous chapters owing to the reduced amount of horse-power extracted per square foot of heating surface, more were required for a given output. A direct comparison can be made to a small internal combustion engine employing some form of forced induction (supercharging / turbocharging) and a larger, normally-aspirated engine

¹⁰ Leyland & Brassy, *The Naval Annual*, 1906 *Op. Cit.*

protected or moderately sized armoured cruisers. Not all of the Board agreed with this course, as has also been shown, Wilson in particular regarding the construction of the type as a lost opportunity to gain a significant qualitative advantage over rival powers.¹¹ That he was overruled was unfortunate; Wilson's strategic and tactical expertise was far in advance of most of his contemporaries, and this was reflected in his preferences for material, and the opinion he shared with White regarding the types.

The six follow-on *Devonshires* of the 1901/02 programme in many ways represented a more active attempt to reign in the spiralling construction, running, maintenance and manning costs by deliberately restricting dimensions. Despite the massive scale of the British construction programmes from 1898-1901, France and Russia had both responded with new programmes of their own and the margin of superiority was believed slim; of particular concern was the Law which in late 1900 passed both the French Chamber of Deputies and Senate, providing for 6 first-class battleships and 5 armoured cruisers by 31 December 1906.¹² The *Devonshires* were at best a match for their moderately sized contemporary rivals, and as Wilson had pointed out when the previous class was developed, given the inevitable tendency for vessels and their weapons to increase in size and power over time, deliberately restricting dimensions simply hastened the pace at which they would fall back into the second rank.¹³ That this was increasingly appreciated by the rest of the Board is evident, and there were no serious attempts to restrict dimensions of first-class cruisers for some years. The first-class cruisers of the 1902/03, and 1903/04 programmes (the *Duke of Edinburgh* / *Warrior* classes) saw an increase in displacement of some 20 per cent, and increase in per-unit cost of nearly 30 per cent over the *Devonshires*.¹⁴ The three *Minotaur* class cruisers of the 1904/05 programme, the last in the Royal Navy to be equipped with intermediate-calibre artillery, saw further increases of 7.2 per cent in displacement and 15.4 per cent in cost over the *Duke of Edinburghs*.¹⁵ These increases in numbers of vessels constructed, along with the rise in unit size and costs, resulted in an increase in spending on first-class cruisers from £10,314,565 on the 21 protected vessels of the *Blake* to *Diadem* classes, to £32,594,702 on the 35 armoured

¹¹ TNA ADM 1/8724/93 Remarks of Admiral Wilson on White 'Report on the Design for New Cruisers, Supplementary Programme 1898-99' in appendix of Commander S. King-Hall 'The Evolution of the Cruiser'

¹² TNA CAB 37/56 Confidential Memorandum on Ship-Building, Navy Estimates 1901-1902, January 17, 1901 p.5

¹³ TNA ADM 1/8724/93 Remarks of Wilson *Op. Cit.*

¹⁴ See Table 5.1 The following vessels in question were the *Duke of Edinburgh* and *Warrior* classes, sometimes classed together under the former of the two as class-name

¹⁵ *Ibid*

vessels from the *Cressy* to *Minotaur* classes.¹⁶ The costs involved, a jump of 3.16 times that of what had been seen previously, in conjunction with continued expenditure on battleships, were both economically and politically unsustainable, above all when combined with the concomitant rise in manning requirements, which in turn mandated increased expenditure on shore facilities.

The Cabinet had been expressing increasing reservations for several years, and unsurprisingly the Treasury and Exchequer in particular were particularly concerned. In Confidential Memorandum to the Cabinet on the overall financial situation, Hicks Beech (Chancellor of the Exchequer 1895-1902) presented a gloomy outlook, the avowed purpose of which was ‘an earnest appeal to my colleagues for economy in the preparation of their estimates for next year’s ordinary expenditure.’¹⁷ Unable to envisage a sufficient surplus to take off even 1*d* of the income tax in 1902/03, despite complaints about its retention at a high 14*d* level, Hicks Beech, taking the case of the Royal Navy first, pointed out that the Estimates had risen from 18,700,000*l* in 1896/7, to 30,876,000*l* in the current financial year, and that he did not know of any reason why any further increases should be required. In his view, increases –mostly automatic– might be necessary in certain areas, but these

...should be counterbalanced by savings under other heads, e.g., by the completion of the reserves of guns and ammunition, and the fall in the price of coal. The rate at which we have been increasing our expenditure on new construction and in the number of men, in our competition with France and Russia, might now, I think, be lessened with perfect safety.¹⁸

Hicks Beech did not refer exclusively to the Navy however, expressing similar concerns over spending elsewhere, most notably on the Army and Civil Service which were also singled out. In concluding his paper, he accepted that the proposed economies would be both difficult and unpopular with some of his colleagues, and would doubtless excite the wrath of the Navy League, the ‘Service Members’ and the Daily Mail, but that in his opinion, ‘it would be far safer and better for our party in the end than continuing in course which leads straight to

¹⁶ *Ibid* Figures excluding armament and stores

¹⁷ TNA CAB 37/58, 109 Sir M. Hicks Beech, Bt. (Chancellor of the Exchequer), Confidential paper to Cabinet on the financial situation & a call for economy in estimates, October 1901, p.2

¹⁸ *Ibid* p.4

financial ruin.’¹⁹ If Hicks Beech hoped that he would be able to check the rising costs, he was to be severely disappointed by the First Lord of the Admiralty’s 21 page response of 16 November in which, while accepting the need to control expenditure, he stressed the Navy also needed to be maintained at its required strength; something he could not do ‘if the growth of the Estimates is arrested abruptly or arbitrarily, or otherwise than in accord with a definite policy.’²⁰ The country, Selborne continued, expected two things of the Navy

Firstly, that it should be strong enough in Battle-ships with their accessories of Cruisers, Destroyers, Torpedo-boats, &c., to have the reasonable certainty of victory in any naval war which can be foreseen ; secondly, that it should be strong enough in Cruisers to give adequate protection to our mercantile marine in time of war.²¹

Selborne largely laid the responsibility for the increased estimates at the doors of France and Russia, reiterating the claimed ‘purely defensive’ nature of the British fleet that had been voiced by Goschen in Parliament several years earlier, a view that was popularly received, if not entirely truthful. In a follow-up dated 7 December, he noted increases in both rival fleets to be larger than expected, although it was impossible to provide reliable figures.²² His original memorandum of 16 November placed considerable emphasis upon ‘the necessity of still further increasing the number of our armoured cruisers’ to cope with the rival programmes abroad.²³

Evidently not satisfied that he had carried his point, Selborne circulated a third memorandum among his Cabinet colleagues the following January, in which, in addition to the traditional French and Russian rivals, he made the further point that during the previous five years, ‘three new navies have sprung into existence –those of the United States, Germany, and Japan.’²⁴ Selborne won the argument over the medium term, since his proposed ‘equality plus a margin’ with the combined fleets of France and Russia was finally considered in October of

¹⁹ *Ibid* pp.7-8

²⁰ TNA CAB 37/59, 118 First Lord of the Admiralty [Selborne] ‘The Navy Estimates and the Chancellor of the Exchequer’s Memorandum on the Growth of Expenditure’ 16 November 1901, p.2

²¹ *Ibid*

²² TNA CAB 37/59, 127 First Lord, Confidential Memorandum on Navy Estimates 1902-1903, Comparative Statistics, p.1 After 1900, Russia did not provide the British Embassy with copies of their Naval Estimates, as they had in previous years

²³ *Ibid* p.14

²⁴ TNA CAB 37/56 ‘Confidential Memorandum on Ship-Building’ *Op. Cit.* pp.6-7

1902.²⁵ In effect, it called for a three-power standard as against France, Russia and Germany, the latter of whom the First Lord acknowledged was a deliberate challenge to Britain.²⁶ First-class cruisers played a major part of these proposals, since the Board's general strategic approach was

...not to lay down any more second-class cruisers, but to build first-class armoured cruisers for commerce protection and fast third-class cruisers for scouting and station work, which will gradually take the place of the old type of second and third-class cruisers as the ships wear out.²⁷

The programme outlined called for 'laying down three battleships and four armoured cruisers in each of the four fiscal years from 1903-04 to 1906-07, which Selborne projected would entail an initial increase in the navy estimate of from £2.5 million to £3 million, though he expressed the hope that there would be no further increases on the same scale within the period named.'²⁸

On this basis, it was inevitable that the Estimates would (and did) continue to rise, but despite his defence of the service, even Selborne recognised that this trend could not continue indefinitely; quite apart from the expense in itself, political opposition was steadily mounting until by 1904, the First Lord was forced to begin accepting reductions.²⁹ It was within this background that Sir John Fisher was appointed as First Sea Lord (the traditional Sea Lord title replacing Naval Lord) in October 1904, primarily owing to his promise of bringing reductions to the Estimates.

Sir John Fisher, the changing strategic situation from 1900, and a new-model navy

Possibly no single person in modern naval history engenders such controversy as Admiral Sir John Arbuthnot Fisher. Born 25 January 1841 to Sophie, wife of Captain William Fisher, A.D.C. to the Governor of Ceylon, he entered the Royal Navy aged 13 in 1854 on board HMS *Victory*, and within five years he had witnessed four naval battles, the first of which

²⁵ J. Sumida *In Defence of Naval Supremacy: Financial Limitation, Technological Innovation and British Naval Policy, 1889-1914* (London: Unwin Hyman, 1989) p.23

²⁶ TNA CAB 37/59, 118 'The Navy Estimates and the Chancellor of the Exchequer' *Op. Cit.* p.11

²⁷ *Ibid* pp.14-15

²⁸ Sumida *Op. Cit.* p.23

²⁹ *Ibid* pp.24-25

was the successful bombardment of the fortress and arsenal complex of Sveaborg outside Helsinki 9-10 August 1855.³⁰ As an example of naval power-projection, it almost certainly created a strong impression on the mind of the young Fisher, as would the three battles he took part in (having only witnessed the Sveaborg bombardment) when serving on the China Station during the Second Anglo-Chinese war.³¹ These latter would provide an additional lesson: that of the limitations of naval power, although arguably more importantly to his career, he served under one of the leading intellects of the contemporary service, Captain Charles Shadwell, FRS, who instilled in him an interest in science and technology which he would exploit to the full. Lacking the social connections to secure promotion as a matter of course (although he possessed an uncanny ability to charm those who could exert a positive influence upon his career), he followed the example of Admiral Astley Cooper Key in using his interest in and willingness to develop new technologies, particularly in gunnery and torpedoes, to further his ambitions and forge a career-path of his own.³²

By the time he reached the rank of Captain, it was evident that Fisher would attain high command, although by the late 1890s it was far from certain that he would become the professional head of the Navy. Fisher's was an autocratic rather than authoritarian temperament.³³ As a senior officer he was notoriously Machiavellian in his political and service manoeuvrings, vindictive, ruthless with 'enemies' (of which he had many), and he frequently appeared to contradict himself, although this latter was in part due to a propensity for carefully matching statements to people or situations, which did not necessarily reflect his real intentions.³⁴ He was at this time a master of manipulating the press, having been indirectly involved with Stead's 'Truth about the Navy' articles of 1884.³⁵ He would largely continue this practice throughout his subsequent career, and most notably during his time in the Mediterranean, following the appointment of Walter Kerr as First Naval Lord.³⁶ Fisher's volcanic energy was legendary, and while no lover of conventional physical exercise, he was a gifted ballroom dancer. This appears to have been a genuine personal liking, although he

³⁰ R. Mackay 'Fisher of Kilverstone' (Oxford: Clarendon Press, 1973) pp.9-10

³¹ A. Lambert *Admirals* (London: Faber and Faber, 2008) p.292

³² *Ibid* p.293 Fisher was also often both charming and kind to contemporaries and subordinates, although they too would often find themselves discarded

³³ N. Dixon *On the Psychology of Military Incompetence* (London: Pimlico, 1994) pp.271-272

³⁴ Lambert *Admirals* p.293

³⁵ P. Padfield *The Battleship Era* (London: Rupert Hart-Davis, 1972) p.114

³⁶ Fisher feared Kerr's appointment would prevent his becoming First Naval Lord, since on Kerr's retirement he would himself be close to mandatory retirement age (short of being promoted Admiral of the Fleet)

evidently was able to use it order to gain a degree of intimacy with powerful women whom he could turn into allies.

As a result of his technical background and expertise, Fisher was often perceptive of developments in material, sometimes showing genuine imagination and flair in his assessments of their value (or otherwise) but it is also largely true to say that ‘in practical judgement and timing he was not reliable.’³⁷ A deeply religious man, he also had a penchant for using Biblical texts in his communications, official or otherwise, ‘especially those having reference to Smiting, or Coming Swiftly from Behind, or the ruthless and remorseless dealings of Jahveh with his enemies, or the disagreeable things that happened to people who were not found Watching.’³⁸ The shock-value of his prose and pronouncements, riddled with points of admiration, capitalisations, italicisations, use of varying fonts and colours remains high more than a century later. Not without reason did the future Lord Hankey, then a Captain of Marines, write home from the Mediterranean in September 1899 with an evident mixture of relish and trepidation that ‘the new Admiral –Fisher– has just joined the fleet; he is said to be a tremendous scoundrel.’³⁹

Having experienced it first-hand, Fisher loathed war, and it was this in addition to intellectual disposition that made him both a proponent and exponent of the strategy of deterrence. In this he was not alone: it had been, as previously indicated, the unwritten strategic doctrine of the service from at least the 1860s onward. From 1892-97 he had been Controller, and later commanded the North American and West Indies Station. He was recalled to be the British naval delegate to the First Hague Conference, a function which he executed with conspicuous success, not least due to the contrast between his ‘restrained diplomatic performance in the formal sessions of the conference, and his torrential and frequently lurid conversation during the intervals between them’.⁴⁰ While at the Conference Fisher likely met Ivan Bloch, the Polish banker whose great six-volume study of modern industrial war would be published in English by Stead as *Is War Now Impossible* shortly after the Conference.⁴¹ How much of a

³⁷ Mackay *Op. Cit.* p.212

³⁸ F. Young *With the Battlecruisers* (Edinburgh: Birlinn, 2002) p.25

³⁹ *Ibid* p.225

⁴⁰ *Ibid* p.219

⁴¹ N. Lambert *Planning Armageddon: British Economic Warfare and the First World War* (London: Harvard University Press, 2012) p.30

direct influence Bloch had upon Fisher, is, as Lambert notes, sadly unquantifiable, though Fisher was almost certainly exposed to his ideas.⁴²

Following the Hague Conference Fisher was appointed C-in-C Mediterranean Fleet, and it was in the Mediterranean that the majority of the ideas that he would later refine into *Naval Necessities*, his manifesto on the reformation of the service and the future maritime strategy of Britain, first found expression. Fisher's time as C-in-C Mediterranean Fleet has passed into legend: fleet efficiency markedly improved in his tenure; he lectured widely and encouraged junior officers to express their own ideas. He returned to the Admiralty as Second Naval Lord 1902-03 when his considerable (albeit highly erratic) genius helped drive training reforms.⁴³ Departing the Admiralty to become C-in-C Portsmouth Dockyard, he also sat with Lord Esher on the Committee for Imperial Defence. It was during this time that, with support from five naval officers he began to refine the ideas that he had initially conceptualised, derived or obtained during his time in the Mediterranean into the document (arguably the collection of documents) that would become *Naval Necessities*.⁴⁴ Fisher was convinced he could reign in naval expenditure by means of radical reforms to dramatically increase efficiency, perfectly meeting First Lord Selborne's requirements.⁴⁵ Largely on the strength of his promise to cut the apparently spiralling cost of the service, Fisher became First Sea Lord, as the post was now redesignated, in October 1904, and the document, in revised form, was presented to Cabinet on 6 December.⁴⁶ Despite its peculiar structure of intermingled reports and letters along with the inevitable lurid Old Testament quotations, it presented what amounted to a radical integrated strategic vision for the future service. The most immediate and materially dramatic step was an analysis of the Royal Navy's entire fleet of vessels, which were assessed and categorised on the basis of their value as fighting ships. The basic principle / measure employed was that

⁴² *Ibid*

⁴³ E. Grove *The Royal Navy: A New Short History* (Houndmills: Palgrave Macmillan, 2005) p.89

⁴⁴ Captains Henry Jackson, John Jellicoe, Reginald Bacon, Charles Madden and Commander Wilfred Henderson. These were the 'Committee of Five.' To these would later be added William Henry Gard, Chief Constructor Portsmouth Dockyard and Alexander Gracie of Fairfield Shipbuilding Co., making Fisher's 'seven brains'

⁴⁵ Grove *The Royal Navy* p.89

⁴⁶ *Ibid* There were multiple variations / drafts of *Naval Necessities*, with arguably the definitive version being printed in Lieut. Commander P. Kemp [ed.] *The Papers of Admiral Sir John Fisher Vol. I* (London: Navy Records Society, 1960) which to ensure consistency is used throughout this thesis

Every vessel that has not high scouting speed, or the highest defensive and offensive powers, *is useless for fighting purposes*.⁴⁷

Those deemed unfit for such duties and were not required for use as depot or special service ships: the ‘goats’ (and some ‘llamas’) were to be sold off and broken up as a waste of resources and manpower.⁴⁸ To this vast scrapping programme was added a complete revision of manning, with the establishing of nucleus crews (partly freed up from scrapped vessels) which would theoretically allow those vessels in reserve to be rapidly brought up to operational status. A dramatic reorganisation of fleets and squadrons was also proposed, which over the medium-long term were to go hand-in-hand with a major shift in vessel design. The ‘Scheme’ was an integrated programme that, it was insisted, needed to be executed in full to attain its laudable goals of improving service efficiency, fighting capability, and instant readiness for war.⁴⁹ The view, luridly set out, was that

...It will be obvious then that the whole of this business is a regular case of “the house that Jack built”, for one thing follows on another, *they are all interlaced and interdependent!* That’s why it was said to begin with:-

The Scheme! The Whole Scheme!!

*And Nothing But The Scheme!!!*⁵⁰

The purging of useless vessels from the service made sense from all perspectives, though Fisher did to an extent have an advantage of circumstance when it came to economies. While the estimates had increased dramatically over the previous decade, the years 1902/03 and 1903/04 had seen additional short term increases (the purchase of the two *Swiftsure* class light-battleships from Chile and the need to address arrears in repairs) which accounted for a proportion of the apparent savings (or at least reductions in the estimates) immediately afterward.⁵¹

⁴⁷ Kemp *The Fisher Papers Vol. I* p.43 Original italics

⁴⁸ *Ibid* pp.12-16 The majority of those identified were indeed sold off for scrapping in fairly short order

⁴⁹ Lambert *Sir John Fisher’s Naval Revolution* pp.97-98

⁵⁰ Kemp *The Fisher Papers Vol. I* p.20 Original italics

⁵¹ See Sir William White (writing as ‘Civis’) ‘The State of the Navy, V.-Recent Naval “Economies”’ *The Spectator* 15 December, 1906 p.980 Although by this juncture White was ill-disposed toward Fisher (not without some cause), his points, though often overlooked, are not without some merit

For all its drama, *Naval Necessities* and many of Fisher's subsequent policy decisions have caused enormous debate because he rarely explained exactly what he was doing and why. Scrapping programmes and rearrangements of manning were visibly apparent enough, and some rationale behind them was stated, but of wider strategic matters little was directly set out in writing. While as Seligmann remarks Fisher, rarely a man to entertain doubts, will have been certain in his own mind, sharing his ideas was rarely part of his agenda.⁵² The overwhelming personality of the man however can overshadow certain facts, one of which being that there was precedent aplenty for his reticence at explaining his views on service strategy: Milne, Cooper-Key, Hood and even Richards had to varying extents declined from giving voice to, or even explicitly stating in writing, RN strategic doctrine. The reasons on occasion varied, although politics was usually a key factor.⁵³ Fisher took it somewhat further in refraining from enlightening many in the service however, and in this respect at least, took 'secrecy' too far. It has however provided naval historians with much to discuss and speculate over, and the debate over what Fisher was attempting to achieve is unlikely to ever fully abate given the lack of written evidence on the matter.

At the turn of the century, the global maritime and imperial challenge posed by France and Russia was still regarded by the service as the principal threat to be countered, though the mounting naval capability of other nations, particularly Germany, was receiving increasing levels of attention, and as noted in previous chapters the RN was unconvinced the Franco-Russian challenge was as serious a matter as is often believed. Both nations (particularly France) had caused the Admiralty some headaches on account of a vacillating strategic approach through much of the 1890s, mandating the twin-pronged construction of battleships and cruisers to counter the two threats posed.⁵⁴ This worked both ways though: the lack of consistency in France had largely been the result of political tampering and the existence of rival factions in favour either of the *guerre d'escadre* or the *guerre de course*, which wreaked havoc on attempts to create a coherent force-structure and was widely believed to have destroyed the aims of the major construction programme of 1900.⁵⁵ Nevertheless, commerce-

⁵² M. Seligmann *The Royal Navy and the German Threat 1901-1914: Admiralty Plans to Protect British Trade in a War Against Germany* (Oxford, OUP, 2012) p.67

⁵³ Certainly for Milne and Hood, very likely for Cooper-Key and Richards

⁵⁴ T. Ropp *The Development of a Modern Navy: French Naval Policy 1871-1904* (Annapolis: Naval Institute Press, 1987) p.254

⁵⁵ See 'The French Naval Programme' *The Engineer* 12 October 1906 p.373

raiding by various types of first-class cruiser was this point was seen as being at the heart of France's naval requirements.⁵⁶

The establishing of the Anglo-Japanese Alliance from 1901 helped counter the Russian naval challenge, such as it was, though this would not be completely negated until the end of the Russo-Japanese war of 1904-05, and therefore the effect upon wider RN strategy was relatively minor until this time, when it was possible to withdraw the battleships from the China Station, leaving a powerful cruiser squadron in its place.⁵⁷ As such the signing of the *Entente Cordiale* in April 1904 reduced the chance of a conflict with France, or the possibility of extensive raiding of British commerce. The financial impossibility of Britain being able to maintain superiority over all possible naval challenges was a primary motive behind the desire to establish more cordial relations with a European power.⁵⁸ Other political and economic factors aside, from a naval perspective, it was also rather more in British interests to reduce or eliminate the French challenge since her fleet was of greater potential threat to British trade than that of any other European power, having been largely developed for just that purpose. Moreover, despite the significant tensions that resulted from the Anglo-Japanese Alliance, which almost resulted in outright conflict following the North Sea Incident of late October 1904, since France was allied with Russia it was likely in the medium term that a similar understanding with that nation would ultimately result. In the event, the hoped-for annihilation of the Russian fleets in the Russo-Japanese war almost eradicated any potential challenge from that quarter for the immediate future, and provided considerable impetus for the Anglo-Russian *Entente* of August 1907.

The naval challenge from Germany was of a somewhat different nature. In 1894, the Oberkommando of the German Navy issued a memorandum written mostly by Alfred Tirpitz on the importance of sea power, in which an emphasis was laid upon a Mahanian battlefleet approach, and a general strategy in line with the *guerre d'escadre*.⁵⁹ This document in essence formalised views Tirpitz had previously expressed; the recommendations were not immediately furthered, but the strategic purpose of the fleet that would later be built up can be traced to this document. Germany passed its first Naval Law in 1898, aiming to establish a

⁵⁶ Seligmann *Great Britain's Security Mirage...* p.871

⁵⁷ There being, by the turn of the century, few illusions about the limitations of the Russian Navy –see previous chapters & Seligmann *Great Britain's Security Mirage...* pp.863-864

⁵⁸ Grove *The Royal Navy* pp.88-89

⁵⁹ E. Woodward *Great Britain and the German Navy* (Oxford: Clarendon Press, 1935) p.19 Tirpitz was elevated to the Prussian nobility and became 'von Tirpitz' in 1900

fleet of nineteen first-class battleships (along with twelve large cruisers and miscellaneous smaller craft) and coerce Britain into an entente against her traditional French and Russian rivals.⁶⁰ The Second Naval Law of 1900 was more serious from the Royal Navy's perspective. Tirpitz took advantage of the Second Boar War to bring in a comprehensive programme which was to double the number of battleships to 38, increase the number of large cruisers to 14, and ensure 34 small cruisers and 96 destroyers.⁶¹ Professions of the expansion being a purely defensive measure were rather negated by the publication of a memorandum attached to the Law, in which Tirpitz's 'risk strategy' was expounded. The fleet was to be large enough

...that even "the strongest naval power" could not fight it without seriously weakening its own naval power and leaving it helpless against a coalition of other naval powers (i.e. France and Russia)... the German battle fleet did not have to be so strong as that of the greatest naval power, because the latter would not, as a rule, be able to concentrate all its naval forces against Germany. The cold calculation behind this doctrine was that England, rather than risk a clash would a powerful concentrated German fleet, would prefer to make concessions to Germany in the colonial field.⁶²

As Marder points out, the major flaw in the reasoning was that Britain would always be on bad terms with France and Russia, or would accept the challenge without any response, whether in kind or through other means. The outlook delineated in *Naval Necessities* however was far broader in conception than a response to the challenge of a single nation, and the concentration of battleships in European waters was more a reflection of the altered strategic situation and the concomitant reduced need to maintain battle-squadrons on throughout the world than a response purely to the increased threat posed by the German naval build-up. The German challenge would become increasingly significant over time, and the Admiralty's strategic policy would increasingly be turned in this direction over time.⁶³ However, Fisher was well aware of the global scale and requirements of the British Empire, and the service could not simply divert all its attention to a single possible opponent. Equally, it seems that he believed that recent technological developments, particularly that of the torpedo and torpedo-craft were undermining the utility of the battleship itself. Nicolas Lambert has in recent years

⁶⁰ Grove *The Royal Navy* p.84

⁶¹ A. Marder *The Anatomy of British Sea Power* (London: Frank Cass Co., 1964) p.456

⁶² *Ibid* p.457

⁶³ S. Grimes *Strategy and War Planning in the British Navy, 1887-1918* (London: Boydell, 2012) p.225

popularised the view that Fisher adopted a strategy of 'flotilla defence' whereby the British homeland, major colonial stations and 'narrow seas' were defended by integrated fleets of the latest torpedo-craft, while blue-water operations were conducted by squadrons of fast armoured cruisers.⁶⁴ Whether one accepts the 'flotilla defence' thesis or not though, it is fair to point out that the battleship's status as the pre-eminent capital ship was under threat:

Now battleships could be sunk by torpedo craft, surface and sub-surface. What was the use of the battleship therefore, he asked. The answer was clear: 'none... if battleships have no function that first class cruisers cannot fulfil they are useless to the enemy and do not need to be bought'.⁶⁵

Although the latter point was radically stated, the threat to the battleship was not an unknown concept to the RN. Exercises on torpedo-craft offense and countermeasures had taken a significant place in the majority of the annual Manoeuvres of the 1890s, while as shown, first-class cruisers had been playing prominent roles in many of these since 1893 as part of fleets, while the 'flying squadron' principal for reinforcing threatened locations was far from being a new strategy. An operational example had recently occurred, when the First Cruiser Squadron, under Rear-Admiral Percy Scott was detached in 1908 first to South Africa, and later to South America to help promote British interests.⁶⁶ Equally, as illustrated, existing first-class cruisers had the ability to fight battleships, and some had even been designed with such duties in mind. Initially however, following Fisher's instalment as First Sea Lord, the Navy would henceforth comprise three main commands in European waters:

The eight battleships of the Channel Squadron would become the Atlantic Fleet, based at Gibraltar. The Home Fleet would become the Channel Fleet, reinforced by four battleships from the Mediterranean to 12 units. The Mediterranean Fleet would have eight units; the China Fleet would retain five battleships until the outcome of the Russo-Japanese war became clearer (Fisher wanted to bring them home). Each

⁶⁴ N. Lambert *Sir John Fisher's Naval Revolution* p.10

⁶⁵ E. Grove 'Battleship or First Class Cruiser? HMS Dreadnought and the Limitations of Jackie Fisher's Radicalism' Society for Nautical Research Annual Lecture, 1 December 2006; aka 'The Battleship is Dead, Long Live the Battleship; HMS Dreadnought and the Limits of Technological Innovation' *Mariner's Mirror* Vol. 93/4 (2007) p.419

⁶⁶ It was also in order to separate the largely Fisherite Scott from Admiral Lord Charles Beresford, C-in-C of the Home Fleet, and Fisher's greatest service-opponent

European Fleet would have attached ‘flying squadrons’ of armoured cruisers ‘ready to go anywhere’ as required.⁶⁷

Blockade however, appears to have been the dominant thesis of Admiralty war planning at this time. In December 1903, an NID report ‘advocated a “watch” on France’s Atlantic and Channel bases as the most effective means to destroy the French fleet by preventing the junction of its various squadrons’ –providing the blockading force did not attempt to get too close, it was believed small-craft would not hamper their effectiveness.⁶⁸ These were gradually adapted over time, the 1901 Manoeuvres assessing advance base concepts for blockading forces, and these would continue in modified form as the strategic environment changed and the threat of the dual-alliance was replaced by the rise of the German naval challenge.⁶⁹ This continued to operate with the policy of focal-area defence for trade-protection outside the European theatre. Confirmation occurred at a meeting at the Admiralty on 30 April 1905, which reviewed the history of trade protection back to an 1874 paper by Milne.⁷⁰ The meeting was nominally convened to ‘reconsider the whole question’ of trade defence, and examined the three general possibilities of convoy, patrolling trade-routes, and focal area defence. Convoy was once again dismissed, and of the other two options, stationing cruisers at focal-points was favoured for the following reasons:

1. Fewer cruisers required
2. Less coal consumed, wear & tear on machinery & boilers, ergo more ready for action at any given moment
3. May take advantage of moderate weather to keep filled up with coal & stores
4. Can be more readily found when concentration of force is required
5. Merchant vessels when passing may keep cruiser[s] constantly informed about what is going on
6. Commander of local squadron on hearing news of an attack may despatch an appropriate force to deal with enemy & reinforcements in known location.

⁶⁷ Grove *The Royal Navy* pp.89-90

⁶⁸ Grimes *Op. Cit.* p.35

⁶⁹ *Ibid* p.41

⁷⁰ TNA ADM 116 866b Secret. Minutes on meeting on ‘The Protection of Ocean Trade in time of war’ 30 April 1905. Present at the meeting were: Admiral Sir John Fisher, 1st Sea Lord; Capt. C. L. Ottley, DNI; Capt. R. H. S. Bacon, Naval Assistant to 1st Sea Lord; Capt. E. F. Inglefield, Assistant DNI; Capt. G. A. Ballard, Assistant DNI; Commander Wilfred Henderson; W. F. Nicholson Esq., Private Secretary to 1st Sea Lord

7. Merchant vessels know where to head if threatened & will lead enemy to our cruisers
8. Cruiser squadrons, speed at station & at right angles to trade-routes will see more vessels they are protecting that in patrolling the routes up & down
9. Cruiser[s] stationed in squadrons at certain points on trade-routes will form useful intelligence bases where information may be collected and from which merchant vessels may obtain directions as to the safest routes to follow.⁷¹

It was further suggested that neutral waters might not offer as much protection as many expected, particularly since the waters of a weak power may be, and often would be violated with impunity. Trade, it was proposed, should be limited to specific ‘war-routes’, which it was believed would allow commerce to be defended more effectively, and should be seen as ‘a huge bait to bring enemy cruisers out of port.’⁷² The outright stating that trade was ‘bait’ to draw enemy commerce raiders to their destruction is interesting in itself, although it was largely inherent to the focal-defence system. Also present at the meeting was Captain Edward Inglefield, who had in 1901 been tasked to expand on the details of the most recent trade-protection plans; later permanently attached to the NID he had been scouring London for wider information on the global trading system, and this has some interesting wider connotations.⁷³ Recently, Lambert has argued that as the decade wore on, Fisher’s Admiralty would increasingly move toward a strategy of economic warfare, away from the ‘traditional’ concepts of blockade. This ‘was predicated upon the twin expectations that the outbreak of hostilities would trigger a countdown toward economic and social Armageddon and that Britain could manage the descent into the abyss.’⁷⁴ In effect, it was the British equivalent of the German Schlieffen Plan, designed to exploit British dominance over the international cable communications networks, shipping, trade-routes, port facilities and key economic centres. The strategy Lambert describes was to turn the tables on those who had argued British dominance was a weakness that could be attacked via the *guerre industrielle*, and actively exploit it to utterly destroy an opponent’s (specifically, Germany’s) economy in a very short space of time, while Britain could remain relatively unscathed. Economic warfare itself, like flotilla defence in the Royal Navy, was never fully implemented, but aspects

⁷¹ *Ibid*

⁷² *Ibid*

⁷³ Lambert *Planning Armageddon* p.28

⁷⁴ *Ibid* p.4

almost certainly fed into the more conventional ‘blockade’ strategy.⁷⁵ Certainly Inglefield’s knowledge of global trading will have made him a valuable presence at the meeting to discuss commerce-defence plans (quite apart from his more conventional service experience) and lent some wider perspective to proceedings.

The constitution of the fleets in European waters varied somewhat over time as the strategic position altered. As of 1904-05, Germany had been just one of multiple naval rivals that needed to be considered by the Admiralty (and not necessarily the most significant). With the Anglo-Japanese Alliance in place and the signing of the *Entente Cordiale* in 1904 however, Britain effectively changed the whole strategic calculus of defence policy.⁷⁶ France was now an ally, while Russian naval strength had been wiped out by the Japanese, leaving only Germany as a challenger to British maritime dominance. Possibly as a reflection of this, and to head-off demands for cuts to the 1907/08 construction programme, Fisher began to reduce the number of commissioned vessels from the main fleets with the stated object of placing them in reserve; a policy that was widely seen as a public relations disaster for the Admiralty. The First Sea Lord apparently attempted to nullify the storm of criticism that arose from the more jingoistic press and fleet commanders by announcing the withdrawn vessels (including several of the latest and most formidable types, along with a huge number of torpedo-craft) would form the core of a new ‘Home Fleet’ –itself causing even greater protests. However, there are indications that this was one of Fisher’s more Machiavellian moves, and was what he had intended to do before ever he became First Sea Lord.⁷⁷

Alternative explanations to Lambert’s exist; Grove has suggested that given its composition and when considered in light of the First Sea Lord’s general strategic thinking, it was the embodiment of Fisher’s new-model strategic-reserve intended for a global reinforcing role.⁷⁸ Recent research by Buckley however, has suggested that with its vast number of torpedo-craft plus the Fifth Cruiser Squadron, with the latest armoured cruisers and the first all big gun capital ships, it was indeed the force intended to contain Germany in the North Sea.⁷⁹ If so, this reinforces the view that Fisher saw the fast cruiser type armoured ship as his preferred

⁷⁵ As Lambert points out, the term ‘blockade’ as generally used (including here) is technically incorrect since it had a specific legal meaning, but it makes for a convenient handle

⁷⁶ Grove *The Royal Navy* p.93

⁷⁷ See Lambert *Si John Fisher’s Naval Revolution* pp.157-160

⁷⁸ Grove *The Battleship Is Dead* p.425.

⁷⁹ Christopher Buckley has uncovered new evidence suggesting this interpretation in research for his forthcoming University of Salford Doctoral Dissertation on the origins of the Home Fleet

weapon to exploit the 'weather gauge' of high speed against a slower foe (see below). The German battleships were no more heavily armed than the later British armoured cruisers and would have been at a severe disadvantage against them, especially given the increasing availability of the latest big-gun ships.

An addition to the German battlefleet strategy that has lately received considerable attention from Seligmann was the possible threat of their renowned high-speed ocean-liners being converted into AMCs for use as commerce-raiders.⁸⁰ This was not a new threat in itself: as indicated in Chapter Two the possible use of converted fast liners had been considered by the Admiralty since the mid-1880s, and was one that was taken seriously. The possibility dwindled in the 1890s as France and Russia developed dedicated naval commerce-raiders, but with the new German liners vying for the Blue Riband, and the gradual rise of the naval challenge from that quarter, around the turn of the century it was taken increasingly seriously once more. Seligmann contends 'fear of German commerce raiding was both an original core issue and an enduring problem that kept Germany at the forefront of the Admiralty's attention.'⁸¹ Given the strategic disadvantages Germany laboured under in terms of facilities in the homeland and abroad this may be overstated, but the central case that the Admiralty was aware of a possible threat is well made and supported, and certainly, the liners had a high sustained sea-speed that even a *Drake* could not match.⁸² These may well have had considerable influence upon Fisher's strategic views, and the *Invincibles* developed largely in response –a matter considered below. Ultimately, his intentions were those of a visionary and technocrat, heavily exploiting new material in an attempt to create a more efficient, battle-worthy service better suited to the strategic climate of the day. The first-class cruiser was, and would remain a major component in Fisher's outlook. Before considering how he wished to develop it however, it is necessary to examine the status of the type in the first years of the Twentieth Century, prior to his appointment as First Sea Lord.

⁸⁰ Seligmann *The Royal Navy and the German Threat*; also 'New Weapons for New Targets: Sir John Fisher, the Threat from Germany, and the Building of HMS Dreadnought and HMS Invincible, 1902-1907' *The International History Review* 30:2

⁸¹ Seligmann *The Royal Navy and the German Threat...* pp.170-171

⁸²

A return to larger dimensions

Well before Fisher became First Sea Lord, and even during the early development stages of the *Devonshire* class, sketches had been prepared for larger vessels with greater outright fighting capability; a reversion to the full-sized first-class vessel exemplified by the *Drakes*.⁸³ Although unquestionably well designed and powerful vessels for their displacement, particularly when modified during their construction to add two further 7.5in gunhouses in place of the forward double-deck casemates, the *Devonshires* also represented an at best uneasy compromise between fighting capacity and dimensions. The introduction of the new 7.5in gun was welcome in light of the gradually improving armour of foreign commerce-raiding types, which was gradually reducing the utility of the 6in rapid-firing breech-loader as a primary armament, but the *Devonshires* possessed insufficient numbers of either the 7.5in or the 6in to achieve a good offensive balance, and the type was little more capable of fleet operations than the *Monmouths*. The latest French armoured cruisers had reverted back to the size of the *Jeanne d'Arc* (and also finally received KC armour), and with the Board also increasingly considering the first-class cruiser for the fleet-role as a fast division, a return to larger dimensions was necessary.

The 1901 Manoeuvres had like several previous exercises exploited the heavy-scouting role of the vessels, and this tendency would increase over the following five years, while the Royal Naval College and NID produced numerous memoranda on the subject. In 1902, Lieutenant Tristan Dannreuther at the NID produced a paper on 'The Tactical Organisation of a Large Fleet' with a number of combat scenarios played out, and in which the van squadron was assumed to have / require at least a 3-knot speed advantage over the other vessels.⁸⁴ Realistically speaking when it came to existing types this meant the *Cressys* and *Drakes*, while the use of them as a fast-wing was also hinted at with comments on the use of Lord Howe's frigates and the vital role their concentration of fire on the rear of an enemy line played – a remark with a distinct resemblance to the views contained in Samuel Long's 1892 INA paper.⁸⁵

A counterpoint was provided by Captain H. J. May when the Senior Officers' War Course at Greenwich Naval College were instructed to carry out a series of investigations into the

⁸³ D. Brown *Warrior to Dreadnought: Warship Design 1860-1905* (London: Caxton, 2003) p.160

⁸⁴ TNA ADM 231/37 'The Tactical Organisation of a Large Fleet' p.15

⁸⁵ *Ibid* p.19

matter.⁸⁶ The rival ships employed for the purposes of the report were referred to as ‘A’ and ‘B’ but were respectively based upon the *Connecticut* class battleship and *Tennessee* class armoured cruiser of the United States Navy.⁸⁷ Presumably the staff at the Naval College felt these would make a good comparative basis since their characteristics were known and they were also the largest of such types in foreign service. Just as importantly, since the Royal Navy was unlikely to fight itself (other than in terms of internal politics), there was little purpose in using its own vessels as the yardstick. The report itself was quite comprehensive, noting the value of the faster though more lightly armed ‘B’ against a *Royal Sovereign* class battleship of the Naval Defence Act, but concluding that the slower, more heavily armed and protected ‘A’ would be preferable if opposing a battleship of more recent design, and was generally superior if both sides wished for a decisive battle:

...for fighting in a fleet, the B ships are much inferior to the A’s. Their speed may be of the greatest moment strategically, but it is well nigh [*sic.*] a negligible quantity tactically.⁸⁸

May’s paper is often referred to, but care is needed in drawing too many conclusions from it given the assumptions it was based upon: that both sides were equally well-handled and equipped, wished for ‘decisive battle’, and that they would be comprised exclusively of one type or the other. Under different conditions, where such rigid assumptions were unlikely to occur, a rather different set of conclusions arose, as May himself would point out. The first war game of 1903 at the Royal Naval College again under May tended to underline the importance of the armoured cruiser ‘especially to that power which is specially strong or specially weak at sea.’⁸⁹ A variety of ways in which the types could be used were assessed during the exercises held that year, the first of these seeing them employed as part of the battle-line on one side, and prolonging the line itself (slightly astern) on the other.⁹⁰ A further exercise saw them specifically employed by ‘B’ fleet, which had an inferiority to the rival ‘A’

⁸⁶ TNA ADM 1/7597 Admiralty: Intelligence Department Report (No.653) ‘Tactical value of speed as compared with extra armour and guns’ May 1902

⁸⁷ It is notable that the Naval College staff described ‘A’ as a ‘Heavily Armed Battleship’ and ‘B’ as a ‘Lightly Armed Battleship’, clearly matching the intentions behind the *Tennessee* class design, and also those of the slightly earlier British *Cressys*

⁸⁸ TNA ADM 1/7597 ‘Tactical value of speed...’ p.15

⁸⁹ TNA ADM 231/38 ‘Précis of Strategical War Game carried out at the Royal Naval College, Greenwich, in the early part of 1903’ NID Report 706 October 1903 p.18

⁹⁰ TNA ADM 231/40 ‘Tactical Exercises, 1903 (Mediterranean, Home and Channel Fleets, and Cruiser Squadron)’ NID no.720, February 1904 pp.10-13

fleet in battleships, 'to make use of their speed, and engage the nearest end of the enemy's battle line', their usual station being a mile on the outer quarter of either wing of the main battle squadron.⁹¹ This was deemed to be practical, May remarking that

a very large proportion of "B's" fighting strength lay in the armoured cruisers which provided much more than half the heavy projectiles that could be fired each minuet, and also nearly two-thirds of the protected QF fire. Therefore it was absolutely essential for "B's" success that the armoured cruisers should be kept close up in support of "B" battleships.⁹²

On the first attempt this did not work out, largely due to the 'B' fleet armoured cruisers being separated from the main battle-squadron by around two miles at the commencement of the action; a second set of exercises that day following the same criteria saw this mostly reversed as the cruisers kept closer company, but underlined how vital co-operation between the slower and faster divisions was.⁹³

Sir William White had retired from his post as DNC in December 1901, his last official day in office being Friday, January 31 1902.⁹⁴ Succeeding him was Philip Watts, returning to the Admiralty from his position of general manager and naval architect to Armstrong Whitworth & Co., at Elswick. Watts is a rather more elusive figure than his predecessor. A year younger than White, he was born in Portsmouth in 1846, his father being a principal constructive officer in the Royal Dockyard. Apprenticing as a shipwright from 1860, he was selected for the Royal School of Naval Architecture in South Kensington in 1866. Prior to leaving for Elswick, he worked on calculating vessel dimensions, and with Froude at the latter's test tank facility, as well as holding a post as Assistant Constructor at Pembroke.⁹⁵ The relationship between White and Watts appears to have been circumspect, in which there was respect but occasional mild clashes. During the discussion on Watts's 1899 paper on Elswick Cruisers at the Institution of Naval Architects, White, needled at being patronised on somewhat questionable grounds and evidently wishing to remind those present of the wider history, remarked 'my friend and successor at Elswick (Mr. Watts), whose appointment I had the

⁹¹ *Ibid* p.33

⁹² *Ibid* p.38

⁹³ *Ibid*

⁹⁴ F. Manning *The Life of Sir William White* (London: J. Murray, 1923) p.444

⁹⁵ For a more extensive background on Watts, see the Obituary in *TransINA* Volume LXX (1928)

pleasure to arrange before I returned to the Admiralty, has more than justified in his subsequent career the high hopes I had of his future.’⁹⁶ Despite their being just a year between them, it is evident that White still regarded himself as the master and Watts his talented junior.

The two *Duke of Edinburgh* class cruisers provided under the 1902/03 programme (with four more slated for 1903/04) saw dimensions jump back to 13,550 tons load displacement, up from the 10,850 load displacement of the *Devonshires*.⁹⁷ The deck-plan and side-elevation of the type is shown in Figure 5.3. The first vessels for which Watts was responsible designer after being appointed DNC, W. H. Whiting was in charge of the design, which was loosely derived from the studies for more heavily armed *Devonshires*.⁹⁸ 505ft 6in between extremities (a nominal 480ft) their design trials speed was the same 23 knots as the *Drake* and *Monmouth* classes, 20 Babcock and 6 cylindrical boilers feeding a pair of 4 cylinder TE engines for 23,500 I.H.P. with the usual two shafts.⁹⁹ The class were amongst the first cruisers to be fitted with oil sprays in the furnaces to increase the combustion and raise power, although the smoke cloud was then sardonically likened ‘to that produced by the best Japanese steam coal.’¹⁰⁰ The double-bottom under the boiler and engine-rooms was utilised for carrying this.¹⁰¹ With a maximum coal capacity of just over 2,000 tons, radius of action was approximately 8,000 miles at 10 knots.¹⁰²

⁹⁶ Sir William White, in discussion on P. Watts ‘Elswick Cruisers’ *TransINA* Volume XLI (1899) p.303

⁹⁷ Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin and Co., 1912) p.181

⁹⁸ N. Friedman *British Cruisers of the Victorian Era* (Barnsley: Seaforth, 2012) p.257 Also see Brown *Warrior to Dreadnought* p.161

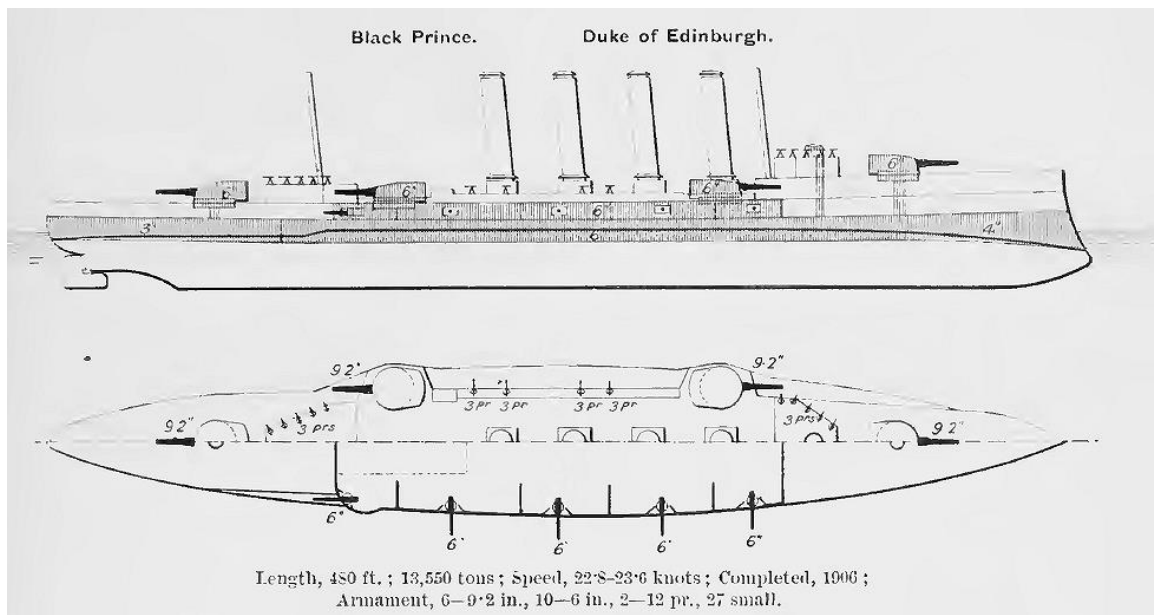
⁹⁹ R. Chesneau & E Kolesnik [eds.] *Conway’s All the World’s Fighting Ships 1860-1905* (London: Conway Maritime Press, 1979) p.72

¹⁰⁰ Parks *Op. Cit.* p.444

¹⁰¹ Friedman *British Cruisers of the Victorian Era* p.260

¹⁰² *Ibid* p.445

Figure 5.3: *Duke of Edinburgh* class cruiser deck-plan and side-elevation



Source: Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin & Co., 1912)

Plate 11

With fewer restrictions on the budget, armament was increased, reflecting both the increased levels of protection in foreign cruisers, and the intended fleet capability of the new type. Six 9.2in Mk X were employed in single turrets, with chase weapons fore and aft, and wing turrets abreast the fore and mainmasts giving a 4-gun broadside. The beam turrets were intended to provide axial fire, but due to excessive blast effects, their training arcs were limited in practice to 30 degrees of the fore and aft line.¹⁰³ Five of the new rapid-firing 50 calibre Mk XI 6in were employed on each broadside in central main-deck batteries rather than the casemates that had previously been employed.¹⁰⁴ In comparison to the previous 45 calibre 6in BL Mk VII it was slightly heavier at just over 8 tons, had a 35lb charge as opposed to the 23lb charge of the earlier weapon, and muzzle velocity was raised significantly up to 3060 ft./sec. from 2535 ft./sec.¹⁰⁵ The *Dukes* were the last class of British cruiser that adhered to the Admiralty's policy of providing a secondary armament identical with that adopted with first-class battleships of the same date.¹⁰⁶

Protection in the class was provided by a 6in thick KC belt extending over 260ft amidships, from 4ft 10in below the waterline to just below the main deck. The ends were closed with 6in bulkheads, and the belt was extended with 4in armour to the bows, and 2in aft to the stern. The belt armour was effectively extended vertically to the top of the maindeck level by the 6in battery armour. Deck protection was a 1in main deck reduced to ¾in under the battery where the armour bulkheads provided additional stiffening, and a ¾in lower splinter deck that increased to 1 ½in over the steering gear. The CT had 10in armour, and the turrets 7 ½in faces, 5 ½in sides and 4 ½in backs.¹⁰⁷

Even before the second of the two vessels (*Black Prince*) was laid down, significant concerns were raised over the proximity of the main-deck 6in battery to the water. Selborne himself wrote to the Controller on this point, remarking that he was

...somewhat disturbed in respect of some of the 6 inch guns of the "Duke of Edinburgh" class of Cruiser. Will not their gun-ports be even nearer the water than are

¹⁰³ *Ibid.* p.443

¹⁰⁴ K. McBride 'The *Dukes* and the *Warriors*' Warship International No.4, 1990 pp.363-394

¹⁰⁵ NMM *Duke of Edinburgh* class ship cover, Memorandum from Director of Naval Ordnance to DNC, Controller, Secretary and First Naval Lord, 23 June 1903

¹⁰⁶ Sir William White 'The Principles and Methods of Armour Protection in Modern War-Ships' in T. Brassy [ed.] *The Naval Annual, 1904* (Portsmouth, J. Griffin & Co., 1904) p.121

¹⁰⁷ Chesneau & E Kolesnik *Op. Cit.* p.72

the main deck gun-ports of the “Drake” class; and if this is so, is not that an error we should not be justified in repeating? When we were considering the designs we had not the experience of the “Drake” class before us. Now we know that the 6 inch guns on the main deck of that class could hardly be fought at all except in a dead calm.¹⁰⁸

Watts responded to the First Lord’s query with a memorandum to the Controller on 8 June. It was stated that alternative arrangements had been discussed by the Board before the main-deck battery was selected, including one where eight 6in weapons would be provided in four twin turrets on the upper deck, two on each side.¹⁰⁹ Watts stated this would entail a reduction in side armour to just the belt below the main deck, with barbette protection being provided for the bases of the turrets, that this would result in a displacement increase of 150 tons, entail an entirely new design, and as a result it would probably not be possible to call for tenders before October that year.¹¹⁰

The box-battery configuration had been selected by the Controller because it theoretically allowed some ahead and astern fire, which would not have been possible with upper-deck gunhouses, since they would be blocked by the wing 9.2in turrets.¹¹¹ Watts attempted to support May, acknowledging that the main-deck battery was lower to the water than in the *Drakes* –a consequence of a desire to keep the upper deck armament of 9.2in guns ‘as low as practicable’, stating the forward 6in guns would be better off in moderate weather owing to their being positioned further toward the centre of the ship.¹¹² Evidently the dissatisfaction with the *Duke of Edinburgh*’s low-mounted maindeck 6in battery continued throughout the year before either of the vessels had even been launched. On 12 December, Whiting circulated a memorandum which further discussed the idea of altering the design to replace the battery with eight 6in in four twin turrets on the upper deck between the wing 9.2in guns, but laying greater emphasis upon a more recent suggestion:

If, as now suggested, an upper deck armament of 7.5” guns be preferred, then 4 of these guns can be carried in separate turrets in lieu of the 10-6in main deck guns. There will be a small increase of weight (100 to 150 tons) and a small decrease in

¹⁰⁸ NMM *Duke of Edinburgh* class ship cover. S.17442-03, Selborne to Controller, 28 May 1903

¹⁰⁹ NMM *Duke of Edinburgh* class ship cover. S.17442-03, Watts to Controller 8 June 1903

¹¹⁰ *Ibid*

¹¹¹ Friedman *British Cruisers of the Victorian Era* p.260

¹¹² NMM *Duke of Edinburgh* class ship cover. S.17442-03, Watts to Controller 8 June 1903

metacentric height (probably about 3 inches), both of which might be accepted if the suggested change of armament be considered desirable and of importance.¹¹³

Two months later, Watts reported that experience with recently completed *Monmouths* indicated that the *Duke of Edinburghs* would complete with a hull weight some 200 tons less than that calculated in the legend, and the use of Yarrow boilers in the four vessels of the class that were to be constructed as part of the 1903/04 programme would result in a further saving of some 85 tons.¹¹⁴ With additional expected minor weight-savings in armour, approximately 300 tons of weight would be available for modifications to the armament of the last four vessels of the class, which would provide for fitting four 7.5in guns in upper-deck gun-houses in place of the 6in box-battery, while still retaining the armour of the latter to improve protection.¹¹⁵ On 30 March 1904, in a meeting with Naval Lords, Admiral Fawkes (C-in-C Cruiser Squadron), Captains Jellicoe, Camble and Madden, it was stated that the captains of the Cruiser Squadron were unanimous in their view that the 6in battery would be unworkable in any seaway and that four 7.5in guns in upper deck gunhouses would be preferred for the four new cruisers on these grounds, and because they offered superior control at longer ranges; this was confirmed in a meeting with the First Lord directly afterward, and the design was modified to reflect these changes in the four vessels of the 1903/04 programme, now officially named *Warrior*, *Achilles*, *Cochrane* and *Natal*, the four 7.5in being the new 50 calibre Mk II pattern.¹¹⁶

Practical confirmation of the limits of the 6in box-battery occurred in the 1906 Manoeuvres. On 29th June, the brand-new HMS *Black Prince* was operating as part of the Blue 2nd Cruiser Squadron, engaged in a *guerre de course*. Ordered to keep away to starboard and rendezvous with the rest of her squadron 60 miles north of Cape Villano (Spain), she sighted the Red 3rd Cruiser Squadron, including the *Drake* class *Leviathan* at 5.48pm. *Black Prince* deemed it advisable to draw them off to the east, inform the location and course of the enemy vessels to the Flag of her own squadron, and fight *Leviathan* 'on the principle that Black Prince's four

¹¹³ NMM *Duke of Edinburgh* class ship cover. Copy of C.N.1./4252/1904 Whiting to Controller 12 December 1903.

¹¹⁴ NMM *Duke of Edinburgh* class ship cover. Watts to Controller 23 February 1904

¹¹⁵ *Ibid*

¹¹⁶ NMM *Duke of Edinburgh* class ship cover. Controller (Admiral William May) to Naval Lords, Civil Lord, Financial Secretary and First Lord 31 March 1904 The first two *Dukes* were considered too far advanced to be modified

9.2-in., guns which could bear, more than equalled the two 9.2-in. guns and 6-in. guns which the former could bring to bear on her.

‘During the engagement, which took place at a speed of 22 knots on both sides, the Third Cruiser Squadron had the wind, which was N.E., fresh, with considerable sea abeam or slightly abaft the port beam, thus enabling the lee batteries to be engaged. On the other hand the “**Black Prince**,” steaming at this great speed with the wind and sea on her port bow, was in a very bad position for fighting her port guns, as green seas were sweeping her fore and aft. The “**Black Prince**’s” guns, although reported cleared away, and after a quarter of an hour’s engagement at ranges from

“*Leviathan*” - - 8,000 to 4,000 yds

“*Carnarvon*” - - 7,000 to 4,000 “

“*Lancaster*” - - 8,100 to 4,000 “

“*Suffolk*” - - 9,000 to 3,800 “

at 6 p.m. the “**Black Prince**” was put out of action and ordered home, and it was decided by the chief umpire at the close of the Manoeuvres that, as her guns had not been trained, “**Leviathan**” had suffered no damage.¹¹⁷

The extra length of the 50 calibre Mk XI gun exacerbated this problem relative to the earlier vessels and in March 1916 both vessels were drastically modified, the main-deck battery being closed up and six of the 6in fitted to the main deck with shield protection.¹¹⁸

Sometimes treated separately as the *Warrior* class, the four vessels of the 1903/04 programme were, other than the modifications to the armament and upper deck layout, largely a repeat of the previous ships, the only other major difference being the use of Yarrow water-tube boilers, which were both lighter and physically simpler than many other water-tube types. The deck-plan and side elevation of the type is shown in Figure 5.4. Figure 5.5 shows a cross section of the Yarrow boiler, indicating its straight tubes, which greatly facilitated ease of maintenance. The battery armour in the *Warriors* was retained per Watts’s suggestion to protect the bases of the 7.5in barbettes, and as in the previous two vessels, usefully extending

¹¹⁷ TNA ADM 231/47 Confidential. Naval Manoeuvres, 1906 pp.249-250 An interesting example, since it illustrates the limits of maindeck weapons, but also that such guns were not automatically unworkable, since *Leviathan* was perfectly able to train her lee batteries. Thus prevailing conditions and tactical positioning should be factored into the equation

¹¹⁸ Brown *Warrior to Dreadnought* pp.161-162

the side-protection vertically to the top of the main deck.¹¹⁹ Maximum coal bunkering was 100 tons less than their half-sisters.

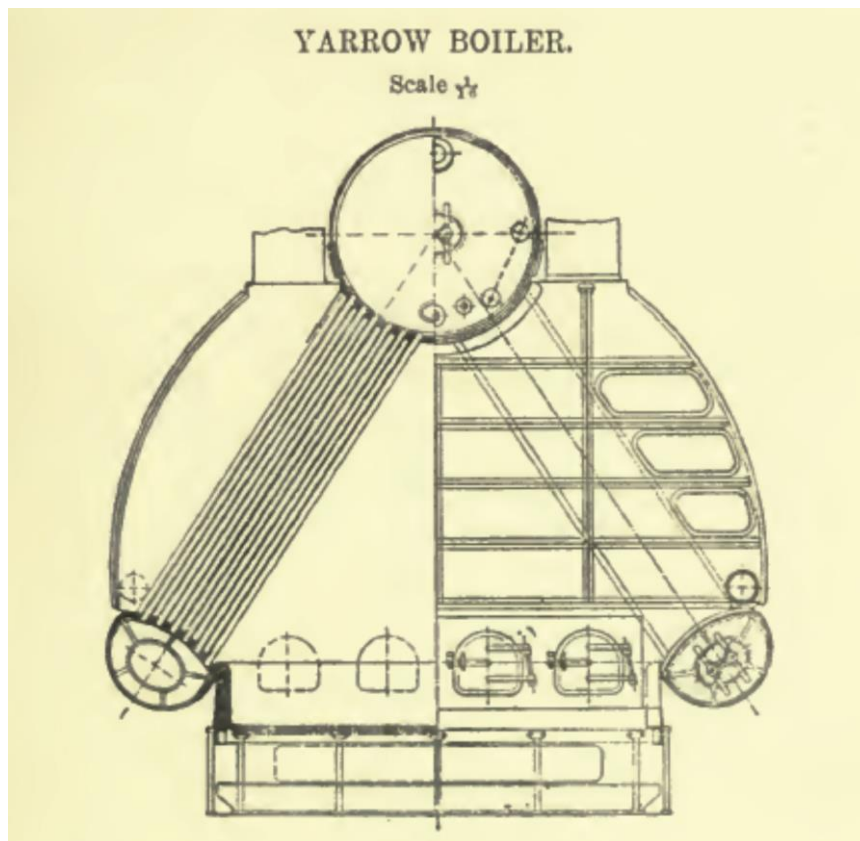
¹¹⁹ Technically it was superior owing to the lack of gun-ports

Achilles. Cochrane. Natal. Warrior.

Length, 480 ft.; 13,550 tons; Speed, 22·3–23·3 knots; Completed, 1906–1907;
Armament, 6—9·2 in., 4—7·5 in., 1—12 pr., 31 small.

Plate 10

Figure 5.5: Yarrow Water-tube type warship boiler



Source: L. S. Robertson [trans. & ed.] *Marine Boilers: Their construction and working dealing more especially with tubulous boilers. Based on the work by L. E. Bertin* (New York: D. Van Nostrand Co., 1906) p.470

A problem found was excessive temperatures around the boiler rooms, and there was some concern over how this would affect the cordite stowage lockers in the ammunition passages that ran beside the boiler rooms.¹²⁰ It was also discovered that the temperature in the after 7.5in and 9.2in magazines, which were located near the stoke-holds, was too high, and extra cooling was required. This was a significant flaw, which had not occurred in previous vessels, when White had refused outright to entertain proposals ‘to place magazines and shell rooms in situations where the explosives stored in them would be exposed to the deteriorating influences resulting from high temperatures.’¹²¹ In general, the surviving plans held by the National Maritime Museum appear to bear out White’s remarks; a report on magazine temperatures in the *Good Hope* and *Leviathan* (*Drake* class) stated that ‘the magazine temperatures were practically unaffected by variations in open air temperature, or by long and hard steaming’, the highest temperature recorded being 69 degrees Fahrenheit, despite a 30 hour full-power trial.¹²²

The issue of magazine temperatures was partially addressed with considerable extra refrigeration equipment, but the lockers were impossible to cool, and after lengthy discussion in which the possibility of removing the lockers was seriously contemplated, it was decided that they should be employed for temporary stowage only, to reduce the deterioration of the cordite.¹²³ It is significant to note that HMS *Natal* of the class was lost 30 December 1915 in Cromarty Firth through after-magazine explosion. A considerable amount of data on the loss of the vessel is available, revealing she had on board a quantity of ‘First Use’ charges for her 9.2in and 7.5in guns which had not been used up, nor landed for the purposes of testing the state of the cordite degradation as should have been the case.¹²⁴ Some of these were very elderly, notably lots B.177 and C.499, manufactured in October 1904.¹²⁵ As revealed in the evidence given to the Court Martial of the survivors, the frequent changes of Gunner appointed to *Natal* almost certainly contributed to these omissions.¹²⁶ Nevertheless, the somewhat mediocre magazine arrangements of the class will not have helped matters.

¹²⁰ NMM *Duke of Edinburgh* class ship cover C.N. 121470/06 Jellicoe (DNO) to Controller 5 February 1907

¹²¹ Sir W. White ‘On the Maximum Dimensions of Ships’ Transactions of the Society of Naval Architects and Marine Engineers Volume XIX (1911) pp.34-35

¹²² NMM *Drake* class cover Handwritten report W. E. Smith “‘Leviathan’ magazine temperatures’ 22 May 1902

¹²³ NMM *Warrior* class ship cover, Captain R. Bacon for D.N.O. 16 August 1907

¹²⁴ ADM 178/123 G01418 1916 Confidential. Report on the loss of H.M.S. “Natal” at Cromarty on 30th December 1915 p.533

¹²⁵ *Ibid* Also noted in a letter from Jellicoe to the Admiralty, dated *Iron Duke*, 4 January 1916

¹²⁶ *Ibid* p.536 para.45

With the design of the *Duke of Edinburgh* class modified to general satisfaction, by late summer of 1903 attention was turning to the first-class cruisers for the 1904/05 Programme. Like the previous classes, these were very much intended as fleet vessels, capable of acting as heavy-scouts and a supporting wing for the battlefleet, as well as being able to perform the detached duties expected of a cruiser. On 5 August, the Controller informed Watts that a new design of armoured cruiser would be required for the following year's Estimates, and that he wished for some sketch designs for the information of the Board, and to assist them in coming to a decision.¹²⁷ The designs were desired for 1 December, latest, and key features desired were given thus:

The new design should have all the guns of the Main and Secondary armament in Turrets with a good command so that they could be fought in a seaway.

I should like you to consider for armament a combination of (1) 9.2" & 7.5" guns; (2) 9.2" and 6" guns; (3) All 7.5in guns. All to be of the most recent type.

The defence to be practically the same as "DUKE OF EDINBURGH" and if possible 7" or 8" on the waterline amidships.

The speed 23 knots for 8 hours

The draught, mean, not more than 25 ½ feet, other conditions similar to Duke of Edinburgh.

The cost is not to exceed the Duke of Edinburgh and it would be a great advantage if this was reduced.¹²⁸

Eleven designs were submitted for consideration by the Board exhibiting various combinations of the armaments specified, all in turrets with a good command that could be fought in a seaway. The DNO (MacLeod), reviewing the sketch designs, expressed concern over guns being crowded, and spaced too close together, further stating that he did not wish to see the 6in gun to be included in any design, nor the 7.5in (however numerous) made the heaviest weapon

¹²⁷ NMM *Minotaur* class ship cover Copy of S.22298/1903, Controller to DNC, 5 August 1903. See also TNA ADM 8724/93 King-Hall 'The Evolution of the Cruiser' Op. Cit. Appendix to Chapter II, "Minotaur" class

¹²⁸ *Ibid*

...in view of the role quite likely to be allotted to these high speed, well protected vessels. They may very possibly be subjected to battleship fire in the exigencies of action and would then find the want of more effective belt piercing ordnance.

Upon these conditions I favour the two 9.2" pairs and balance in 7.5" pair guns... but I would prefer to see two 10" pairs and balance in 7.5" pairs.¹²⁹

The DNO's preference for the 10in gun seems to have primarily been a response to the US *Tennessee* class, which carried four weapons of this calibre, although the 10in calibre was widely discussed at the time, and was already in use in the Royal Navy, in the *Centurion* and *Renown* class battleships.¹³⁰ MacLeod was presumably also influenced by the fact that the Royal Navy had a week earlier acquired the two *Swiftsure* class battleships that had been building for Chile, which were also so-equipped. The extra size would have improved outright penetration capabilities, but was not seen to have a significant enough advantage to be worth replacing the 9.2in. It seems that the cost of the vessels, at well over a million apiece came as enough of a surprise that cheaper designs were requested from the DNC, with the 7.5in weapons in a box battery or casemates to avoid the expensive barbettes and gunhouses, and (theoretically) allow a smaller ship.¹³¹ This proposal did not gain much traction however, and it was decided that

...the money ought not to stand in the way of having a good design of Armoured Cruiser, and they [the Naval Lords] preferred to have a really good ship and to spend more money on it, and to reduce the number of ships so that the money spent on new construction should not be exceeded as a whole –in fact, they preferred quality to quantity, and this was considered especially to be the case as these ships will not be built for three years, and vessels now designed should be with the object that they shall be up to date 10 years hence.¹³²

With the 9.2in gun as a major feature of the new cruiser's armament, it was further stated outright that under certain circumstances, the new type could take their place in line of

¹²⁹ NMM *Minotaur* class ship cover, DNO (MacLeod) to Controller, 18 December 1903. Original underlining

¹³⁰ Friedman points out that the DNO omitted to mention the fact that US vessels did not carry an equivalent to the 7.5in, retaining a large battery of 6in in a mixture of independent casemates and a central box-battery. See *British Cruisers of the Victorian Era* p.265

¹³¹ *Ibid*

¹³² NMM *Minotaur* class ship cover, Controller to Naval Lords, Secretary, Financial Secretary & First Lord 'New Designs of Armoured Cruisers to be laid down in 1904-5, 16 February 1904

battle.¹³³ This had been practiced to sporadic success in the 1903 exercises, while those of the following year were somewhat curtailed in the early stages due to poor weather conditions, though a cruiser action was fought to little useful effect as the stronger force did not press the action.¹³⁴

The Manoeuvres of 1906 however were much more revealing. These were amongst the largest-scale of all the annual Manoeuvres, and were largely done with an eye toward Germany, and how best to establish a blockade.¹³⁵ For that year, ‘in order to make a study of two important problems of naval strategy’ they were divided into two distinct periods of assumed hostility, separated by a week.¹³⁶ The first dealt with testing arrangements to counter a surprise attack on the Home Fleet and Channel ports, the second with arrangements for defending trade against a *guerre de course*. During the second period, commander of the defending Red fleet was Sir Arthur Wilson, while Sir W. H. May was C-in-C of the Blue fleet, which was to engage in the commerce-raiding activities. These exercises saw the most extensive use of first-class cruisers to date in the annual manoeuvres for all purposes. In one of her final operational outings, HMS *Terrible*, operating out of Falmouth as part of the 6th Cruiser squadron belonging to Wilson’s Red Fleet, once again proved the value of the first-class cruiser’s improved seakeeping compared to smaller types. With the squadron strung out across a 30 mile stretch to give them the best chance of locating enemy ships that might attempt to attack the trade-route, she spotted and easily chased down two opposing destroyers which were unable to force against a head sea.¹³⁷ She later successfully engaged HMS *Niobe* in a single-ship action after HMS *Spartiate* suffered overheating of her crank heads.¹³⁸

Throughout the second period of the exercises, Wilson’s primary object had been to bring the opposing Blue force to action, using the trade he was to protect as bait to draw the opposing forces out to their destruction.¹³⁹ This was closely in line with the strategy outlined the previous year, and it is interesting that the Blue C-in-C had expected to encounter convoys: a system Wilson had not the slightest intention of implementing. As had been expected, initial

¹³³ TNA ADM 8724/93 King-Hall *Op. Cit.* “Minotaur” class

¹³⁴ TNA ADM 231/43 ‘Tactical and Strategical Exercises, 1904’ NID (No.769) April 1905 pp.6-8 A number of *Monmouths* were employed however, despite their limited fleet utility and trade-defence design goals

¹³⁵ Grimes *Op. Cit.* p.

¹³⁶ 1906 Manoeuvres, p.1

¹³⁷ 1906 Manoeuvres, p.170

¹³⁸ *Ibid* p.199 & 316

¹³⁹ *Ibid* p.324

mercantile losses were high, but had the 'war' continued into a third week, it was expected the majority of the attacking forces would have been destroyed or blockaded in port; the dispositions at the end of the NID report strongly suggest this would have been the case. The Manoeuvres were adjudged to

...bring out strongly the importance of speed and the necessity for speed endurance, or the power to maintain speed, in all classes of ship.

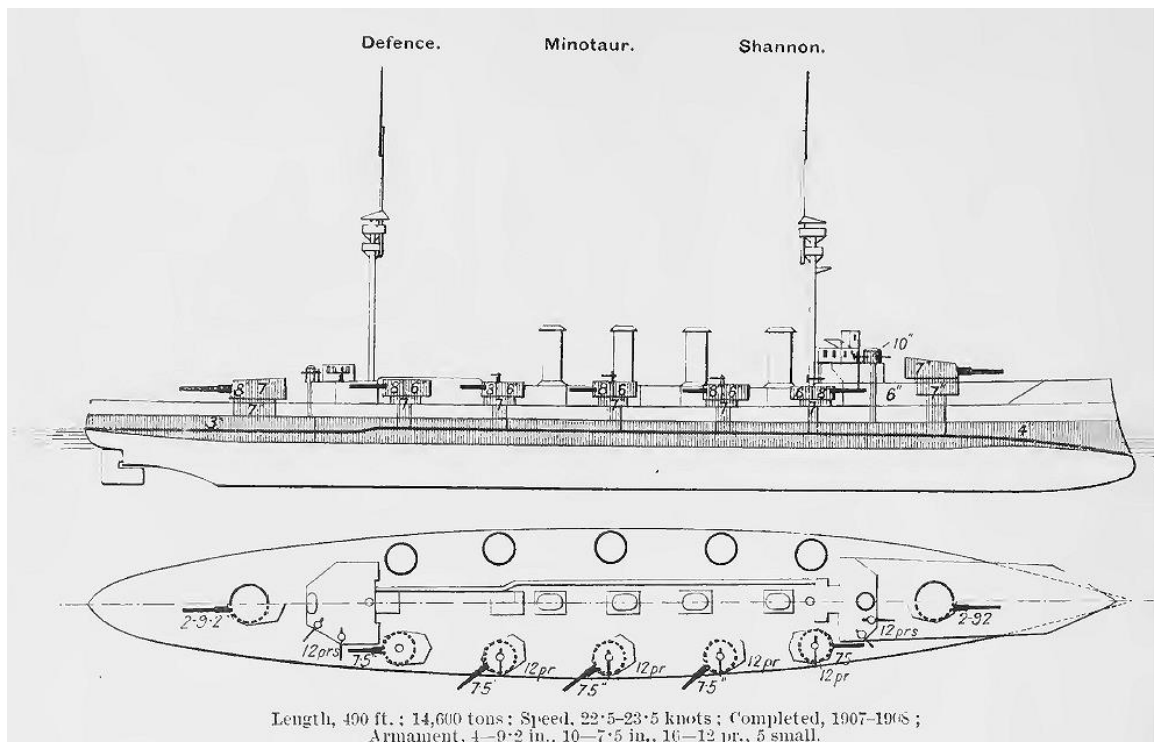
These points are emphasized in the various concentrations of a widely spread line during sweeping operations; in the power to postpone or to force and action; in chasing; in conveying information ; and during action.

...it is impossible to attach too great importance to the maintenance of engines and boilers at their highest degree of efficiency, and equally impossible to give too much consideration to the question of coal consumption and coaling arrangements.¹⁴⁰

The three *Minotaurs* were the largest armoured cruisers completed for the Royal Navy with intermediate calibre armament. The deck-plan and side-elevation is shown in Figure 5.6.

¹⁴⁰ *Ibid* p.331

Figure 5.6: Minotaur class deck-plan and side-elevation



Source: Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin & Co., 1912)

Plate 10

On 490ft (519ft overall length) and 14,600 tons load displacement their design speed was 23 knots for an 8 hours trial, 24 boilers (Yarrow in *Defence* and *Shannon*, Babcock in *Minotaur*) for a nominal 27,000 I.H.P. feeding two sets of four cylinder triple expansion engines on twin shafts.¹⁴¹ Like their immediate predecessors, the *Minotaurs* were fitted with oil sprays to increase combustion when required, and the mixed suite of water-tube and cylindrical boilers employed in British first-class cruisers since the *Devonshires* was dispensed with as the initial problems with the water-tube type had been addressed.¹⁴² With 2,000 tons of coal, radius of action was just over 8,000 miles at 10 knots.¹⁴³

During the design stages of the *Minotaur* class, a considerable amount of discussion occurred regarding hull forms. These were in reference to a belief among serving officers that the hollow entrance at the bow seen in many first-class cruisers increased their pitching and reduced their speed in a head sea relative to those with fuller lines, although it was accepted that the latter gave more resistance under other conditions and would result in the loss of around half a knot of speed.¹⁴⁴ The Controller in particular during the development of the *Duke of Edinburghs* had asked for model tests to be made comparing hollow and straight waterlines; Froude, the doyen of testing, complained that such comparisons were difficult given that it is almost impossible to change one aspect of a hull form without affecting several others in the process.¹⁴⁵ Watts, whose reputation was heavily built upon his skill in designing hull forms, was also strongly against any alterations, in which he was supported by Whiting.

Matters finally came to a head when Selborne stepped in on 5 May 1903, and effectively came down on the side of the Controller, insofar as the latter suggested the only definitive way of ascertaining whatever truth there might be was by full-scale testing, specifically to produce an alternate hull form with straight lines, slightly greater beam and shallower draught to ensure the same basic displacement. The original intentions appear to have been to carry this out with one of the four *Duke of Edinburgh / Warrior* class vessels of the 1903/04 programme, but this was not done. Presumably this was because the alterations to the armament of these vessels took priority, and it was felt better to delay matters until more

¹⁴¹ R. A. Burt 'Minotaurs' in R. Gardiner & A. Lambert [eds.] *Warship Quarterly* [No.42] (London: Conway Maritime Press, 1987) pp.83-95

¹⁴² Parkes, *Op. Cit.* p.448

¹⁴³ *Ibid* p.447

¹⁴⁴ See for example Penrose FitzGerald 'On the "Lines" of Fast Cruisers' *TransINA* Vol. XLV (1903)

¹⁴⁵ Brown *Warrior to Dreadnought* p.162

extensive design work and tank trials could be carried out. These confirmed the straight lines provided no advantages over the hollow and a half-knot loss of speed, but the Controller appears to have espoused the cause of straight lines and proposed in July 1904 that one of the three new cruisers for the 1904/05 programme, now officially termed the *Minotaur* class should be so constructed to provide a full-sized trial; a suggestion strongly opposed by the First Naval Lord.¹⁴⁶ Despite the objections of Lord Walter Kerr, Watts, Whiting and Froude, final approval was granted on 10 August 1904, and the *Shannon* of the new cruiser class was designed with straight lines, a foot of additional beam, and a foot less draught of water.

Comparative trials were made between *Minotaur* and *Shannon*, with her straight hull form on 3 December 1907. These were deliberately held in exceptionally rough weather since it was under these conditions some believed straight profiles superior. The trials almost entirely exploded this myth, *Shannon* making 22.49 knots as against 23.01 for the *Minotaur*, despite generating 28,350 I.H.P., exactly 1,300 more than her sister, and confirming the remarkable accuracy of the test-tank results at Haslar.¹⁴⁷ Both vessels apparently exhibited good behaviour despite the poor conditions, with low levels of vibration and steering well. It was also noted that the cooling issues that had occurred in the *Duke of Edinburghs* / *Warriors* had been addressed.¹⁴⁸

Twin mountings and gunhouses were readopted in the class for the 9.2in weapons, a pair of the new 50 calibre Mk XI being carried fore and aft as chase guns, providing the same four gun broadside as the six single guns in the previous two classes. The mounting itself was the same as that designed for the *Lord Nelson* class battleships.¹⁴⁹ Ten 7.5in Mk. V were carried in single turrets on the upper deck, five on each beam, the single barbettes and gunhouses being favoured owing to the reduced likelihood of a single hit disabling multiple weapons, and the higher rate of fire the single-mountings were expected to achieve.¹⁵⁰ The total weight of broadside was thus an impressive 2,520lbs, with the twin mountings providing improved arcs of fire and reduced blast for the 9.2in guns. Protection followed a similar pattern to the *Duke of Edinburghs*, with a 6in KC belt covering 272ft amidships up to the height of the

¹⁴⁶ NMM *Minotaur* class ship cover, Copy of C.N.1/14127/04 Controller to DNC, Naval Lords, Financial Secretary, Secretary & First Lord, 'Pitching Experiments. Hollow V. Straight Lines.' 8 July 1904, & Kerr's response p.448 dated 11 July

¹⁴⁷ NMM *Minotaur* class ship cover C.N. 38664/07 Watts & Whiting to Board of Admiralty 4 December 1907

¹⁴⁸ *Ibid*

¹⁴⁹ Friedman *British Cruisers of the Victorian Era* p.266

¹⁵⁰ *Ibid*

main deck. This belt was extended to the bows with 4in, and aft with 3in. The battery armour that had effectively extended the vertical extension of the belt up to the top of the main deck in the earlier vessels was eliminated, the 7.5in barbette mounting tubes having 7in armour on their outside faces with 3in inner instead.¹⁵¹ The main deck was $\frac{3}{4}$ in for the length of the belt, slightly increasing to 1in fore and aft, while the curved lower protective deck was also $\frac{3}{4}$ in increasing to 1 $\frac{1}{2}$ in above the steering gear. The forward CT had 10in armour, the 9.2in gunhouses 7in with 8in faces, the 7.5in gunhouses 6in sides, 8in faces and 4 $\frac{1}{2}$ in backs.¹⁵² Some thought was given to telescopic funnels to minimise target area in action, but this was not pursued, largely on cost grounds as well as practicality, and the type completed, like the *Dukes* and *Warriors* with ordinary short funnels, which themselves later had to be raised owing to unacceptable smoke interference and to improve draught to the boilers.¹⁵³

In general, the nine new first-class cruisers created under Watts's directorship marked a welcome improvement over the *Monmouth* and *Devonshire* classes, primarily due to the Board abandoning attempts to restrict displacement and aiming for fighting power. Although since the *Imperieuse* class there had been a reasonably consistent construction pattern in which a modest number of large vessels were then followed by a larger number of somewhat less expensive first-class types, until the *Monmouths* this had not significantly affected the capabilities of the vessels relative to contemporary rivals in which a significant qualitative advantage was maintained over most potential opponents. With the *Monmouths* and *Devonshires*, this edge over their rivals began to be eroded, and while superior to several smaller types, notably the *Dupleix* and *Bayan* classes, they were run much closer by contemporaries of similar displacement. With rival powers, notably France, Germany and the United States building larger types the Board had little alternative but to return to a qualitative based approach and abandon attempts to seriously restrict dimensions of first-class cruisers.

The new cruisers were principally designed with a view to their having a fleet capacity as well as operating independently in the trade-defence role. Thus their general design objectives were very similar to the *Cressy* and *Drake* classes, the details of their designs reflecting the inevitable evolution of gunnery and desires of the Board. As fighting vessels,

¹⁵¹ NMM *Minotaur* class ship cover, DNC to Naval Lords 'Shields and barbettes for 7.5" 50 calibre gun mountings' 19 July 1904

¹⁵² Chesneau & Kolesnik *Op. Cit.* p.73

¹⁵³ NMM *Minotaur* class ship cover C.N.1/3118/04 Durston to Controller 10 March 1904

they stand up well compared with contemporary French designs, the *Dukes* and *Warriors* edging the *Leon Gambetta* and *Jules Michelet* classes in speed and gun-power, while having a similar or superior level of protection. The *Ernest Renan* roughly matched the *Warriors* with little to choose between the types, notwithstanding the somewhat different approach to their design, with the French vessels continuing with a lighter calibre, but more numerous armament, and possessing on trials at least a remarkable turn of speed. The *Edgar Quinet* class were in some aspects the equal of the *Minotaurs*, although their armament was not entirely turret-mounted, and given the protracted build times this is something of a moot point since by the time they were completed, the Royal Navy had been operating the first three *I* class battlecruisers for several years, with a fourth completing at approximately the same time as the French cruisers.

The three types also appear to exhibit a reasonable level of superiority over roughly contemporary German designs in most respects. Only the two *Scharnhorst* class vessels approached, though not equalled, them in size. In practical sea speed the British cruisers had an edge, and the *Warriors* and *Minotaurs* had a much superior armament configuration, with all major weapons turret mounted in upper-deck gunhouses rather than a combination of turrets and casemates. Armour was similar to the British vessels, with a slight advantage in deck protection, which could be considered a trade-off against their inferior broadside weight compared to the *Warriors* and *Minotaurs*.¹⁵⁴

The American cruisers of the *Pennsylvania* and particularly *Tennessee* classes were a rather more formidable proposition. The British vessels all outstripped their US rivals in speed for a similar power and displacement (in the case of the *Minotaurs*). Much of this can be attributed to their superior hull forms, even that of the *Shannon*, since the Royal Navy had for years benefitted from the work of Froude and the Haslar test tank facilities, whereas model testing for the US Navy was still quite new, and largely dismissed by Engineer-in-Chief Melville.¹⁵⁵ Equally, the US vessels were designed with more of an eye to their being light / fast battleships than cruisers per se, and like White's *Cressy* class, they were specifically designed

¹⁵⁴ 1,692.6lbs for the *Scharnhorsts*, 1920lbs for the *Warriors*, 2520lbs for the *Minotaurs* based on simultaneous discharge. Weight of fire over 1 minute, under ideal conditions, was *Scharnhorst*: 8,463lbs *Warrior*: 8,480lbs, *Minotaur*: 12,080lbs. In practice the advantage would likely have been even more marked since the British vessels carried all their armament in upper-deck gunhouses, whereas the German cruisers carried their 5.9in weapons in maindeck casemates, severely reducing their utility

¹⁵⁵ N. Friedman *US Cruisers: An Illustrated Design History* (Annapolis: Naval Institute Press, 1984) p.54

for fleet duties, it being anticipated that they could fight anything including battleships.¹⁵⁶ Thus, some sacrifice of speed was accepted in order to obtain heavier protection. The latter was somewhat superior to the British vessels, the thinner belt being compensated for by a substantially thicker protective deck. In terms of armament, the American vessels followed an approach akin to that of the *Cressys*, *Drakes* and *Duke of Edinburghs*, with relatively heavy weapons supported by a large battery of 6in guns (and suffering the same problems associated with maindeck guns), whereas the British moved toward a heavier 7.5in secondary armament after the *Dukes*; along with the preceding *Devonshires*, the *Duke of Edinburgh* and *Black Prince* marked the point in the service in which the 6in became the secondary armament in practice as well as in (official) name.

Despite the improvements in the *Duke of Edinburghs* / *Warriors* and *Minotaurs* over their predecessors, and their rough equality – superiority over their contemporary rivals, they were not without faults, and in some respects lacked the clarity in design of previous fleet or fleet-capable types. Most obviously was the unworkable 6in maindeck battery in the first two vessels. The maindeck casemates in White's cruisers had been a significant disadvantage, but the battery employed in *Duke of Edinburgh* and *Black Prince*, in which a lower freeboard was necessary to avoid excessive top-weight from the six 9.2in turrets, was even worse off. During March 1916, both vessels were extensively modified with the batteries removed, the gun ports closed, and six 6in mounted on the upper deck. With the proximity of the 9.2in turrets and potential blast issues, it seems unlikely that this alteration brought any major benefits, while the weapons, their crews and ammunition supply routes would have been heavily compromised.¹⁵⁷ The relatively low freeboard amidships and aft, along with a continuing of the policy that had begun with the *Drakes* in reducing shell-bursting structures and upper-works also resulted in their being wet ships. Although sometimes described as being 'poor sea boats' their high forecastle enabled them to run at high speed in poor conditions, and it is likely that this was more a euphemism for their wetness (exacerbated by their main-deck battery) than major objections to their behaviour.

¹⁵⁶ *Ibid* p.46 'Light / fast battleship' probably being a happier term than 'second class battleship' with its implications of reduced dimensions / displacement / capability. The *Cressys* could also be regarded in precisely the same terms. As Friedman notes, the use of State names for the vessels merely adds confirmation that the US cruisers were considered capital ships

¹⁵⁷ Parkes *Op. Cit.* p.443

Many of the problems associated with the first two *Duke of Edinburghs* were addressed in the four modified vessels of the 1903/04 programme. The eradication of the 6in battery and the substitution of four single 7.5in gunhouses on the upper deck was a substantial improvement in itself, particularly since the battery armour was retained, providing a respectable vertical extent to the side protection. The reduction in metacentric height caused by the increased top weight also reduced their stability sufficiently to make them very steady ships and excellent gun platforms, able to fight their all-turret mounted guns in almost any weather.¹⁵⁸ All six vessels though suffered from mediocre deck protection, roughly equal to the smaller *Devonshires* (with possibly a slight edge going to the smaller vessel) and inferior to both the *Cressys* and *Drakes*. Although at the time of their design battle-ranges ranges were, by later standards, still relatively short and the trajectory of projectiles reasonably flat, given the steady shift toward a heavier main battery, this was a significant weakness only partially ameliorated by the increased vertical height of protection from the battery-armour. The same point may be raised for the *Minotaurs*: while deck armour was necessarily expensive in fiscal and dimensional terms when used in conjunction with side armour, the Board had expressly favoured quality over quantity, and despite their other merits, the horizontal protection was no better than it was in their immediate predecessors, and since the side armour did not extend as high, protection was even more reliant upon these weak decks. Notwithstanding the fact that the ammunition hoists from the magazines and shell-rooms were provided with armoured tubes, the protective scheme was a mediocre compromise, particularly since coal defence was not as extensively utilised as it had been in earlier vessels (a consequence of their upper-deck gunhouses and the protected tubes beneath them). The decision to build *Shannon* with straight lines is also startling, given the importance attached to the type, which approached cost-no-object status, and the fact that all the hard evidence available from extensive testing and experience over several decades was firmly against such a move. Despite the problems though, in general analysis, the *Minotaurs* had many positive attributes, and they had an edge over their contemporary rivals, albeit with a heavy bias toward offense.

As a matter of pure historical speculation if the Board felt more radically inclined, an alternative would have been to employ a design of similar displacement and speed with a uniform battery of 9.2in, resulting in a vessel akin to a reduced *I* class battlecruiser. May raised precisely this possibility at the end of 1904, partly with an eye vessels for the 1905/06

¹⁵⁸ *Ibid*

programme, but also because he was considering changing the *Minotaurs* then under construction.¹⁵⁹ Fisher was also considering a type along these lines, and such a vessel was in fact loosely described in *Naval Necessities*.¹⁶⁰ An alternative proposal by the Controller for the 1905/06 programme vessels called for an armament of eight 12in guns in four twin turrets, ‘two side by side on the forecastle and two more superfiring aft on the centreline.’¹⁶¹

Ammunition Passages: a re-evaluation

A feature in all British first-class cruisers from the *Powerfuls* to the *Minotaurs* was the use of ammunition passages below the protective deck[s], through which projectiles and propellant could be rapidly transported from the magazines and shell rooms to the guns.¹⁶² Commenting in a confidential memorandum explaining the design features of the *Diadem* class protected cruisers, Sir William White stated

Roomy ammunition lobbies into which the magazines and shell rooms converge have been provided at each end of the ship. These lobbies are connected by passages through which a continuous supply of ammunition will be kept up. Rapid hoisting to the gun positions will be effected, possibly by the use of electric motors. The conditions of service of ammunition in the “Powerful” class, and these new cruisers is greatly superior to other first class cruisers British and Foreign.¹⁶³

These passages were introduced by White roughly contemporaneously with casemates for the quick-firing / intermediate-calibre armament, and were regarded as the most practical and safest solution to the problem of rapidly conveying ammunition from magazines and shell rooms to the guns. They have subsequently been criticised as a dangerous flaw. Referring to the *Royal Sovereign* class battleships, which also had these passages, distinguished former naval architect David Brown categorised them as ‘the biggest weakness of the ship, and

¹⁵⁹ Friedman *British Cruisers of the Victorian Era* p.266

¹⁶⁰ It was the belief that the Royal Navy was building a successor to the *Minotaurs* along these lines that appears to have prompted the German SMS *Blucher* of 1907 –an excellent armoured cruiser, but obsolete even when being designed by the introduction of heavy artillery in the *Invincibles*

¹⁶¹ Friedman *British Cruisers of the Victorian Era* p.266

¹⁶² Brown *Warrior to Dreadnought* p.136 These passages were also a feature of all White’s battleships, both first and second class, during his time as DNC. Several of Philip Watts’s cruiser designs for Elswick also had variations on this feature, although usually less complete

¹⁶³ NMM *Diadem* class ship cover ‘Confidential Memorandum on *Diadem* class: Enclosure to docket containing general description of the design’ (13 July 1895) p.2

perpetuated in later designs. The passage could transmit flash from an explosion, and could also spread flooding.¹⁶⁴ In support of this contention, the loss of the *Minotaur* class armoured cruiser HMS *Defence* at the Battle of Jutland is often raised as an example of the hazards associated with ammunition passages.¹⁶⁵ Witnesses reported that *Defence* was hit near her after 9.2in turret, and an explosion ‘was seen to travel forward along the magazine passage supplying the 7.5in turrets, each of which exploded in turn from aft.’¹⁶⁶ Figures like Jurens have concurred in leaping to condemn ammunition passages as a dangerous fallacy.

This is however an overly simplistic assessment. Certainly, if a vessel were exposed to heavy AP shellfire, they could be a vulnerable point, but this completely ignores the fact that *Defence* and her predecessors were not designed for the tactical environment that existed at Jutland but for that of an earlier era, when they were far less likely to face such attack. As has been previously established, first-class cruisers (and battleships) prior to the development of the all-big-gun vessels were designed for a comparatively unscientific gunnery environment. Fire control was in its infancy, anticipated battle ranges were by 1914-18 standards very short, while the weapons themselves and the projectiles fired were different from those that would be faced during the Great War. When considered in the context of this contemporary artillery environment, dominated by flat-trajectory intermediate-calibre weapons, the ammunition passages were far from being the security of the ship that Brown and others, ignoring the actual operating environment, like to claim. Located behind side armour, protective decks and coal-protection, they were no more vulnerable to such assault than other parts of the vitals. This was particularly the case in White’s designs, which had stronger horizontal protection than later types, and were designed when armour piercing shell was comparatively new and solid shot still widely employed, significantly reducing the chance of a bursting charge being carried into the vitals.¹⁶⁷ More effective armour piercing shell was being developed, but by the turn of the century even large-calibre projectiles of this type

¹⁶⁴ Brown *Warrior to Dreadnought* p.129

¹⁶⁵ *Ibid* p.128

¹⁶⁶ D. Brown *The Grand Fleet: Warship Design and Development 1906-1922* (London: Caxton, 2003) p.167
Brown also states a similar situation occurred with the large German armoured cruiser *Blucher* at the Dogger Bank engagement of 1915, albeit as only fire rather than explosion

¹⁶⁷ Initially this was Palliser chilled iron, which was steadily supplanted by forged steel shot, e.g. Holtzer. See War Office *Treatise on Ammunition* (London: His Majesty’s Stationary Office, 1905) p.103; also Parkinson *The Late Victorian Navy* p.141

remained of limited reliability and could only carry bursting charges through relatively thin armour (generally un-cemented, and at relatively perpendicular / direct angles).¹⁶⁸

At Coronel, both *Good Hope* and *Monmouth* (especially the latter, despite her lighter protection) survived a respectably long time without a catastrophic detonation of magazines or projectiles, despite their poorly trained crews. Even more notable, at the Jutland engagement HMS *Warrior* received approximately fifteen heavy shell hits (11in & 12in calibre) and six strikes from 5.9in, without suffering a similar catastrophic fate to *Defence*, demonstrating that even in these changed gunnery conditions, subject to heavy AP shellfire, the dangers of ammunition passages, while far from ideal, can be overstated.¹⁶⁹ Nor is it clear what practical alternatives existed. With the large number of intermediate-calibre guns spread along a considerable length of hull, there was no room for each casemate or gun-house to have independent magazines and shell rooms, and the passages were certainly a safer means of transporting ammunition than existed in earlier classes, which lacked any defended route at all for the conveying of projectiles and propellant. On balance then, the use of ammunition passages in RN cruisers up to the *Minotaurs* can at worst be called a case of *faute de mieux*. As long as a mixed armament was employed, independent magazines and shell-rooms, the proliferation of which can in any case hardly be exempted from the charge of increased danger through greater target area, were unlikely to be a practical or realistic option. It seems therefore that under the conditions they were designed for the passages did a perfectly acceptable job, and were certainly a far better option than not having any defended means of transporting projectiles and propellant to the guns at all, especially in a period when a high rate of fire was the most practical means of obtaining hits on an opponent.

Fisher, evolving design and Dreadnought: the first big-gun armoured cruiser

The influence of Fisher during his time at the Admiralty as DNO and Controller has been noted in previous chapters. During his time in the latter role in particular, he worked well with White; an unlikely partnership given their utterly dissimilar personalities, but one which

¹⁶⁸ A point underlined by the poor performance of British AP shells at the Dogger Bank and Jutland engagements during the Great War.

¹⁶⁹ J. Campbell *Jutland: An Analysis of the Fighting* (Annapolis: Naval Institute Press, 1986) p.290 *Warrior* had slightly superior armour protection than did *Defence*, possessing a 6in upper belt that was omitted in the later *Minotaur* class vessels –see chapter 3 for further details. However, this in practical terms offered little or no advantage when faced with heavy artillery, except at the most extreme oblique angles

he greatly benefitted from at the time and later, since as Manning points out, he shared in White's success.¹⁷⁰ Despite their cordial working relationship, a point of disagreement between the two on the surface at least appeared to have been Fisher's liking at the time for second-class battleships. White, as previously illustrated,

...held very definite opinions upon the necessity for British ships being equal to or better than the best built abroad, and had no use for the second best whether from the "economical," "moderate dimensions," "size v. numbers," or any other point of view.¹⁷¹

Fisher however had largely been responsible for the two *Centurion* second-class battleships intended primarily for the China Station and Pacific, and especially the one-off *Renown*, which notwithstanding their mediocre standing amongst naval historians, were quite well received by many naval officers at the time. More pertinently, it seems that Fisher viewed them less as second-class battleships, but as crossover vessels, in the grey zone between battleship and cruiser, although he does not seem to have explicitly said as much at this stage. Fisher would later state outright though that

No-one can draw the line where the armoured cruiser becomes a battleship any more than when a kitten becomes a cat!

The 2nd class battleship *Renown* is really only an armoured cruiser! You can count her whichever way you like according to what you want to prove!¹⁷²

Behind the dry humour is a perfectly valid point, one underlined in the notes he left for his successor (Domvile) as C-in-C Mediterranean Station, where he expressly pointed out that owing to a deficiency in armoured cruisers '...it is necessary to detail Battleships to work with Cruisers.'¹⁷³ The fundamental point is that nomenclature by nature is an approximation and there are invariably grey areas where types cross over. The *Cressys* were another example: classed as 'armoured cruisers', they were designed to operate as a fast wing to a battlefleet, and were perfectly capable of doing so. In later years, the fast-division role would

¹⁷⁰ F. Manning *The Life of Sir William White* (London: J. Murray, 1923) p.381 On the whole, Fisher seems to have got more out of the partnership, such as it was

¹⁷¹ Parkes *Op. Cit.* p.366

¹⁷² Kemp *Fisher Papers Vol.I* p.28 *Renown* is generally considered a second-class battleship, albeit one having a more powerful battery of QF guns than was common for second-class types

¹⁷³ TNA ADM 1/7597 Confidential Notes for Successor left by Fisher

be fulfilled by ‘fast battleships’, which begs the question: what is the difference between an armoured cruiser designed for this particular duty, and a fast battleship designed for the same? Assuming no significant variations exist in basic design objectives, realistically the terms may be considered synonymous.

Of course, the first-class cruiser had been a genuine second type of capital ship ever since the reintroduction of side-armour.¹⁷⁴ The most recent *Duke of Edinburghs* / *Warriors* and *Minotaurs* moved the first-class cruiser in the direction Fisher had in mind, and he seems to have been comparatively quiet about them, despite having been at the Admiralty when the former were under development. It is possible that he did not wish to risk clashing with the Controller’s province, although it is rather more probable that at the time of their design, he had not yet developed his own ideas sufficiently and as such was unwilling to pass much comment. The *Minotaurs* in any case came very close his proposals of March 1902 to Selborne on ‘Fast Armoured Cruisers’ for which four 9.2in (originally 10in) and twelve 7.5in were advocated.¹⁷⁵ However, with a design 23 knot trials speed (around ½ knot less for *Shannon*), they were not fast enough by his assessment of future requirements –certainly not for catching converted fast liners.

Speed was Fisher’s particular obsession, and he was always angling for a good margin of superiority over possible rivals, both from strategic and tactical perspectives. In the former case he was indubitably right; in the latter, he was also largely correct, with certain caveats. It is often suggested that Fisher saw speed as a form of protection in itself for vessels (the oft-repeated claim attributed to him that ‘speed is armour’).¹⁷⁶ In reality, his view was somewhat more subtle. Fisher did not regard speed as a form of protection *per se*, but as means of allowing a force to dictate the terms of an engagement. Speed in Fisher’s parlance was ‘the *weather gauge* [original italics] of the olden days. You then fight just when it suits you best.’¹⁷⁷ As a result, a degree of protection would be obtained, but this was incidental, or at least subordinate to the wider object.

¹⁷⁴ The term ‘second class battleship’ might be applied. Here though it is taken that second-class types were smaller and cheaper vessels, where a first class battleship or cruiser was less restricted in terms of displacement or cost. Again,

¹⁷⁵ Brown *Warrior to Dreadnought*. p.180; see also Sumida *In Defence...* p.43

¹⁷⁶ Parkes *Op. Cit.* p.489

¹⁷⁷ Kemp *The Fisher Papers Vol. I* p.28

Following his arrival at the Admiralty as First Sea Lord, Fisher and the Board set up a Committee on Designs; officially appointed 22 December 1904, its professed task was to investigate, consider and report upon the requirements of future ships for the Royal Navy.¹⁷⁸ A more cynical perspective, such as that voiced by Roberts, was that its principal function was to validate decisions that had already been arrived at.¹⁷⁹ Though mildly exaggerated, it does have a reasonable basis in reality. Ostensibly the Committee, which first met on 3 January 1905, considered the question of the new-model battleship first, only moving to armoured cruiser designs later. This new model battleship would become HMS *Dreadnought*, the vessel Fisher is most commonly associated with, although it is often pointed out that the *Invincibles* (or 'I' class) were his real 'love.' The policy that created her has been described as 'in too many respects, risky, insufficiently considered, ill-informed and unnecessary.'¹⁸⁰ Such assessments though are founded upon mistaken assumptions, both as to Fisher's intended strategic approach, and the nature of HMS *Dreadnought* herself.

As has been suggested most notably to date by Grove, there is substantial evidence pointing toward the supposed 'revolutionary battleship' HMS *Dreadnought* herself being closer to existing armoured cruisers than battleships in terms of intended mode of operation, and even certain design characteristics.¹⁸¹ This was actually stated outright in Fisher's remarks on the 'Fighting Characteristics of Vessels of War' contained in *Naval Necessities*: the new battleship proposed was nothing other than '*a glorified armoured cruiser*.'¹⁸² Perhaps owing to his frequently Machiavellian tactics and disingenuous statements, few people appear to have taken Fisher's remarks literally. The 'armoured cruiser' name has also had considerable stigma since Great War 1914-'18, when many vessels so-named were lost, it being forgotten

¹⁷⁸ Parkes *Op. Cit.* p.472 The Committee Members included: Rear-Admiral Prince Louis of Battenberg (D.N.I.); Eng. Rear-Admiral Sir John Durston (Engineer-in-Chief of the Fleet); Rear-Admiral A. L. Winslow (C.O. Torpedo & Submarine Flotillas); Captain Henry Jackson (shortly to succeed May as Controller); Captain John Jellicoe (shortly to succeed Rear-Admiral Henry Barry as D.N.O.); Captain C. E. Madden (shortly to become Naval Assistant to Controller); Captain R. Bacon (Naval Assistant to First Sea Lord). Civilian members were: Philip Watts (D.N.C.); Lord Kelvin (the famous physicist & mathematician); Professor J. Biles (Prof. of Law, University of Glasgow); Sir John Thornycroft (Thornycroft Shipbuilding Co.); Alexander Gracie (Fairfield Shipbuilding Co.); R. E. Froude (Superintendent Admiralty Experimental Works); W. H. Gard (Chief Constructor Plymouth Dockyard & shortly to become Assistant D.N.C.); Commander W. Henderson (Secretary to Committee); E. H. Mitchell (Assistant Constructor & Assistant Secretary of the Committee). Constructor J. H. Narbeth acted as Secretary to the D.N.C. and had responsibility for working up details of the designs considered. Fisher himself served as Chairman, though was not technically a member

¹⁷⁹ Roberts *Battlecruisers* p.19

¹⁸⁰ J. Brooks 'Dreadnought: Blunder, or Stroke of Genius' *War In History* Volume 14 No.2 (April 2007) pp.157-178

¹⁸¹ Grove *The Battleship is Dead* pp.415-427

¹⁸² Kemp *The Fisher Papers* p.31. Original italics. See Also Sumida *In Defence...* p.53

that in their own operating milieu, they were highly capable fleet-units. Fisher's use of the term then, implies the new vessel was expected to be used as the fast division of a contemporary battlefleet.¹⁸³

The reasons for Fisher retaining the 'battleship' name appear to be inherently tied to the balancing act he was forced to perform between his strategic objectives and the political realities (both internal to the service, and in the wider national spheres) he was confronted with. Despite the widely acknowledged capabilities of the armoured cruiser, Fisher was only too well aware that to attach such a name to the new vessel would be problematic. This was acknowledged by the disingenuous remark in *Naval Necessities* 'At the present moment *naval experience is not sufficiently ripe to abolish totally the building of battleships* so long as other countries do not do so.'¹⁸⁴ In truth, as far as the technologically-radical Fisher was concerned, there was more than sufficient experience to abandon the battleship type in favour of the first-class armoured cruiser. This is largely a matter of context. The term 'cruiser' is typically associated with trade defence, and the fast-division duties that emerged at the end of the Nineteenth Century are often forgotten. Fisher did not forget:

The most advanced thinkers in the Navy and those having the greatest personal experience at sea have come to the conclusion that the battleship is really dead. No one need fight a battleship except with submarine boats or destroyers, and the sole function of battleships in future wars is to be sunk. They can defend nothing day or night with any certainty.

But this new battleship now proposed will not only be a battleship but a first class cruiser superior to any but the very latest, hence for years to come she will be useful since whether battleships are or are not used in the future her speed will always make her of the greatest value.¹⁸⁵

It is probable that *Dreadnought* herself was not as extreme a vessel as Fisher would have liked, but he selected the best compromise solution that was available to him: that of ensuring that the new 'battleship' was a well armoured and exceptionally heavily armed armoured cruiser of relatively high

¹⁸³ Which by nature would mean a capacity for wider operations if required, à la the *Cressys*

¹⁸⁴ *Ibid* p.41 As in above, original italics. Selborne, a confirmed supporter of the battleship, added the notation 'Indeed not! The battleship is essential, just as much as 100 years ago. Ask the Japs.'

¹⁸⁵ Memo on 'H.M.S. "Untakable"' cited by Parkes *Op Cit.* p.469

speed by the standards of the day.¹⁸⁶ Such crossover vessels were far from being a new proposition as the previous chapters have indicated. Fisher saw *Renown* in this light, and White had introduced such a type with the *Cressy* class fleet-cruisers, while similar vessels were in service with, or under construction for the Italian, Japanese and US navies. The two *Swiftsure* class battleships acquired by the Royal Navy had been intended to counter Argentinian cruisers, while the *Canopus* and *Duncan* class battleships both made mild concessions in protection in order to obtain a slightly higher speed without sacrificing too much in the way of armament. It would later be done again, only by that point the nomenclature had changed to 'fast battleship.' Thus it may be advanced that the nomenclature is ultimately less relevant than the design intention; Fisher merely continued an existing process. The chosen name though may have had some particular relevance: the First Sea Lord was very careful in his choice of vessel names, and despite his professed disinterest in history, those given to the majority of the vessels launched during his tenure were highly evocative. *Dreadnought* was of course an established title for battleships, having a strong lineage stretching back to the Sixteenth Century, most recently having been the best-regarded of the mid-Victorian coast-assault breastwork monitors, and before that a three-decker. The name, with its grandeur and history was a reflection of her abilities, may also have provided, deliberately or otherwise some reassurance in the face of her more radical technical features.

Before the Committee on Designs had even been appointed, Watts began preliminary investigations for a large vessel with a speed of 21 knots. One of the first documents in *Dreadnought's* cover (number four) is a letter from Watts to Froude at the Admiralty Experimental Works dated 19 November 1904 on hull lines and necessary power:

I am having some inquiry made as to what is involved by higher speeds for Battleships and Cruisers and shall be glad if you can give me some information as to I.H.P. required.

Battleship. Taking *Cressy* as basis and flattening the form of section as in Lord Nelson it is assumed that *Cressy* Form (Armoured Cruiser of August 1897) can be taken as 440 x 69.5 x 24 = 11,900 Tons; changing then to 455 x 83 x 27 and fining down slightly gives 16,500 Tons.

Will you be good enough to send me an estimated E.H.P. curve 16 to 22 knots for such a form.

¹⁸⁶ Fisher would later employ creative nomenclature when he ordered three light-battlecruisers (the *Courageous* class during the Great War 1914-'18, under the designation 'large light cruisers')

Perhaps you can suggest a better way of obtaining a better form of the same dimensions and displacement and if you can please do so.

A form is wanted which can be driven at

20 knots for 19 to 20,000 I.H.P. and

21 knots for 22 to 24,000 I.H.P.¹⁸⁷

As is the case with all such documentation, there is a danger of reading rather too much into Watts's query, particularly the reference to the *Cressy* class armoured cruisers. Since 21 knots was desired, it makes perfect sense that an proven existing hull-form of a large naval vessel designed for the same speed would be used as an initial basis. Nevertheless, the connection is interesting in the abstract, with the speed desired being equivalent to the then-standard fleet cruiser.

The brief given to the Committee on Designs for required features set the following requirements:

Speed: 21 knots.

Armament: 12-in guns and a-t-c [light quick-firing Anti-Torpedo Craft] guns. Nothing between. 12-in. guns to be as numerous as possible. No guns on main deck, except a-t-c guns if necessary to place them there.

Armour to be adequate.

Must be capable of using docking accommodation at Portsmouth, Devonport, Malta and Gibraltar.¹⁸⁸

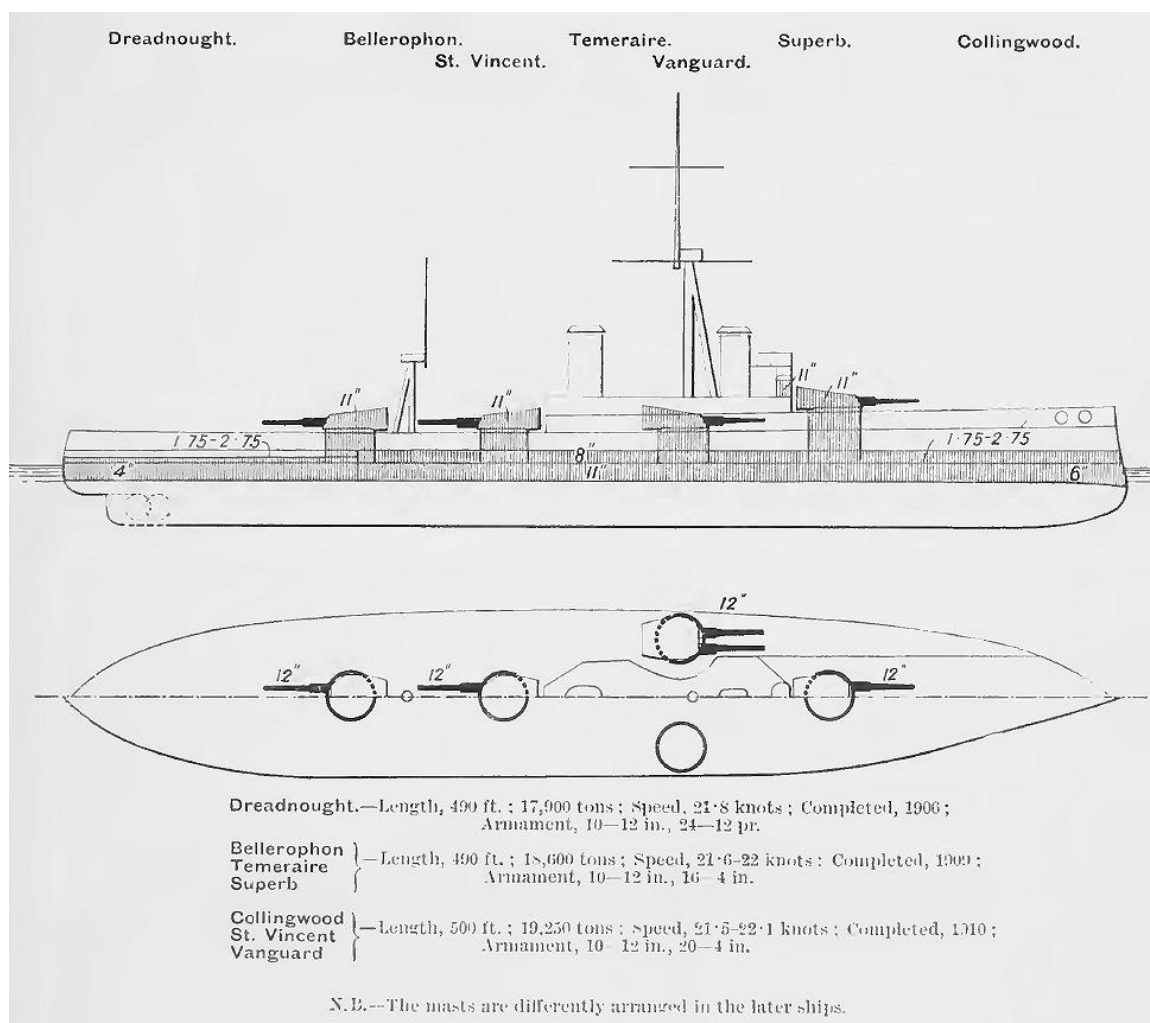
526ft in overall length and with a load displacement 18,122 tons (nearly 22,000 deep load), the resulting *Dreadnought* was a significant jump in size over any preceding British first-class naval vessel: approximately 2,000 tons over the *Lord Nelsons* and 3,500 tons over the *Minotaurs*.¹⁸⁹ Her deck plan and side elevation are shown in Figure 5.7.

¹⁸⁷ NMM *Dreadnought* ship cover, copy letter Watts to Froude on forms and dimensions 19 November 1904

¹⁸⁸ Parkes *Op. Cit.* p.472

¹⁸⁹ Grove *Battleship or First Class Cruiser?* p.415

Figure 5.7: Dreadnought class deck-plan and side-elevation



Source: Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin & Co., 1912)

Plate 3

18 Babcock and Wilcox water-tube boilers fed four-shaft Parsons turbines for a design 23,000 Shaft Horse Power (S.H.P.) and the specified trials speed of 21 knots.¹⁹⁰ This was a good 3-knot margin over most contemporary battleships (excepting lighter types like the *Swiftsures*) and given her considerable size a match for many existing cruisers under practical sea conditions, particularly since the turbine was far more efficient in high speed running, and possessing far fewer moving parts was capable of maintaining high revolutions over extended periods reliably with little wear. The introduction of the turbine was by far the most radical aspect of the design, since at that point there was little naval experience with them, other than in three destroyers (*Viper*, *Cobra* and *Eden*) before the decision was made to employ turbines in *Dreadnought*. Nevertheless, the potential benefits in reliability, efficient high-speed running, physically smaller size and a much improved power-weight ratio over reciprocating types were deemed sufficient to take the considerable gamble of making the change.

The armament configuration provoked much discussion; eventually the ten 12in Mk X 45 calibre guns were disposed in a cramped configuration of three centreline and two wing turrets for an 8-gun broadside, and an apparent 4 or even 6-gun axial fire, although in practice the blast effects would have caused severe damage to the decks and upper works if the wing turrets were fired fore and aft. This disposition was described by the former DNC as ‘viciously bad’ on account of the blast issues, restrictions of space on the upper deck and the multiplicity of magazines and shell-rooms.¹⁹¹ The ideal solution was the superfiring twin turrets on the centreline fore and aft, as introduced in the US *Michigan* class, but this was not possible owing to the retention of open sighting hoods in the British gunhouses, which would have exposed those in the lower turret to severe blast from the superfiring weapons.¹⁹² Despite the problems, the paper-potential for heavy axial fire of the configuration ultimately chosen had considerable appeal for the end-on tactics frequently advocated by Fisher, who would later remark in his memoirs:

¹⁹⁰ NMM *Dreadnought* ship cover; Legend dated 12 May 1905; also quoted in J. Roberts *The Battleship Dreadnought* [revised edn.] (London: Conway Maritime Press, 2001) p.13 [Table 5]. Note: SHP (the power delivered to the propeller shafts) was typically employed for power figures following the introduction of turbines, displacing the IHP previously used (a theoretical value for reciprocating engines assuming them to be frictionless in their energy conversion within the cylinders)

¹⁹¹ Manning *Op. Cit.* p.477 See also Sir William White ‘On the Maximum Dimensions of Ships’ Transactions of the Society of Naval Architects and Marine Engineers Volume XIX (1911) pp.34-35

¹⁹² There were also concerns over the proximity of the barbettes and the possibility of a single hit disabling multiple weapons and raised metacentric height

I am an apostle of “End-on Fire,” for to my mind broadside fire is peculiarly stupid. To be obliged to delay your pursuit by turning even one atom from your straight course on to a flying enemy is to me being the acme of an ass.¹⁹³

Many of the early sketches, both official and Gard’s unofficial studies, placed considerable emphasis upon this ability.¹⁹⁴ Axial fire naturally had somewhat more significance for cruiser types, especially since in Fisher’s view the enemy would frequently be running away. This was of course the critical assumption; working on this basis, Fisher was perfectly correct in emphasising end-on fire capacity. If an enemy remained to fight, the advantage would be significantly eroded and arguably would pass to the broadside unless the attacking fleet (i.e. that possessing greater axial-fire capacity) had such a significant speed advantage to dictate range and positioning. Fisher of course had served through the mid-Victorian period, which was largely dominated by littoral combatants, and, should a naval action at sea occur, end-on tactics as illustrated in Chapter One were widely favoured and discussed; given this background, it is not improbable that he carried some of this mind-set with him, consciously or otherwise. Although this appears inconsistent with many of the advances being made in fire-control and long-range gunnery, since *Dreadnought* (and the *Invincibles*) were designed when ranges were still much shorter and single aimed shots were (at least by Fisher) still contemplated, such an approach becomes rather more understandable, whether one acquiesces with the underlying tactical principle or not.

Despite popularly being seen as a disciple of heavy artillery, Fisher was actually a late convert to the all-big-gun approach that was adopted in *Dreadnought*. Until his departure from the Mediterranean, and indeed for a time afterward, his preference was for

...the greatest number of the largest quick-firing guns in *protected positions*. They call it the *secondary* armament; it is really the *primary* armament!

¹⁹³ Fisher *Memories* (London: Hodder and Stoughton, 1919) pp.121-122 Although expressed years after the event, Fisher’s preference for end-on-fire was a view he held reasonably consistently for much of his career, likely first being developed during his captaincy of the first-class coast-assault ship HMS *Inflexible* in the 1880s

¹⁹⁴ It seems that blast effects, nor the physical space for magazines and shell-rooms were considered in these studies, some of which were nevertheless quite interesting, particularly the Fisher-Gard designs, perhaps most notably what was known to the Committee as ‘Design E’ featuring super-super-firing barbets all on the centreline, with the particular intention of maximising end-on fire. Design ‘D’ by Narbeth, with two twin turrets mounted abreast fore and aft, with a super-firing twin turret on the centreline was an alternative proposal for maximising end-on-fire

In these days of very rapid movement the huge gun firing (comparatively) *slowly* is as obsolete as the foot soldier in the Boer War!

Whoever hits soonest and oftenest will win!

...So the problem is to fix the smallest large gun to put at each end of the ship, and the largest small quick-firing gun to put elsewhere with the largest arc of fire and the best view.¹⁹⁵

The smallest large gun to Fisher was the 10in, while he regarded the largest quick-firing gun to be the 7.5in. The *Swiftsure* class light battleships, designed by Edward Reed for Chile and purchased by Britain in 1903 to prevent their being acquired by Russia, well matched these stipulations.¹⁹⁶ Fisher's view expressed above was inherently a refinement of the gunnery approach that had been dominant since the introduction of the quick-firing gun, where owing to the relatively short battle-ranges and lack of effective fire-control, outright rapidity of fire was what counted, since it increased the likelihood of hitting an opposing vessel.

The effectiveness of rapid-fire was significantly improved around the turn of the century when Captain Percy Scott introduced continuous aim techniques. By modifying the ratios in the gun's elevating gear, Scott allowed the gunner to constantly track the target, compensating for the roll and movement of the ship. Adding a telescopic sight refined this and brought about a remarkable improvement in accuracy. Scott is often credited with the introduction of telescopic sights, although the Ordnance Committee appears to have been ahead of him in this regard.¹⁹⁷ On his return from the Mediterranean to take the post of Second Naval Lord in 1902, it appears that Fisher was confronted by advances in gunnery that went well beyond his extension of the quick-firing artillery paradigm. The Naval College had been conducting comparative exercises between vessels of mixed and uniform heavy artillery configurations, while the Controller had also been studying the matter. Moreover, it was believed that torpedoes were starting to pose a significant threat to large vessels at the 3,000 yard battle-ranges then regarded as common. Although almost certainly highly overestimated, the fear of the torpedo was sufficient for there to be a general desire to extend

¹⁹⁵ Fisher, cited by J. Roberts *Battlecruisers* (London: Caxton, 2003) p.12 The positioning of the heavier weapons fore and aft of course provided reasonable weight of end-on fire as chase weapons

¹⁹⁶ Parkes *Op. Cit.* p.457 The *Swiftsures* were the last vessels to be designed by Sir Edward Reed before his death, and rather ironically bore almost no resemblance to any of his previous designs, resembling more one of White's *Cressys* than the heavily armoured types Reed had always strongly advocated

¹⁹⁷ J. Brooks *Dreadnought Gunnery and the Battle of Jutland: The Question of Fire Control* (Abingdon: Routledge, 2005) p.41

battle-ranges beyond their effective operating window. The conclusions reached by the gunnery experts indicated a major shift away from lighter rapid firing weapons in favour of the big gun. The primary motives that led away from the mixed calibre armament to a uniform heavy battery were:

1. Increasing battle range necessitated by the menace of long-range torpedo attack
2. Long-range hitting now being practicable, it might very well determine the result of an action
3. Salvo-firing was the only known method of control at long ranges
4. This necessitated a uniform heavy armament of eight or more guns
5. The heaviest guns made the most accurate firing with decisive results.¹⁹⁸

Salvo firing involved discharging half the broadside armament and observing the fall of shot from the splashes. Direction and range were then corrected for, and the other weapons discharged, the process being repeated until the range was found and a straddle achieved. A mixed calibre armament rendered this largely impractical owing to the difficulty in differentiating between the splash of the different calibre projectiles. These conclusions in favour of the big naval gun as the decisive weapon would later appear to be supported by evidence from the Russo-Japanese war, and particularly the Battle of the Yellow Sea that took place 10 August 1904. Study of the Battle of Tsushima 27-28 May 1905 might have led to very different conclusions but by then, the decision had been taken in favour of a uniform heavy battery with the almost complete suppression of a quick-firing armament (barring light anti-torpedo-boat weapons).¹⁹⁹

Around this time, it seems Fisher's preference also shifted toward a uniform main armament, but of moderate calibre: in the case of battleships sixteen 10in, and for first-class cruisers sixteen 9.2in.²⁰⁰ This appears to have been an attempt at striking a balance between outright gun-power and rate of fire, and even suggests a preference for the smaller weapon since it

¹⁹⁸ Parkes *Op. Cit.* p.466

¹⁹⁹ Sir William White, in 'Notes on the Armaments of Battleships' *Transactions of the Society of Naval Architects and Marine Engineers* Volume XVIII (1910) strongly advocated the retention of a secondary armament of rapid-firing intermediate calibre guns, in association with a heavy but not excessive main battery (eight 12in to allow effective long-range salvo-firing)

²⁰⁰ Although the calibres were only 0.8in apart, the difference in projectile weight was quite marked: 380lbs for the 9.2in, as against 500lbs for the 10in

could deliver a far greater number and total weight of projectiles in a given time period.²⁰¹ Only later would Fisher become a champion of a uniform heavy armament (12in or larger); the leading supporters of this in the Royal Navy appear to have been the Controller (Rear-Admiral May), Captain H. J. May of the Naval College and Captain Reginald Bacon –the latter was clearly influenced by papers from the two Mays, and was probably himself the major influence upon Fisher in this regard, who was one of the later converts.²⁰² Such a move toward a uniform heavy-calibre armament was also being explored elsewhere. Cuniberti's famous article 'An Ideal Battleship for the British Fleet' that appeared in the 1903 edition of Jane's All the World's Fighting Ships brought the idea to wider public attention, in Japan the idea was being explored, while in the United States they had also been mooted for several years, most notably by Lt.-Com. William Sims.²⁰³ The two *Michigan* class battleships with their eight 12in guns were under development as *Dreadnought* was laid down.

Evidently Fisher was still thinking during 1904/05 primarily in terms of the 8,000yds range he had practiced the Mediterranean Fleet at, with expected battle-ranges of around 6,000yds. However, this was certainly not what the majority of his subordinates or those advocating long-range fire had in mind, who were already contemplating salvo-firing at ranges above 10,000yds. Despite appearances though, it would be incorrect to accuse Fisher of inconsistency in his approach to armament. At a fundamental level he was always attempting to achieve the optimal configuration for the contemporary gunnery conditions, and he matched the armament, as he saw it, to those conditions as far as possible. The theoretical advantages to the all-big-gun armament however largely depended on the ability to rapidly acquire the range and hit frequently. *Dreadnought's* fire-control system has rightly been described as imperfect, and certainly much work was still needed in this critical area, both in terms of range-finding, plotting, and allowing fine-control over the gun-mountings.²⁰⁴ Despite the problems though, it can also be fairly described as 'the most advanced gunnery system available in an era of very rapid progress.'²⁰⁵

The two main control positions were in the foretop (which owing to the placement of the mast behind the foremost funnel to aid boat-handling, located it directly in the smoke and

²⁰¹ Sumida *In Defence...* p.53 Some fifty per cent

²⁰² Brown *Warrior to Dreadnought* p.186 The reliably cynical Brown remarks that one is reminded of the saying 'There they go, I must hurry after them for I am their leader.' *Ibid* p.180

²⁰³ Cuniberti was not thinking of long-range fire potential so much as increased destructive power at close range

²⁰⁴ Brooks *Op. Cit.* p.44

²⁰⁵ Grove *The Battleship is Dead...*p.423

heat and rendered it at high speed uninhabitable) and a platform on the roof of the signal tower.²⁰⁶ These fed the main or secondary Transmitting Stations (TS) data from 9ft Barr and Stroud rangefinders. The TS was equipped with the Mk1 Dumaresq, which automatically calculated range-rate and speed across as they changed with bearing.²⁰⁷ It also had two of the newly developed Vickers range clocks which continuously indicated the best current estimate of the changing range, obviating the need for this to be calculated manually by officers with stopwatches aloft.²⁰⁸ Theoretically, *Dreadnought* could engage two targets simultaneously since the main TS was partitioned to allow it to serve the two control positions if required; the aft (secondary) TS 'appears to have been used only to direct the 27 unprotected 12-pounders disposed around the ship to deal with torpedo boats.'²⁰⁹

The total design weight of protective material worked into *Dreadnought* was 5,000 tons; approximately 27.6 per cent of her load displacement.²¹⁰ An 11in amidships KC belt tapering to 7in at the lower edge was employed stretching from the centre of 'Y' barbette stretching forward to 'A' barbette, where it strangely thinned to 9in.²¹¹ This belt was extended with 6in KC to the bow; under deep load conditions it was completely submerged, with the only exposed vertical armour being the 8in KC upper belt. 11in KC was also employed on the barbettes, gun-house faces (sides and back were 8in & 4in) and CT. Horizontal protection was a substantial improvement on earlier vessels, with three armour decks: the main deck was 1in over the lower conning and signal towers, $\frac{3}{4}$ in elsewhere, the middle-deck 1 $\frac{3}{4}$ in on the flat, 2 $\frac{3}{4}$ in on the slopes, increasing to a uniform 3in over A and Y magazines, and the lower deck was 1 $\frac{1}{2}$ in forward, 2in aft, increasing to 4in at both ends. Underwater protection was given special attention, unpierced watertight bulkheads extending to 9ft above the nominal waterline and longitudinal bulkheads to protect magazines and shell rooms.²¹² The fact that the Committee on Designs were instructed to consider vessels with uniform armament of 12in guns and speed of 21 knots, and that the armour should be 'adequate' is sometimes asserted to be an indication of Fisher's lack of interest in armour.²¹³ Reginald

²⁰⁶ Roberts *The Battleship Dreadnought* p.30

²⁰⁷ Brooks *Op. Cit.* p.24

²⁰⁸ Grove *The Battleship is Dead* p.423, and *Ibid* p.25

²⁰⁹ Grove *Ibid*

²¹⁰ *Ibid* The data in this paragraph is derived from this Legend and from Roberts's book

²¹¹ Friedman, in *British Cruisers of the Victorian Era* p.243 states *Dreadnought* had the same 9in KC belt as the *King Edward VII* class battleships; presumably the confusion arose from the thinning of *Dreadnought*'s main 11in KC armour belt to 9in abreast 'A' barbette

²¹² Grove *The Battleship is Dead...* p.421

²¹³ Roberts *Battlecruisers* p.32

Custance, who had a deep and mutual animosity with Fisher, enquired in March 1913 on the question of armour,

...On what principle is it applied? The thickest armour is all perforable by the primary guns at fighting ranges, but it is much thicker than is required to keep out projectiles from the secondary guns. I am unable to understand the principle on which it is applied. I can understand that the armour might be imperforable to the primary guns, or to the secondary guns, or to fragments of bursting shell, but to put on armour which can be perforated by the primary guns, but is thicker than is necessary to keep out the secondary guns or the fragments of shell, would seem to require some explanation.²¹⁴

Custance's points appear reasonable: at the relatively short battle-ranges common at the time the Committee on Designs sat (typically around 6,000yds or less), no acceptably sized vessel could carry sufficient thicknesses of armour to withstand assault from heavy AP projectiles while also possessing reasonable speed and armament.²¹⁵ Equally, that given to *Dreadnought* appears to have been excessive to defend against many intermediate-calibre batteries. However, there were other considerations: battle-ranges were slowly increasing, and as the range opened, so slightly thinner armour became viable. Also, some of the more recent types of battleships were carrying a heavier intermediate-battery, and the weapons themselves and their projectiles were also improving. Furthermore, AP projectiles were still, at least in Britain, of dubious capability, and assault from such projectiles was not necessarily the paramount consideration in developing a protective scheme. The real weakness of *Dreadnought's* armour was the main belt being submerged under many load conditions. For the same 5,000 tons weight available, a continuation of White's approach of employing slightly thinner vertical protection over a wider area, in association with even stronger protective decks would likely have worked better, particularly against longer-range fire, and even more when it is considered that rivals would be playing a game of catch-up, and thus *Dreadnought's* armour would be less likely to be exposed to heavy artillery for at least the first half of her career.

²¹⁴ Admiral Sir Reginald Custance, in discussion on Alan H. Burgoyne Esq., M.P. 'Recent Developments in Battleship Type' *TransINA* Volume LV Part I (1913) p.14

²¹⁵ Sumida *Op. Cit.* p.56

Sub-optimal armament and armour configurations aside though, *Dreadnought's* deployment with the latest armoured cruisers allocated to the Home Fleet, whatever the latter's role (see above) gives more than a clue to Fisher's thinking. As Grove argues:-

The most modern armoured cruisers were sent to this Fifth Cruiser Squadron as a matter of routine from *Duke of Edinburgh* onwards in March 1906. Where else to send *Dreadnought*, this new, more powerful armoured ship, capital ship even, than to work with these fast and powerful assets? Although a knot or two slower in maximum speed on the measured mile, *Dreadnought's* turbines gave her the advantage over the notional 'cruisers' in long distance cruising speed. What more powerful or flexible force, given the standards of the time, could be imagined in 1907 than *Dreadnought* operating with *Duke of Edinburgh*, *Achilles*, *Cochrane*, *Natal*, *Warrior* and *Leviathan*? By the end of 1908 it was *Dreadnought*, *Inflexible*, *Indomitable*, *Achilles*, *Natal*, *Warrior*, *Defence*, *Minotaur* and *Shannon*, a formidable force²¹⁶

The deployment of *Dreadnought* with the Home Fleet cruiser squadron provides considerable confirmation of the strong cruiser-bias in her inherent design, and the objectives of those responsible for her creation. Additional confirmation comes from the fact that HMS *Bellerophon*, one of three detail refinements on *Dreadnought* that Fisher was later press-ganged into building, was also attached to the Home Fleet. During the 1909 Manoeuvres she was under the command of Captain Hugh Evan-Thomas, who would later find fame at Jutland in 1916:

Sir William May's mainly pre-Dreadnought 'Red Fleet' was chasing Curzon-Howe's 'Blue Fleet', with the speedier *Bellerophon* pushing boldly ahead. Evan-Thomas was acting as a single ship fast division and, in doing so, overhauled and 'sank' four Blue cruisers.²¹⁷

The fast-division function with the capacity to overwhelm more modestly armed types is thus largely confirmed. This ability continued while the majority of the battlefleet were reciprocating-engined and would only cease some years later when the entire fleet was turbine powered to the same average speed; the introduction of the *Queen Elizabeth* class

²¹⁶ Grove *The Battleship is Dead...* p.425

²¹⁷ A. Gordon *The Rules of the Game: Jutland and British Naval Command* (London: John Murray, 1996) p.372

vessels (theoretically) capable of 25 knots would repeat the process, continuing, as pointed out by Andrew Lambert, the significant fast-wing element in RN tactical thinking.²¹⁸

The New Testament ships

The vessels officially designated as armoured cruisers (later ‘battlecruisers’) were a much purer physical expression of Fisher’s strategic and tactical views, a point which Fisher himself made for many years and is now generally accepted.²¹⁹ In many ways this is likely so, though it does not seem the First Sea Lord was too downcast over the *Dreadnought*. Like all of the British big-gun armoured cruisers / battlecruisers they remain mired in a controversy that began almost as soon as they were laid down. While much of this was a response to their big-gun armament, at its heart was a lack of clarity regarding what the vessels were actually for. Fisher was the driving force behind the *Invincibles* but characteristically refused to provide any direct explanation about what he envisioned their role to be.

In his recent work, Seligmann has returned to the explanation for the type provided by Reginald Bacon in his biography of Fisher. Bacon, Seligmann points out, knew Fisher as well as anyone, having worked closely with him for years at the Admiralty and served as *Dreadnought*’s first captain. His statement is that the *Invincibles* were developed to supply a long-standing desire in the service: ‘a ship fast enough to hunt down any armed merchant ship afloat, and at the same time to be able to fight any cruiser afloat...’²²⁰ This is an interesting point, and Seligmann makes a strong case for it indeed having been the intention behind the design, pointing to several reports in 1906 calling for the type to replace armed Cunard liners in the role of hunters of German auxiliary cruisers.²²¹ Many senior figures in the service were less-than-enthusiastic about arming British liners to counter rival AMCs, with good reason, since, not having been designed as naval vessels, they lacked any protection at all, rendering an action rather too much a matter of luck and placing considerable onus on whoever got in the first shot. Moreover, British liners, with a handful of exceptions were not ranked amongst the fastest, so even if they were converted into AMCs themselves, they would be unable to catch an equivalent preying on British commerce.

²¹⁸ A point emphasised by Professor Lambert in his feedback on the first draft of this thesis

²¹⁹ Seligmann *New Weapons*... p.314

²²⁰ R. Bacon, cited in Seligmann *The Royal Navy and the German Threat* p.69

²²¹ *Ibid* p.78

The emphasis on the counter to converted liners is important, and does provide support for some of the design decisions and characteristics, though care must be exercised given that Bacon, as having some responsibility for the decisions of the era, cannot be regarded as unbiased.²²² Seligmann lays much emphasis on the Admiralty reacting to a perceived shift in threat to commerce, away from dedicated commerce-raiding cruisers and toward fast armed liners, the implication being that this supports a shift in strategic priorities on the part of the Admiralty away from the traditional Franco-Russian challengers and toward Germany, with whom AMCs are more commonly associated.²²³ The evidence provided in support is persuasive, noting parliamentary select committees set up to consider the matter as early as 1901, and which concluded the threat came from Germany. However, it overlooks the fact that the potential threat from fast AMCs had been appreciated by the Board since at least 1885, and there was precedent aplenty for creating a cruiser designed to hunt down and kill such types: William White and Lord Hamilton had largely conceived the *Blakes* for this purpose sixteen years earlier.²²⁴ Thus, while the Admiralty certainly took increasing interest in countering the German naval challenge, Seligmann's contention that there was something particularly novel about developing such a type does not stand up, nor is the support for a near-total shift in strategic prioritization for trade-defence as strong as it appears.

The instructions given to the Committee on Designs for the official new vessels stipulated that the new vessels should have the following characteristics:

Speed: 25 knots

Armament: 12-in. guns and a-t-c guns. Nothing between. 12-in. guns to be as numerous only as is consistent with the above speed and reasonable proportions.

Armour: to be on similar scale to "Minotaur" class.

Docking facilities to be carefully observed.²²⁵

This theoretically gave considerable scope to the Committee for selecting configurations, dimensions and engine choices. The 12in gun was selected largely with an eye to the new vessels having 'an additional use in being able to form a fast light squadron to supplement the

²²² Seligmann *New Weapons*... p.304

²²³ *Ibid* pp.315-317

²²⁴ See Chapters Two and Three, also Friedman, *British Cruisers of the Victorian Era*, p.218

²²⁵ Parkes *Op. Cit.* p.472

battleships in action, and worry the ships in the van or rear of the enemy's line.'²²⁶ This was a classic first-class cruiser function, but despite Bacon's support for the 12in, as Seligmann suggests it was unnecessary for trade-protection where the excellent 9.2in gun would have been more than adequate.²²⁷ The real reason, as first publically suggested by Philip Watts, was probably pressure from Fisher, who was always in favour of RN vessels outgunning rivals, and a wish to respond to the Italian *Regina Elena* class, designed by Vittorio Cuniberti, and the Japanese *Tsukubas*.²²⁸ Both of these types had incorporated 12in guns; the former was officially considered a light / fast battleship, and carried two 12in supported by twelve 8in. The decision to build the latter with four 12in guns in two twin turrets supported by twelve 6in in casemates was apparently taken based on experience from the Yellow Sea battle, when the Japanese came under accurate fire from the Russian fleet at extremely long range.²²⁹

The early sketches by May for 12in-gunned armoured cruisers had assumed reciprocating engines; turbines were selected for the final design. A letter from the Engineer-in-Chief (Durston) dated 12 January 1905 in the *Invincible* class cover strongly advocated the use of turbines, on the grounds that the greater efficiency of turbines allowed similar horse power levels to be obtained with less boiler power (an expected ratio of 41:35 in favour of turbines), while the size, space and weight savings would be considerable; the latter in the order of some 700 tons.²³⁰ A major consideration was to reduce the size of the boiler rooms as far as was consistent with efficient working and maintenance; it seems this was with an eye to reduced internal target area.²³¹ It was likely this that helped tip the balance away from the reciprocating 4-cylinder triple-expansion type, which had realistically reached the limit of its development potential, in addition to the potential improvements in reliability and efficient high-speed running. As with the previous design, a wide variety of configurations for the 12in armament were debated. Sketch Designs A through C were derived from May's studies, featuring two twin barbettes abreast of each other and forward of the bridge, various configurations being employed for aft barbettes. Sketch 'A' had twin superfiring barbettes on the centreline, sketch 'B' two twin barbettes abreast of each other abaft the mainmast, and

²²⁶ Francis Bacon, cited in Roberts *Battlecruisers* p.18

²²⁷ Seligmann *The Royal Navy and the German Threat...* p.82

²²⁸ P. Watts 'Warship Building 1860-1910' *TransINA* Vol.LIII (1911) [2nd volume] p.323

²²⁹ R. Grey [ed.] *Conway's All the World's Fighting Ships, 1906-1921* p.233

²³⁰ NMM *Invincible* class ship cover. Memorandum, Engineer-in-Chief A. Durston to W. H. Whiting, 12 January 1905

²³¹ *Ibid*

sketch 'C' a single twin turret on the centreline abaft the mainmast.²³² As had been the case before, whether there would have been space for these barbets, let alone their magazines and shell rooms is questionable. These configurations were ultimately rejected, partly through the space issues, but also due to restricted arcs of fire and severe blast issues. Eventually sketch design 'E' was selected featuring four twin barbets in a diamond arrangement, the wing gunhouses staggered to allow a mild arc of cross-deck fire assuming the opposite gunhouse was disabled.

The new vessels, initially named *Invincible*, *Immortalite* and *Raleigh* were a substantial jump in size over their immediate *Minotaur* class predecessors, having a load displacement of 17,250 tons, and 530ft between points.²³³ Figure 5.8 shows the deck-plan and side elevation of the type. The names *Immortalite* and *Raleigh* were officially dropped on 2 December 1905 in favour of *Inflexible* and *Indomitable*.²³⁴ The ship cover for the class is not enlightening regarding the reason for this change; however, it is noteworthy that those finally adopted were established capital ship names whereas *Immortalite* and *Raleigh* had traditionally been associated with frigates and cruisers.²³⁵ There was also precedent abroad; as noted in Chapter Three, the American 'Big Ten' armoured cruisers of the *Pennsylvania* and *Tennessee* classes had all received State names, underlining their capital-ship standing.

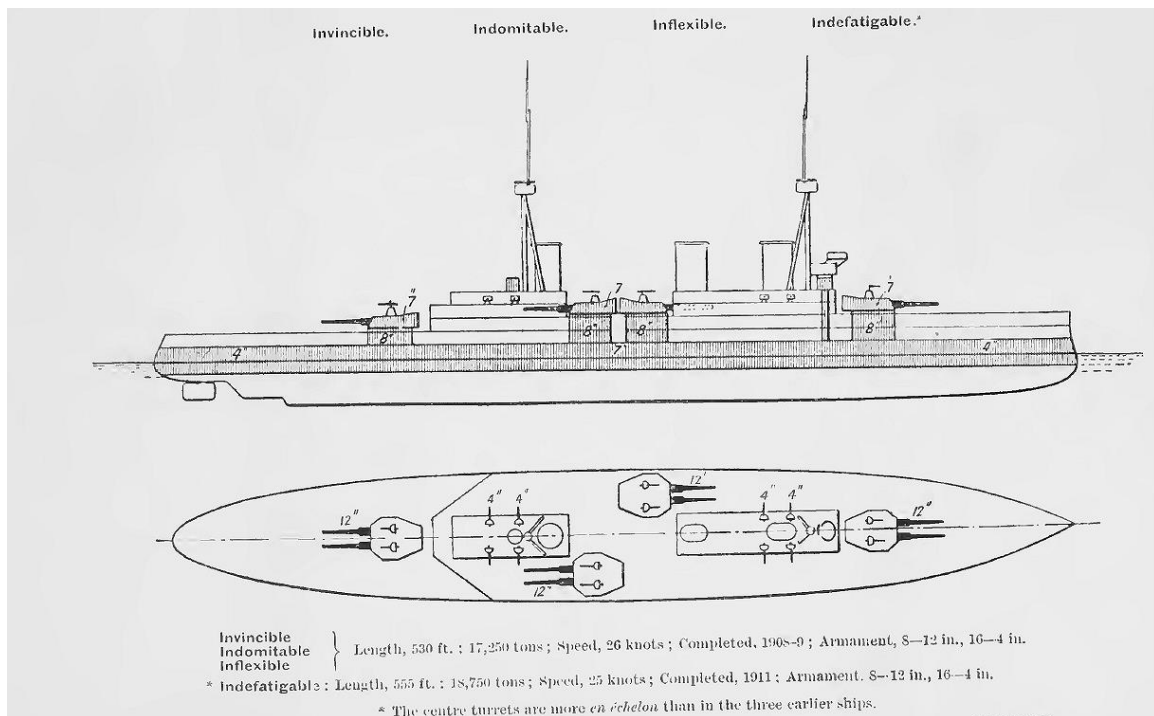
²³² Parkes *Op. Cit.* pp.489-490 provides rough sketches of these configurations; the large number of surviving originals are in the *Invincible* class cover, in various forms

²³³ NMM *Invincible* class cover, Confidential memorandum 'British warships, building or projected'. Undated, but presumed mid-late 1906

²³⁴ NMM *Invincible* class cover Confidential Memorandum Cn'20729/5

²³⁵ In the case of the former, 5th Rates, a wooden screw frigate, and an *Orlando* class cruiser at the end of its useful life, and sold for scrapping under Fisher's scrapping programme 1 January 1907. In the latter, a mixture of sloops, 4th & 5th Rates, and one of Sir Edward Reed's three big unarmoured iron screw frigates

Figure 5.8: *Invincible* ('P') class deck-plan and side elevation



Source: Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin & Co., 1912)

Plate 9

31 Yarrow or Babcock boilers fed 4-shaft Parsons turbines for a design 41,000 S.H.P. and 25 knots, theoretically slightly down from the 25 ½ knots that Fisher had originally favoured. A complete absence of vibration was reported, and with a 500 yard turning circle, Captain Harding of HMS *Donegal* stated on *Indomitable's* trials that she steered better than any ship he knew.²³⁶ All three of the class achieved or exceeded 26 knots on trials, with power outputs approximately 10 per cent above the design figure.²³⁷ Parkes claims 28 knots was obtained under service conditions, but does not provide any source.²³⁸ Such a speed seems highly unlikely since the later *Lion* class battlecruisers required over 70,000 S.H.P. for 27–28 knots, and their substantially longer hull had an efficiency advantage at higher speeds to that of the *Invincibles*. Be that as it may, the class were exceptional steamers, helped by the remarkable efficiency of their propellers, those of *Invincible* in particular attaining an almost unprecedented 57.7 per cent.²³⁹

This sustained high speed capability, helped by their considerable freeboard, was a substantial improvement over earlier types over long periods, even those like the *Drakes* with a reputation for being excellent steamers. Following her commissioning, *Indomitable* took Prince George (later King George V) to the City of Quebec Tercentenary celebrations, escorted by HMS *Minotaur* and on the return leg was reported to have averaged 25.13 knots, slightly exceeding the 25.01 knots the great Cunard liner *Lusitania* (also turbine powered) made between 5–10 July that year.²⁴⁰ In contrast to the high-speed run made by the Second Cruiser Squadron two years before no engine trouble or major mechanical failures occurred, starkly illustrating the significance of the turbine for high-speed warships: the enormous reduction in moving parts and inertia eradicated most of the sources of wear and tear, boosting reliability to a significant degree and ultimately reducing maintenance requirements and the inevitable down-time needed for refits.²⁴¹ The turbine's reliability also meant a

²³⁶ NMM *Invincible* class cover W. H. Davis, report on *Indomitable* trials 13 April 1908. The 500 yard turning circle seems extremely small given their considerable size

²³⁷ Viscount Hythe [ed.] *The Naval Annual, 1912* (Portsmouth: J. Griffin and Co., 1912) p.482 A copy of a Telegram to the DNC dated 29 April 1908, reporting the full-power trials results of *Indomitable* indicating 26.11 knots on the measured mile is contained in the *Invincible* class cover

²³⁸ Parkes *Op. Cit.* p.495

²³⁹ *Invincible* had equal diameter (10ft 6in) and equal pitch (10ft 11in) for the propellers on the inner and outer shafts, unlike her two sisters. NMM *Invincible* class cover "'Invincible" class particulars of propellers.' Undated, but per above, likely mid-late 1906

²⁴⁰ See The Sydney Morning Herald, Wednesday 5 August 1908 p.9 The runs were of course somewhat different and *Lusitania* and her sister *Mauritania* would both later exceed this, interestingly once the former's propellers were changed

²⁴¹ In fairness, it should be stressed that British first-class cruisers were already rather better off than most rivals with triple-expansion engines. Their relatively under-stressed nature, thanks to the use of four-

dedicated liner-killer was somewhat easier to create than it had been with reciprocating engines; liners could use long-stroke pistons since within reason, vertical height was a non-issue for their engines. A naval vessel required its engines protecting, thus height needed to be limited.²⁴² Since balancing horizontally mounted engines was problematic, this had typically entailed either increased boiler pressures, or increased revolutions with a short-stroke to allow smaller engines to fit under protected decks.²⁴³ Philip Watts had been a notable advocate of the latter with his cruiser designs at the Armstrong Elswick yard during the later 1890s.²⁴⁴ Both methods tended to impact on reliability, although the RN's vessels tended to be less highly stressed compared to many contemporary rivals and those built privately. As a result a large liner, with its inherently superior seakeeping and unstressed engines would typically possess a higher sea-speed over an extended period than a naval cruiser, and thus be able to evade it. The introduction of the turbine at a stroke (or lack thereof) removed this problem, and the *I's* 25 knot trials speed may have been selected to give them a significant advantage over the fast German liners.²⁴⁵ Also, assuming the medium-term intention was to elevate the RN's main force to the same 21 knot speed as *Dreadnought* a heavy scout would need to possess a 3 – 4 knot margin over her, as had been the case with the reciprocating engined battlefleet and their first-class cruiser contemporaries.

The strategic value of high speed was a major subject of debate during the latter stages of the 1890s and first decade of the Twentieth Century, mainly because for a given vessel displacement it could only be obtained by making sacrifices elsewhere. Strategically speaking this may be distilled down to the potential reduction in radius of action through increased fuel consumption, and thus as Corbett illustrates, raises the fundamental question of whether speed or radius of action has the greater strategical value, or lends itself to the greater number of strategical combinations.²⁴⁶ Corbett's paper was by far the most lucidly argued exposition on the subject there had been to date. Rejecting lines of argument that tended to cite exceptional examples to support their contentions but ignored all others, he considered the matter from the perspective of oceanic operations, and movements in narrow seas. By general

cylinders, and an emphasis upon natural draught to the boilers tended to result in fewer breakdowns and wear; the turbine elevated this still further

²⁴² Seligmann *The Royal Navy and the German Threat...* p.74

²⁴³ In some cases, an armoured hood for the piston-heads would be added above a protected deck

²⁴⁴ See Philip Watts 'Elswick Cruisers' *TransINA* Vol. XLI (1899)

²⁴⁵ Seligmann *The Royal Navy and the German Threat...* pp.77-78

²⁴⁶ J. Corbett [later Sir Julian] 'The Strategical Value of Speed in Battle-Ships' *JRUSI* 51:2 (1907) p.825 Corbett splits this basic strategical point away from potential tactical consequences to increased speed, namely reductions in gun-power or armour

consensus, high speed was accepted as being of greater strategic value than radius of action in the latter case. But while the obverse may appear to be true for oceanic operations, Corbett contended that this did not necessarily apply equally to all maritime Powers. In the case of the British Empire, with its dominance of the global trading routes, its multiple colonial assets and coaling stations, most of which were denied to potential opponents, coal endurance and outright radius of action was less significant.²⁴⁷ This was closely in line with the pre-war British deterrence strategy, exploiting the advantage of long-range communications (still mostly undersea telegraph) and more numerous bases and dry-docks around the world, flying squadrons of cruisers being available for rapid deployment to where they were needed.²⁴⁸ Though eroded by this time, Britain retained a sufficient advantage for such an approach to remain very practical for countering challenges outside the European theatre.

The *Invincibles* carried four twin gunhouses with 12in 45-calibre Mk X in barbettes disposed fore, aft and staggered on the wings. End-on fire was a significant consideration, although as with the battleships, blast from the wing turrets would cause severe damage to the decks and upper works and all but eliminated this capacity in practice. Mountings in *Indomitable* and *Inflexible* were standard BVIII, as had been used in *Dreadnought*, albeit with 6 rather than 3-cylinder training engines which allowed smoother operation.²⁴⁹ *Invincible* herself carried experimental electrically-powered mountings, to different designs by Vickers and Armstrongs. This had been partly at the instigation of Jellicoe in his capacity as D.N.O., since electrical operation in theory had some advantages in reduced weight compared to the hydraulic mountings normally used. Both proved an expensive failure, and their efficacy was under severe question even before they were fitted. Reliability proved atrocious, the mountings finally being converted to hydraulic power March-August 1914.²⁵⁰ Owing to potential confusion between 'B' and 'C' when used verbally to refer to the turrets, the wing gunhouses were designated 'P' (port) and 'Q' (starboard); a system also adopted for *Dreadnought*.²⁵¹

²⁴⁷ *Ibid* pp.826-827

²⁴⁸ A. Lambert 'Economic Power, Technological Advantage, and Imperial Strength: Britain as a Unique Global Power, 1860 – 1890' *International Journal of Naval History*, Vol.5 No.2 pp.30-31

²⁴⁹ Roberts *Battlecruisers* p.84

²⁵⁰ *Ibid* p.86 Also see letter initialled F.B. (Francis Bacon) in the *Invincible* class cover dated 22 December 1912, with a computed cost by the D.N.O of £151,200.

²⁵¹ NMM *Invincible* class cover G15380/20633-5 Confidential memorandum, Controller (Jackson) to Messrs Armstrong, Whitworth & Co., and Messrs Vickers, Son & Maxim London / Barrow, 30 October 1906

The height of the forward 12in gunhouse above the load waterline was 2ft less than in the *Minotaurs* at 32ft, but ample for good gunnery conditions. However, the wing barbettes and gunhouses were 6 1/2ft higher than in the earlier type, although the height of the after gunhouses was similar between the types.²⁵² Parkes states the class were reported to be good sea boats (definition unspecified), but that they were not considered particularly steady gun platforms.²⁵³ Presumably by 'good sea boats' they were found to be reasonably dry ships; since they were large, with a respectable level of freeboard and had fewer gunhouses on their upper-decks than their predecessors, this is not surprising. The matter of their being mediocre gun platforms was likely a result of their needing considerable initial stability to compensate for the top-weight of four twin 12in gunhouses carried high. This would in turn have resulted in a relatively short period of oscillation, and as a consequence, they would have been more susceptible to be set rolling by ordinary conditions at sea than many earlier types.²⁵⁴

The vital matter of fire-control was handled by a modified version of the system introduced in *Dreadnought*. With these official cruisers the ability to hit quickly and accurately at long range was just as significant an aspect to the design, as it was partly intended that the type should be able to exploit its speed in order to dictate the range where it could optimally employ its heavy artillery. While relatively primitive by later standards, it was at the time, like that of *Dreadnought*, better than that in most other vessels. Spotting tops on the masts operating 9ft Barr and Stroud rangefinders communicated with two TS on the lower deck, equipped with Dumaesq calculators and Vickers range clocks, the constant updates of range and bearing being followed on a plotting table.²⁵⁵ The *Invincibles* had a significant advantage over *Dreadnought* in that their foremast, with its spotting top was located forward of the foremost funnel, thus moving it out of the stream of hot air and gasses that crippled the effectiveness of the ostensible battleship's fire control.²⁵⁶

Armour was (as indicated to the Committee on Designs) roughly akin to the *Minotaurs*. A total of 3,460 tons of material, or 20 per cent of the normal load displacement was devoted to

²⁵² NMM *Invincible* class cover. Memo to Controller from Watts, giving sheer drawing, legend, midship section, armour & rig drawing, dated 22 June 1905

²⁵³ Parkes *Op. Cit.* p.495

²⁵⁴ White *On the Maximum Dimensions of Ships* p.16

²⁵⁵ Roberts *Battlecruisers* p.90

²⁵⁶ This was fortunate, since at a meeting of the Committee on Designs 6 February 1905, Fisher 'appeared very anxious that the boat stowage and mast arrangement shown on the Battleship model should be adopted in the Cruiser' NMM *Invincible* class cover. Minutes on Committee Meeting; handwritten date note at 7 February

the protection, with major characteristics being an 11ft 3in deep amidships belt of 6in KC from 'A' to 'X' barrette, extending 7ft 3in above and 4ft below the load waterline. The belt terminated in a curved 6in bulkhead abaft 'X', but was extended with 4in KC to the bows. 7in KC was used on barbettes and gunhouses, 10in on the forward CT. The magazines had additional 2 ½in side armour below the waterline. Horizontal protection was provided by a protective deck, 1 ½in thick on the flat and 2in on the slopes behind the armour belt, increasing to 2 ½in aft of the belt and decreasing to 1 ½in forward.²⁵⁷ The armour scheme of the *Invincibles* was principally intended to defend against assault from relatively flat-trajectory intermediate calibre projectiles at ranges up to approximately 9,000 yards. It was not expected to provide complete protection from heavier-calibre fire at any range.

Brown makes the point that 'today's designers are accustomed to weapons against which there can be no practical protection and ships are designed to limit the consequence of such hits.'²⁵⁸ However, he overlooks the fact that this was also attempted in the *Invincibles* (and to a lesser extent, as indicated above, *Dreadnought*). The general system 'did not provide for immunity from damage, but was intended to limit the effects of shellfire by restricting the extent of such damage and by reducing the risks to the more important areas of the ship, namely the motive power, the main armament, the steering gear, and the control positions.'²⁵⁹ Thus modest thicknesses of armour were spread over reasonably wide areas, with patches of additional plating around the critical magazines and shell-rooms. This approach to armour was derived from an analysis of the actions and damage received in the Russo-Japanese war, along with British trials results of projectiles and armour, and given the available evidence, makes sense since the type was not intended for protracted gunnery duels with more heavily protected capital ships.²⁶⁰ The Admiralty and Constructor's Department, based on the performance of British heavy projectiles under test conditions also had considerable reservations about APC [Armour Piercing, Capped] shell, but were rather more favourably impressed by large-capacity shells and high explosives that could cause extensive damage to ships' structures, thus tended to favour CPC [Common Pointed, Capped] and to a lesser extent HE [High Explosive] projectiles.²⁶¹ This, Roberts contends, explains the strong

²⁵⁷ NMM *Invincible* class cover, *British warships, building or projected*

²⁵⁸ Brown *Warrior to Dreadnought* p.193

²⁵⁹ Roberts *Battlecruisers* p.99

²⁶⁰ *Ibid* This latter may have been a mistake given the mediocre performance of British AP shells, but this too can be overstated since projectiles improved in the years following the design of the *I* class

²⁶¹ Roberts *Battlecruisers* p.102 APC shell was an armour-piercing shell with a soft cap on the nose to reduce the likelihood of it shattering or breaking up on face-hardened armour. CPC shell was effectively a

emphasis in British ships on splinter protection and medium thicknesses of armour, and there is little in the ship covers that suggests otherwise.

At the time of their design, the *Invincibles* (and *Dreadnought* if stock assumptions over definitions are set aside) were the most powerful cruisers in the world; a status they would not lose until the commissioning of their successors and the German *Von der Tann*. Roberts classes them as very successful ships taken ‘as an interpretation of their design requirements.’²⁶² This seems a fair assessment; they would have had little difficulty catching and overwhelming most smaller cruisers (an ability proven during the Falkland Islands engagement in 1914), converted ocean liners and given the conditions that existed at the time of their design, using them as the fast wing of a battlefleet seems a reasonable proposition. Their turbine engines were as successful as they had been in *Dreadnought*, they fully realised the speed requirements set out for them, and with the exception of *Invincible’s* electrically operated gun mountings, with their uniform 12in armament they theoretically outgunned the cruisers of Italy and Japan which carried mixed batteries of 12in with smaller 8in or 6in weapons.

As with *Dreadnought* and their intermediate-calibre armed predecessors though, the *Invincibles* are certainly not above criticism. The armament disposition settled upon was superior to that of the ostensible battleship as it was less cramped, but the blast effects from the wing turrets rendered four or six-gun end-on fire a matter of wishful thinking. On the displacement few other options for 12in artillery were available though. The basic balance of speed, offensive and defensive power in the *Invincibles* seems to have been the product of conflicting views on their duties though – a consequence, one feels, of Fisher’s reluctance to explain what it was he was trying to achieve.

The 12in gun was most likely selected as a response to the latest Japanese and Italian vessels being so-equipped (albeit as part of a mixed battery). However, if they were intended for killing fast armed liners per Bacon’s contention, then as Seligmann points out the 12in was completely unnecessary, and this was appreciated by senior officers like Prince Louis of Battenberg. It made more sense for hunting down and killing dedicated enemy cruisers,

common explosive shell with the fuse in the base rather than the nose to aid penetration; it too had a soft cap to reduce the chances of immediate breakup when impacting face-hardened armour

²⁶² *Ibid*

although was arguably excessive even for this role. In the short term, they could be employed as a fast-division for a battlefleet since until a significant number of all-big-gun rivals emerged, they would be facing a mostly QF armed opponent, and their protection was not relatively badly off compared to the *Minotaurs* or *Warriors* –a point overlooked by many. However, across that relatively short time period, the fast-division role could be largely taken by *Dreadnought* and her immediate successors, realistically negating any need for them in this role. In the medium to longer term, as all-big-gun vessels took an increasingly prominent role in rival fleets, their protection rendered them far too vulnerable. On learning the details of the armour scheme, the former DNC commented that ‘12-inch guns with 7-inch barbette armour do not commend themselves to me.’²⁶³ Mark Kerr had similar misgivings, expressing his concern to Watts when *Invincible* was completing that the move toward heavy-calibre weapons was opening the range, and that the armour would not be able to defend against projectiles coming in at a high trajectory.²⁶⁴ Sir Philip concurred with these views, but stated he had not been allowed sufficient weight to create a more heavily defended vessel.²⁶⁵ Given the conditions and weights available, the choice of continuing the general theme of 6in belt armour seems a poor one except in the case of their being primarily designed for killing fast armed liners, since such AMCs were never likely to be equipped with an especially heavy armament. It was inadequate given the artillery it would increasingly be exposed to if expected to serve in a fleet-role, marginal for countering opposing armoured cruisers given the steady move toward heavier armament in general. Assuming a larger ship was not permissible, then increasing the protection to the barbettes and throwing the balance of weight available into a comprehensive protective deck scheme would likely have worked better, and is likely what White would have proposed.

In conjunction with *Dreadnought*, the three *Invincibles* formed the material blueprint of the new-model service that Fisher wished to develop (at least for the heavy vessels). While the First Sea Lord almost certainly felt the former to be less radical than he would have preferred, it is also probable that he did not view her as too significant a compromise to his intentions. *Dreadnought* would be followed with the three *Bellerophon* class vessels; virtual repeats with detail refinements, while the design of the three official armoured cruisers would be stretched to create the otherwise basically similar *Indefatigable*. A useful, highly flexible and extremely

²⁶³ Quoted in Manning *Op. Cit.* p.477

²⁶⁴ Parkes *Op. Cit.* p.495

²⁶⁵ *Ibid*

powerful fighting force (notwithstanding certain weaknesses in terms of the vessel designs) could thus be envisioned of four heavily defended and armed vessels of respectable speed capable of forming an extremely powerful fast-division to a contemporary battlefleet, with four faster, more lightly protected and armed vessels for use killing commerce-raiders, and temporarily serve the fast-division role, even if this was likely not viewed as their primary function.

Consequences and conclusions

As shown by Sumida, by the beginning of the new century the financial ramifications consequent of the policy of constructing two distinct types of capital ship were increasingly severe. While this was not an impossibility during earlier, reasonably buoyant financial periods, as economic conditions weakened, so the strain on the national purse caused by the massive annual naval estimates became less politically viable. Admiral Sir John Fisher, the maverick, mercurial genius of Royal Naval history came to office largely on account of his promise to reduce spending and improve efficiency; this he initially achieved, although some of the savings should be considered in light of the baseline being artificially high. Nevertheless, his scrapping programme purged the service of a large number of vessels that had little practical use in war, and which had far outlived their fighting value. As is well known, this went hand-in-hand with a dramatic structural reorganisation, both of manning, and composition of fleets.

Since Fisher rarely explained his intentions, numerous interpretations have been advanced for his strategic intentions, which varied over time to meet the changing conditions. It is often said that Fisher's concentration of battle-squadrons in European waters was a response to the increasing German naval challenge, but initially it seems clear that it was as much a reflection of the altered geostrategic circumstances. The Anglo-Japanese Alliance went some way to countering the rivalry with Russia; the subsequent near-extermination of the Russian fleets during the Russo-Japanese war effectively neutralised any maritime threat from this quarter for the immediate future. Even more significantly the *entente* with France, though not eliminating the possibility of conflict with that nation reduced the likelihood. Since France's fleet had been built up largely to threaten British commerce, notwithstanding political interference which had resulted in a vacillating construction programme, this was a major shift, although it did not necessarily cause an instant shift in prioritisation, since as Seligmann

points out, the Admiralty were wary of a perceived threat to trade from German fast liners converted to AMCs. The reduced necessity for maintaining battle-squadrons outside European waters inevitably resulted in the recall of many battleships stationed elsewhere, since there was no practical requirement for retaining them in such locations. With the rapidly increasing German naval challenge though, it was convenient.

In the medium-long term, Fisher's intention was however to exploit the latest technologies available to give Britain a crucial strategic and tactical edge. The revisionist flotilla-defence perspective argues that he intended to utilise surface and sub-surface torpedo craft and mines to defend the UK homeland and major foreign bases, while first-class cruisers would become the service's only capital ship. These were ideal types for hunting down potential commerce-raiders following the service's continuing policy of focal-area defence for protecting trade, since they could rapidly overwhelm smaller types, and had a rapid-transit ability. In the first years of the century, although not quite as effective in a fleet action as their battleship counterparts, they were perfectly capable of fighting them, and their additional flexibility rendered them a more useful type. Whether the flotilla-defence interpretation is accepted or not, what is clear is that Fisher never wavered from his preference for first-class vessels possessed of a considerable speed margin over rivals. The flotilla aspects themselves are more contentious, and whether the technology was ready is another matter that lies outside the scope of this thesis. Some moves appear to have been made in this direction but the scale of implementation remains a matter for debate.

By the turn of the century, the Board abandoned attempts to restrict dimensions of first-class cruisers, and returned to the fleet-cruiser model pioneered in Britain by Sir William White. This was largely enforced by rival nations moving toward larger types which the *Monmouth* and *Devonshire* classes would have struggled to counter unless operating in numbers. The heavier main battery introduced also reflected changing gunnery conditions, as well as the increased levels of protection of foreign vessels. The vessels were generally sound, though it would seem the Board felt the lack of White's guidance, since though outwardly impressive and undoubtedly capable, the new cruisers lacked some of the design refinements and clarity the former DNC brought. The oft-criticised ammunition passages in contemporary British capital ships was not one of them however, since there was little option but to use them when vessels were armed with a large number of intermediate-calibre guns, and in an era of comparatively short battle-ranges and flat-trajectories, when heavy armour-piercing shell was

less likely to be encountered, they were far from being the significant weakness they are sometimes claimed to be. Unworkable 6in box-battery in the *Duke of Edinburghs* aside, all nine vessels matched the requirements of the service well and can be reasonably assessed as superior to contemporary foreign rivals, albeit with a bias toward speed and practical gun-power.

The introduction of the all-big-gun vessels had a significant effect on the wider strategic situation, and gave the Royal Navy a decisive technological head-start over other nations, be they friendly or otherwise. Although sometimes regarded as a blunder, on the principle that it obviated Britain's lead in existing types and was based upon faulty intelligence data, this is to completely misunderstand the complexities of the situation. The existing fleet was not instantly rendered valueless; superiority was maintained over equivalents elsewhere, which could not simply be ignored, while Britain established a lead over rival nations in new construction. This latter was particularly significant, since Fisher's strategic approach was to a large extent predicated upon ensuring technical superiority over equivalent rivals. Uniform heavy artillery was an inevitability in any case; the United States and Japan in particular were adopting or moving to adopt this approach. From a British (or at least Fisher's) perspective, just as significant was the increase in speed over all earlier types. Both *Dreadnought* and the *Invincibles* were substantially faster than any then-current battleship; under practical conditions, thanks to the introduction of the turbine engine the former was as fast as the majority of existing large cruisers (especially over extended periods or in poor weather conditions) while the latter could outstrip anything afloat. By constructing two heavily armed capital ships with a major speed advantage over all current rivals, Fisher threw foreign construction programmes into severe confusion. Since Royal Navy strategy was not fully understood abroad (or by many in the UK), attempts to meet it were uncertain and their effectiveness initially blunted. This was especially true for Germany, locked into its Navy Laws. When counters from foreign powers came, they were with a new generation of battleships, often slower and retaining reciprocating engines. However, Fisher was attempting to take the Royal Navy in a very different direction, circumventing the mire of the traditional battlefleet whether other nations continued to construct such types or not.

This leads to the question of what *Dreadnought* herself actually was. Normally classified a battleship, many of her characteristics at the time of her design and for the first years of her life were consistent with existing fleet-cruisers, while her posting to the 5th Cruiser Squadron

indicates that she was intended, at least initially, to operate with them as a fast wing for the existing battlefleet, with the practical possibility of independent operations as part of the cruiser squadron if required. The term ‘cruiser’ itself though may be misinterpreted. When the *Cressys* were created, they were known as armoured cruisers, and designed for use as a battlefleet’s fast division. The later *Dukes*, *Warriors* and *Minotaurs*, also had a strong fleet-emphasis in their design, while the *Drakes* were perfectly capable of performing in the role should they be required to. At the time of her creation, *Dreadnought* also fell into this criteria. Later such types would be known as ‘fast battleships’ –the nomenclature being, as suggested above less important than design characteristics, intentions, and the manner in which it was used. It is slightly ironic to reflect that while the Fusion committee set up by Fisher was tasked to merge battleship and cruiser features into one vessel type, an existing vessel, namely *Dreadnought*, had already done just that. By any realistic measure, though not without flaws she was a very successful vessel. The *Invincible* class were also successful when judged by the criteria to which they were designed, which, like the *Minotaurs*, was heavily biased toward offense. If criticism is due, it should be directed rather toward these requirements, which were not as well thought out as they should have been. It is difficult to avoid the conclusion that, fine designer though he was, Sir Philip Watts was probably too reticent on this point, and a better balanced fighting vessel would likely have resulted had his more vocal predecessor been in the same position.

Flawed though the British first-class cruisers of the era may have been, they did retain in general a good edge in fighting power over rival vessels throughout the period, and made a formidable fighting force. This period was the culmination of a general trend in the development process of the first-class cruiser that had taken place since the mid-1880s. As the new century opened, it was a genuine alternative form of capital ship. Within a handful of years, largely thanks to Fisher and especially turbine technology, its two forms: the fleet-capable type, and the commerce-protector would become the inspiration for all of the Royal Navy’s first-generation all-big-gun vessels.

Conclusion:

The first-class cruiser 1884-1909 in perspective

The first-class cruiser was one of the most important vessels of the late Nineteenth and early Twentieth Centuries, yet there have been no attempts to date to produce an in-depth assessment of the type's development from the mid-1880s until the close of the first decade of the Twentieth Century. It is this gap in the historiography that this thesis seeks to fill, by examining how it fitted into the service's changing requirements through this time, how it was employed in practice, how and why it rose to increasing prominence, and why it has often been overlooked.

In the early 1880s, the vessel type that would later be officially termed the cruiser was steadily leaving behind the tactical morass of the mid-Victorian era. Until comparatively recently, this had been considered a 'Dark Age' period during which the classical battlefleet that had held sway for over two centuries had largely vanished into a heterogeneous collection of seemingly bizarre 'Neanderthals of naval architecture, doomed to extinction by the march of enlightened progress.'¹ Worse still, the contemporary Admiralty's 'ideas of strategy were not so much misguided as non-existent.'² It has been argued that it was largely owing to the efforts of three naval theorists; Captain Sir John Colomb, his brother, Vice-Admiral Philip Colomb, and John Knox Laughton that this period of decay was overturned, by showing the 'historic relevance of a strong battle fleet navy.'³

Cooper Key's tenure as First Naval Lord in particular has been singled out for exhibiting vague 'tactical and operational thought.'⁴ His performance before the Carnarvon commission, it is alleged, revealed 'in the starkest terms possible his lack of any strategic insight or consideration of trade protection.'⁵ Yet in their rush to condemn Cooper Key as an inept strategist interested only in the minutiae of administration, it seems that many historians have

¹ J. Beeler *Birth of the Battleship: British Capital Ship Design 1870-1881* (London: Caxton, 2003) p.10

² N. A. M. Rodger 'The Dark Ages of the Admiralty, 1869-85, Part I: "Business Methods", 1869-74' in *Mariner's Mirror* 61/4 (November 1975) p.331

³ R. Parkinson *The Late Victorian Navy: The Pre-Dreadnought Era and the Origins of the First World War* (Woodbridge: Boydell Press, 2008) p.238

⁴ B. Ranft 'The protection of British seaborne trade' in Brian Ranft [Ed.] *Technical Change and British Naval Policy 1860-1939* (London: Hodder and Stoughton, 1977) p.4

⁵ Parkinson *Op. Cit.* p.29. See also Ranft *Ibid* pp.3-4

given little consideration to the possibility that he might not have been especially disposed to providing all and sundry with details of Royal Navy strategy. Cooper Key was not overly fond of the Foreign Intelligence Committee established in 1882, fearing that it might threaten his authority; it is mysterious therefore that it has been assumed he would willingly divulge information to other parties, including rank-amateurs who might well cause the service problems. It is true to say that the balance of evidence suggests Cooper Key was not an Alexander Milne, Geoffrey Hornby, Frederick Richards, or John Fisher. The fact of the matter is though, he did not need to be. A general policy, heavily derived from Milne's studies and potentially lethal to naval challengers, was in place, and there was scant reason to change it. During the mid-Victorian era, the limitations of contemporary materials had dominated both the strategic and tactical imperatives; as Beeler and Lambert have shown however this did not mean that there was a lack of thinking on either subject. The Admiralty did have a strategic doctrine, but it was not one that the service chiefs were at all inclined to share with politicians or publicise in a wider sense.

Since the wrought-iron and simple-stage expansion engines of the era rendered seagoing fleets impracticable once gun-power outstripped the protective ability of available armour, the service developed dedicated littoral combatants for the European theatre, intended to batter their way into defended enemy harbours on outbreak of war and destroy opposing forces before they had chance to break out. Coast-assault went hand-in-hand with the prevailing strategical climate of the era, before Britain adopted an isolationist policy and might, as a primarily maritime power, be expected to assault an opponent's littoral in support of a Continental ally. It was to operate in conjunction with a system of focal area-defence for commerce protection; a policy devised by Admiral Sir Alexander Milne. Although adapted over time, this would remain the foundation of the Royal Navy's commerce-protection strategy for some four decades. The purpose for the reticence on discussing strategy outside the service is not difficult to discern. Quite apart from an inbuilt disinclination to explain such matters to non-professionals, an aggressive policy of coast-assault was never likely to find favour with many politicians, especially in the Liberal party, who in government or opposition would have caused a storm of protestation. This was even a factor in the vessel designations themselves, with the duplicitous 'coast-defence' being substituted for 'coast-assault.' The political and economic ramifications of this policy would indubitably have been severe, nationally and internationally, in an era of quickly improving communications and literacy, but there was no viable alternative. Ergo, a secretive approach makes sense. The

trade-defence strategy of focusing upon specific regions; geographical ‘choke-points’, confluences of major trade-routes, or generally areas of high commercial shipping-density was also not intended for wider consumption. The price of the strategy was the likelihood of high initial losses to shipping until raiders were hunted down; an eventuality that was anticipated, and regarded as acceptable.

It was in this mid-Victorian crucible that the first-class cruiser was born. Its precise origins are difficult to trace given the rapidly changing material conditions of the era; received wisdom has it that they descended from second-class ironclads such as Sir Edward Reed’s *Audacious* class of the late 1860s, later, Sir Nathaniel Barnaby’s HMS *Shannon* of the early 1870s, and thence in stages to the two *Imperieuse* class. This is undoubtedly true as far as it goes. However, it can be suggested that the type also had roots in the high-freeboard, masted first-class cruising ironclads that reached their zenith with the *Alexandra* and *Temeraire*. The Royal Navy ceased constructing the type owing to the difficulty of achieving a reasonable level of protection against the latest heavy guns. Yet, in the years following the October 1887 fleet-reclassification, many of the broadside ironclads would be designated cruisers. Although this can be seen as a down-rating of elderly types to keep them on the books, with their respectable speed, sea-keeping and range were well-suited to cruiser duties, since they were good sea-boats, and their modest protection and armament were less of an issue in the trade-defence role. On a distant level they, like the *Shannon*, could be considered a spiritual ancestor of the *Cressys*, and arguably, the earlier *Blenheims*, *Edgars* and *Diadems*.

At this time, and until the late 1890s the first-class cruiser was seen principally as a trade-protection type. While to an extent other uses were mooted, this remained its main function, though as the battlefleet began its concurrent evolution toward a seagoing capacity, so a greater interest in its use as a heavy scout arose. The seven *Orlandos* marked a significant step forward in the gestation of the type, and they can be seen as the first truly modern first-class cruisers built for the Royal Navy. Much of this was due to the more widespread availability of new technologies, the most significant aspect being the introduction of steel and the triple expansion steam engine, with the attendant improvements in power and range. They were a transitional type though, reflecting features of the mid-Victorian period as well as providing indications for future types.

Sir William White, qualitative superiority and the first 'battle-cruisers'

Of the two figures that are key in this story of British first-class cruiser development, Sir William White and Sir John Fisher, White had the greatest impact. Sir Alexander Milne must also receive due recognition as the man who created the Royal Navy's highly effective, but necessarily shadowy trade-protection strategy, though his time was rather before the beginning of the period primarily covered by this thesis. White, conversely, was a key figure for much of the era, moving well beyond the material remit that might be expected of the DNC and deep into the realms of service strategy and tactics. His view was that these were just as much integral parts of his job: that in order to advise the Board properly and to ensure the superiority of service ships, the Director of Naval Construction should know what rival powers were constructing, and how the Royal Navy intended to employ its vessels. It was this breadth of involvement as much as his design and organisational skills that made White the greatest naval architect of his generation. In this, he remains unsurpassed.

The first-class cruiser of the era, though often marginalised in the historiography, was a vital part of the service, owing to the nature of the contemporary naval challengers. Although the *Jeune École* is generally accepted as having died out in the early 1890s, the commerce-raiding elements that had been incorporated into it remained a major strategic interest for many naval powers, most notably France and Russia, and, to a lesser extent, the United States. All laid down cruisers dedicated to, or with a heavy emphasis upon, attacking (British) trade. The *Dupuy de Lome* in France, *Rurik* in Russia and *Columbia* in the United States are the most striking examples dating from the early 1890s, and France in particular would place a considerable emphasis upon such types for over a decade. Despite the attention given to such vessels in foreign services however, the first-class cruisers designed under White generally possessed a considerable performance advantage over contemporary rivals in most respects as qualitative superiority was demanded. The Royal Navy invested in large scale tests, from the highly secret *Resistance* experiments, from which effective protective arrangements were derived, to Froude's model tests in the large dedicated tank at Haslar, both of which White championed. The importance of both, along with the constant armour trials on board the *Nettle* cannot be overstated since they gave the RN a critical technological edge over the vessels of potential challengers.

For the majority of the period covered, the dominant naval weapon was the intermediate-calibre quick firing gun, largely due to their rate of fire which, before the development of

effective centralised fire-control was the surest way of hitting something at more than point-blank range. These intermediate-calibre weapons were quite capable of riddling thin side-armour or the large undefended areas of hull above a thick but narrow waterline belt. Until the development of effective face-hardened steel armour, the optimal means of protection in a first-class cruiser was with internal curved armoured decks associated with extensive coal-protection and intricate subdivision, vertical armour reserved only for barbettes, casemates, conning towers and gunhouses. The efficacy of this approach was later confirmed by the *Resistance* trials, and combat experience in the Sino-Japanese war, and it was employed in all the Royal Navy's first-class cruisers from the *Blenheims* to the *Diadems*. The former were the largest cruisers in the world at the time of their design and the first vessels to be termed 'battle-cruisers' (albeit entirely unofficially) by Rear-Admiral Samuel Long, confirming that certain naval officers were seriously considering fleet-duties for first-class cruisers. While primarily designed for trade-protection, Long and several contemporary progressive thinkers like Eardley-Wilmot appear to have perceived, as the battlefleets regained the capacity to fight at rather than from, the sea, so the latest first-class cruiser types could be useful heavy scouts, or if handled carefully even function as a fast division or squadron – a point underlined at the Yalu engagement during the Sino-Japanese war. Selborne would later make the note on Fisher's *Naval Necessities* that 'the experience of the present war [the Russo-Japanese conflict 1904-05] shows that protected cruisers like *Powerful* if they have protected gun positions, are much more valuable than I had supposed.'⁶

With the development of effective face-hardening techniques, the French navy initiated a new era by equipping their latest first-class cruiser *Jeanne d'Arc* with a complete belt of Harveyized armour plate. The introduction of face-hardened armour was the most significant material advance made during the 1890s, and it in turn effected a step-change in the capabilities of first-class cruisers, and ultimately the strategical and tactical environment as a whole. The substantially improved defensive capabilities wrought by face-hardened plate allowed a first-class cruiser to carry a sufficient amount of defensive armour to make close-action with battleships a completely practical proposition. The protection of the *Cressy* class, which introduced such armour into British first-class cruisers was in fact broadly equal to the *Canopus* class battleships, outright gun-power being traded for a 3 – 4 knot increase in speed. These vessels were designed principally for fleet-duties (with even their length being

⁶ Lt. Com. P. Kemp [ed.] *The Papers of Admiral Sir John Fisher Vol.1* (London: Navy Records Society, 1960) p.42

restricted to facilitate effective manoeuvring with battleships), trade-protection being relegated to a subsidiary role. It was only with the following *Drake* class that the service built a nominal response to the *Jeanne d'Arc*, rather contradicting suggestions that the Admiralty was thrown into instant panic by this vessel's supposed superiority over existing British trade-protection types like the *Diadems* –a superiority that may not have been as significant as often believed. This was likely the result of knowing that, hysterical comments in the press notwithstanding, British yards generally had greater capacity and quicker build-times than those of foreign nations, and therefore a degree of lag was acceptable. The new side-armoured types in the Royal Navy also possessed a significant advantage over French construction both in size and defensive capabilities, since from the reintroduction of vertical protection in the *Cressys*, British vessels carried Krupp Cemented plate.

It is slightly ironic that the *Cressys* and *Drakes* were never described as 'battle-cruisers' (hyphenated or otherwise) since if the term is to be taken in its most literal sense, they were the vessels that it most accurately described: within the context of their own QF-gun dominated era, their defensive measures were quite sufficient to allow them to trade blows with battleships for a reasonable amount of time. They were, in essence, a genuine alternative form of capital-ship, having in many respects rendered the 'traditional' battleship obsolescent if not obsolete. Given the global requirements of the Royal Navy and the fact that the principle European rivals placed a general (though somewhat inconsistent) emphasis upon commerce-raiding, it can be argued that the new armoured cruisers were in fact better-adapted for the contemporary service's needs and the idea of ceasing battleship construction though not seriously entertained by the Board, would not have been unrealistic.

It has been suggested that Sir William White came to exercise a dominant influence over the Board throughout his tenure as DNC. Much of this assessment can be traced back to King-Hall's 1928 staff monograph on 'The Evolution of the Cruiser', and to an extent it is true. White would often carry the Board with him, but the Board were far from being acquiescent, and regularly overruled the DNC. This was most obviously manifested with the Board's request at the end of the Nineteenth Century for a class of more modestly sized cruisers, primarily for trade-defence. The resulting *Monmouths* and subsequent *Devonshires* can be seen as an attempt to get more 'bang for the pound' in terms of raw vessel numbers given that the principal rival powers were concentrating upon cruiser construction; whether this was the best use of resources is far more questionable. On balance, although the number of focal area

regions for trade-defence increased over time, the requirement for a large number of cruisers with only a marginal superiority over rival vessels seems at best dubious. Since the Controllers at the time (Wilson and May) were not in favour of smaller types, it may seem surprising that the Board continued with the construction of first-class cruisers of modest displacements while fully aware of their limited fighting power. There were extenuating circumstances though, and the decision should be considered in terms of the broader context of finances. First-class cruiser construction had formed a significant portion of new construction in the yearly Estimates since the Naval Defence Act, and this trend increased rapidly over time, especially following the introduction of costly face-hardened armour plate. The *Devonshires* were contemporaneous with the rather expensive *King Edward VII* class battleships, thus some degree of practical cost-saving was likely. Nevertheless, it is difficult to disagree with White, Wilson and May's preferences for larger vessels, and twelve *Drakes* or upgraded versions thereof would almost certainly have granted the service greater capability than the ten *Monmouths* and six *Devonshires*, although this would admittedly have mandated upgrades to infrastructure owing to the size of the vessels, and restricted the number of ports they could visit abroad.

The service first-class cruisers White had responsibility for were by no means flawless, although many of the criticisms can be rejected as based on simplistic or mistaken premises. With this in mind, Beeler's concluding remarks upon Nathaniel Barnaby also seems apposite to White: though not perfect by any stretch of the imagination 'he was correct much of the time, and under the circumstances that was no mean accomplishment.'⁷

The Watts and Fisher era

Philip Watts succeeded White as DNC in early 1901, returning to the Admiralty from the Armstrong Elswick yard with a stellar reputation for building cruisers. Watts was known for favouring a heavier armament on a given displacement than his predecessor, although care must be exercised in attributing the increased number of heavier weapons in service vessels purely to him. The armaments were Board requirements, with considerable input from the DNO in the Controller's department, just as they always had been. The evidence in the surviving Ship's Covers and Admiralty Memoranda suggests rather strongly that Watts was

⁷ Beeler *Op. Cit.* p.214

nowhere near as proactive as White had been, and was happier to remain the servant of the Board, providing them with what they asked for rather than offering advice in a larger sense about what was required. Given that Watts was modestly famous for his cruiser designs, it is appropriate that the first Service design for which he had responsibility was the *Duke of Edinburgh* class, which was an improvement on the preceding two types, largely on account of greater size, and marked a return to the fleet-cruiser approach of the *Cressys* and *Drakes*. Their heavier 9.2in battery marked the changing gunnery conditions, with ranges gradually increasing, the greater size and protection of rival foreign vessels, and their projected fleet-duties. They were also the last British first-class vessels to be equipped with the 6in gun.

By the early Twentieth Century the financial burden of constructing two different types of capital ship was becoming unsustainable, although this was as much a matter of politics as pure economics. On an international level, the strategic situation was changing as Britain began to forge alliances with other nations, which had a concomitant impact upon construction, and the types of vessels required. In this changing environment, Selborne, the First Lord of the Admiralty, appointed Admiral Sir John Fisher as First Sea Lord largely on his promise to cut the spiralling Navy Estimates. Exactly what Fisher was planning remains a matter of considerable debate, since he rarely explained what his intentions were, his initial policy document, *Naval Necessities* not giving definitive strategic answers, and indeed it is probable that his views adapted over time as conditions altered. There are in essence three very broad interpretations that have emerged in the historiography. The ‘traditional’ perspective popularised by Marder and Parkes holds that with the demise of the Franco-Russian naval challenge and the rise of that from Germany, Fisher concentrated battle-squadrons in home waters, and attempted to provide the Royal Navy with a critical technological edge by adopting the turbine-powered, all-big-gun *Dreadnought* battleship in classic battlefleet strategy. This would be complimented by the big-gun battlecruisers intended to overwhelm all earlier cruiser types, though it is sometimes acknowledged that this latter type was Fisher’s real ‘love’ and that he would have happily have built these as the sole heavy units for the service for all duties, on the principal that ‘speed was armour’ and they could exploit this tactically to avoid serious danger even in a fleet-context.

Conversely, the ‘revisionist’ perspective on the era, with notable contributions from Nicolas Lambert, has advanced the idea that the Admiralty did not regard Germany as a significant threat until rather later in the first decade of the Twentieth Century, and that Fisher took a

rather broader global strategic view rather than focusing on one European nation. His technological approach was even more radical than was widely believed, intended to revolve around an integrated policy of 'flotilla defence' using light forces to defend the UK mainland, critical overseas bases and the 'narrow seas', while large [battle]cruisers capable of rapid deployment around the world to anywhere they would be needed; these vessels could also effectively mop up possible threats to British commerce. As time progressed and German naval power grew, it is also contended that Fisher's Admiralty moved toward a drastic policy of economic warfare that was to exploit Britain's dominance of the global trade routes and the majority of communications networks. This was expected, unlike conventional blockade measures, to be able to win a war rapidly through the near-total destruction of their economy. Unfortunately, both of these perspectives often struggle to connect pre-Fisher conditions with the Fisher era, especially when it comes to the first-class cruiser and its place in RN policy and strategy. This may be because the apparent drama of the Fisher reforms tends to overshadow its links to existing service policies and this may be discerned in assessments of vessel design and development itself, especially that of the contemporary first-class cruisers and their development.

A middle-ground exists, largely established by Sumida which straddles the boundaries between the Royal Navy's global commitments on the one hand, and a concentration upon the German naval challenge on the other. Within this broad remit, recent work on broad RN strategy and war-planning by Grimes and Seligmann in particular have revealed that the service continuously developed, refined and tested plans in light of contemporary strategic developments and challenges. The latter has particular relevance for this thesis, since it lays considerable emphasis upon service policy from the start of the Twentieth Century, slightly before Fisher arrived as First Sea Lord, *vis a vis* trade defence, and the need to counter an increased threat to commerce from Germany while the service was still nominally concentrating on the Franco-Russian challenge. By focusing on this area though, it does not attempt to make significant connections to existing strategic policy for trade defence, nor note precedents in vessel design.

That Fisher did not wish, nor intend to develop a conventional battlefleet is probable, instead rather wishing to exploit the greater versatility afforded by first-class armoured cruisers, which had been challenging the supremacy of the battleship ever since the introduction of Harvey and particularly KC armour plate. This at least is made clear throughout most of

Naval Necessities and much of his writing elsewhere, a classic example from the former being the following:

Of what use is a battle fleet to a country called (A) at war with a country called (B) possessing no battleships, but having fast armoured cruisers and clouds of fast torpedo craft? What damage would (A's) battleships do to (B)? Would (B) wish for a few battleships or more armoured cruisers? Would not (A) willingly exchange a few battleships for more fast armoured cruisers?⁸

While overstated, probably for effect, Fisher made a fundamental point, and it seems he went some way to attempting to achieve goals along the lines of those unsubtly hinted at above. The strategic value of speed to the Royal Navy was very high given its global commitments. The term 'cruiser' however needs certain qualification since even within the remit of first-class vessels, types and capabilities varied depending on anticipated function: the nomenclature itself can only ever be approximate. On the one hand there were dedicated trade-defence types which could be used as heavy scouts for a battle-fleet if required. On the other, there were vessels intended to have a capacity for operations not just with the battlefleet, but for taking their place in a battle-line, or forming a fast division in a fleet action. As things turned out, the first of these would be succeeded by the big-gun battlecruisers, considering them purely in terms of function and duties. The second type would become what would later be known as 'fast battleships', heavier protection and armament being possible thanks to the adoption of the steam turbine and greater displacement. The term 'armoured cruiser' when employed to describe a fleet-cruiser at the turn of the century though, and 'fast battleship' are essentially synonymous. Despite Fisher's setting up the famous 'fusion committee' to combined battleship and cruiser features, HMS *Dreadnought* herself had already achieved this goal: far faster than existing reciprocating-engined battleships, she, like the existing fleet-cruisers, was well-able to form a fast-division to such a battlefleet for the first years of her life, and though naturally excessive, she could have performed independent operations if called upon, just like the fleet cruisers. Her being attached to the 5th Cruiser squadron, comprising the most modern armoured cruisers at the time, is significant: they were the only types that had any chance of keeping up with her, and

⁸ Kemp *Op. Cit.* p.41

thus their modes of operation would have been akin, a point underlined by *Bellerophon*'s activities in the 1909 Manoeuvres.⁹

Seligmann has recently returned to Admiral Reginald Bacon's statements that the battlecruisers were created largely as counter to the possibility of commerce-raiding by fast (German) ocean liners rearmed as AMCs, and it is likely that these were at least one intended target for the new type, though this was hardly a new type of threat and the Royal Navy had developed types to counter such possible AMCs before; a point overlooked in the focus upon the period from 1900 onward. Overwhelming existing first-class cruisers was also likely a broad objective, although the design brief for the type, not least the decision to equip it with 12in artillery, seems questionable in the medium-longer term. With that said, during the early years of their life, they would not have to face all-big-gun vessels in a battlefleet context, should they have been required to do so, and their armour was no worse than that of the *Minotaur* class armoured cruisers then under construction. Ultimately, a 9.2in armament would have produced a better balanced vessel, and there were moves following the *I*'s to bring it back, possibly for cost-saving, but also likely a reflection that the 12in had resulted in an uneasy balance of offensive and defensive powers.

The basic principal behind trade defence during the period covered did not fundamentally alter, though the detail varied depending on the anticipated threat, and increasingly commerce itself was described as 'bait' to draw out raiders which would then be destroyed by fast first-class cruisers in focal areas, which had been reaffirmed as the optimal means of protecting trade in April 1905. A rapid-transit ability had always been vital to the success of such operations, with armoured cruisers where necessary shifting to locations where required; a strategy that exploited long-distance communications and the greater number of available bases for coaling and dry-docking to counter threats on a global basis. The introduction of the turbine, with its dramatic improvement in power-to-weight, high-speed efficiency and, most important of all, reliability, only made the system more effective. It was put to the test in 1914, and worked, the most dramatic instance being the annihilation of Von Spee's squadron by the two *I* class battlecruisers *Invincible* and *Inflexible*, with various older armoured cruisers at the Falkland Islands engagement.

⁹ *Bellerophon* being largely a repeat of the basic *Dreadnought* design, with some detail refinements

Under Fisher, the first-class cruiser reached the culmination of a quarter of a century of continual development within the service. It began as a trade-defence type capable of effective heavy-scouting duties with the protected-deck vessels of the late 1880s and early 1890s. By the final years of the Nineteenth Century, technological advances in armour allowed the production of a high-speed type capable of use as the fast-division of a contemporary battle-fleet, or even to take its place in the battle-line. And from 1905, all of the Royal Navy's first-model big-gun types, irrespective of their official designations, had in their DNA something of these first-class side-armoured cruisers originally developed by Sir William White in the late Nineteenth Century.

Appendix I

Naval Estimates 1884 – 1909¹

<i>Year</i>		<i>Totals £M</i>	<i>Year</i>		<i>Total £M</i>
1884	=	10.8	1897	=	21.8
1885	=	12.4	1898	=	23.8
1886	=	12.9	1899	=	26.6
1887	=	12.4	1900	=	27.5
1888	=	13.1	1901	=	30.9
1889	=	13.7	1902	=	31.3
1890	=	13.8	1903	=	34.5
1891	=	14.2	1904	=	36.9
1892	=	14.2	1905	=	33.4
1893	=	14.2	1906	=	31.9
1894	=	17.4	1907	=	31.4
1895	=	18.7	1908	=	32.3
1896	=	21.8	1909	=	35.1

¹ Totals are rounded to the nearest £100,000. Various values may be found depending on which figures from the Estimates are utilised. Those in the table above are net, recorded in the House of Commons Parliamentary Papers in millions sterling. Estimates were given based on a financial year beginning on 1 April, therefore those indicated as 1884 are the 1884-1885 Estimates &c.

Appendix II

*Diadem and Cressy Class Cruisers -Notes on design*¹

Confidential

Submission of the Director of Naval Construction to the design of New First Class Cruisers
("Diadem" Class.)

S.10268

1895

Minute of D.N.C. on Docket

The Programme of Construction for the current financial year provides for commencing four first class cruisers, one at Pembroke and three by contract.

The details of the design have been very fully discussed by the Naval members of the Board on the former papers attached.

The details of the armament have been exhaustively considered on G.4441/94, various alternative arrangements having been compared before a decision was reached by the Naval Lords. Subject to that decision the details of the armament, arrangement of magazines, transport of ammunition have all been worked out in conference with the D.N.O. See G399/95.

A provisional complement has also been arranged for the purposes of the design, but the exact numbers have yet to be determined, in accordance with the established procedure; and it is anticipated that there will be no difficulty in regard to accommodation of the full numbers likely to be required.

The design has now been worked out in detail, and the various calculations completed.

In accordance with the regulations, the Sheer Draught and Midship Section are now submitted for Board approval and stamp.

A legend form is also enclosed, on which are compared the various details of the new design, and the corresponding details for the "Powerful" and "Blenheim".

As the class is one of considerable importance a descriptive account of the principle features of the design has been prepared and is herewith submitted for information and consideration.

It will be noted that Board approval of the design was given on S.5241/95 so far as the legend of weights and principle dimensions and particulars are concerned.

¹ The notes presented here are an abridged and slightly edited version of the reports by Sir William White contained in the respective ship covers held by the National Maritime Museum Ship Plans Collection (Woolwich Arsenal). A copy is also available in the National Archives NA ADM 116/446.

This was done previously to submitting a description of the class to Parliament in a special paper (copy herewith).

(signed) W.H. White
13th July 1895

ENCLOSURE TO DOCKET CONTAINING GENERAL DESCRIPTION OF THE DESIGN

Origin of the design

In the consideration of the five years Programme of Construction it was contemplated to include a number of first class cruisers which should be intermediate in size and cost between the “Powerful” and the “Blenheim.”

In round figures it was assumed that the cost per ship if built in a Dockyard (exclusive of incidental charges and armament) would be approximately £500,000.

The first sketch design was submitted for consideration in June, 1894, and certain principal features were then provisionally approved by the Naval members of the Board.

One governing condition laid down, in view of the very favourable reports received from the “Crescent” and “Royal Arthur,” was that in these vessels a long high forecastle should be provided as in the two earlier ships named, instead of following a flush deck arrangement which had been adopted for the “Blake” and “Edgar” classes.

Further that over the lighter quick-firing guns mounted on the upper deck amidships, shelter decks should be built similar to those provided in the battle ships and in vessels of the “Powerful” class. In the previous first class cruisers no similar shelter decks were provided.

It was also laid down that the ships should have their bottoms wood sheathed and coppered.

Comparison to the “Blenheim” class.

Various suggestions for embodiment in any future cruisers of the “Blenheim” class, have from time to time been received, notably the provision of facilities for the transport of ammunition below the protective deck, greater boiler power, high forecastle, and shelter over the midship guns. These evidently lead to increase of size.

These points have received careful consideration in this design. It has been found necessary to increase the length considerably for the following reasons:-

- (1) To complete the triple side below the protective deck throughout the length of the compartment occupied by the propelling machinery.
- (2) To accommodate machinery and boilers which should be capable of developing sufficient power to give the vessel a high continuous sea speed.
- (3) To maintain a good stowage of coal conveniently near the furnaces.
- (4) To provide ammunition passages below the protective deck.

The length required for propelling machinery and coals in the new ships subject to the foregoing conditions is 197 feet as against 161 feet in the “Blenheim.”

The arrangements by which the longitudinal transport of ammunition is effected below the protective deck are as follow:-

Roomy ammunition lobbies into which the magazines and shell rooms converge have been provided at each end of the ship. These lobbies are connected by passages through which a

continuous supply of ammunition will be kept up. Rapid hoisting to the gun positions will be effected, possibly by the use of electric motors. The conditions of service of ammunition in the “Powerful” class, and these new cruisers is greatly superior to other first class cruisers British and Foreign.

These considerations fully account for the increase of 60 feet in length over the “Blenheim.”

The following comparison summarised the points in which the new cruisers differ from the “Blake” and “Blenheim” and the introduction of which necessitates the additional size and cost per ship:-

1. Armament
14 12-prs. and 12 3-prs. substituted for 18 3-prs.
Military rig with three fighting tops instead of plain with no tops.
2. Protection of Armament, viz:-
12 6-inch Q.F. guns in casemates in “Blake” the three remaining 6-inch guns in present vessel being in the open but protected by shields.
3. Transport of Ammunition.
Two ammunition passages below Protective Deck enabling the 6-inch and 12-pr. ammunition to be transported under protection; large protected hand up trunks are provided, and arrangements are made by which the service of ammunition will be facilitated, possibly by the use of electric motors.
4. Addition of Forecastle and fore and aft bridges:-
By this arrangement 6 6-inch Q.F. guns can be fired right ahead and the men working the 12-pr. guns on the upper deck are fairly well sheltered.
5. Ship sheathed with wood and coppered.
“Blake” has steel bottom.
6. Possibility of maintaining a continuous sea speed of 19 knots in smooth water, a distinct advance on “Blake.”
7. Stowage for 2,000 tons of coals as against 1600 tons in “Blake.”
8. Much improved W.T. subdivision of coal bunkers above Protective Deck.
9. The provision of a wing passage bulkhead beneath Protective Deck giving greater protection against torpedoes and ramming in action and also against grounding.
10. The provision of a disposable weight (or Board Margin) of 150 tons.

Dimensions and proportions.

These are stated in detail on the accompanying Legend.

The most careful consideration has been given to the choice of dimensions and form of the vessel, and [sic] due regard has been paid to the suggestions made during the discussions in Parliament by Sir Edward Harland in regard to a closer approximation to the proportions used in merchant steamships, and especially to increase of length and diminution of beam and draught as favouring speed and carrying power.

Our investigations, however, based on the particular recommendations which Sir Edward Harland made for vessels for the “Powerful” type and supplemented by carefully-conducted model experiments indicate that it is not possible to give effect to his recommendations or to secure the advantages which he anticipated.

Briefly summarised the conclusion reached is:- that subject to the essential condition of securing sufficient stability in association with a form adapted to economical propulsion at high speeds the recommendations of Sir Edward Harland cannot be carried into practical effect in a war cruiser.

Doing the best that seemed possible on the lines laid down by him for a vessel of the “Powerful” class, it was found that the form needed to give the carrying power and stability was not nearly so well adapted to propulsion at the higher speeds as that actually adapted for the vessels as they are now building.

But beyond this question of propulsion it is of great importance to note that in a war-ship increase in length necessarily carries with it diminished handiness and manoeuvring power, as well as a larger target for gunfire and an increased weight of protective material and structure.

This statement is made in order that their Lordships may be assured that we are always desirous of impartially considering any suggestions that may be made for possible improvements coming from gentlemen who are experienced in ship-building.

The radical differences, however, of type, and distribution of weights in war-ships and merchant ships have not been sufficiently appreciated in the recommendations by Sir Edward Harland.

Gun Armament

The full discussion of this matter appears on G4441/94. The final decision of the Naval Lords was in favour of a uniform armament of 15 6-in. Q.F. guns, rather than association of a lesser number of 6-inch guns with 8-inch or 9.2-inch guns. Twelve of these 6-inch guns are provided with casemate protection and three (on forecastle and quarter-deck) with revolving shields.

Six of these guns can be fired in line ahead, and five directly astern.

On each broadside 8 6-inch guns will be available. The second 6-inch gun on the forecastle can also be brought to bear for a considerable arc of training on either bow, which is a matter of great value in chasing. In addition to the 6-inch guns the vessel will carry 14 12-prs. and 12 3-prs. besides smaller guns.

The details of the disposition of the armament, and the horizontal arcs of training of the guns will be more clearly understood from the small scale drawing attached; which also gives a general idea of the external appearance of the vessel when completed for sea.

Fighting Tops and their Armament.

The number and dispositions have been decided on G776/94 attached. There will be three fighting tops, two on the foremast and one on the mainmast, each containing 3 3-prs. Q.F. guns.

Torpedo Armament.

Three torpedo discharges have been arranged for two in a submerged room forward, firing on a fixed bearing on the beam, and a third at the stern above water firing in line with the keel, and provided with a protective mantlet.

In the "Powerful" on account for her much greater size, it has been possible to provide two submerged torpedo rooms; but in these cruisers space can be found for only one, as in the "Blenheim."

Speed.

It is anticipated that the measured mile speed with *natural draught* will be 20 ½ knots when the ship has on board 1,000 tons of coal, and is in other respects complete for sea. As compared with the "Blenheim," the new cruiser would be about ½ a knot faster with natural draught on the measured mile trial, and about 1 ½ knots slower than the "Powerful."

For continuous steaming at sea it is estimated that a speed of 19 knots will be maintained in smooth water and with clean bottoms.

Owing to the adoption of the water tube type of boiler it is anticipated that the new cruiser will be about 1 ½ knots faster than the "Blenheim" for long distance steaming at sea.

The corresponding sea speed for the "Powerful" is estimated at 20 knots.

Propelling Machinery and Boilers.

The arrangements of propelling machinery and boilers proposed for the new cruisers are very similar to those adopted for the "Powerful." The "Belleville" type of water tube boiler is proposed, for reasons which have been stated fully in recent discussions. (See summary attached). It is not proposed to introduce forced draught.

On an eight hours contractor's trial it is estimated that 16,500 horse power should be developed, and at sea that it will be possible to develop [sic] continuously 12,500 horse power, which would correspond in smooth water and with clean bottom to 19 knots mentioned above.

Coal Supply and Bunker Capacity

The total bunker capacity arranged for is about 2,000 tons. All the spaces that can be conveniently assigned for coal supply have been appropriated for that purpose. In the Navy List displacement and at the designed Load Draught (in accordance with recent practice), half this bunker capacity, that is, 1,000 tons, is included. When the bunkers are completely filled with coal the ship will be immersed about 20 inches more than the normal load line; when the reserve feed tanks are also filled she will be about 22 inches deeper than the load line.

Her freeboard amidships in this fully laden condition will be about 14 feet; and the conditions of stability as explained in detail hereafter will be satisfactory.

In this deep load condition the speed would be diminished by about half a knot in smooth water. The consumption of coal when the vessel is at sea will of course gradually bring her to the normal load line which may be taken as representing about the mean condition of load.

Coal Endurance.

Taking the standard speed of 10 knots for cruising and allowing for the consumption for auxiliary purposes, it is estimated that starting with bunkers full the new cruisers could steam

over 8,500 knots in smooth water with clean bottoms before their coal was exhausted. This endurance is about 25 per cent greater than that on our latest type of battle ship (the "Majestic" class).

The corresponding estimate for the "Powerful," gives a radius of action of 11,000 knots, and for the "Blenheim," 7,500 knots.

It is difficult to make any trustworthy comparison of coal endurance for British and Foreign cruisers. Published figures for the latter in many cases obviously grossly exaggerate their real capabilities in this respect.

But the actual maximum weights of coal carried are known in most cases and indicate that our vessels must have the greater endurance. Moreover, the foregoing estimate are based, so far as possible, on the results of actual experience.

Stability.

The conditions of stability for these cruisers have been made the subject of most thorough and careful calculations. In connection with the submission of recent designs both for battle-ships and cruisers, it has been repeatedly explained to their Lordships that the tendency in modern construction to increase height of freeboard, height of guns above water, and the protection afforded to the guns, their crews, and the transport of ammunition, all have the inevitable effect of raising the centre of gravity of the completed vessels far higher in relation to the total depth than was customary in earlier designs.

The French have in this matter practically forced the hands of the designers of other nations. It is well known that in some of their latest and most important vessels this has been carried so far that the conditions of stability are not satisfactory owing to the large preponderance of upper weights accepted during construction. The vessels are so "tender" that they heel to large angles when turning in smooth water.

In these cruisers, as in the "Powerful" and "Terrible," the character of the armaments and its protection necessarily involves a considerable difference in the vertical distribution of weight from that which held good in the Blake and Edgar classes, where only four maindeck guns have casemate protection. The conditions of stability are therefore affected by the increase in upper weights.

Taking first the question of *Metacentric Height*, which measures the stiffness of the vessel or her power to withstand inclination when subject to external forces (such as wind pressure, or the action of her helm) the following are the results anticipated for the new vessels. In the deepest load condition, the metacentric height is estimated as about 2 ¼ feet. In the extreme light condition practically the same metacentric height will be maintained. In the intermediate condition with 1,000 tons of coal on board, stowed in convenient positions, there will be about 2 ½ feet of metacentric height.

In other words the stiffness will remain practically constant with convenient working of the coal. Even if the lower bunkers were entirely empty of coal and the upper bunkers were full (about 1250 tons) the metacentric height would still be as great as that possessed by many cruisers and merchant ships in their most favourable condition of stability. On the basis of all

past experience, therefore, the new vessels will possess ample *stiffness* and such a metacentric height as should favour steadiness in a seaway.

Passing to the consideration of the *stability at large angles of inclination* curves have been constructed under various assumptions. It may be stated generally that the *maximum stability* is attained at an inclination of about 35 degrees to the vertical: and that the range of stability under such conditions of stowage as are likely to be existent at sea varies from 60 degrees to nearly 70 degrees according as the forecastle doors are open or closed.

This range of stability is rather greater than that possessed by the “Devastation” class and closely approaches that of the “Monarch” as a rigged ship with considerable sail power. It is, however, less than the range possessed by the earlier cruisers of high freeboard in which the upper weights are proportionally much smaller.

Having carefully considered the whole matter we are of opinion so far as all past experience and analysis furnishes a guide that in the new vessels (which possess no sail power) the range of stability may be regarded as sufficient for sea-going and fighting purposes.

It may be explained further that no possible change in the form of the vessels or in the proportions of breadth to depth would sensibly affect this matter of the range of stability.

It is practically governed by the vertical position of the centre of gravity, and that is dependent upon considerations above explained particularly in regard to the disposition of armament and its protection.

This matter was fully explained by me to the Board when the designs for the “Majestic” and “Powerful” classes were under consideration. It is now again dealt with in this submission because it is of the highest importance that the facts should be placed before their Lordships not merely in reference to this design but in regard to the tendency of recent construction in all countries.

While we are of the opinion that the conditions of stability just explained are such as may be accepted with due regard to the safety and good behaviour of the vessels, it must also be understood that in working out the designs it will be necessary to steadily resist any proposals for changes which would tend to further raise the centre of gravity and so diminish the stability.

Protective Arrangements of the Hull.

The principle protection of the vitals of the ship consists of a curved steel deck which closely resembles in its form and thickness the arrangements approved for the “Powerful” and “Terrible.”

Over the engines and boilers (that is to say a length of nearly 200 feet in the ship) the plating is in three thicknesses making up a total of 4 inches of steel; at the extremities the thickness is about 2 ½ inches.

Having regard to its form and its position in relation to the water-line, this deck furnishes a very strong defence for the machinery, boilers, magazines, shell rooms, and steering gear against all forms of attack and particularly against shell fire.

The crown of the deck is nearly 3 ½ feet above the designed load line with 1,000 tons of coal on board, and the lower edge of the 4-inch plating is about 4 feet below the water-line.

The two upper layers of plating are stopped somewhat short of the ship's side as shown on the midship section. This arrangement enables an excellent structural attachment to be made of the framing above to that below the protective deck.

Moreover having regard to the position of this portion of the deck below water, and to the constant presence of coal in the lower angles of the bunkers it does not appear necessary to carry out the full thickness to the side. If this were done an additional weight of at least 150 tons would be involved at a portion of the deck least likely to be struck.

The arrangement is, in principle, very like that which when applied to belt armour tapers the thickness gradually towards the lower edge.

The lower edge of the deck where it meets the side is 6 ½ feet below the water line, whereas in many foreign battleships of larger beam, the depth of armour belt under water is only about 5 feet.

It will be observed from the midship section, that in accordance with established practice, the fullest possible use is made of *coal protection* by means of bunkers placed above the protective deck. About 60 per cent of the total coal stowage is in fact above this deck.

In connection with the design of the second class cruisers ("Arrogant" class), an arrangement was introduced where is here repeated in order to give increased protection.

A longitudinal partition has been constructed into the upper coal bunkers with cofferdam attached thereto, so that it will be in the discretion of the captain, until a very late period in the consumption of the coal; to maintain the coal in the outer bunkers close to the side and above the protective deck.

These bunkers will hold about 750 tons. Without drawing upon them the coal endurance (of the remaining 1250 tons) at a speed of 10 knots is estimated at about 5,00 knots. The stiffness of the ship is such, that the whole weight of that coal could be left in place with the lower bunkers absolutely empty. This is a most important feature in the defence, especially when the fact is noted that the upper side bunkers are divided into numerous compartments by transverse partitions.

Probably the ship will be in her best fighting condition when absolutely full of coal and at her deep load draught. The crown of the deck will then be about 18 inches above water, and the lower edge of the deck will be nearly 8 feet below water. In the upper bunkers there will be a solid mass of coal reaching to the main deck overlying machinery and boilers having a transverse thickness on each side of from 20 to 25 feet.

Experiment shows that coal stowed in bulk in this manner is one of the best possible "shell stiflers," and its presence would prevent the access of large quantities of free water, and so assist in maintaining buoyancy and stability.

The total weight of the armour in this protective deck is 1,200 tons.

Casemate Protection.

As already explained 12 of the 15 6-inch guns are to have casemate protection. The weight assigned to these casemates and to the thick steel tubes for bringing the ammunition up into the casemates from below the protective decks will amount in the aggregate to about 560 tons.

Total Weight of Protective Material.

Including the conning tower the mantlet to stern torpedo tube, and other items in the defence, the total weight of protective material in these vessels will aggregate about 1,850 tons, or about one-sixth of the total displacement.

It is, in fact, the heaviest item in the legend of weights apart from the structure proper. Yet it is the fashion in some quarters to speak of vessels protected in this manner as “unarmoured.”

Alternative Methods of Protection.

Considerable attention has been directed of late to the fact that whereas the Admiralty has adhered to the protective deck system for cruisers, in foreign navies the use of vertical armour on the sides has been preferred.

The mode of application of such vertical armour on the sides of ships varies very greatly in different vessels: for example, the French cruiser “Dupuy de Lome” has her sides covered with thin armour throughout the length to the height of the upper deck.

The “Rurik,” of the Russian navy, and the belted cruisers of the “Orlando” class in our own navy, have a narrow belt of moderately thick armour extending through a portion of the length and associated with a horizontal protective steel deck. In this feature they resemble many battle-ships.

In the American cruiser “New York” a protective deck similar to that fitted in the “Blake” and “Blenheim” is supplemented by a narrow strake of thin armour in the region of the water-line extending over the length occupied by the engines and boilers: this is over less than half the total length of the ship.

In the Italian Navy an arrangement has been made by which the thin side armour is carried up to protect the guns in the central battery.

All of these applications of armour on the sides of cruisers with the exception of the belted type exemplified in the “Rurik” and “Orlando” may be considered to be based upon the fundamental conception that the explosion of shells with large bursting charges of high explosives shall be made to occur on the sides of the ship.

Experiment has shown that with certain types of projectiles this result can be obtained, and our own “Resistance” experiments indicated very clearly how this matter stood.

Since the date of the “Resistance” experiments attempts have been made with more or less success to modify projectiles and fuzes in such a way as to enable bursting charges of high

explosives to be carried through thin armour; and the highest authorities have expressed the opinion that this will be perfectly feasible.

So far as experimental information is concerned it may be said that the facts were clearly before the Board of Admiralty after the “Resistance” experiments had taken place, and that in view of these experiments and with full knowledge of what was being done abroad, it has hitherto been considered preferable not to fit thin side armour as hull protection to British cruisers.

The question has been repeatedly and exhaustively discussed in connection with successive designs.

Some of the most important of these are attached (see S.568/88 and S.4307/89).

When the “Powerful” and “Terrible” were designed in 1893, the matter was again most carefully considered and repeatedly discussed at meetings of members of the Board.

On all occasions it has been decided hitherto that the balance of advantage in vessels of the cruiser class was to be found in the use of a strong protective steel deck in association with effective coal defence, rather than in the adoption of thin vertical armour.

It has necessarily to be admitted that apart from any conclusive experience in actual warfare the best distribution of a given weight of protective material is largely a matter of opinion.

So far as experience has gone, however, it is in favour of the view that in all classes of ships, the primary necessity in defence is the protection of the vitals by a steel deck. This deck may be associated, (as it customarily is in battle-ships) with the thick waterline belt of armour, or it may be strongly curved and associated with a protected citadel rising to a considerable height above the water as in our “Majestic” class, or it may be supplemented by thin side armour rising to the main or upper deck; but in all these varieties of protection the underlying idea is that the ultimate defence is in the strength of the deck.

The Admiralty view hitherto has been that with a given weight of protective material the true principle is to place the defence afforded by the deck itself beyond question and so far as deck protection is concerned battle-ships like the “Renown” or “Majestic” class and cruisers such as the “Powerful” or the “Blake,” or the vessels now proposed are very nearly on equal terms.

Whereas in our recent battle-ships intended for close action and to force the fighting this deck is associated with a strong and extensive armoured citadel, in the cruisers with their higher speeds, large coal supplies and different conditions of stability, the preference has been given to an enlarged coal supply and special arrangements for coal defence rather than to devoting weight to side armour.

It is of course unquestionable that in a ship of given dimensions, speed, armament, and coal supply, a certain weight will be available for defence of hull and armament. If out of this available weight a certain proportion is assigned to thin side armour then it follows that there must be diminished protection in the form of the deck or casemate or some other feature.

To illustrate this general statement a reference may be made to what would be required if in the designs now submitted it were decided to fit a total thickness of 4 inches of steel on the sides throughout the length between the protective and the main decks.

The weight required for such a thickness of side and the framing needed to support the thin armour, would be about 1,000 tons. The total weight devoted to the deck protection is about 1,200 tons. Consequently if all other features of the defence remained unaltered except the protective deck only 200 tons instead of 1,200 tons would be available for deck protection, and the deck as a protective deck would practically cease to exist.

Stated in another form out of the 1,850 tons of material devoted to purposes of protection more than half would be appropriated to the thin side armour and to extra supports required behind it and about 800 tons would remain available for the defence of the armament transport of ammunition and the deck.

On the former papers including those which deal in detail with the results of the “Resistance” experiments will be found a clear statement of the reasons which have guided the Admiralty so far in not following the lead of foreign navies in regard to thin side armour on cruisers.

As a matter of convenience, however, the conclusions which have been reached may be briefly summarised.

1. Experiments show that when thin side armour is fitted with a special view to its use as a defence against high explosives then enormous damage may be done behind that armour by means of chilled cast iron projectiles. In other words that having constructed a thin armoured side to minimise damage from a form of attack which necessarily involves great risks in the firing of large bursting charges from the guns of an assailant, the result is to enable that assailant to vary his form of attack and at less risk and cost to inflict very serious damage.
Those who saw the results of the attack with Palliser projectiles on the decks behind the thin armour of the “Resistance” will realise how serious was this matter and to what distance from the point of impact the injuries done by mitraille and splinters extended. It was the consideration of these facts which led to the introduction of the system of the isolation of individual guns in separate casemates, and the danger seems to have been greatly overlooked in many foreign ships when the lighter Q.F. guns are concentrated in batteries protected by thin armour.
2. As above stated the highest authorities are of opinion that it will be possible to devise projectiles that shall carry their bursting charges through the thin armour.
3. It has been demonstrated that when the explosion of large charges of high explosives takes effect on thin side armour the local damage to the side is of very serious extent. The French experiments on this matter were most instructive and conclusive.
4. The “Resistance” experiments on the unarmoured parts of a ship showed that when a shell containing high explosives burst on a thin side the local damage was less than when the side was stronger, say when supported by a girder or frame.

The explosion in such cases took effect close to the side, but the full violence of that explosion did not extend to any great distance, the gaseous pressures lowering rapidly as the products of explosion diffused themselves.

In this connection reference may be made again to the French experiments from which the authorities drew the inference that even with large melinite charges, if the bursting could be determined at a distance of about a metre from a protective deck, the damage to the deck would be enormously lessened.

As explained above the ultimate protection of the vitals depends chiefly in all classes of ships upon the power for that deck and the protection it affords.

5. The remarkable development of Q.F. guns, such as the 12-pr. and 25-pr., in recent years gives the power to an assailant of riddling this side armour with steel projectiles very nearly as readily as the thin sides of a ship without vertical armour could be riddled by the smaller natures of Q.F. guns.

In other words, the thicknesses of armour 3 to 4 inches used in most of the so-called armoured cruisers affords no real defence to the water-line region against the attack of Q.F. guns, which can be carried in considerable numbers on board ships.

On the whole, therefore, it has been held to be preferable in British cruisers to develop as much as possible within the limits of weight available, the strengths of the protective decks, the protection of the principal Q.F. guns, and the transport of the ammunition.

The alternative policy within the limits above mentioned of weight available involved the fixing in the form of a passive and incomplete defence of a very large weight of thin armour, and consequently weakening all the other features of the defence.

The association with strong protective decks of well sub-divided coal bunkers necessarily adds to the defensive power of the ships when the coal is present, and the arrangements made in recent vessels and proposed to be repeated here by which a considerable weight of coal can be kept close to the side until a late period in the service of the ship necessarily adds to the value of the coal protection.

It is unquestionable that the thin sides above the protective decks will be freely penetrable by the projectiles of the smallest guns; but it is obvious that in the working out of the fuel the coal in the angular spaces above the protective deck will be retained to a very late period, and this will constitute a most important feature in the defence.

It may be hoped that after the thin sides are severely damaged the longitudinal coal bunker, bulkheads, and cofferdams situated at a considerable distance within the ship will give the means of considerably lessening the inflow of water, locking it in fact in the other coal bunkers to a great extent.

Much has been made of the experience at the battle of the Yalu, as proof of the value of thin armour. Having carefully read most that has been published on this subject as well as the

official reports, it does not appear that the experience in that engagement is worth much in forming an opinion on this point.

On the Chinese side both a belted cruiser, and a protective deck cruiser were sunk by gunfire; but we know that all the Chinese ships had been much neglected and were ill adapted; probably their watertight sub-division was practically non-existent.

On the other hand the Japanese had a very considerable number of cruisers of the protective deck type in the engagement, and lost none of them. Again the two Chinese battle-ships were vessels of the central citadel type with large unarmoured ends and under water decks. It had been predicted by those who were opposed to the central citadel that such vessels when exposed to the fire of quick firing guns would speedily be sunk or capsized.

But as a matter of fact this result did not follow, and the explanation seems to be that, while the unarmoured ends were riddled to a very considerable extent the region of the water line was relatively little injured.

What has been done abroad indicates of course the possibility, if it be so desired by their Lordships of constructing cruisers of considerable power with thin side armour, but for reasons explained above when dealing with stability, if such types of vessels were to be designed, it would be necessary to carefully consider the whole question of the vertical distribution of weight, the height of freeboard and the height at which guns and their protective material could be carried.

In fact it would constitute an entirely new departure and one requiring the most careful investigation.

The fundamental ideas on which this design is based are as follows:-

1. Special adaptation for service with the Channel & Mediterranean Fleets; & the performance of all duties hitherto devolving on First Class Cruisers attached to Fleets.
2. Capacity for close action, as adjuncts to battleships
3. Suitability for employment on detached services; if required to be used for the protection of shipping, commerce & communications.
4. Armament, protection, speed & coal endurance to be such that the new cruisers should be formidable rivals to the best cruisers built or building for foreign Navies.

For nearly two years past, since the design for the Diadem class was completed, this matter has engaged my attention; & I have made a careful study of all this is being done abroad. My visits to France & Italy, made privately when recovering from illness, gave me much information, to which some valuable additions were made during my holiday this year. The official visits which I last year made to Germany & Russia were also of great service, in giving me closer acquaintance with the ideas prevailing amongst those charged with the decision & preparation of new designs.

The present proposals originated largely from what I found in progress in Italy early in 1896. owing to financial pressure the construction of battle-ships had been nearly suspended. Only two such ships of moderate size were in hand, & advancing slowly. The Italian Naval Authorities had therefore, been driven back upon the policy of constructing cruisers; protected & armed in such a manner that they could, when necessary, be associated with battle-ships, & take part in fleet-actions. The Carlo Alberto & Garibaldi are representatives of this type: & in my judgement are exceedingly well designed vessels.

There were many features in these vessels that appeared susceptible of improvement; & for the Royal Navy there could be no question of the substitution of cruisers for battle-ships. On the other hand, the inspection of these vessels confirmed the opinion I had previously entertained: viz, that the time had arrived when it had become necessary to construct cruisers for fleet-work, which should be capable of taking part in fleet-actions as adjuncts to battle-ships.

Hitherto the conception generally accepted has been that modern cruisers correspond to, & take the duties of, frigates formerly serving with fleets. As scouts & attendants on the battle-ships their place will no doubt, be always fairly described in this manner. But whereas frigates, in old days, took no part in fleet-actions, there seems absolutely no reason, under modern conditions, why first-class cruisers should hold aloof if designed & constructed suitably. This has become true largely through improvements in armour & armaments made in the last few years, & the point seems of sufficient importance to justify further illustration.

If cruisers are to be built capable of acting with battle-ships in fleet actions, they must be given such protection to buoyancy, stability, guns & crews, as will enable them to come to close quarters with the enemy without running undue risks.

¹ Notes on *Cressy* class side-armoured cruisers

Until the latest improvements in armour were made, the thicknesses & weights necessary to secure adequate protection, over a sufficient area & height of broadside, were such as to involve very large dimensions & cost, when associated with the high speeds & large coal supplies necessary in cruisers. Consequently, it may be said, with confidence, that no existing cruisers have the necessary protection to justify their undertaking close action with battle-ships, except it be the Italian cruisers above mentioned & a few vessels similarly protected & of a later date.

In my Report on the Diadem class (written in July 1895) I have explained fully the policy of the Admiralty up to that date in adhering to strong protective decks & coal protection, rather than following the lead of foreign Navies, & using thin vertical side armour.

All that was said in that Report still holds good, & there is no reason for supposing that our cruisers, with their strong protective decks, are not capable of meeting, on more than equal terms, foreign cruisers, built at or near the same dates, with thin vertical side armour, & weak protective decks.

As an example, a comparison between the Dupuy de Lome & the Edgar class may suffice. The former has her broadside covered with soft steel plating a little less than 4 inches thick: & her protective deck is about 2 inches thick. Her armament includes 2 – 7.4 inch, 6 – 6.2 inch Q.F. & a number of smaller guns. The 7.4 & 6.2 inch guns are in turrets with 4 inch armour. Her speed is 20 knots as a maximum, for a very short period.

The Edgar class have protective decks 5 inches thick: they carry 2 – 9. inch guns, 10 – 6 inch Q.F., & a number of smaller guns. The armament is better disposed as well as more powerful. Larger supplies of ammunition are carried. Four of the 6 inch guns are in casemates with 6 inch armour: the remaining 6 inch guns & the 9.2 inch guns have shield protection. The maximum speed is nearly 21 knots, for a four hours trial.

The 4 inch side armour of the French cruiser has been provided partly at the sacrifice of the protective deck. It can be smashed & perforated by Palliser projectiles from 6 inch guns. Against shell attack from guns of large calibre it is not effective, being too thin for armour of that quality.

If an action took place between these two cruisers, the absence of vertical side armour in the Edgar would surely be more than compensated for by her superior armament & stronger protective deck. And, speaking generally, it may be affirmed that up to the present time British cruisers built at a given date are fully equal to engaging foreign cruisers of comparable classes & sizes, built about the same period. Nor must it be overlooked that by adopting the protective-deck system very large economies of cost have been made, & for a given outlay vessels of superior speed, armament & coal endurance have been obtained, as compared with what would have been possible had thin side armour been adopted. The Edgar cost £367,000: the Dupuy de Lome £416,000.

While there is no reason for supposing that the past policy of the Admiralty has been unwise in regard to cruiser construction there is undoubtedly a necessity for a new departure: in view of the improvements recently made in armour.

The ships built under the Naval Defence Act of 1889 had the best armour then procurable. Since 1894 we have had the Harvey system, & successive improvements thereupon. The progress made may be represented by the fact that in 1889 – 93 a plate 10 ½ inches thick was needed to resist the attack of 100 lbs. Holtzer projectiles fired from a 6 inch gun with a striking velocity of about 2000 feet per

second. Now a 6 inch plate can afford equal or superior protection. The proportionate thicknesses & weights are as 100 to 57.

This remarkable economy of weight in relation to protection necessarily alters all the conditions of design for cruisers. It is still true, that if armour is kept so thin as to offer no efficient defence, it is preferable to do without vertical plating on the sides altogether, & to strengthen protective decks. But it is equally true, that within limits of size & cost which are not prohibitive, it is now possible to build first-class cruisers of high speed, well armed & with good coal supplies, which shall have vertical armour of sufficient thicknesses to give protection to buoyancy, stability & armament against armour piercing projectiles from the largest true quick-firing guns & against the attack of shell with large bursting charges from guns of greater calibre.

If such cruisers are to be capable of working with battle ships, it is most important that they should not very greatly exceed the latter in length. Otherwise they cannot manoeuvre in company.

These points were discussed at the Meeting of the Naval Members of the Board held on the 3rd May (see other papers) & certain leading features were determined upon, to be embodied in an "outline Design". That design has since been worked out in sufficient detail to enable the following statement to be prepared of what is practicable. It will be understood that in the completion of the drawings & calculations necessary for the building of ships, should the proposals now made be generally approved, certain modifications may be required in dimensions & displacement. This will not however sensibly affect cost or time of construction.

For service with the Mediterranean or Channel Fleets, where there are ample facilities for docking at command, wood-sheathing & copper on the bottoms is not necessary, for these cruisers any more than for battle ships. It is proposed, therefore, to dispense with it. This will save about £40,000 on first cost: about 550 tons in weight: & 9 inches in draught by the omission of keel.

This ships will, of course, be less capable of keeping the sea for long periods without fouling of bottom & corresponding loss of speed. But experience with the Blenheim & Edgar classes shows that even on distant stations, unsheathed ships can be used without serious trouble if docking is properly seen to. Docking facilities abroad, moreover, are being greatly increased.

Hereafter it will be shown what would be the effect of adding wood & copper sheathing to the ships proposed.

It has been decided that the thicknesses & general disposition of the vertical armour on the sides of the new cruisers should be similar to those adopted in the "Canopus" class.

On the accompanying drawing the proposed arrangements are indicated. Over a length of about 230 ft amidships the sides are covered with armour plating about 6 inches in thickness., from a depth of 5 ft below the normal waterline to a height of 6 ½ to 7 ¼ ft above. The total depth of vertical armour is, therefore, about 12 ft.

Athwartship armoured bulkheads, 5 inches thick are placed at the ends of the 6 inch side armour, thus enclosing a "citadel" upon which the protection of buoyancy, stability & trim largely depends.

At the upper edge of the citadel armour a protective (main) deck 1 inch thick is to be fitted: & at the lower edge a second protective deck 1 ½ inches thick. Nearly the whole space between these two

protective decks will be assigned to coal-bunkers, well-subdivided into separate compartments, & giving a great increase to protection.

Before & abaft the citadel the lower protective deck extends to the extremities. From the citadel forward to the bow the sides are to be protected by nickel-steel plating worked as in Canopus class; & giving a total thickness of 3 inches of steel. Abaft the citadel the plating will be somewhat thickened in the region of the water-line. As is usual in all battleships & cruisers the spaces at the extremities, above the protective deck, will be very minutely subdivided: & to a large extent occupied with stores. Any considerable or objectionable changes of trim resulting from injuries to the sides in action & the entry of water above the protective deck will thus be avoided.

The development of this feature of hull protection in the new design will be better understood from the statement that whereas in the “Diadem” class 1200 tons and in the “Powerful” about 1500 tons are so appropriated, in the new cruisers about 1800 tons will be required – an increase of 50 per cent on the Diadem, and over 20 per cent on Powerful.

Contrasting these defensive arrangements with those of recent foreign armoured cruisers so far as they are known, the advantage will undoubtedly be with the new ships.

The details of the French ‘Jeanne d’Arc’ are not published authoritatively; but I have been informed that there is to be a narrow water-line belt of armour about 6 inches thick, with a thinner strake of armour above.

The German cruiser “Ersatz Leipzig” is to have a narrow water-line belt of armour having a maximum thickness amidships of about $7\frac{3}{4}$ inches, tapered to about 4 inches at the bow and stern. This belt rises only about $2\frac{1}{2}$ feet above water and extends about 5 feet below. A protective deck rather less than two inches thick is worked at the top of the belt. Above this the only assistance to protection of buoyancy and stability is given by a small cork-filled cofferdam: the value of which must be extremely small.

The Russian cruiser “Rossia” also has a narrow belt of 10 inch armour in the region of the water-line, stopping about 60 feet from the bow, with a $2\frac{1}{2}$ inch steel deck above the belt. Such belts give little or no protection to buoyancy and stability, because of their narrowness.

We have examples in the Imperieuse and Orlando classes among our own cruisers. It is interesting to note that the Russians have abandoned this system and imitated the arrangement of our battle-ships in the “Oslyaba” class.

The Chilean, so-called, “armoured” cruisers have curved protective decks of moderate thickness associated with a narrow strip of 6 inch armour extending over a portion of the length in the region of the water-line.

The American “New York” & “Brooklyn” are similar in their protection, but have very thin armour extending over very small areas.

The Italian cruisers of the “Garibaldi” class are well protected vessels so far as thickness & area of hull-armour are concerned. That armour, however, has been made at Terni & the quality is probably inferior to that now procurable in this country. So that the defence is not so good as that proposed for the new cruisers.

It is known that the Argentines have purchased cruisers of this class from Italy; & it is believed that the large cruisers building or to be built for Japan will be well-defended by vertical armour.

For cruisers designed to act as adjuncts to battle-ships in fleet-actions, it has been considered necessary to carry guns of such energy & shell power as would be effective against the defences of the secondary armaments of foreign battle-ships.

After repeated discussions it has been held to be undesirable to adopt the 8 inch calibre for the Royal Navy in any new vessels.

The 9.2 inch gun, of which new designs are now under consideration, was decided upon by the Naval Members of the Board as most suitable for the new cruisers. One to be carried on the forecastle as bow-chaser, one to be carried aft on the quarter deck. Both guns to be of the latest type.

The 6 inch Q.F. gun is also being improved in velocity & energy. Provision has been made for utilising these heavier & more powerful weapons.

The number of these 6 inch guns was left open by the Naval Lords until the design was worked out to some extent.

On the picture drawing (herewith) of the new cruisers I have shewn 12, 6-inch guns in casemates. Good positions can be found for that number of guns, which is identical with the casemated guns in "Diadem" & "Powerful" classes.

It must be pointed out, however, that the adoption of the 9.2 inch guns & the armour protection for them, involves such an increase of weight as compared with the Diadems 4 6-inch Q.F. bow & stern chasers with shield protection, that it is not possible to accept the increase without a considerable increase of displacement.

I would, therefore, submit for the consideration the following proposals:-

- (1) To carry 12, 6-inch Q.F. guns, each gun having 100 rounds of ammunition as the normal supply. The magazines to be made capable of holding 200 rounds per gun, & that supply to be put on board when required. Or
- (2) To carry 10 6-inch guns, with 200 rounds per gun as the normal supply.

For the service proposed with the Channel or Mediterranean fleets the first course appears preferable. If employed on detached service magazines can be filled up.

The armament provided for is –

- 2 9.2-inch guns of new type protected as in Powerful
- 10 6-inch Q.F. guns with 200 rounds or 12 6-inch Q.F. guns with 100 rounds
- 14 12-prs Q.F.
- 10 3-prds
- 2 Torpedo Tubes submerged

The estimated weight of this armament is about 35 tons greater than that of the “Diadem” class: but the protection to the armament will involve about 50 tons increase of weight: making an increase of over 80 tons –over 6 per cent – on these items.

It is possible that some criticism may arise over the change of armament made from the “Diadem” class where an uniform armament of 6-inch Q.F. guns was adopted, there is really no contradiction. The “Diadem” class were designed for detached service & to meet foreign cruisers then built or building. For these services the balance of advantage was considered to lie in the uniform armament of 6-inch Q.F. guns. The new cruisers are designed specially for fleet-service & for close action as adjuncts to battle-ships. Consequently it has been thought desirable to introduce 9.2 inch guns, in well-protected & commanding stations, instead of having 6-inch bow & stern chasers with shield protection. Both of these guns will be available on each broadside.

It is proposed to give the 9.2-inch guns the same thicknesses of protection as have been accepted for the guns of identical calibre in “Powerful”. The armour at the base of the gun-mountings will be about 6-inch & on the shields 6-inch. The 6-inch Q.F. guns are to have “casemate” protections with armour on the fronts about 5 inches thick.

Armoured ammunition tubes will be fitted as usual.

The service of ammunition will be carried out through passages situated below the lower protective decks, as in all recent battle-ships & first-class cruisers.

It will be seen for this description that the protection to the secondary armament will be identical with that approved for the “Canopus” class. The essential difference between the new vessels & “Canopus” class is in the character & protection of the bow & stern chase guns. In this respect the arrangements finally approved for the “Powerful” class have been followed.

Two submerged discharges can be arranged in a single room, placed either before or abaft the engine & boiler rooms as may be preferred.

There is not available space for two submerged torpedo rooms: nor can it be secured unless the ships were lengthened by about 20 feet.

The demands made for protected space in the hold are very great, in consequence of the great engine power, heavy armaments & large coal supply.

The arrangements of propelling machinery & boilers provisionally adopted for the outline design after consultation with the Engineer-in-Chief, are similar to those of the latest vessels of the “Diadem” class. Belleville boilers, with economisers, & four cylinder triple expansion engines are contemplated.

All these points will be carefully considered, in the preparation of the design, by the Engineer-in-Chief.

For present purposes, it suffices to assign the requisite weights and spaces for the power estimated to be required for the maximum speed.

It was decided by the Naval Members that the maximum speed to be obtained on the trial should be from 21 to 22 knots.

It is proposed to realise 21 ½ knots with natural draught on the Contractors' trial of eight hours duration.

This appears less than the maximum speeds named for some recent cruisers building abroad. It is unnecessary, in view of my recent report on this matter (see other papers) to do more than say, that, provided the trials were made under identical conditions, the speed proposed for the new cruisers will not be found inferior to that realised by foreign cruisers.

For example, the French "Jeanne d'Arc" has a reputed maximum speed of 23 knots. She has this estimated speed associated with the Normand type of boilers. The adoption of these boilers is questionable, as trials are in progress at the present time. But even if it is adopted it may be assumed that the maximum power & speed are to be obtained with high forced draught, not natural draught, as with our cruisers. The maximum speeds of French ships are not maintained more than four hours in most cases, & with high forcing cannot be longer continued. If natural draught trials were made for eight hours the Jeanne d'Arc would realise a much lower speed, or, if the boilers proposed for our new cruisers were made of the same type and highly forced according to French usage, the speed would be about 23 knots for a short period.

To realise 21 ½ knots the new cruisers will require about 21000 I.H.P., as against 18000 I.H.P. for 20 ¾ knots in the latest vessels of the "Diadem" class.

The new cruisers will therefore closely approach the sea-speed provided for in the designs of "Powerful" & "Terrible" & will certainly equal or surpass other cruisers.

The Naval Members were of opinion that the New Cruisers should correspond closely in coal endurance with the latest battle-ships. It would appear that at cruising speeds of 10 knots this condition will be realised if the vessels carry about 1600 tons of coal, as against 1800 tons in "Majestic" class, & 1600 tons in "Canopus" class.

Bunker capacity can be found for 1600 to 1700 tons of coal. At the normal draught & Navy List displacement 800 tons will be carried. This agrees with "Canopus" class.

With the increased engine power demanded by higher speed, & the extension of engine & boiler spaces, as well as the adoption of the armoured citadel for hull-protection, larger bunker space cannot be secured in a vessel of the proposed dimension.

Starting with bunkers full the new cruisers should be capable of steaming for 30 days at a speed of 10 knots. At the highest sustained sea-speed of 19 ¾ knots the vessels should be capable of steaming for about 120 hours & covering about 2400 knots before their coal was exhausted.

The bunker capacity in "Diadem" class is for about 2000 tons: more space being available. These vessels are specially designed for detached service & a larger coal supply is valuable.

For the purposes of the outline design a provisional complement has been assumed of 725 officers & men. This has been done on the basis of the compliment approved for the "Diadem" class, allowing for increase in engine power & differences in armament. The same number of officers has been

assumed, & it is understood that the new cruisers will not be fitted as flagships, in view of their intended service.

This provisional compliment is open to revision under the established regulations.

It may be stated, however, that the accommodation available in the new cruisers would be practically the same as in the “Diadem” class, & it is anticipated that after providing for the provisional compliment, there will be a margin for supernumeraries.

In arranging the Legend of weights the allowance was made for the New Cruisers for provisions & consumable stores has been on the same basis as is followed for the battle-ships with which they are intended to work, viz: for 4 weeks’ supplies.

The provision & store rooms will be made as large as possible so as to provide for the conditions of detached service on which the vessels may sometimes be employed.

The whole subject of stability in modern high-sided battle-ships & cruisers was discussed in my Report of July 1895 on the Diadem class (copy attached). To that Report I would again call attention, as the matter is of supreme importance.

What has happened to so many French ships might easily have occurred here had I not steadfastly resisted suggestions made to follow the French lead, & to increase loads of armour & armament placed at great heights above the water. Subsequent events have fully justified my action.

This is a critical question in connection with the new cruisers & has relieved close attention. It becomes absolutely necessary, in passing from the “Diadem” class to the new vessels, to vary somewhat the vertical distribution of weight –that is to say heights of decks & guns above water.

My proposal is, therefore, to maintain the long high forecastle which has proved so valuable a feature in the “Royal Arthur” & “Talbot” classes, with 31 feet of freeboard forward. The upper & main decks will be placed about 1 foot lower than in the “Diadem” class. The main deck guns of the new vessels will consequently be about 11 feet above water instead of 12 feet as in Diadems.” This height is very considerable & compares well with other classes. The upper deck guns will be from 17 ½ to 18 feet above water: & the 9.2 inch gun on forecastle 34 ft.

With these & other changes that need not be mentioned, I am of opinion that satisfactory conditions of stiffness & stability will be secured for the ships in all their conditions of loading, included of course their deepest draught.

At the same time it must be clearly understood that additions of weight aloft cannot be accepted during construction. The balance of the design must not be disturbed.

The higher speed required in the new cruisers & the introduction of considerable weights of vertical side armour, necessarily involve additional cost as compared with the “Diadem” class.

On the other hand the omission of wood & copper sheathing carries with it a reduction of cost of about £40,000.

Until we have worked out the design more thoroughly it is not possible to do more than approximate to the cost. But it may be stated that, if built by contract, under conditions as favourable as those which were secured for the Diadem class, the new vessels should be obtained at an average cost not exceeding £650, 000. The Diadem class (contract built) cost about £550,000: the Powerful & Terrible about £700,000.

The “Jean d’Arc” class is estimated to cost £800,000. All these figures are exclusive of armament.

(Signed) W. White
10.6.97

Appendix III

Drake Class Cruiser -Notes on design¹

Strictly Confidential.

S.9873/98
Report on the
Designs for New First Class Cruisers
by
The Assistant Controller and Direction of Naval Construction

S.9873/98

Strictly Confidential.

Designs for New First-Class Cruisers

The enclosed Report is submitted for consideration and decision on the following points:-

1. The character and disposition of the armament, including its protection.
2. The thickness and distribution of vertical and horizontal armour protecting buoyancy and stability.
3. The type of boilers and engines.
4. The character and duration of the trials on which the maximum speed of 23 knots is to be realised.

It will be understood that in Designs Nos.1 and 2 provision has been made for Belleville boilers (economiser type), worked under natural draught, and capable of maintaining 23 knots for eight hours, with a sea-speed of 21 knots.

The engines provided for are similar in type and rate of revolutions to those approved for "Cressy" class.

In Design No.3 similar engines and boilers are provided for, but the 23 knots speed is to be maintained for four hours under moderate forced draught. The sea speed would be about 19 $\frac{3}{4}$ knots. In Design No. 4 small tube boilers are assumed, and somewhat quicker turning engines.

When their Lordships instructions have been received on these and any other points, the detailed design will be proceeded with. With all possible overtime, having regard to heavy current work on other ships building, the new designs cannot be completed in less than three months from receipt of definite instructions.

W. H. White
23.5.98

¹ The notes presented here are an edited version of the report by Sir William White contained in the Ship Cover held by the National Maritime Museum Ship Plans collection.

DESIGNS FOR NEW CRUISERS OF 23 KNOTS' SPEED

Alternative designs for these vessels have been most carefully considered in accordance with the decision reached on papers relating to the programme of construction for 1898-99.

The high speed to be attained necessarily carries with it the employment of machinery of very great power. A most thorough inquiry into the best forms and dimensions possible in association with certain conditions of protection and armament has therefore been undertaken, and has occupied much time. It has embraced a very large amount of work and calculation in this office, a careful study of all available experimental data, and the construction and trial of certain new models.

We are thus enabled to proceed with comparative certainty in the preparation of a series of sketch designs providing for the trial speed of 23 knots, which has been fixed by the Board.

It may be of assistance in the consideration of these sketch designs, if the principles upon which they are based are fully stated; although in certain respects what will be said must constitute a repetition of what has already been said in regard to the design of the "Cressy" class.

Principle Dimensions

Length.

For the high speed required, speaking broadly, increased length beyond that of the "Powerful" class would favour *economy of power*. Other considerations, however, put a limit upon the length of the new ships. Docking facilities exist for the "Powerful" class at five British home ports outside the Royal Dockyards, viz., Birkenhead, Southampton, Tilbury, Belfast and Glasgow.

Abroad, these ships can be docked at Hong Kong, Sydney, Auckland, and Halifax, as well as Malta.

From the drawings of these docks now available, it appears that *no increase of length* beyond the "Powerful" is permissible in the new cruisers if docking facilities are to be secured, especially abroad.

Again, as is explained hereafter, the use of vertical armour on the side of the new vessels introduces new conditions not appearing in the design of the "Powerful" class or other "protected" cruisers. It may in fact be preferable to accept less length and increased engine power, in order to economise on weight and cost of armour.

The decision as to length, therefore, is one requiring full consideration of various possible advantages and disadvantages. This will appear more clearly from the particulars given for the sketch designs.

Draught.

It is agreed that the draught should be such, if possible, that the new ships should be capable of passing through the Suez Canal, completely armed and equipped, but with only a small quantity of coal on board. The "Powerful" and "Terrible" can be brought into a condition for passing through, but other adjustments or removals of weight are necessary. They are

sheathed ships, and the presence of the wood keel and false keel adds 9 inches to the draught, which is equivalent to the removal of 300 tons of weight. It will be seen, therefore, that the use of sheathing must exercise a marked effect upon the design in regard to passage through the canal. Moreover the development of engine power in relation to displacement required for the maximum speed becomes greater if it has to be obtained on a lighter draught.

Beam.

Although increase in the extreme breadth *per se* is not practical to economical propulsion at high speeds, yet, for many reasons, it is desirable not to have the breadth of the new cruisers sensibly greater than that of the "Powerful."

There is a prevalent idea that narrowness in relation to length necessarily favours economical propulsion. This has been demonstrated to be untrue, although, as above stated, increased length favours economy at high speeds.

Freeboard amidships.

The minimum *freeboard* amidships (measured to the height of the upper deck) is for practical purposes a constant quality, and must at least equal that of the "Cressy" class.

The reasons for this are as follows:-

1. With the maximum draught of water that can be accepted consistently with facilities for passing through the Suez Canal, the minimum depth in hold (measured to the lower protective deck) is fixed by the height required for the accommodation of the boilers.
2. The height between this lower protective deck and the main deck is determined by the considerations
 - (a.) There must be sufficient height for working the coal in the large bunkers situated above the lower protective deck.
 - (b.) The 6-inch Q.F. guns on the main deck, which form an important portion of the armament, should be placed at such a height above water as to secure their efficient working. In the "Cressy" the height of the axis of the 6-inch guns above water is 11 feet, and this cannot reasonably be diminished.
 - (c.) When the two foregoing requirements are met, a reasonable height is secured for the armoured citadel (or side armour), viz., 6 ½ feet above water. A less height of citadel would not give adequate protection to buoyancy and stability.
3. The minimum height between the main and upper deck must be sufficient to permit of the efficient working of the 6-inch Q.F. guns in casemates.

The total height of freeboard amidships to fulfil these various conditions is 14 feet. This was fixed in the case of the "Cressy," which has 15 inches less freeboard amidships than the "Diadem," and 3 feet 6 inches less than the "Powerful."

Freeboard forward.

In determining the minimum height of freeboard forward it is necessary to consider chiefly two questions:-

- (a.) The height necessary to permit of the vessel being driven at high speed against the sea,
- (b.) The risks incidental to injuries to the bow by an enemy's fire when chasing her in a seaway, and to the consequent entry of water.

In the design of the "Blake," a vessel less than 400 feet long, I proposed a height of freeboard forward of 20 feet. In most of the "Edgar" class, which are 15 feet shorter than the "Blake" and designed for 2 knots lower maximum speed, the height forward is also 20 feet.

An alternative design was prepared at the same time and was eventually adopted for the "Royal Arthur" and "Crescent," with a high forecastle and two 6-inch Q.F. guns substituted for the 9.2-inch gun. The freeboard forward in these two vessels is 27 feet and 6 inches.

This feature of a high forecastle in a more pronounced shape was also suggested for the vessels of the "Sharpshooter" class, and has since been carried out in the "Talbot" and "Cressy" classes.

Experience with the "Royal Arthur" and "Crescent" proves them to be far more capable of maintaining high speed in a seaway than are the other seven vessels of the "Edgar" class with lower freeboard forward. This is confirmed by experience with the "Talbot" class of nearly the same length as the "Edgar" class. In the Sharpshooters the advantages of the high freeboard forward have also been most marked.

Inquiries have been made as to the heights of freeboard forward adopted in swift ocean passenger steamers.

In the Atlantic Service I find that for vessels of 20 to 22 knots' speed experience has led to a height of freeboard of from 30 to 33 feet.

In the "Powerful" class the corresponding height is 34 feet, in the "Diadem" class 32 feet, and in the "Cressy" class 31 feet. In the new vessels it is submitted that a minimum height of 30 feet should be adopted.

If the height were reduced to 24 or 25 feet, and the upper deck were given greater "sheer" so as to reach this height without the construction of a forecastle, there would be a saving in weight of about 50 tons.

The axis of the bow chase guns would then be lowered to 28 or 29 feet above water, instead of 32 feet with the forecastle and the 30 feet height of freeboard.

This saving in weight is so moderate as compared with the reduction in other qualities that it would not appear worth making. Nor could the small difference in freeboard have any sensible effect in reducing the risks of injury to the bow or the entry of water when steaming head to sea in chase. With the protective arrangements and subdivision contemplated at the bow, even with the 30 feet height of freeboard, there should be no difficulty in clearing water from above the main deck supposing the bow to be injured. This is again referred to hereafter.

BOAT-DECKS

In all recent first class cruisers and battleships a distinctive feature of the designs has been the building up of the bulwarks amidships and the construction of a steel "boat deck." A shelter for the crew under ordinary circumstances is thus provided, and this can be utilised for sleeping berths in hot climates. In bad weather at sea the ships are also much the dryer. These are, however, secondary advantages of the boat-deck. It was introduced primarily to give protection to the crews of the upper deck guns (usually 12-prs.) from *debris* arising from the destruction of the boats, &c. by an enemy's fire in action.

While the comfort and dryness of the ships are considerably increased by the existence of these boat-decks, they necessarily involve a considerable addition to weights aloft, estimated to reach 70 tons in one of the new first class cruisers, as compared with what would be necessary if we reverted to arrangements similar to those of the "Blake" and "Edgar" classes, where there are shelter decks forward and aft, skid beams for the heavier boats and low bulwarks between the shelters.

If the boat-deck is abolished, it would undoubtedly be desirable to transfer the 12-prs. now mounted in the upper deck amidships to suitable positions on the main deck. In this way the protection against torpedo boat attack might be efficiently carried out, and the crews of these light guns would be sheltered from *debris* in action although not otherwise protected.

On the other hand, the command of the men at the 12-prs. would not be so good as it is under the existing arrangements with the guns grouped within a moderate longitudinal distance on the upper deck.

Casings and ventilators.

In addition to the lessening of the top hamper by the omission of the boat deck and reduction in the height of the bulwarks, it is contemplated to revert to lower casings around the funnels, engine hatches, &c., and to minimise as far as possible the weight of cowls and other ventilators.

PROTECTION TO BUOYANCY AND STABILITY

Side armour.

The principles upon which the distribution and thickness of the vertical armour of modern cruisers ought to be arranged are fully discussed in the report on the "Cressy" class. Nothing has occurred since that discussion which appears to modify the general conclusions then reached.

The proposed cruisers will probably remain on active service for 20 years. Inevitable improvements in artillery, projectiles, and explosives will occur during that period, all tending to degrade their defensive power, which is for practical purposes a fixed quantity. It would, therefore, appear unwise to accept any less thickness of vertical armour on the sides in the region of the machinery and boilers than that which was adopted for the "Cressy" and "Canopus" classes, viz., about 6 inches.

It would be possible, of course, to save a few tons in weight by tapering the thickness (in the vertical sense) from the waterline to the lower edge of armour. This has been done by the French in their cruisers, and is a reversion to a very old practice. But the saving in weight would only be about 40 tons; the cost of the manufacture of the armour would be increased, and the time necessary for its production would be made greater. This arrangement is not recommended.

Nor does it appear desirable to revert to the system of having the greatest thickness of side armour for a few feet above and below the waterline associated with thinner armour above the "belt." This was what was done in the Naval Defence battleships. After full discussion the system was abandoned. All our later ships of the "Majestic," "Canopus," "Formidable," and "Cressy" classes have armour uniformly thick from the main deck down to the protective deck. This appears to be the best possible distribution of the material for defensive purposes, considering all the risks; and it is recommended that it be adopted in the new cruisers.

Side armour of French cruisers.

According to the best information available the "Jeanne d'Arc" and "Montcalm" classes are armoured as follows for a considerable portion of the belt amidships:

Waterline belt	-	-	5.9 inches thick for 3 feet of width; tapering to 3 inches at lower edge.
"Montcalm"	{above belt to main}		3.75 inches thick; about 6 feet wide.
	{deck about 8 feet}		
	{above W.L}		
"Jeanne d'Arc"			3 inches thick; about 6 feet wide.
Total depth of side armour	-	-	- 13 feet.
Depth below water of side armour	-	-	- 5 feet.

It is said, moreover, that in view of the difficulties of manufacture these armour plates are to be of soft nickel-steel, not "Harveyed." In my judgement this defence is quite inadequate under existing conditions of attack, and, as above stated, the distribution of the armour is not good.

As our new cruisers are to be built specially with reference to the "Jeanne d'Arc" and her consorts, it may be thought that we need not give them the greatly superior defence to buoyancy and stability proposed, viz., vertical side armour about 6 inches thick, extending over a height of 11 ½ feet from 5 feet below water to 6 ½ feet above. This armour, moreover, would be made according to Krupp's modification of the Harvey process, so that its defensive power would be immensely greater than that of soft nickel-steel, such as the French contemplate using.

The answer to this suggestion seems to me simple and complete. It would be no justification of our reduction in what has been fixed after careful consideration as a proper standard for defence of buoyancy and stability, to accept a lower standard, because of the French action. Our cruisers may have to meet other vessels than the French cruisers. Already there are in existence in the Spanish, Japanese, Argentine, Chilean, and Italian navies vessels of high speed, having hull-armour of good quality 6 to 7 inches thick. More such vessels will be built.

Moreover, our new cruisers, like the “Cressy” class, should be capable of acting with battleships, and consequently should be given good protection.

The thickness of armour adopted in “Cressy” and “Canopus” classes suffices, under conditions of service, to give protection from the armour-piercing projectiles of the largest true quick-firers, to compel the bursting of shells having large explosive charges from guns of large calibre, and to deal with so-called armour-piercing shells of guns up to the 9.2-inch. This is as matters now stand; but there will inevitably be further improvements in projectiles and guns to be reckoned with at an early period in the service of the ships, and this points to the undesirability of using thinner armour.

As matters now stand the special processes of manufacture, which add so much to the power of armour, cannot be successfully carried out in plates much below 6 inches in thickness, in association with the maintenance of definite forms necessary in ship-work. In other works, diminished thickness must be accompanied by a considerable loss of protective power in relation to weight and thickness.

On the whole, the greater weight and cost involved in maintaining our accepted practice, as compared with reducing defence, as the French have done in the “Jeanne d’Arc” and “Montcalm,” are fully justified by the very great gain in defensive power.

Protective decks.

For the new cruisers it is proposed to repeat the arrangements of the double protective decks amidships, having an aggregate thickness of 2 ½ inches, which have been approved for the “Canopus” and “Cressy” classes.

I am of the opinion, however, that it will be desirable to put the greater thickness of protective deck on the main deck instead of on the lower deck in the new cruisers, which must necessarily have greater length, and large deck areas.

When chasing or being chased the deck-areas of the vessels will offer targets of from 480 to 500 feet in length, and from 65 to 70 feet in extreme width.

Under the supposed circumstances of a chase there would, undoubtedly, be great risk of effective shell fire delivered against such deck-targets, since the range would be varied very slowly as the ships close.

It is proposed to make the main deck amidships about 1 ½ inches in thickness, and the lower deck about 1 inch.

Modified protection at the bow.

For the reasons just stated I would also recommend that the protective plating on the main deck be continued right forward to the bow.

Instead of having an armoured bulkhead enclosing a citadel at the fore end (as in the “Cressy” and “Canopus” classes), it is proposed to utilise the weight in this extension of the deck plating, and in adding to the thickness of the vertical armour on the sides towards the bow.

As the ship narrows towards the bow, it is proposed to gradually reduce the thickness of side armour from 6 inches down to 2 inches, as indicated on the drawings attached. For most of the length this side-plating would terminate at the main deck, and be met by the protective plating; but right forward, for a length of about 40 feet, the 2-inch plating would be carried to 22 feet above water. In this manner we should secure efficient defence against raking fire from the stern-chase guns of an enemy, and reduce the risk of the entry of water from shot-holes in the bow.

There would, of course, be good sub-division of the internal space forward, both above and below the main deck. Up to the height of the main deck, 6 ½ feet above the waterline amidships, the side armour would give good security against the necessarily oblique impact of projectiles. Even if the light unarmoured sides above the main deck and abaft the 2-inch bow armour were riddled, there would be little difficulty in clearing the water that might enter – perhaps by suitable freeing scuttles- as the normal height above the waterline is considerable.

Alternative plan for protection against raking.

Another suggestion for giving protection against raking fire is to construct an armoured screen bulkhead reaching to such a height above the upper deck as would also suffice to shelter some of the bow chase guns.

From the nature of the case such an arrangement would have to be placed some distance from the bow, although far forward in the vessel.

There would, in fact, be a length of 435 feet abaft this bulkhead in one of the new cruisers; and the risks of injury to deck-target above described would remain practically unaltered for a considerable portion of the length of the vessel. Even when allowance is made for the flat-trajectories of modern projectiles their “angles of descent” at long ranges are considerable, and no practicable height of armoured screen bulkhead would ensure complete protection to the main deck.

Moreover, the bow before the screen bulkhead would remain liable to riddling, and to the entry of water in a seaway, to the same extent as if no such bulkhead existed.

On the whole, therefore, the available weight of protective material would appear to be better disposed if put in to the form indicated on Sketch No.1, with a more strongly protected bow, and good main deck plating.

Protection of stern.

At the after end of the new cruisers it is proposed to adhere to the arrangements of the “Cressy” class, terminating the vertical hull-armour by a cross-bulkhead. Abaft this there will be a single protective deck situated a little below water. Injury to the stern and consequent admission of water above this deck is of secondary importance. In the “Cressy” class, for example, if the corresponding spaces were riddled and filled with water, the change of trim would only be 30 inches -15 inches more draft aft and 15 inches less forward – and the vessel would be little affected as regards speed, stability, or manoeuvring power.

ARMAMENT

Disposition and horizontal command of guns

In considering the most suitable disposition and horizontal range of command of the guns in the new cruisers, it would appear to be necessary to provide efficiently for three requirements:-

- (1.) For a powerful bow fire for use when chasing.
- (2.) For an efficient stern fire for use when being chased.
- (3.) For an efficient broadside fire for use in single ship actions or when engaged as adjuncts to the fleet.

The first of these requirements is, no doubt, of very great importance, in view of the fact that the immediate purpose for which the new cruisers are required is to deal with the “Jeanne d’Arc” and other fast cruisers, which (being presumably less powerfully armed and defended) would be anxious to escape from our cruisers.

It would, however, obviously be a mistake not to look forward and to provide for a contingency certain to arise during the period that the new cruisers will continue on service. At some time or other they must require to escape from a more formidable adversary, and therefore should be given a powerful stern armament.

The third condition, viz., that of single ship actions or association with a fleet will, of course, be a permanent one if these cruisers are to be regarded as capable of acting with fleets as well as performing detached service.

Broadside armament of 6-inch Q.F. in casemates.

There appears to be a consensus of opinion that we cannot sensibly improve upon the disposition of the 6-inch Q.F. guns, which has been carried out in the “Diadems,” “Powerful,” “Canopus,” “Majestic,” and “Formidable” classes.

This involved the provision of double-storied casemates, giving fore and aft fire to 8 6-inch guns –four towards the bow and a similar number towards the stern, as well as intermediate casemates on each side of the ship in which the guns have a horizontal arc of training of 120 degrees.

12-pr. Q.F. guns.

It has been previously stated that, if the boat deck should be abolished, the 12-pr. guns would be better placed on the main deck between the casemates, or before and abaft them, rather than on an open upper deck. This point requires decision.

Bow-chase guns.

In recent first-class cruisers there are two arrangements of the bow-chase guns.

In the “Powerful” and “Cressy” classes a single 9.2-inch gun is mounted on the middle line, and is available across the bow and on both broadsides through 270 degrees of horizontal training. These bow-chasers are protected by 6-inch armour.

In the “Diadem” class two 6-inch Q.F. guns are mounted on the same athwartship line of the forecastle. Only one of them is available on each broadside; but both are available ahead and through considerable arcs of training on each side of the line of keel. These 6-inch guns in the “Diadem” have only shield protection.

It appears to be generally agreed that for the new cruisers it would not be desirable to repeat the “Diadem” arrangements, but that adequate protection should be given to the bow-chase guns.

6-inch bow-chase guns mounted behind armoured screen bulkheads.

One alternative method is indicated on Sketch No.2, which provides for mounting two 6-inch Q.F. guns in approximately the same positions as in the “Diadem,” and protecting them by an armoured bulkhead with suitable ports formed therein to give large arcs of training.

Only one of the 6-inch guns would be available on each broadside; both of them would be available for bow-chase purposes through about the same arcs of training on either side of the keel line, as in the “Diadem” class.

Twin 6-inch guns in armoured turret.

Another alternative, indicated in Sketch No. 3, would be to place two 6-inch guns in a single armoured turret forward situated at the middle-line.

It would be necessary in that case to introduce mechanical appliances for training the turret and hoisting ammunition. So far as weight is concerned, this arrangement would be more favourable than that on Drawing No. 2 with a fixed armoured screen. It would have the great advantage that both 6-inch guns would be available on each broadside.

Stern-chase guns.

Similar considerations to the foregoing apply also to the character and positions of the stern-chase guns.

Comparative advantages of 9.2-inch and 6-inch Q.F. chase guns.

As between the 9.2-inch gun and the 6-inch for bow and stern-chase purposes, the following statement will be of interest, taking *one end* of the ship only for purposes of comparison.

A 9.2-inch gun of the new type, protected and mounted as in the “Cressy” class, involves a total weight of about 200 tons.

If the two bow-chase guns were placed behind a 6-inch armoured screen bulkhead, and that screen were extended down to the main deck protective plating, so as to form some defence against raking fire, the total weight of the two 6-inch guns, mountings, ammunition, and protection would amount to 240 tons.

With a turret protected by 6-inch armour, and containing two 6-inch guns, the corresponding weight would be about 140 tons, allowing for mechanical power for training and ammunition hoists.

It thus appears that the last-mentioned arrangement would enable two 6-inch guns to be carried on the forecastle as bow-chasers instead of the 9.2-inch gun, and would leave a margin of weight sufficient to provide an additional 6-inch gun and its casemate on the main deck amidships.

As between the 6-inch and the 9.2-inch gun, there is necessarily a great difference in the rate of fire. While each of the former could deliver from four to five aimed shots per minute, that is to say eight or ten for the pair of guns, the 9.2-inch gun would only deliver a round in about 45 seconds.

If it were only a question of rapidly destroying by shell-fire the unarmoured or lightly armoured structures of an enemy's cruisers –which was the condition chiefly to be considered when the armaments of the "Powerful" and "Diadem" were being settled- then there are undoubted advantages to be gained by the adoption of the uniform armament of 6-inch Q.F. guns.

My personal views on this question were fully stated at the time when these designs were in hand, and I then endeavoured to summarise the gains to be obtained with such a uniform armament.

But since these vessels were designed, the construction of cruisers with substantial vertical armour on their sides and strong protective decks has been greatly developed, and this change of condition has led, in the case of the "Cressy" class, to the decision by their Lordships to adopt the 9.2-inch guns for bow and stern-chase.

That decision, in my judgement, is a wise one for the following reasons:-

As noted under the head of "Armour Protection," when a vessel is chasing or being chased, the range remains nearly constant over a considerable period of time, and the greatest risk to be run of disablement, supposing the bow to be protected by thin armour, is that of injury to the protective decks, and disablement to the propelling machinery or boilers, or the explosion of magazines.

The mere destruction of the unarmoured superstructures of the modern type of cruiser by the shell-fire of the 6-inch gun would not be likely to cause the termination of such a chase; but a well-planted projectile for the 9.2-inch gun would undoubtedly involve much more serious risks. Shell-fire from the 6-inch guns would not, in these respects, compare with that from the 9.2-inch gun.

One feature, however, in the 9.2-inch gun as it at present stands clearly requires amendment, viz., there must be greater rapidity of loading.

Our experience with the 12-inch guns, and with the 10-inch guns mounted in the "Centurion," "Barfleur," and "Renown," indicates clearly that there will be no difficulty in greatly accelerating the rate of loading 9.2-inch guns if we apply suitable mechanical appliances.

As long as the 9.2-inch guns remained with only shield protection, there were obvious reasons against the extension of mechanical appliances for their working, but this is no longer true.

With the modern quality of armour, and the thickness of armour contemplated, these mechanisms in the 9.2-inch gun would be as well protected as are considerable portions of corresponding mechanisms in the “Centurion” or “Renown.”

Question of the 8-inch gun.

The question of the 8-inch calibre gun has been repeatedly considered in connection with cruiser armaments.

Hitherto, it has been held undesirable to multiply calibres, or to introduce calibres intermediate between the 6-inch and the 9.2-inch.

The so-called quick-firing Elswick 8-inch gun is in reality not a true quick-firer, although its breach mechanism and loading arrangements are admirable. No doubt very rapid firing has been obtained from the 8-inch gun on an open emplacement, and with a large number of men able to work freely in an open space. But the weight of the shot would clearly prevent the continuance over any moderate period of this rate of fire; and in the restricted space of an enclosed turret or gun-house, such rapid operations would in themselves become impossible with manual power.

The value of the 9.2-inch gun is increased by the fact that foreign nations are adopting, on a large scale, our casemate system of protecting the broadside armament; and, although in the “Jeanne d’Arc” or “Montcalm” class the thickness contemplated to be used on these casemates appear to be somewhat less than we employ, yet it cannot be overlooked that this is not true in other foreign cruisers; and, in the future, increased thicknesses of casemates and turrets or stronger qualities of armour are certain to be employed.

Our own recent experiments show that the 6-inch plate of the Krupp quality can deflect, with very little injury, the common shell from a 9.2-inch gun striking it at an angle of obliquity of about 20 degrees, and can resist special armour-piercing shell from that gun with great success.

Under Service conditions the 6-inch Q.F., or even the 8-inch, gun is, therefore, not likely to be really effective against these gun emplacements.

Many officers of high standing in the Service have expressed to me their concurrence in the arrangement of the armament in the “Royal Arthur” and “Crescent.” They carry a 9.2-inch gun aft, and 6-inch Q.F. guns as bow-chasers.

This is a system of armament which I proposed 15 years ago for fast protected cruisers to be built for foreign navies not possessing armour-clads; and where, therefore, the vessels might have had to make a running fight with armoured ships.

If there were only to be one heavy gun in a cruiser, I still think it would be advantageous that it should be placed aft rather than forward; but, on the whole, the balance of advantage would appear to lie in the “Cressy” arrangement, which has a 9.2-inch gun both forward and aft, so placed as to be available on both broadsides.

Magazines and ammunition passages.

The arrangements for stowing ammunition in Her Majesty's ships, and for transporting it from magazines and shell-rooms to the guns, have been very carefully studied for many years past.

For large cruisers and battleships designed since 1889 the established practice has been to place the magazines and shell-rooms before and abaft the machinery and boiler spaces in positions where high temperatures are not likely to occur, thus preventing deterioration of the powder or cordite. For the bow and stern-chase guns the hoist of ammunition is practically vertical. For the 6-inch Q.F. guns the longitudinal transport takes place in ammunition passages situated below the lower protective decks, in the best defended part of the ship. From these passages vertical protected hoists lead up to the several casemates and gun-decks. Arrangements are made in the passages near the lower end of the hoists for hooks and ready-racks, in which ammunition can be stowed to diminish the labour of transport in action.

After a careful study of these arrangements, I am of opinion that our established practice is greatly superior to them, and should not be departed from.

There are two classes of alternatives. One, which we fitted in the "Edgar" class and "Blenheim," is to have armoured "ready-use magazines" built in the bunkers above the protective decks, capable of holding a certain number of rounds for each 6-inch Q.F. gun. These ships were not of sufficient size to permit of the construction of ammunition passages. But obviously the plan of ready-use magazines is not so good as that of ammunition passages. And it is necessary to provide means for reaching and refilling the ready-use magazines when the supply is exhausted.

The other alternative, much favoured in foreign designs, is to multiply the number of the magazines, and to place them, as far as possible, vertically under the guns. This system has two great drawbacks. It places the magazines for broadside guns in positions where high temperatures occur from the nearness of engines and boilers, and it isolates the supplies of ammunition for guns of the same calibres.

Our system, with its duplicated magazines and shell-rooms forward and aft, enables the ammunition at either end of a ship to be used for any gun, provided that it can be transported through the passages. Injury forward may flood the magazines and shell-rooms there, but those aft remain available and accessible, or visa versa.

Nor is it an unimportant matter that the protected passages enable voice tubes and other fittings to be carried fore and aft besides providing for communication under cover by messenger in action.

The only objection that can be made against the existence of the passages is that they occupy space which might be used for additional coal. In vessels of moderate size – such as second and third class cruisers – this is consideration of such importance that passages are not fitted. In the "Blake" and "Blenheim," the largest ships without such passages, the desire to increase bunker space as much as possible led to the omission of passages. We have had many suggestions from these ships to the effect that their omission caused a serious loss of efficiency. So far as I am informed, the general opinion of the Service is in favour of their great value.

It is interesting to note that the French have copied our system in the “Jeanne d’Arc.” M. Bertin, the designer, made a thorough inspection of the “Magnificent” in my company two years ago, before the “Jeanne d’Arc’s” design was proposed.

SPEED

It has been decided that in the new cruisers the speed of 23 knots shall be maintained on the Contractors’ trials, which in recent Admiralty practice extend over eight hours’ continuous steaming under natural draught in the stokeholds.

These conditions have not yet been approached, either as regards the duration of the trial or the absence of forcing in the stokeholds, by any of the foreign cruisers whose reputed maximum speeds range from 22 $\frac{3}{4}$ to 23 knots.

Confining attention for the moment to those vessels which are said to have realised those speeds on actual trial, the total number is small. They are as under:-

	Tons	H.P.	Knots
United States Navy:-			
“Columbia”	7,375	18,500	22.8
“Minneapolis”	7,375	20,800	23
Japanese:-			
“Yoshino”	4,180	15,000	23
Argentine:-			
“Nueve de Julio”	3,500	14,350	22.74
“Buenos Aires”	4,500	13,000*	23.2
Chilean:-			
“Blanco Encalada”	4,400	14,500	22.76
“Esmeralda”	7,000	16,000†	23

* *Some accounts give 14,000. H.P*

† *Some accounts give 18,000. H.P*

All except the first two vessels are of Elswick design, and of very similar type, differing in length and displacement. We have no authoritative statement of the engine-power developed on trial, the figures given above being taken from published accounts. There are obvious inconsistencies between the results for different vessels, and the figures for power in the case of the “Buenos Aires” and “Esmeralda” are open to grave doubts if the speeds are correctly reported.

Without dwelling on these points, however, it is necessary to remark that the trials of these vessels were not made under Admiralty conditions, that the speeds were maintained for short periods, and that forced draught was used in the stoke-holds. If Admiralty conditions of trial were observed the speeds would be much lower, for it is possible to develop very high powers for short periods under the conditions described. In the past, when forced draught was used on trial of Her Majesty’s ships, from

50 to 60 per cent. draught above the natural draught power has been developed for short periods. Experience led, however, to the abandonment of such trials for Her Majesty's ships, as the results did not represent conditions of practice, and the boilers (of cylindrical type) suffered from forcing.

Having so little information about the conditions of trials for these vessels, it is difficult to estimate their speeds under Admiralty conditions of working machinery and boilers. As an example only, it may be stated that if the "Esmeralda's" boilers were forced 50 per cent. above their natural draught power, then at natural draught the speed would be about $20\frac{3}{4}$ knots instead of 23 knots.

These vessels have very quick-running engines also, of comparatively short stroke and making a high number of revolutions per minute. This tends to large economy of weight in proportion to maximum power developed.

Again, we know little respecting the weight of coal and stores carried at the speed trials, or the draught and displacement. It has, however, transpired that in many cases the weight of coal has been only one-third of the bunker capacity. On service, fully stored and equipped, the decrease in speed due to extra immersion must be considerable in ships of their size.

Fuller information is available for the trials of the American cruisers. Their speed was measured by two runs (out and home) on a 44-knot course with one turn, and therefore lasted less than four hours. About 40 per cent. of their bunker capacity was carried as coal. The circumstances of the trial must have made it difficult to eliminate the effect of tide, and may have sensibly influenced results. An estimated correction was made. The boilers were forced, but only to a moderate extent. The engines ran rather above 130 revolutions per minute. No long distance trial under natural draught was made. The "Columbia" averaged about 18 knots across the Atlantic, and must have then developed about 40 per cent. of the maximum power associated with the reported speed of 23 knots. Probably if tried for eight hours under natural draught she would not attain more than $19\frac{1}{2}$ knots, instead of the reported 23 knots.

These statements will suffice to show the important bearing upon the design of the new vessels which the more stringent conditions and longer duration of their trials must exercise.

Swift cruisers building.

Turning from the completed vessels to vessels either building or projected for maximum speeds of 23 to 24 knots, the following list includes all that are known:-

	Tons	H.P.	Knots
French Navy:-			
"Guichen"	8,146	24,000	23
"Chateaurenault"	7,890	23,000	23
"Jurien de la Graviere"	5,550	17,000	23
"Jeanne d'Arc"	11,092	28,000	23
Building at Elswick:-			
Japanese, "Takasago"	4,200	17,000	24
Chinese, "Hai-Tien"	4,300	17,000	24
"Hai-Chi"	4,300	17,000	24

The four Elswick vessels are very nearly repetitions of the “Yoshino,” and it is reported that with power and speed are to be obtained at *light* draughts of water, and with *high forced draught* in the stokeholds. I would add that the reputed speed of 24 knots is not likely to be obtained with 17,000 H.P. if the “Yoshino” required 15,000 for 23 knots.

The “Guichen” and “Chateaurenault” are “Corsair-cruisers” based on the American “Columbia,” but with water-tube boilers (small diameter tubes in “Chateaurenault”). They have triple-screws, and ought to attain 23 knots if the power specified is realised. The “Jurien de la Graviere” is based on the Elswick type, and in regard to triple-screws and type of boiler follows the corsairs. The “Jeanne d’Arc” stands alone in size. She has ample boiler power and should (apart from an inefficiency of the triple screws) secure a safe 23 knots for four hours, and a continuous sea-speed of about 21 knots. This is the vessel which must be kept chiefly in view in considering the speed appropriate to the new cruisers. The experiment being made in her by using modified Du Temple boilers (with small diameter tubes) is a serious one, no doubt. As regards *numbers of boilers* (48) however, she stands on the same footing as our “Powerful” and “Terrible.” A considerable saving in weight is effected by using the small tube boiler even when compared with the latest type of Belleville boiler. This is dealt with hereafter.

Ratio of horse-power to displacement at high speeds.

From the foregoing tabular statements it will be seen that when the speed of 23 knots is to be attained, very great engine-power is required; and that the ratio of horse-power to tonnage increases as size is diminished.

In the “Yoshino,” of 4,180 tons, about 3.6 H.P. per ton was required; in the “Minneapolis,” of about 7,400 tons, about 2.8 H.P. per ton; and in the “Powerful,” of 14,200 tons, at 23 knots a little over 2 H.P. per ton would suffice. Increase in size, therefore, favours relative economy in propulsion, and consequently favours increased carrying power.

I have fully explained these matters to the Board on many occasions, and particularly in connection with the design of the “Powerful.” At that time I pointed out the fact that the *same horse-power* would be required for 22 knots speed, whether the vessels were made about 450 feet long and 12,000 tons or 500 feet long and 14,000 tons. Now we have the actual trials of the “Diadem” and “Powerful” to go upon; and they absolutely confirm my forecast. From 21 to 23 knots the “Diadem,” of 11,000 tons would require as great engine power as the “Powerful,” of 30 per cent. greater displacement. The French designers have also accepted this principle. In the “Jeanne d’Arc” they have provided 28,500 H.P., which is very close to the power which would drive the “Powerful” at 23 knots. Probably they have taken a margin of horse-power, in order to provide fully for possible losses due to triple-screws as compared with twin screws.

From these facts an important deduction may be made, bearing on the design of the new cruisers. Whether their displacement be 10,500 or 14,000 tons, for the speed of 23 knots, the *difference in engine-power, in weight of propelling apparatus, and in engine-room compliments,* cannot be very marked. Hence in the smaller vessel (*the machinery and boiler*

spaces being nearly the same as in the larger vessel) there will remain *much less protected space* for magazines, torpedo rooms, and other “vitals.” And, as the weight of propelling apparatus will be very nearly the same, the *disposable margin of weight* –for armament, armour, coals, and equipment – must be very seriously diminished in the smaller vessel. This will appear more clearly from the alternative sketch designs described hereafter.

PROPELLING APPARATUS

When such enormous engine powers have to be provided, unusual importance attaches to the selection of the most suitable types of engines and boilers. Which shall yield the required power with the least weight consistent with a due provision for strength, efficiency, and durability, as well as for economy in coal consumption.

Types of boilers and corresponding weights.

Boiler room weights, 28,000 H.P.

			<i>Tons.</i>
I.	Cylindrical boilers: natural draught, 8 hours' trial	-	2,000
II.	Cylindrical boilers: moderate forcing, 4 hours' trial	-	1,680
III.	Cylindrical boilers, high forced draught, 3 hours' trial	-	1,400
IV.	Belleville boilers with economisers: natural draught, 8 hours' trial	-	1,250
V.	Belleville boilers: moderate forcing, 4 hours' trial	-	1,030
VI.	Small-diameter tube boilers such as in “Jeanne d’Arc”: moderate forcing, 3 to 4 hours	-	1,000

The figures for the “Jeanne d’Arc” are necessarily only approximate, as details have not been published. They show that if the intentions of the French designers are realised and economy in weight of about 250 tons will be secured. This saving in weight will be obtained in association with the use of a much *greater weight of water* in the small tube boilers than is provided for the Belleville boilers. According to published statements, in the Normand-Sigaudy type of boiler first contemplated for the “Jeanne d’Arc,” the weight of water for a given horse-power is nearly *three times* that provided in the Belleville boilers.

According to published reports the “Jeanne d’Arc” is to have an ample provision of boiler power. Her maximum indicated horse-power is given at 28,500 (French) H.P. Reduced to English measure this would be about 28,100 H.P. A further correction is necessary, as in French practice it it [sic] appears to be usual to include an allowance for auxiliary engines in the horse-power. Taking this allowance at 5 per cent., the horse-power for propulsion, on our basis, would be about 26,700 H.P. The heating surface is stated to be about 78,500 square feet, which gives 2.94 square feet of heating surface per horse-power at maximum development. In the “Speedy” the corresponding figure for small-tube boilers is 3.1 square feet; in the “Pelorus” herself, 2.24 square feet; in later vessels of the “Pelorus” type, somewhat greater. With Belleville boilers the provision is represented by 2 ½ square feet per horse-power in the “Powerful,” and 2.63 square feet in the “Argonaut.” These figures indicate

the fact that only “moderate forcing” will be necessary in the “Jeanne d’Arc” when developing the full specified power.

Long distance steaming.

Contract trials for a few hours at a certain power may not be, and in fact are not, associated with equal developments of power by different types of boilers for long-distance steaming at sea. Taking the boilers tabulated above, the following figures indicate approximately the power that could be continuously developed for long periods at sea, if the trial power were 26,000 H.P.

			<i>H.P</i>
I.	Cylindrical boilers: natural draught	-	17,000
II.	Cylindrical boilers: moderate forcing	-	14,000
III.	Cylindrical boilers: high forcing	-	12,000
IV.	Belleville boilers: natural draught	-	21,000
V.	Belleville boilers: moderate forcing	-	18,000
VI.	Small tube boilers: “Jeanne d’Arc”	-	21,000

The estimate for the “Jeanne d’Arc’s” boilers is based on the actual performance of the “Pelorus” on a long distance trial (60 hours), on the assumption that 3.7 square feet of heating surface gives one H.P. as it did on that trial. On this basis the “Jeanne d’Arc’s” small-tube boilers should give as great a power for long distance steaming at sea as Belleville boilers about 25 per cent heavier, and carrying much smaller weights of water.

On the side of coal consumption French reports claim excellent results for Normand and other boilers of the small-tube type. We have our own experience with the “Speedy” and “Pelorus” as well as in many destroyers. That in the “Speedy” represents several years of service, and shows good relative economy in coal consumption. Her proportion of heating surface to maximum development of power is very little in excess of that reported in the “Jeanne d’Arc.” The trials of the “Pelorus” have been largely experimental, and in her the provision of heating surface is not relatively so large.

So far as can be seen, therefore, the use of small-tube boilers in the “Jeanne d’Arc” does not carry with it any necessary increase in the rate of coal consumption.

If it did so then, for a given radius of action at defined speeds, the aggregate weight of coal and propelling apparatus might be increased, even though the weight of boilers were largely diminished. But there is no reason, so far as I am aware, for anticipating such a result from the use of small-tube boilers proportioned as in “Speedy” or “Jeanne d’Arc.”

Space, as well as weight, requires consideration in regard to boiler installations. From the comparative designs submitted for the Royal Yacht by Messrs. Humphrys, one with Belleville boilers, the other with Yarrow boilers, and from other investigations it appears that the floor space is practically identical, while the height required for the small-tube boiler is rather less.

The small-tube boiler, possibly in a modified form, and with large and thicker tubes than are used in destroyers, appears to offer substantial advantages from the side of weight, and (on the basis of our “Speedy”) no inferiority in the rate of coal consumption. A full consideration

of the subject seems desirable, therefore, before a decision is reached, especially in view of the action taken in France.

There are, of course, other questions of great importance in regard to the choice of boilers; such as ease of examination, cost of maintenance, durability &c. On these questions the Engineer-in-Chief will advise the Board. The preceding statement has been made primarily to illustrate the important influence which the selection of the boilers must have on the design of the new cruisers.

Main engines

Attention has already been drawn to the fact that in the 23-knot cruisers built or building the engines are of the “quick-running” type, making a large number of revolutions at maximum power, having comparatively short strokes. These engines are consequently much lighter in relation to their power than the engines fitted in Her Majesty’s ships. Whereas our large engines run at 110 to 120 revolutions per minute, when working at full power, the engines of the Elswick cruisers run at 150 to 160 revolutions, and are proportionally much lighter.

The greatest power hitherto applied to these quick-running engines, on a single shaft, seems to have been 9,000 to 10,000 H.P. All the Elswick ships have twin-screws.

Similar action has been taken in America and France for the engines of their swiftest cruisers. Triple-screws are there adopted, and even in the “Jeanne d’Arc” the power of each engine is below 10,000 H.P. With the highest speeds contemplated in our new cruisers, the power on each shaft will be from 14,000 to 15,000 H.P.

The use of quick-running engines, with short strokes, has a further advantage in vessels of moderate draught of water and depth in hold. In vessels like our “Medea” or “Apollo” classes, in order to provide sufficient height to accommodate engines with longer stroke than is used in the Elswick cruisers of equal draught, armoured “coamings” have been constructed, above the protective deck, around the cylinders. A weight of from 100 to 120 tons has been involved in this arrangement, and considerable additional expenditure. The performances of these vessels on long-distance steaming at high speeds has been satisfactory, and many of them have been severely tested.

In the Elswick cruisers of moderate draught with much shorter strokes the cylinders are kept entirely below the protective decks, as they are also in Admiralty practice when the depth of hold permits. In consequence of this, armoured coamings are unnecessary, and the weight required for them can be otherwise appropriated.

Some of the Elswick ships, with engines designed and built by Messers. Humphrys, have now been several years on service. The “Yoshino” had much hard work during the war with China, and is well spoken of. We have little detailed information as to the practical workings of the engines in most of the ships, but I have been informed by officers of various foreign services, and by the makers of the engines, that the results have been satisfactory.

Practice of the Mercantile Marine.

In the mercantile marine the conditions of service are altogether different from those of the Royal Navy. Passenger steamers work from port to port over known distances and always at maximum speed. Mercantile practice is, therefore, in favour of long strokes and moderate

rates of revolution, which means much heavier engines. Economy of weight is not of such great importance in these ships as it is in war ships. Merchant steamers having sea-speeds of 20 to 22 knots, have load-displacements of 16,000 to 20,000 tons, and carry small weights of cargo, in addition to their coal supplies.

For war ships ordinary cruising is done at low speeds requiring less than 20 per cent. of the maximum power.

Under these cruising conditions the rate of revolution is very moderate, and large cylinder capacity necessarily tends to losses of efficiency.

As an example, the "Powerful" may be taken. At 12 knots about 3,500 H.P. is required, and about 60 revolutions suffice. At 20 to 21 knots about 18,000 H.P. and 103 revolutions. This is the maximum result anticipated for continuous steaming at sea. At 22 knots about 25,000 H.P. and 114 revolutions are required. This last trial, or maximum development of power, represents contract conditions only occasionally reproduced in service, even in ships of the latest design.

These figures illustrate the fact that for warships a higher rate of revolution for maximum powers than that preferred in the mercantile marine is, on the whole, advantageous and, within proper limits, unobjectionable. Already great progress has been made in this direction in the Royal Navy. Other engineers have gone further in this direction for engines fitted on the swiftest foreign cruisers. The question for decision now is whether a further step can be taken in the new cruisers, which must have engines of greater power than have hitherto been constructed, while fulfilling the essential conditions that the machinery shall possess that strength and endurance which are necessary for the special service.

Triple screws.

The question of triple-screws *versus* twin-screws has been repeatedly discussed in connection with the designs of the "Powerful" and other vessels. While France, Germany, Russia and the United States have adopted triple-screws, we have adhered to twin-screws. So have the builders of the largest and swiftest Atlantic liners, in some of which from 25,000 to 30,000 H.P. is efficiently utilised on twin-screws. Our experience in the "Blake," "Blenheim," "Powerful," "Terrible," and "Diadem" confirms the conclusion derived from mercantile experience.

There has been no prejudice here against triple-screws. Nearly 20 years ago I thoroughly investigated the question, and came to the conclusion that twin-screws would prove superior even with large increases of speed and power. Of course the time may come, draught of water being limited, when higher speeds and correspondingly increased engine power may lead to the more extended use of multiple screws. In the turbo-motor destroyer we are acting on this principle.

But without reproducing former remarks on the subject, it must be stated that the allegation commonly made by outside critics that we forfeit great advantages by not adopting triple-screws, under existing circumstances, is disproved by experience. I am in possession of facts which show conclusively that:-

- (1.) At maximum speeds twin-screws are more efficient than triple-screws.
- (2.) At low cruising speeds triple-screw ships require greater power than twin-screws for equal speeds. This is distinctly contrary to the claim made by advocates of triple-screws. Recently I gage comparative results for the “Rossia” and “Powerful,” but I have others no less striking.
- (3.) Allowing for reductions in weight consequent on the use of quicker-running engines with triple-screws, the total weight of machinery for a given engine H.P. is not less than for twin-screw engines
- (4.) Greater engine room space is needed with triple-screws.
- (5.) With triple-screws the space available near the stern for magazines, &c. is much less than with twin-screws. The symmetrical distribution of ammunition this becomes an impossibility, unless ships are lengthened to give greater hold space aft.

Advocates of triple-screws, when met by facts such as these, fall back on the general principle that greater safety from total breakdown is thus attained. In the abstract this is true. Experience shows, however, that with twin-screws there is a practical immunity from total breakdown. There are many examples of twin-screw ships breaking one shaft, and steaming over long distances with a single engine at work. Obviously the gain possible in this respect cannot outweigh the serious disadvantages above enumerated for triple-screws.

I have been assured by American officers of high rank, that experience with the “Columbia” and “Minneapolis” is adverse to the extended employment of triple-screws. The Italians have tried the system in small vessels, and reverted to twin-screws. Captain Paget recently reported – although I doubt the correctness of the rumour – that the “Gromoboi” (New “Rossia”) was to have twin-screws.

One very influential factor in the use of triple-screws in foreign navies has been the difficulty of manufacturing the large shafts, forgings, and castings required for high powers if twin engines had been adopted. This was the chief reason for using three engines in the American cruisers; and it has been operative in other countries. Here it has no force.

As examples of the effect upon length which the use of three screws has, as compared with twin-screws, I may state that in a vessel of the “Diadem” class, the increased length would be 35 feet.

The “Pallida” class of the Russian Navy are based on our “Talbot” class. Largely in consequence of having triple-screws, they are about 50 feet longer than the “Talbot.”

When vertical side armour is used, such an increase of length in the machinery space is a serious matter, involving, as it does, a corresponding increase in the weight and cost of expensive side armour.

On the whole, I am of the opinion that in the new cruisers twin-screws should be adopted.

Influence of length of machinery and boiler spaces on weight of armour.

Allusion has been made above to the fact that, with vertical side armour as the main protection to buoyancy and stability, great importance attaches to the length occupied by engines and boilers.

It is generally agreed that the full thickness of side armour should be maintained in wake of engines and boilers. Consequently, increase of length of machinery space involves extra weight and cost of armour; and, therefore, increase displacement, much exceeding the additional load of armour in a ship of 23 knots' speed having a fixed draught of water.

Before the boiler-rooms the sides are more lightly armoured, and consequently increase in length involves a less serious penalty in increased displacement. Aft the engine-room there is only a protective deck; and here also increase in length is not a serious matter.

Taking two vessels each of 23 knots speed, but with displacements widely differing, the smaller will, of course, have less internal space, and (as before explained) she will require greater power in relation to her displacement,. Although absolutely less power than the larger ship. As breadth will be less, it is quite possible that in the smaller ship a greater length will be required to accommodate engines and boilers that will be needed in the broader and larger ship. Hence it follows that a larger area, and greater weight of maximum thickness of side armour may be required in the smaller ship. As she necessarily has a less relative margin for carrying power, this fact may involve a considerably diminished protection and smaller coal supply.

This illustration shows that many considerations have to be taken into account in order to ascertain where the balance of advantage lies, in fixing total length as well as the arrangement of propelling apparatus. The problem is, in fact, of a complicated nature, and to be dealt with only by comparing concrete examples, which include estimates for weight of hull, armament, protection, propelling apparatus, &c. It is much simpler in vessels of the "protected" type than in vessels with vertical side armour.

Hold space and bunker capacity.

In cruisers of this great speed, a very large portion of the hold space, below the protective deck, is necessarily appropriated to machinery and boilers. The spaces before and abaft, comparatively limited as they are, have to be appropriated to magazines, shell-rooms, torpedo rooms, &c., and consequently the bunker spaces have to be provided, to a large extent, between the lower and main decks. Roughly speaking, in the "Powerful" class, two-thirds of the bunker capacity is situated above the lower (protective) deck; and this is a typical case.

The arrangement has many advantages, as it strengthens the defence, and enables the stability to be kept nearly constant while the load is greatly varied.

As example of the bearing of increased speed and power upon available bunker space has occurred in the "Cressy" class, where only 1,600 tons of coal can be carried, against 2,000 tons in the "Diadem" class, although the "Cressy's" are 10 feet longer and of 1,000 tons greater displacement.

As explained above, in cruisers of 23 knots, the engine-power and corresponding space does not vary greatly for large variations in displacement, and consequently it will be seen that in the smaller vessels, the available protected hold-space (outside the machinery spaces) must be relatively smaller. The bunker capacity, also, must be less.

In the foreign cruisers of 23 knots, the ammunition supplies are much less than in the Royal Navy, and the vessels are not stored or equipped for independent sea service to the extent usual in our Service. Neither are they given such large complements in relation to engine-power and armament. All this tends to greatly diminish the requirements for internal space in foreign ships, more especially in the holds, and favours the enlargements of bunker capacity. But even under these favourable conditions, the published description of the “Jeanne d’Arc” dwells upon the great difficulties that have occurred in providing for her magazines, &c., in consequence of the enormous proportion of the hold space occupied by the propelling apparatus.

The “Jeanne d’Arc” is to have 2,100 tons of bunker capacity. Her waterline length is about 475 feet, as against 456 feet in our “Diadem,” and 460 feet in the “Cressy.” The French system of measuring the length differs from ours. To compare the two, about 20 feet must be added to our measurements for large cruisers and battleships.

DESCRIPTION OF ALTERNATIVE SKETCH DESIGNS

The particulars of certain alternative sketch designs, submitted for their Lordships’ consideration. All these designs are for *unsheathed* ships. If the vessels were wood sheathed and coppered, their draught of water would be increased by 9 inches, the displacement by 550 to 650 tons, and the trial speeds decreased by about half a knot, and the cost increased by 35,000*l.* to 40,000*l.*

Design No.1. (Sketch No.1.)

This is a vessel of the same length as the “Powerful,” 13,800 tons displacement, and about 28,000 H.P. This power is to be obtained with natural draught from Belleville boilers (economiser type) and with engines similar to those in “Cressy” class.

The weight assigned to armament is the same as that in “Cressy” class, the same numbers and calibres of guns are provided for as in “Cressy,” and the same supplied of ammunition. The disposition of this armament is shown on Sketch No. 1.

Alternative dispositions and natures of armament are shown of Sketches Nos. 2 and 3.

A discussion of the relative advantages of these several armaments appears in this report.

The hull protection includes 6-inch armour on sides abreast engines and boilers, tapering towards the bow (see description), and two protective decks (except at the stern) aggregating 2 ½ inches in thickness.

The continuous sea-speed would be about 21 knots.

Coal supply; 1,250 tons on designed draught and displacement; 2,500 tons bunker capacity.
The cost of this vessel should be about 830,000*l*.

As a matter of information it may be stated that if small-tube boilers were used (as in “Jeanne d’Arc”) the displacement would be about 13,500 tons, and the mean draught might be diminished by about 6 inches. The cost would not be appreciably affected.

Design No. 2.

This is for a ship 20 feet shorter than No.1, and of 13,200 tons displacement. It is identical in protection and horse-power. With similar engines and boilers, it would have equal speed on trial and for continuous steaming. As the machinery space would be of the same length, the same weight of vertical armour would be required in wake of it. A little saving in weight of armour on the bow and in weight of protective deck would result from the diminished length. The coal supply would be diminished to 900 tons normal and 1,800 tons bunker capacity.

The cost would be only about 15,000*l*. less than Design No.1.

It is obvious that this decrease in displacement and cost is not desirable, since it diminishes the coal supply by nearly 30 per cent.

Design No. 3. (Sketch No. 4.)

This is for a ship in which the speed of 23 knots is to be obtained with Belleville boilers *slightly forced*, as in the “Diadem’s” trials. Armament and protection are as in Designs Nos. 1 and 2.

The essential differences are –

- (1.) A natural draught power of about 21,000 H.P., as in “Cressy,” with a corresponding speed of about 21 $\frac{3}{4}$ knots.
- (2.) A power for continuous steaming of about 16,000 H.P., with a corresponding speed of about 19 $\frac{3}{4}$ to 20 knots.
- (3.) A coal supply of 850 tons normal, with bunker capacity of about 1,700 tons.

The length would be about 450 feet, and displacement about 12,000 tons.

Cost about 730,000*l*., or 100,000*l*. less than Design No. 1.

In view of what is now known as to boiler power provided in “Jeanne d’Arc” and the corresponding speeds likely to be attained, this smaller vessel is not recommended.

Design No. 4.

This is for a ship 450 feet in length and about 10,500 tons displacement, capable of steaming 23 knots for 4 hours. It is absolutely necessary on these dimensions to have recourse to small-tube boilers, and moderate forcing.

The coal supply would be 800 tons normal, with a bunker capacity of about 1,600 tons.

The protection in wake of engines and boilers would be reduced to four inches as compared with the standard thickness of six inches.

The main armament would be 14 6-inch Q.F., 4 in two turrets (as Fig. 3) and 10 in casemates.

The sea-speed would probably be 19 to 19 ½ knots.

The estimated cost is about 620,000*l*.

All the foregoing estimates of cost are based on the tenders for the “Cressy” class.

It is not possible to forecast what influence on quotations will result from the abnormal activity now prevailing in shipbuilding and engineering. That condition must affect both time of completion and cost of production.

(Signed) W. H. White
23 May 1898

Appendix IV

British first-class cruisers laid down 1884-1909¹

<i>Class</i>	<i>Name</i>	<i>Type</i>	<i>Tonnage</i>
Orlando (ld. 1885)	<i>Aurora</i> <i>Australia</i> <i>Galatea</i> <i>Immortalite</i> <i>Narcissus</i> <i>Orlando</i> <i>Undaunted</i>	Belted / armoured	5,600
Blake (ld. 1888)	<i>Blake</i> <i>Blenheim</i>	Protected	9,150
Edgar (ld. 1889)	<i>Crescent</i> <i>Edgar</i> <i>Endymion</i> <i>Gibraltar</i> <i>Grafton</i> <i>Hawke</i> <i>Royal Arthur</i> <i>St. George</i> <i>St. Theseus</i>	Protected	7,350
Powerful (ld. 1894)	<i>Powerful</i> <i>Terrible</i>	Protected	14,200
Diadem (ld. 1895)	<i>Amphitrite</i> <i>Andromeda</i> <i>Argonaut</i> <i>Ariadne</i> <i>Diadem</i> <i>Europa</i> <i>Niobe</i> <i>Spartiate</i>	Protected	11,000
Cressy (ld. 1898)	<i>Aboukir</i> <i>Bacchante</i> <i>Cressy</i> <i>Euryalus</i> <i>Hogue</i> <i>Sutlej</i>	Armoured	12,000
Drake (ld. 1899)	<i>Drake</i> <i>Good Hope</i> <i>King Alfred</i> <i>Leviathan</i>	Armoured	14,150

¹ Since the construction of many classes spanned several years, the initial year in which a class was laid down is given.

Monmouth (<i>ld.</i> 1899)	<i>Bedford</i> <i>Berwick</i> <i>Cornwall</i> <i>Cumberland</i> <i>Donegal</i> <i>Essex</i> <i>Kent</i> <i>Lancaster</i> <i>Monmouth</i> <i>Suffolk</i>	Armoured	9,800
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<i>Class</i>	<i>Name</i>	<i>Type</i>	<i>Tonnage</i>
Devonshire (<i>ld.</i> 1902)	<i>Antrim</i> <i>Argyll</i> <i>Carnarvon</i> <i>Devonshire</i> <i>Hampshire</i> <i>Roxburgh</i>	Armoured	10,850
Duke of Edinburgh (<i>ld.</i> 1903)	<i>Black Prince</i> <i>Duke of Edinburgh</i>	Armoured	13,550
Warrior (<i>ld.</i> 1903)	<i>Achilles</i> <i>Cochrane</i> <i>Natal</i> <i>Warrior</i>	Armoured	13,550
Minotaur (<i>ld.</i> 1905)	<i>Defence</i> <i>Minotaur</i> <i>Shannon</i>	Armoured	14,600
Invincible (<i>ld.</i> 1906)	<i>Indomitable</i> <i>Inflexible</i> <i>Invincible</i>	Armoured	17,250
Indefatigable (<i>ld.</i> 1909)	<i>Indefatigable</i>	Armoured	18,500

Additions

<i>Class</i>	<i>Name</i>	<i>Type</i>	<i>Tonnage</i>
Dreadnought (<i>ld.</i> 1905)	<i>Dreadnought</i>	Armoured	18,120
Bellerophon (<i>ld.</i> 1906)	<i>Bellerophon</i> <i>Superb</i> <i>Temeraire</i>	Armoured	18,800
St. Vincent (<i>ld.</i> 1907)	<i>Collingwood</i> <i>St. Vincent</i> <i>Vanguard</i>	Armoured	19,560

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