THE RUSSO-JAPANESE WAR

TECHNICAL LESSONS AS PERCEIVED BY THE ROYAL NAVY

BY

EUR ING David K. BROWN, RCNC

Introduction

The Russo-Japanese war was fought at a time when great technical changes were taking place in the Royal Navy such as the introduction of the *Dreadnought* and the fire control revolution. In consequence, there was a tendency in the Admiralty to regard the war as old fashioned, fought between ships of an earlier generation, using obsolete tactics. On the other hand, detailed reports were closely studied and, in most cases, action was taken swiftly when thought necessary. Japan was allied to Britain and the RN had a team of observers with the Japanese fleet, led by CAPTAIN PAKENHAM[1] and with ENGINEER COMMANDER PATTISON.[2]

The real lessons of the war as perceived by the RN are obscured by the utterances of the First Sea Lord, 'Jackie' FISHER, who tended to quote the war as evidence in support of his current ideas and, since these changed rapidly, so did the lessons he read. For example, his proposals to scrap a large number of obsolescent ships to achieve financial savings from which the new building programme could be funded, was said to be a lesson of the war though it had been put forward in detail before the war began.

The value of speed

In 1902 CAPTAIN H.J. MAY had argued, on a basis of war games at the War College,[3] that speed was of little value in a fight between battle fleets. He thought that the slower fleet could turn on a smaller radius to keep the faster fleet on the broadside. A paper written by his successor, CAPTAIN SLADE[4], in 1906 is frequently quoted, and clearly tried to bring out the lessons of the war. SLADE pointed out that MAY's manoeuvres were possible only in open water and when neither fleet had a pre-determined destination. When the slower fleet was constrained in manoeuvre, as at Tsushima, and had to reach a specific port the situation was changed. SLADE added detail, pointing out that there would never be enough ships to position them for interception of a faster fleet, that the faster fleet can force or decline action and that time could be won by the faster fleet so that victory could be achieved before nightfall. Tactically, he pointed out that speed enables the fleet to bring the whole broadside to bear quickly and keep it bearing. He also said that TOGO used his speed advantage at Tsushima to chose a position and course which would minimize interference from spray. MAHAN took a different line[5], suggesting that it was undesirable to build a new ship with higher speed as it would have to operate in company with slower ships.

JELLICOE (advised by Phillip WATTS)[6] took a pragmatic view; the cost of speed increases rapidly and that selected should be just below that at which the cost becomes 'excessive'.[7] It does not seem to have been brought out that

the cost of individual ships was effectively limited by politicians and that any increase of speed would mean sacrifices elsewhere. *Dreadnought* evaded this restriction by the introduction of turbine machinery, helped by other changes to the hull.

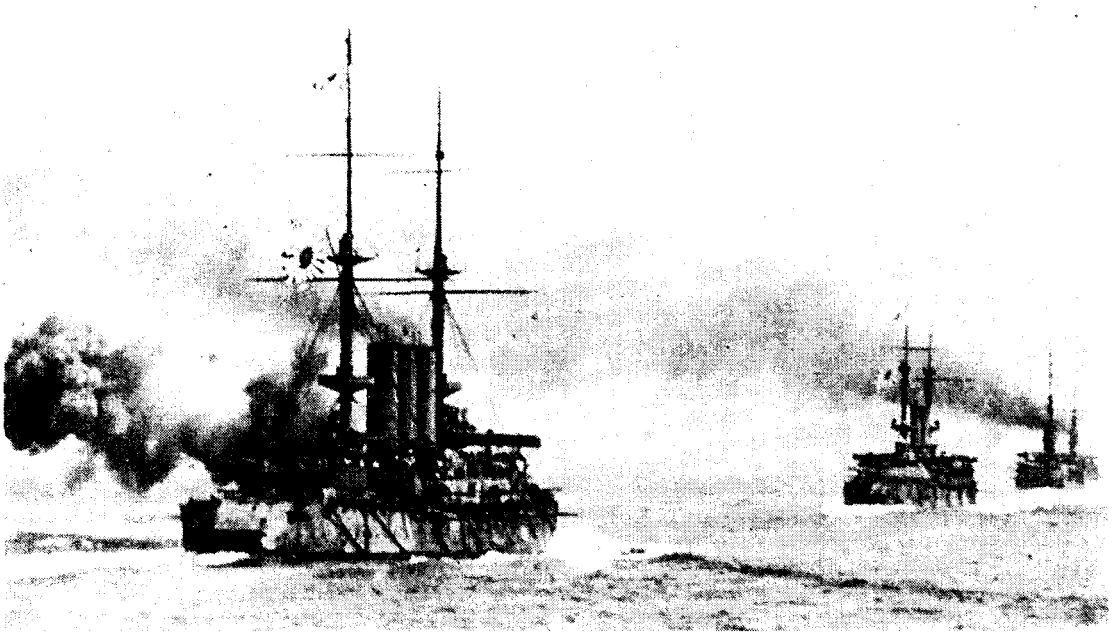

FIG. 1—THE OPENING SHOTS ON THE BATTLE OF 10 AUGUST 1904.
THE REAR SHIP IS THE 'SHIKISHIMA'

On 10 August 1904 (FIG. 1), in the Yellow Sea, the Japanese had only a small speed advantage in speed and were unable, perhaps unwilling, to press the action to a decisive conclusion. At Tsushima the Japanese had a big advantage in speed and were able to control the action. SIMS,[8] quoting LIEUTENANT WHITE, USN, suggests that the speed of the Russian fleet at Tsushima did not exceed 9 knots.[9] This seems quite probable considering the number of old ships in poor condition whilst the extent of fouling during their voyage and long stay at Madagascar would lead to a loss of about three knots on all ships.

Machinery problems

COMMANDER PATTISON frequently mentions the efforts made by the Japanese to reduce the wear on machinery, particularly in 1904. (Remember, they had reciprocating engines) The speed was always kept down, on blockade duty the normal speed was 6–7 knots, though from August to December the big ships were frequently allowed to drift during the day. Even in action, the speed was held down to 15 knots; *Iwate* (FIG. 2) normally never exceeded 150 rpm and only used her full rpm of 160 for 1½ hours during the war. During the 10 August battle, *Asahi* kept to 86 rpm giving half power and about 14.5 knots though her full rpm was 108.

Boilers were cleaned whenever possible but Japanese ships did not dock until December 1904, though divers were used to remove some fouling, and most did not dock again until after Tsushima. At Tsushima the Japanese big ships do not seem to have exceeded 15 knots—*FUJI* couldn't. There was one repair ship with a Constructor Captain, two constructors and two 'engineer constructors'.

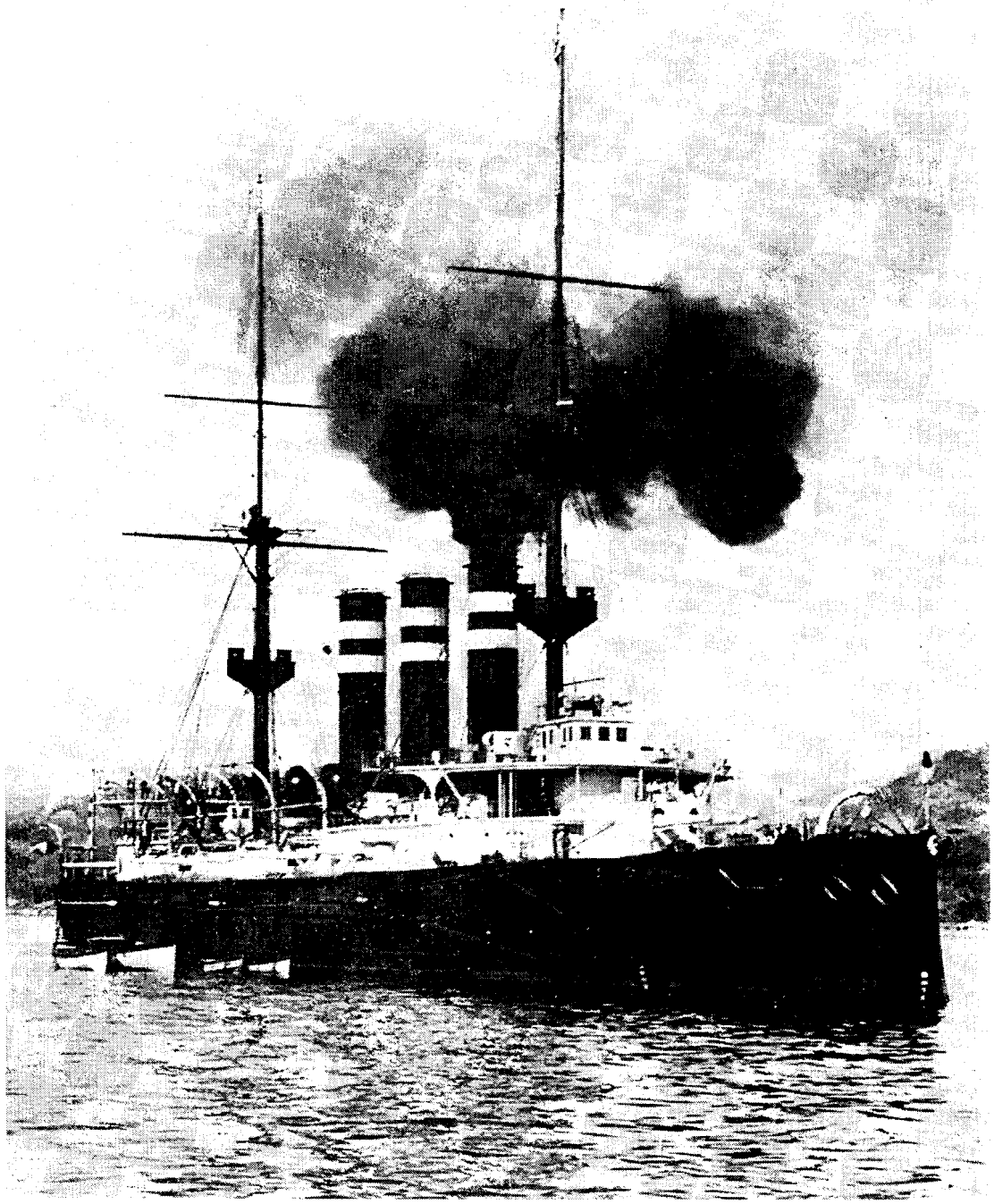

FIG. 2—'IWATE' A JAPANESE ARMOURED CRUISER
BUILT BY ARMSTRONGS, COMPLETED 1900.
DAMAGED AT THE BATTLE OF ULSAN ON 17 AUGUST 1904

Japanese coal was much inferior in calorific value to Welsh and, in the first year, the former was used whenever possible to ensure that Welsh was available for decisive battle.[10] The Japanese were worried that Russian cruisers might prevent further supplies from Wales getting through. Ships were refuelled when possible, taking in 200 ton/hr in harbour (up to 400 maximum) or 100 tons/hr fuelling at sea from junks using 28lb bags.

Guns and shells

The following section deals with gunnery issues;—did they hit, what with and with what effect?—leaning heavily on a report prepared in DNO department in 1906, almost certainly by CAPTAIN E.W. HARDING, RMA,[11] an expert on fire control.

There is strong evidence[12] that both the rate of fire by Japanese ships and the effect of that fire was significantly different between the battles of 10 August 1904 and Tsushima in 1905. SEMENOFF wrote of the latter battle:

> "I had not only never witnessed such a fire before, but I had never imagined anything like it. Shells seemed to be pouring upon us incessantly, one after another." [13]

This statement relates to rate of fire and is supported by evidence that the Japanese were concerned about a shortage of shells, particularly armour piercing, in 1904.

Fire control

Harding wrote[14] that the war:

> ". . . has been rich in lessons on the employment of naval artillery, the more so, perhaps, because it marks the highest achievement of a system of gunnery which is rapidly passing away".

True fire control was extremely primitive in Japanese ships and virtually non existent in the Russian fleet.

Direction of fire was by voice pipe or local control. Japanese ships had Barr and Stroud 4ft 6in rangefinders which were inaccurate at the ranges used and liable to go out of adjustment. The chief RN observer, PAKENHAM, wrote that even a perfect rangefinder[15] would be of little value since individual guns varied so much in performance. He thought a rangefinder might be of value in obtaining an approximation to the opening range but, after that, gunlayers would have to rely on spotting the fall of shot. It is likely that PAKENHAM's views, though wrong, were widely held; indeed, SIMS, the USN's gunnery expert, makes very much the same point based on USN target practice, 1905. It is likely that spotting would be very difficult, even in ideal conditions, at over about 7,000 yards, particularly if also out for line[16] and would be virtually impossible if two or more ships were firing on the same target. Spotting with two calibres close in size would always be impossible.

COMMANDER SIMS, using a track chart prepared by LIEUTENANT WHITE and ENSIGN HENDERSON from notes by a Russian constructor,[17] shows that hits on the Russian ships only occurred when the rate of change of range was low.[18,19] Electrical range transmitters were used and worked well except in *Nisshin* whose were said to be unreliable.

The Japanese believed that fatigue had a major influence on accuracy of firing. They took great pains to rest gunlayers whenever possible—'husbanded eyesight and nervous energy'. Their fire discipline was very good, guns under local control firing only when they had a clear target. SIMS believed that Russian crews were trained for close range action; however, their initial shots at long range were quite accurate, particularly at 10 August (Russian ships at this battle did not have telescopic sights making their performance more remarkable—perhaps it was luck). Russian gunners tended to fire rapidly, even when they could not see.

Telescopic sights were fitted to the Baltic ships just before departure with Krilov sights on the later ships. Barr and Stroud rangefinders were also fitted before departure but in a trial off Madagascar, ranges on a target varied from 7,300 to 11,000 metres. No corrections were applied! There is also a suggestion that there were defects in many Russian guns or mounts.[20]

SIMS suggests short funnels are needed to get control tops above the smoke. This may have contributed to FISHER's desire to abolish or reduce funnels and hence to the unfortunate short funnels of *Invincible*.

Shells and fuses

At the outbreak of war, Japanese shells were filled with 'shimose' (picric acid, similar to Lyddite), the AP shell (base fused) having about a 5% burster and the HE (high capacity, DA fuse) about 10%. The Shimose filling was very sensitive and violent, the high capacity shell, in particular, breaking the casing into innumerable tiny fragments. It was noted that even the base, which was usually blown off intact from powder filled shells, was shattered by Shimose.[21] At 10 August, it was thought that the fuses were too sensitive causing premature explosions which destroyed three of the 12 inch guns.

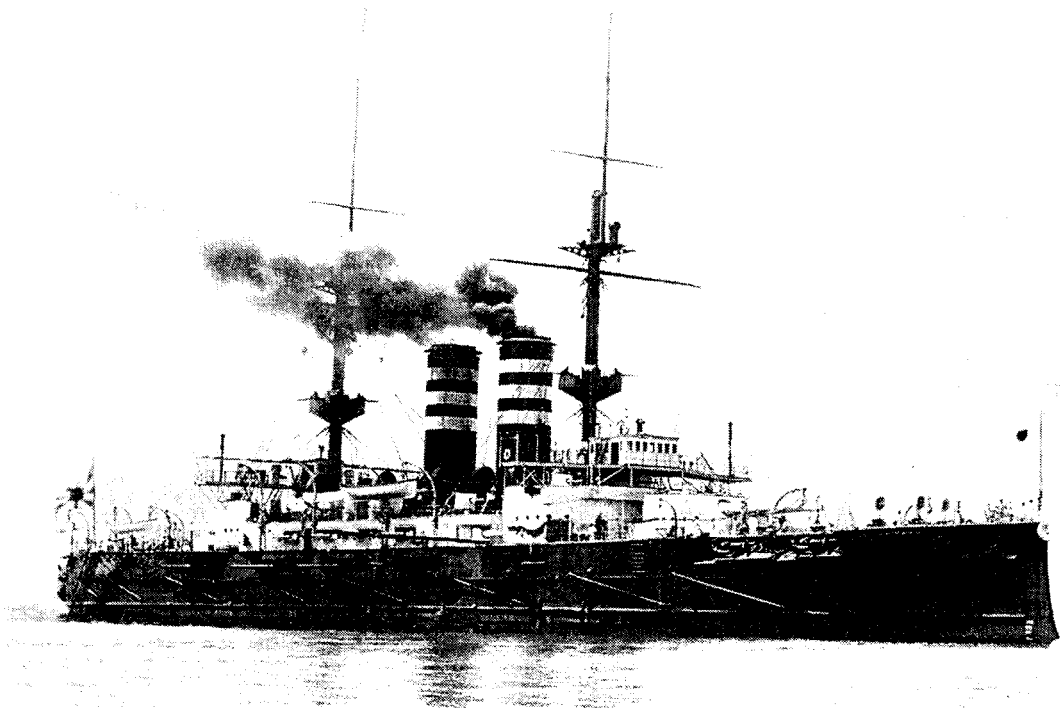

FIG. 3—THE JAPANESE FLAGSHIP 'MIKASA'
BUILT IN ENGLAND BY ARMSTRONGS.
COMPLETED IN 1902 AND MOUNTED FOUR 12 INCH GUNS

Changes before Tsushima

The prematures were blamed on the Ijuin base fuse of the Mk II AP shells[22] and the protection of the fuse against the flame and shock of discharge was redesigned before Tsushima. These precautions seem to have been fairly successful as at Tsushima there were no prematures from 12 inch AP. *Mikasa* (FIG. 3) did have a common shell burst in the muzzle of the right gun of the fore turret without damage. Two hours later, the 28th round,[23] a common shell burst and wrecked the barrel. *Nisshin* had failures in both 8 inch at the same point, suggesting that they were the result of prematures.[24] Even if modifications to the fuses had reduced the chance of prematures, they had done little to improve performance on impact.[25]

Accounts differ widely on what shells were used at Tsushima. It is not well known that a number of high capacity, powder filled shells were issued to Japanese ships before Tsushima[26] but the number of such shells is unknown though it may have been up to three quarters of the outfit. The effects observed suggests that such shells formed a large proportion of those shells fired at Tsushima.

Due partly to the deep draught of the over-loaded Russian ships there were few hits on armour but there were no penetrations on surviving Russian ships and nor are penetrations mentioned by survivors of those sunk. All Russian accounts of Tsushima mention that Japanese shells burst on the least contact. SEMENOFF also says of Tsushima:

> "They (Japanese shells) burst as soon as they touched anything—the moment they encountered the least impediment to their flight. Hand rails, funnel guys, topping lifts of the boats' derricks, were quite sufficient to cause a thoroughly efficient burst."[27]

He continues:

> "In addition to this, there was the unusual high temperature and liquid fire of the explosion which seemed to spread over everything . . . No! It was different to the 10th August!"

Again, there is confirmation of SEMENOFF's opinions. The lack of penetration could be over sensitive fuses, detonation of the Shimose filling on impact or that few AP were fired.

Russian shells

Russian fuses did not do well on 10 August when 2 out of the 16 shells hitting Japanese ships failed to explode and at Ulsan (14 August 1904) 4 out of 15 hits failed. At Tsushima, 8 out of 24 12 inch shells which hit failed to explode as did 28 out of 81 smaller shells which hit. A German account says that in the engagement between torpedo boats on 3 March 1904, Russian shells frequently failed to explode. NOVIKOFF-PRIBOY[28] offers a possible explanation for the failure of the Russian shells. He says that someone at the Ministry of Marine thought that the pyroxylin filling (wet gun cotton) would dry out in the tropics and ordered the moisture content to be increased from 10% to 20-30%. A year later, in 1906, when the fortress of Sveaborg was in revolt it was bombarded by the *Slava* with these wet shells. When the fortress surrendered it was found that few of the shells had exploded. The much higher proportion of duds at Tsushima gives some credence to this story.

It does not seem that the poor performance of shells of both navies was appreciated either in the UK or in the USA; almost certainly the most serious failure to learn from the war. The *Edinburgh* trials of 1910 may have been partly inspired by a suspicion that all was not well.

Penetration of armour

It does not seem likely that any Japanese shell penetrated armour of 6 inch thickness or more. On 10 August there were at least 10 verified hits on Russian armour of 6in or more and there were no penetrations. The Japanese fired 279 AP shells that day. Because many Russian ships were sunk, the evidence is less complete for Tsushima. There were no penetrations of *Orel*'s armour belt though one 12 inch had burst on 5¾ inch armour of the forward belt. SEMENOFF's incomplete account suggests that there were no penetrations of *Suvarov*'s belt or, if there were, they caused little damage or flooding. The even more incomplete accounts from other ships suggest that there were few, if any, penetrations of thick armour. For some ships there are survivors' accounts, for *Orel* a post battle inspection, and these not only fail to mention

any penetration but emphasise that every shell burst on contact. One may see further confirmation of this in the number of prematures, less than in 1904.

There were problems with the support to armour; on 10 August *Tsessarevitch* had a 10 inch plate forced in causing flooding. At Tsushima, *Osliabia* (FIG. 4) had a plate dislodged due to failure of the fastenings and *Orel* had 5 of the 8 fastenings on one plate broken. WHITE[29] describes how a 6 inch plate on *Orel* was forced to pivot, the outer edge being forced out.

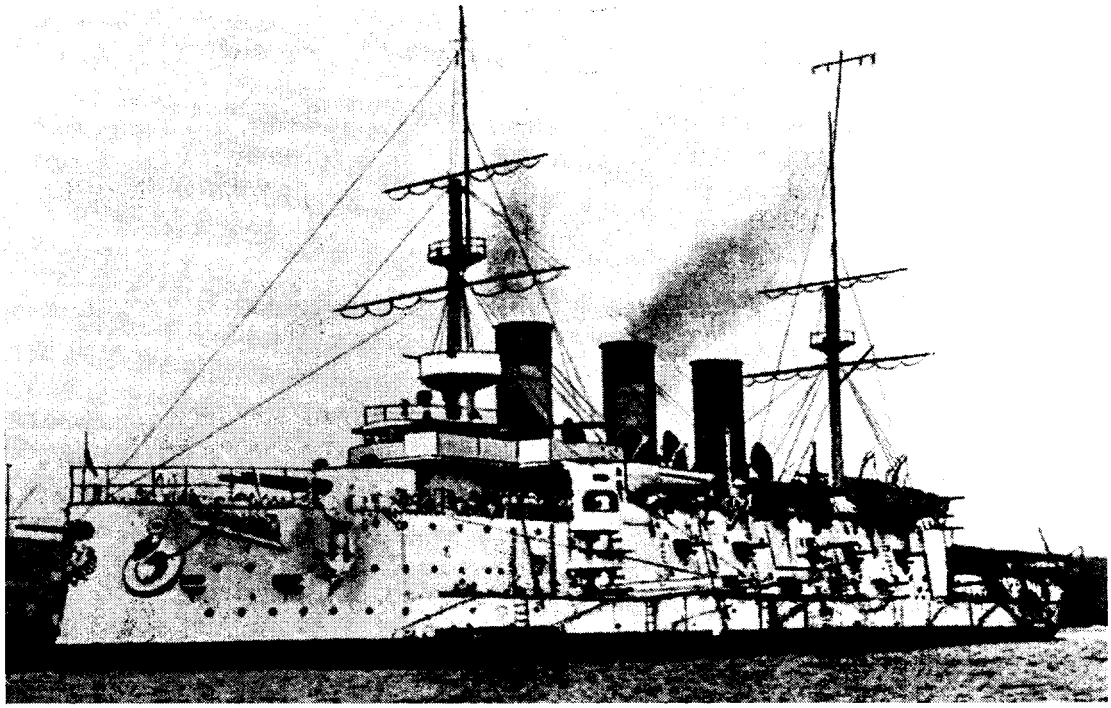

FIG. 4—'OSLIABIA' A SMALL, FAIRLY FAST RUSSIAN BATTLESHIP
COMPLETED 1902 AND SUNK AT TSUSHIMA
NOTE THE TOWERING SIDES WITH NUMEROUS OPENINGS

Russian shells were less sensitive and hence somewhat better at penetration. A 12 inch shell penetrated 6 inch armour on *Shikishima* and burst some distance behind, possibly the only AP shell of the war to function properly, though causing little damage. There were at least six other hits by 12 inch shells on 6 inch armour which pierced to some extent though in these cases the shell seems to have burst while passing through the plate.

Damage to 'Orel'

The damage to this ship is well documented both from official inspections after the battle and from a fascinating, highly coloured but generally accurate account of the battle by a survivor.

> "The *Orel* was hit many times, and large numbers of shells struck the near-by water, drenching us with spray. The sea appeared to form a wall, barring our progress. Vomits of black and brown smoke, jets of flame, fountains of spray thrown up by the bursting shell, created an elemental tempest."[30]

The attachés' reports after surrender and inspection of photos show that the *Orel* was probably hit by five 12in, two 10in, nine 8in, thirty nine 6in and 21 smaller of which 2-12, 5-8, 28-6 & 11 small were on the port side. Table 1 shows that the few 12 inch hits account for most of the weight of shell and burster hitting the ship.

TABLE 1—*Hits on 'Orel'*

Hits			
Calibre	**No**	**Wt Shells (Lbs)**	**Wt Burster (Lbs)**
12	5	4200	405
10	2	980	96
8	9	2250	207
6	39	3400	351

The small number of hits from large shells accounted for a large portion of the projectile and explosive weight hitting the ship.

Conning towers

Damage to conning towers or bridge is of interest. On 10 August, *Tsessarevitch* was hit by two 12 inch shells at about 1837. The first hit the foremast and wrecked the bridge killing ADMIRAL VITGEFT and some of his staff who were standing there (outside the conning tower). The second burst against the projecting roof of the conning tower; blast and splinters entering through the viewing slit killed or wounded everyone inside. In some ships a shelf was fitted below the slit to stop splinters coming through and ricocheting off the roof. At Tsushima, NOVIKOFF-PRIBOY refers to a hit on the conning tower of *Orel* causing casualties from splinters inside[31] whilst early in the battle *Suvarov* had heavy casualties, including ADMIRAL ROJESTVENSKY, from a hit on her conning tower. It would seem that the protection afforded by conning towers was illusory whilst loss of vision was real.[32] The RN continued to fit heavy conning towers up to World War I but they were little used. Alone among major navies, the RN did not fit armoured conning towers in their battleships of the thirties.

Fire

At Tsushima, most Russian battleships were disabled as a result of serious fires long before they were in danger of sinking. Observers comment on the incendiary effect of Japanese shells, SEMENOFF, quoted earlier, says that there was a marked difference from 10 August. It is almost certain that this was due to powder filled shells which were better firelighters than picric acid. There are specific references to paint catching fire with flames either spreading along the surface of fire or spreading from dislodged flakes of burning paint. It is said that the red lead primer did not burn.[33]

A single fire is easy to put out if the fire fighters are unhindered but it is more difficult when they are being fired on and this may be seen as the main contribution of the smaller guns. If there are several fires and fire fighting is hindered by casualties and cut hoses they will spread and join to a single massive conflagration. Ammunition fires seem fairly common and it is surprising that only the *Borodino* blew up; *Iwate* was very close to it. The vulnerability of the lightly armoured ammunition supply routes (and ready use storage) for the secondary armament may be recognized. Casualties in fire parties were severe and due to splinters. HARDING suggests that the serious fires at Tsushima and the long time for which they burnt was due to the coal carried high in the ship. The RN had done much to reduce the risk of fire after the Spanish-American war but there was some further attention was given to the subject and fires were rare in World War I.

Big guns or 'hail of fire'

Most of the post war debate centred on whether the Russian ships were destroyed or disabled by the effects of 12 inch shells or by the 'hail of fire' from smaller guns, particularly 6 inch. JELLICOE in two papers written in justification of the 'all big gun ships' [34] largely ignores the war and bases his arguments for the 12 inch on the rate of hitting during RN battle practice.

TABLE 2—*Rates of fire*

Gun	Rate of fire per minute	
	Gunlayers (Starting with gun loaded)	Battle Practice
12 in	2	1
9.2 in	5	2
6 in	12	4

He shows that the rate of fire in battle practice corresponded closely to that achieved by the Japanese. He emphasised the need to make a clear distinction between rate of fire and rate of hitting which became increasingly important as range was increased.

The senior Royal Navy observer, CAPTAIN PAKENHAM, gave his views in the following well known quotation:

> "The 10 inch guns of the *Peresviet* and *Pobeida* were of 45 calibres, and may also be of greater range, but the effect of every gun is so much less than that of the next larger size, that when 12 inch guns are firing, shots from 10 inch pass unnoticed, while, for all the respect they instil, 8 inch or 6 inch guns might just as well be pea shooters, and the 12 pounder simply does not count. This must be understood to refer entirely to the moral (*sic*) effect."

It is not clear what PAKENHAM based this statement on though it seem consistent with accounts by Russian survivors. It should be noted that PAKENHAM is referring specifically to morale effect. (A sentence too often omitted)

The DREADNOUGHT committee minutes mention briefly the Yellow Sea battle as confirming their views on the value of speed and big guns. In an attempt to decide on the merits of big or medium guns it is necessary to look at fire control and the chance of hitting and on shells for the resulting damage.

Cause of sinking

From Russian accounts one can see a number of common factors, a gradual breakdown of command due to injuries to senior officers and the difficulty in passing orders as voice pipes were cut, access was obstructed by debris, structural damage and fires together with a hail of splinters on the upper deck.

Splinters also affected the stopping of holes above the waterline; not difficult if unhindered, virtually impossible under fire. Such holes led to a build up of water above the protective deck as the ship rolled in the heavy seas off Tsushima, reducing stability and possibly giving a heeling moment. Fire fighting water added considerably to the problem. *Suvarov* had quite severe flooding through a lower deck gun port.

The centre of gravity was high in the Russian ships of French style, with towering sides, and a satisfactory intact metacentric height was obtained by

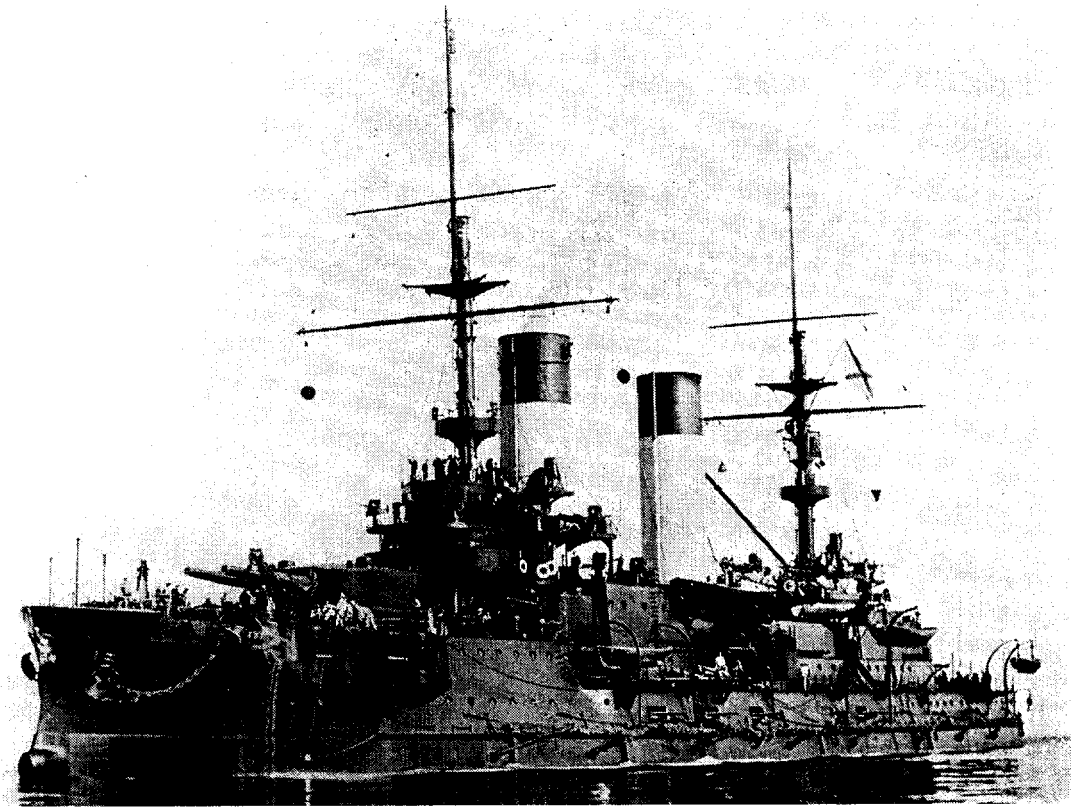

FIG. 5—'ALEXANDER III' OF THE SUVAROV CLASS
THE MOST MODERN RUSSIAN BATTLESHIPS MOUNTING FOUR 12 INCH GUNS SUNK AT TSUSHIMA TOGETHER WITH TWO SISTERS WHILST ANOTHER, 'OREL' SURRENDERED

increasing the beam.[35] Much of the benefit of beam is lost when extensive flooding occurs and it is virtually certain that the stability of these ships after damage was very poor. The centre line bulkhead in the machinery spaces would lead to large heeling moments whilst the righting moment would be seriously reduced if hits had made the upperworks non-watertight whilst the tumble home would further reduce the righting moment. It was a combination of a high centre of gravity, asymetric flooding and reduced righting moment which led to capsize though in the case of *Alexander III* (FIG. 5) and *Osliabia*, flooding of the lightly protected ends was a contributory factor.

PAKENHAM drew attention to the dangers of centre line bulkheads in several of his reports. No attention seems to have been paid to this point which was probably the prime cause of capsize. At the time, capsize was blamed on tumblehome which was used only to a small extent in British ships prior to WW I. He also pointed out the need for unpierced bulkheads and, quite reasonably, it was felt that efforts already in hand, e.g. *Lord Nelson* and *Dreadnought*, were adequate.

Due to failure of the shells, there was no clear guidance on 'all big gun' versus 'hail of fire'. Indeed, the big gun enthusiasts, such as Jellicoe, only referred to the Russo-Japanese war in most general terms. At the short ranges of Tsushima there does seem to be some support for the 'hail of fire' theory as splinters inhibited leak stopping and fire fighting.

Armour

British policy was to fit a fairly thick and deep belt between the turrets with a thinner, upper belt which would keep out all HE shells. The Japanese ships were all of this style, *Mikasa* was generally similar to the *Formidable*

but with thicker turret protection. *Mikasa* received 12 heavy hits at Tsushima but was little damaged; a tribute to ineffective shells rather than to her armour. There was little change in philosophy in either navy after the war though the upper belt was omitted in *Dreadnought*[36] since there was no secondary armament to protect.

The Russians, in their first post war design of the GANGUT class adopted a scheme[37] with thinner armour, spread over a larger area which may be seen as consistent with their view that the serious damage was inflicted by medium calibre, high capacity, HE shells.

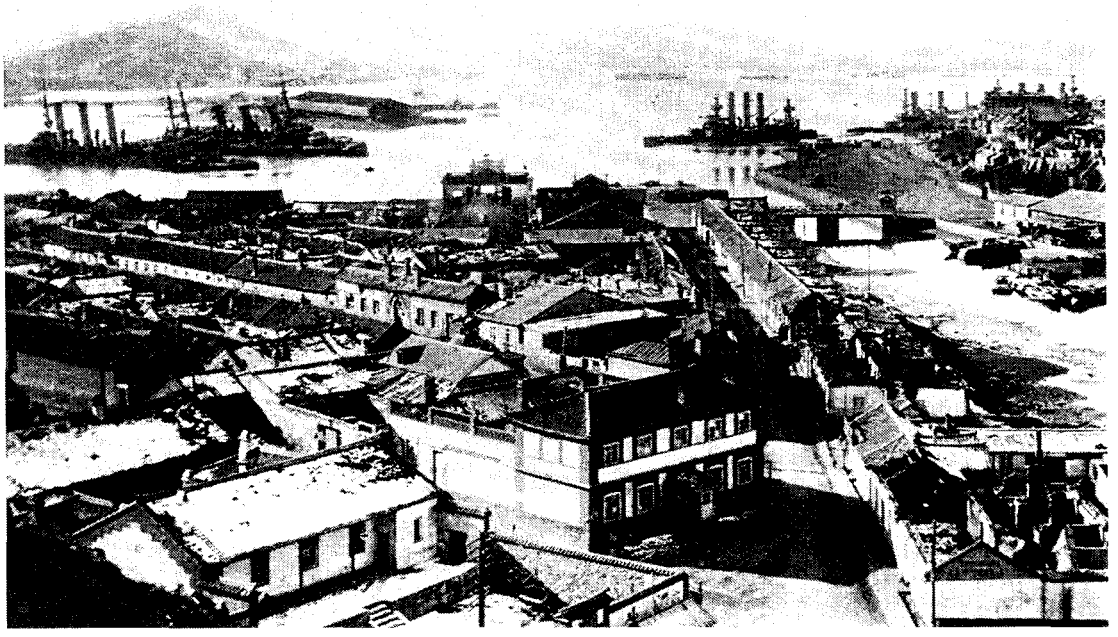

FIG. 6—RUSSIAN SHIPS SUNK AT PORT ARTHUR BY HIGH ANGLE OF GUN FIRE AND SCUTTLING

High angle of fire and deck protection

The attack on Russian ships at Port Arthur by Japanese Army 280mm howitzers appeared, according to some accounts, to show a weakness in deck protection (FIG. 6). Accounts differ greatly as to the cause of sinking of the Russian ships at Port Arthur; it is variously claimed that they were scuttled before they came under fire, that they were sunk by gunfire or that they were damaged and finally scuttled. The most likely explanation is that all explanations were true but for different ships. There is also conflict on the nature of damage caused by gunfire.

On 4 December, the day before the Japanese finally captured 203 Metre Hill, they established an observation post on the slopes.[38] Indirect fire began from eighteen 11 inch howitzers and ten 4.7 inch naval guns, *Retvizan* suffering most. The howitzers used were made at Osaka, and fired a 480lbs projectile for 12,242 yards.[39] On 5 December the *Poltava* was sunk following a magazine explosion[40] and *Retvizan* hit again; she was sunk the next day. On the 7th the *Pobeida* and *Pallada* were sunk by gunfire and *Peresviet* scuttled after damage. It is quite possible that other ships were scuttled in shallow water, early on, suffering damage from gunfire whilst resting on the bottom.[41] Inspection of the wrecks showed the following hits:

TABLE 3—*280mm hits on Russian ships at Port Arthur*[42]

Ship	Hits on deck	No penetrated	Hits on side
Bayan	7	5	5
Pallada	6	0	2
Pobyeda	3	1	6
Peresvyet	9	8	2
Poltava	3	2	2
Retvizan	2	1	4
Totals	30	17	21

Of the 30 big shells hitting the decks, just over half reached the protective deck. The British account suggests that most shells did explode but caused little damage but a German account says that many shells failed to explode; those which did burst on the deck making a hole in so doing. Damage below the deck was local and not severe. The German account instances *Peresvyet* saying that 12 shells hit the upper deck of which 11 passed through to hit the main deck. Six of these went through and hit the armour deck of which 4 penetrated. Those which burst on the armour deck dished it slightly while there was very little damage from those which burst below. This seems broadly in accordance with the British account of the hits on *Bayan* where 4 burst before reaching the protective deck and 3 burst on it causing only slight damage.

The towering hulls of the Russian ships helped to protect them from high angle of fire and the thin protective decks (1¾–2 in) were sufficient to prevent serious damage under these conditions. Some ships had put extra steel plates or sandbags on the upper deck but these were not well thought out and were ineffective. The British report says that some of those listed as hitting the side exploded in the water and led to flooding. However, the German report says that divers who examined the wrecks said that they were sunk by scuttling charges. This is confirmed by REAR ADMIRAL WIREN[43] who says 6–8 torpedo warheads were placed round each ship and exploded just before the surrender on 2 January but there was little time and most of the crews were fighting ashore so that the work was not well done and some charges failed to detonate.[44]

The British view was that high angle of fire against ships at sea was unlikely as the long time of flight would make hits unlikely. The protective deck was intended to prevent damage below from shells bursting above it; the deck was not expected to be hit directly by a shell. At the ranges used in 1905, this was a reasonable line to take.

Armoured cruisers or second class battleships

Once TOGO had lost two of his six battleships to mines, he was forced to use his powerful armoured cruisers in the battle line and, since the Russian fleet had many second rate (or worse) ships at Tsushima, their value was over-rated. It does seem as though *Osliabia* was mainly sunk as a result of fire from cruisers but she was a strange ship. Her main armament was four 10 inch, barely more than the latest cruisers, and she was fast for the day. She had a fairly thick belt (9in Harvey) but it was very shallow and her towering sides made her a fine target for cruiser guns. If an armoured cruiser is to double as a second class battleship, the arguments for an all 12 inch armament apply.

During the battle of Ulsan on 17 August 1904 the *Iwate* was hit by an 8 inch shell in the forward upper 6 inch casemate and the Ready Use ammunition detonated. The explosion put out the lower casemate and the neighbouring upper deck casemate as well together with a 12 pounder. One officer and 31 men were killed and 43 wounded of whom 9 died later. The Captain of *Iwate* said that at 0700 a shell hit No 1 casemate and burst simultaneously with an own shell. Casemates 1, 3, 9 and a 12pdr were disabled. This could have alerted the RN to the dangers of ammunition explosions.

Scouts

The Japanese seem to have relied on destroyers for scouting, based on the Elliot islands though they were always supported by cruisers. This was used by FISHER in arguing that nothing was needed between a big destroyer and a battle cruiser.

Torpedoes—Japanese equipment

The pre-war Japanese torpedo boats came from Schichau and Normand and their destroyers from Yarrow and Thornycroft. The first home design, *Harusame*, was said to be a mixture of the British designs. The only wartime change was to fit an extra 12pdr in place of a 6pdr. The Japanese torpedo force consisted of 22 destroyers (2 mined during the war), 38 first class TB, 35 second class and a few third class of which 4 were sunk in action and some as minesweepers.[45] All destroyers were fitted with W/T with a range of about 60 miles. The Russians had 25 destroyers at Port Arthur of which 6 escaped; 20 torpedo boats at Vladivostock (4 mined) and 9 destroyers with the Baltic Fleet of which 2 escaped.

It is uncertain what torpedoes were used by the Japanese Fleet. Older ships carried Schwartzkopff, described by the IJN as Types 84 and 88, believed to be Schwartzkopff models C/84 and C/84A of 35.6 cms (approx 14in). A British report [46] gives the following data on Whiteheads supplied to Japan:

TABLE 4—*Whiteheads supplied to Japan*

Diameter	Length	Weight lbs	Range Yards	Speed Knots	Charge Lbs
14	15	747	656	26	110
18	12' 1"	864	800	62.3	110*
18	16' 5"	1188	1093	27.8	198

Note: *denotes submerged tubes

In 1904, Japanese torpedoes were not fitted with gyros.[47] In 1905 only a few were so fitted. There was a reserve of 226 torpedoes in store on 1 December 1904.

Opening actions

Up to the start of this war there had been no effective torpedo attacks on moving ships. Three divisions of Japanese destroyers were already on the way from their base at Round Island, some 60 miles away when the Declaration of War was handed to the governor at about 10pm on the 8th.[48] The Russian ships lay outside the harbour with their nets out but otherwise unprepared to fight. The first division of four destroyers fired two torpedoes each (one from one boat) while steaming 'dead slow', scoring three hits. They thought that they had fired at 500 yards but it is likely that the range was at least 800 yards. It is possible that the fourth boat closed to 400 yards

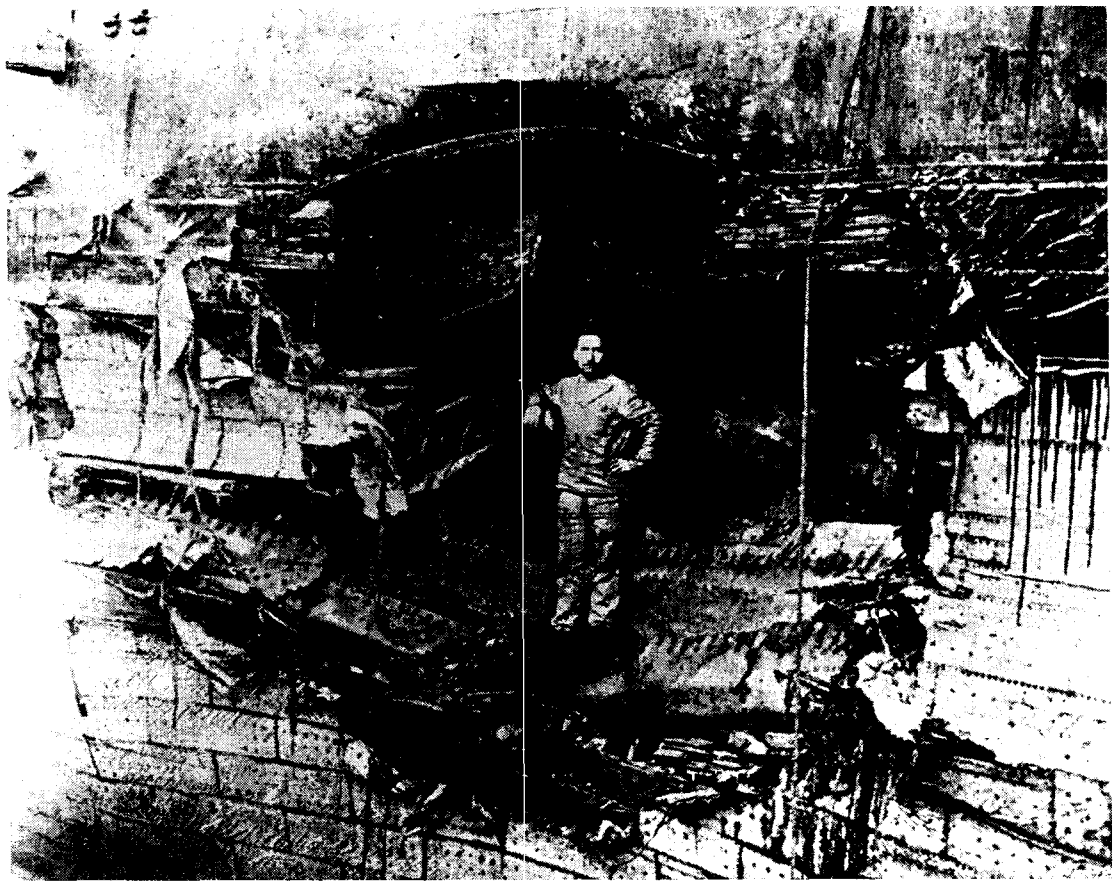

FIG. 7—TORPEDO DAMAGE TO THE RUSSIAN CRUISER 'PALLADA'
COMPLETED IN 1902

hitting both *Retvizan* and *Pallada* (FIG. 7). The second division had been thrown into confusion by a near collision with the first division followed by a near encounter with a Russian guard ship and the third division had also been confused by the Russian patrol and no more hits were scored.

Altogether 10 destroyers fired 19[49] torpedoes for 3 hits against an unready force at anchor. Japanese doctrine called for ships to attack individually, the risk of collision being too high in mass attacks. They also had too much faith in the accuracy of the torpedo, attacking at too great a range—often greater than they realized.

The three ships hit were not sunk but damage from the 18 inch warhead[50] was severe. The most interesting is *Tsessarevitch* which had strong longitudinal bulkheads protecting her magazines from underwater explosions. She was probably hit abaft the magazine, 80 feet from the stern, but the British believed she had been saved by the bulkhead and fitted similar protection in the *Dreadnought*.[51] *Retvizan* was hit on the port side 80 feet from the stem and completed repairs on 28 May, *Tsessarevitch* on 8 June and *Pallada*, hit amidships abreast a boiler room, completed on 16 June. Watertight doors were said to be shut but flooding spread through ventilation trunks.

There was an inconclusive encounter between the fleets on 23–4 June 1904 and Japanese torpedo craft attacked as the Russians were re-entering Port Arthur. It was a bright, moonlit night; 67 torpedoes were fired and there were no hits.[52] The Japanese claimed that they fired at between 440 yards and 1600 yards but it is likely that the true range was greater, though less than the 3 miles given in Russian accounts. There were several other minor encounters in which torpedoes were fired but no hits were scored.

August 10th—Battle of the Yellow Sea

During the main action the fleets were never within torpedo range of each other but there were numerous torpedo attacks on the Russian fleet as it returned to Port Arthur. The night was quite favourable for attackers; no moon but mostly clear and starlit but with a little haze. Good eyesight could detect a battleship at a mile and a half and a destroyer at about 1,000 yards.[53] There was enough swell to slow the attacking force which consisted of 17 destroyers and 29 torpedo boats. Between them they fired 74 torpedoes (which suggests most boats fired) and scored no hits. Most claimed to have fired at 400–600 yards but, again, this was probably an under estimate. The Russians seem to have avoided the use of searchlights and only fired occasionally. Once again, the Japanese tended to attack individually but, until radar and voice radio, co-ordinated attacks, particularly at night, were difficult if not impossible.[54]

'Sevastopol'

Following the Japanese capture of 203 Metre Hill at Port Arthur the *Sevastopol* left the harbour on 9 December 1904 and moored out of sight of the Japanese howitzers, protected by nets. By 16 December the Japanese had launched six gallant attacks on her involving 30 torpedo boats (of which two were lost), two mine launches and three picket boats. Japanese reports show that 124 torpedoes [55] were fired of which one hit and at least two exploded in the nets close enough to cause damage. CAPTAIN von ESSEN's defence was well planned and bravely carried out but it was not a conspicuous success for the torpedo. *Sevastopol* was scuttled in deep water at the surrender.

Tsushima—27 May 1905

Daytime

About 20 torpedoes were fired by the Japanese during the daytime phases, mostly at *Suvorov* after she was disabled. Of the battleships, *Mikasa* fired four single shots against various targets and *Shikishima* fired two. These six torpedoes were the only ones fired during the war by the large number of torpedo tubes in the big ships of both sides. Even the close range at which gunnery actions were then fought was too great for torpedoes prior to the introduction of the heater and gyro. *Iwate* fired four torpedoes, probably the only ones of the war fitted with gyros, at a Russian cruiser at a range of 2000 yards, but failed to hit. The torpedoes were set for 26 knots and 1000 yards! [56] These torpedoes were the only ones fired in battle from the numerous submerged tubes in both fleets.

The despatch vessel *Chihaya* fired two 14 inch at *Borodino* at 1505 at a range of about 2750 yards and two more at *Suvorov* at 1539—at 1800 yards (another stuck in the bow tube). The 5th destroyer division fired five against *Suvorov* at about 1540, probably no hits (2 claimed).[57] About 1600 the 4th division carried out a brave attack—brave since each of the attacking destroyers also carried eight 100lb mines on deck—they fired four torpedoes for no hits. Finally, the 11th torpedo boat division (2nd class, 88 tons) was called on to despatch the battered *Suvorov*. Steaming at 20 knots, they fired 7 torpedoes for three hits at about 800 yards which caused the disabled battleship to capsize and sink within ten minutes.[58]

Night attacks

The sea was rough during the battle and the crews of the destroyers in company were exhausted [59] whilst the commanding officers had very little idea of the progress of the battle or where they were. The torpedo boats had been ordered to shelter at Miura or Kosaki but at about 1450 they sailed to

join the fleet. The sea was on the beam and it was reported that they rolled 50–60°, straining the hulls.

> "Telescopes and glasses were so drenched with spray and spume that nothing could be seen through them, and the men in the torpedo craft had been blinded all day with spray and spume till their eyes were suffused with blood and their sight much impaired." [60]

The Russian ships were picked up using their searchlights at 2000 and the action was inevitably confused. Altogether, 21 destroyers and 32 torpedo boats were available in the area at night of which 14 were unable to fire. A total of 87 torpedoes were fired,[61] 50 by destroyers, 37 by torpedo boats, mostly at close range—400–500 yards. Four hits are known to have been made, one on the small armoured cruiser *Monomakh*; low in the water, she was scuttled the next morning when more Japanese ships approached. The other hits were on ships already disabled; *Nakhimoff* was torpedoed forward and was scuttled off Tsushima the next morning to avoid capture. *Sissoi* was hit in the stern disabling the rudder and one propeller and sank off Tsushima next day. *Navarin* was sunk by the explosion of two mines dropped ahead of her by the gallant 4th division.

This meagre success cost the Japanese two torpedo boats sunk by gun fire, one by collision besides three destroyers completely disabled by collision and one by gun fire with 32 killed and 86 wounded. The morale effect on the Russian Fleet was considerable and was a factor in the surrender on the 28th.

It would seem that the Japanese planned to use divisional attacks of about four boats but, in the confusion of a night action—particularly in such bad weather—even this degree of concentration was not possible. The danger of collision was high as was that of formations breaking up to avoid collision. Most of these problems were unsolved at Jutland and, indeed, it is likely that they were insoluble until the introduction of radar and Talk Between Ships radio.[62] Torpedo attack from destroyers was not effective, day or night, in 1905. The value of torpedoes in battleships and cruisers was zero and only represented an additional hazard.

The total number of Japanese torpedoes fired during the war is in doubt but the Table 5 is of the right order.[63]

TABLE 5—*Number of Japanese torpedoes fired*

Month	Number
February 1904	53
June 1904	56
August 1904	48
December 1904	124
Tsushima	87 (Assumed)
Total	**350**

The three hits on the night off Tsushima seem to be the only ones on moving ships.

Mine warfare

There were heavy casualties on both sides from mines. The Japanese lost a third of their six battleships in one day, whilst the sinking of *Petropavlovsk* off Port Arthur on 13 April 1904 killing ADMIRAL MAKAROV deprived the Russians of their only competent leader. *Pobeida* was damaged on the same occasion.

In all, the Japanese lost to mines the *Hatsuse*[64] and *Yashima*[65] (battleships). *Hei-Yen*, *Takasago*, *Miyako* and *Sai-Yen* (cruisers) and five smaller ships. The Russians lost *Petropavlosk*[66] while the *Sevastopol* was mined twice without being sunk. *Navarin* was sunk by floating mines dropped ahead during the night after Tsushima; a form of attack much feared by JELLICOE.

Lessons

Protection

The most immediate task was to improve the protection of the *Dreadnought* (whose design was almost complete) against underwater explosions. Several papers mention the *Tsarevitch* and her survival after a torpedo hit which was attributed to her thick, inboard, longitudinal bulkhead and it was decided to try a similar scheme. (in fact, the hit was abaft the protection) A test section was built into a merchant ship, the *Ridsdale*, for trial.[67] The trial was conducted with unusual secrecy[68] and no full account has been located.

The British observers with the Japanese fleet frequently pointed out the value of unpierced transverse bulkheads in surviving underwater explosions. *Yakumo* was the only Japanese ship with unpierced bulkheads and it was noted that these caused little inconvenience once one was used to them. PAKENHAM also pointed out that doors to coal bunkers could rarely be shut properly, something already well known. In fact, there had been a gradual reduction in the number of doors below the water line following the loss of the *Victoria* and *Lord Nelson* was designed as the first ship with unpierced main bulkheads.

Minesweeping

There is very little published information on RN work on minesweeping as a result of the war but many hints show that such work was extensive, effective and implemented. By January 1908, FISHER told a sub committee of the Committee for Imperial Defence that mines could easily be cleared but he would not explain the technique as this would 'throw away one of the deepest secrets' possessed by the Navy.[69] That year the conversion began of 13 torpedo gunboats to carry the new sweeping gear.[70] The nature of the sweep is not known but it is likely that it was a wire sweep between two ships using kites to depress the wire. By 1913 it was reported that sufficient gear had been stock piled to equip 82 trawlers and a special reserve force trained to sweep mines was ready.

Mines

In May 1905 FISHER set up a committee to decide on the number of mines required for war. They decided on 10,000 of which 3,000 were to be laid off the Elbe, Weser and Jade. An initial order was placed for 10,000 of the naval spherical type—which subsequently proved almost useless. In 1906 the old cruiser *Iphigenia* was converted into a minelayer, followed by six sister ships.[71]

Enthusiasm then waned, presumably because of the effectiveness of sweeping. By 1914 there were 4,000 mines and though trials of foreign, Herz horn mines had been carried out, none had been ordered. It is likely that there was no direct decision to abandon minelaying but other material was higher priority.

Conclusions on mine warfare

The lessons of the Russo-Japanese war as regards mine warfare were read and acted upon. The scale of the threat was underestimated and it is likely that the success of sweeping gear was over-estimated. Perhaps it was still thought that the Germans would only lay in accordance with international law. GOODALL, visiting the cross channel passenger steamer, *Konigin Luise*, in May 1914 noted that she already had sponsons fitted for minelaying. She was sunk laying mines off Harwich on the first night of the war. FISHER's unusual emphasis on secrecy has led to an incorrect belief that the RN did little on MCM before 1914.

General Conclusions

The RN was generally correct in seeing the war as an old fashioned one from which few lessons could be drawn. However, it is clear that the war was studied very carefully, that some lessons were drawn and, in most cases, swift and effective action was taken to implement necessary changes. The war was seen as confirming many existing ideas and was used to support much of the FISHER revolution. Poor NEBOGATOV's third squadron showed that obsolete ships were a hindrance of no value and the value of speed was reconsidered.

The main debate after the war was between supporters of the all big gun ship and the 'hail of fire' enthusiasts (including WHITE, the former DNC) both of whom claimed that the war supported their views. With hindsight, it seems clear that 10 August demonstrated the possibility of long range fire—over 12000 yards—which made a considerable number of 12 inch essential for salvo firing. Tsushima was fought at closer range and the evidence seems less clear. However, closer examination of the damage, such as the table of damage to *Orel*, demonstrate the destructive power of the larger shell. The value of the 'hail of fire' in disrupting fire fighting and leak stopping is often neglected, even by supporters of the 6 inch.

The RN was concerned over the destructive power of the big, high capacity shell, probably as a result of the *Belleisle* trial. It was this which led them to retain a lighter upper belt and light protection to the waterline rather than an all or nothing scheme as in the USS *Nevada*. It was probably the same reasoning which led British designers to pay a lot of attention to protection and duplication of *Dreadnought*'s fire control communications.

The Admiralty were satisfied with their fire precautions and World War I largely justified their confidence. They also were satisfied with subdivision and this was not entirely justified. PAKENHAM had warned of the dangers of longitudinal bulkheads but these were to topple many ships in the coming war. Spread of flooding through vent trunks etc. remained a problem. Unpierced bulkheads had already been introduced in *Lord Nelson*. Mines took a terrible toll of ships in 1904–5 and the British actions were prompt and sensible though not entirely adequate.

The one serious failure was in not recognizing that Japanese problems with over sensitive fillings of picric acid (Shimose or Lyddite) and AP fuses which detonated before penetration applied to the RN as well. New shells were being introduced at this time and it is probable that it was thought that any such problems had been overcome. Most tests of penetration were with unfused shell (often inert filled) and these failings were not apparent.

Acknowledgements

I must thank the following for supplying information, papers, ideas and criticism. Messrs:—
J. BROOKS, J. CAMPBELL, Dr A. LAMBERT, S.A. LILLIMAN, I. MCCALLUM,

ADMIRAL R. MORRIS, Dr J.R. RECKNER, J. ROBERTS, P. SIMS, A. SMITH, PROFESSOR J. SUMIDA.

References

1. Reports of Naval Attachés. MoD Library.
2. He died before completing his report.
3. Exercises carried out at the RN College. PRO ADM 1/7597.
4. CAPTAIN J.W. SLADE MVO, RN. 'Speed in Battleships', War College, 31 May 1906.
5. MAHAN, A. T. 'Reflections, Historic and other, suggested by the Battle of the Japan Sea.' USNI Proceedings, 1906. (Also US Senate papers 14 January 1907 and National Review 1906)
6. An anonymous paper, 'Building Programme of the British Navy. The Lessons of the Russo-Japanese War in their application to the Programme of Armoured Shipbuilding of Britain, Germany and France'. This paper, held in the Tweedmouth Papers, MoD Library, appears to have been written largely by JELLICOE as DNO, with input from Phillip WATTS (DNC). Only 12 copies were printed.
7. Resistance and hence power for a given speed increase very rapidly as a speed given by V kts = Sq rt(L ft) is approached, close to that selected for *Dreadnought*.
8. SIMS, COMMANDER W.S. USN. 'Big Battleships of High Speed'. This paper was written for President Theodore Roosevelt and, with his permission, passed by SIMS to FISHER (subject to deletion of the paragraphs on fire control).
9. This figure is also given by: NOVIKOFF-PRIBOY, A. *Tsushima, Grave of a Floating City.* London, 1937. (Referenced as N-P). To some extent, SEMENOFF (Ref 12) concurs.
10. Typically, a battleship might use 18,000 tons of Welsh and 3,000 of Japanese throughout the war.
11. *A study of the events of the Russo-Japanese War from the point of view of Naval Gunnery.* Originally CB 47 (confidential book) it was widely circulated—ca 200 copies. It will be referenced as CB 47. Written in 1906, probably by CAPTAIN E.W. HARDING, RMA, there are a few errors and omissions but, overall, it is a most valuable paper.
12. SEMENOFF, COMMANDER V. *Rasplata, 1906* and *The Battle of Tsushima, 1908*, Both John Murray, London.
13. SEMENOFF, V. *The Battle of Tsushima.* Murray, London, 1908.
14. CB 47.
15. The Japanese used British 4ft 6in instruments.
16. Based on a talk by Professor J. SUMIDA at Kings College, London, 12 January 1995.
17. WHITE, R.D. *With the Baltic Fleet at Tsushima.* USNI Proceedings, June 1906. SIMS says that this is an edited version of notes prepared by a Russian constructor acting as an observer on a battleship. WESTWOOD mentions that a constructor, V.P. KOSTENKO, was an observer in a battleship. (WESTWOOD, J.N. *Russian Naval Construction 1905–45.* Basingstoke 1994.)
18. SIMS, LIEUTENANT COMMANDER W.S. *The Inherent Tactical qualities of all-big-gun, one-caliber battleships of high speed, large displacement and gun power.* This was written for President Theodore ROOSEVELT; 508 copies were printed. With the President's permission, a copy was sent to FISHER with some of the fire control section deleted. SIMS had an extensive correspondence with several RN officers and it is likely that he was aware of much of the RN reports on the war, possibly filtered.)
19. The RN Gunnery Manual of 1894 had made this point but it was demonstrated more clearly by the battle.
20. *Moniteur de la Flotte*, 18 November 1905. Not a very reliable source but one in which ROOSEVELT took an interest.
21. In some cases, where an AP shell hit light structure, there were two holes, one of entry and the other from the base being blown back.
22. Mk I & Mk II were identical except they came from different manufacturers. It is likely that Mk II was from Kure. Mk I from Hadfield. The fuse design is attributed to Ijuin but it is likely that it was based on the Krupp-Vickers fuses used in the RN.
23. Note *Mikasa*'s rate of fire; 28 rounds in 2 hours, and she was probably the most heavily engaged Japanese ship.
24. Photograph in Japanese Naval Vessels, Vol II, page 191. The young YAMAMOTO lost two fingers in one of these explosions.
25. A German account suggests that wire wound guns were to blame—unlikely. Marine RUNDSCHAU 1904 and Mitteilungen aus dem Gebiete des Seewesens 1904, quoted in Eisenberg, A (trans). *Naval Experiences of the Russo-Japanese War.* ASNE Journal Vol XXI/1 Feb 1909. From Artilleristische Monatshefte of Feb 1907
26. CB 47.

27. McCallum suggests that some of the 'HE' were actually high capacity, powder filled which would account for their incendiary effect.
28. N-P
29. White, R.D. as ref 15, page 617.
30. Novikoff-Priboy
31. N-P page 179.
32. The only Japanese admiral, Misu, who used a conning tower on *Nisshin* at Tsushima was the only one to be wounded! CB 47.
33. It is interesting that these accounts refer to Suvarovs which were new ships and, as such, would not have had too many coats of paint.
34. Jellicoe as 11, summarized in: Brown, D.K. *Battleship Design*. Warship World, Vol 4, No 1, Winter 1991. See also causes of sinking.
35. It is suggested by Klado and others that weight growth during building left the Suvorovs with an inadequate metacentric height when completed.
36. Note that Fisher asked for this disposition in Naval Necessities (Vol I). It was not a later economy measure.
37. Westwood, J.N. *Russian Naval Construction 1905–45*. Basingstoke 1994.
38. Official History (naval and military) of the Russo-Japanese War, Vol II. London, HMSO, 1912. ca p 628.
39. Smith suggests 1210 ft/sec and range 9850 yds.
40. Photographs in Janes Fighting Ships 1906–7 do not show serious damage.
41. It is said that the machinery of some ships was greased before scuttling so that they would be undamaged when re-floated by a Russian relieving force.
42. Figures from British Naval Attaché report. Slightly different figures are given by a German account translated and published in Eisenberg, A. (trans). *Naval Experiences of the Russo-Japanese War*. ASNE Journal Vol XXI/1 Feb 1909. From Artilleristische Monatshefte of Feb 1907.
43. Wiren. *The end of the Port Arthur Fleet*. Jane's Fighting Ships, 1906.
44. Shells would have to burst very close to the side to cause flooding and it seems quite possible that the holes observed by the RN observer were due to scuttling charges.
45. CB 47
46. Annual report of Torpedo School 1903. PRO ADM 189/23. via Smith.
47. Lieutenant (T) F.D. Arnold-Foster, serving on the China Station in 1904. via N. Lambert.
48. It is said that he was at the opera and decided that the message could wait to the morning.
49. CB 47 gives 22 fired.
50. Details of the torpedoes used are not known but they were probably similar to the 1890 Fiume. This had a charge of 198 lbs of wet guncotton, a speed of 30 knots for 800 yards.
51. They were repaired by late July.
52. *Sevastopol* was mined, taking about 6 weeks to repair.
53. Semenoff page 230.
54. Brown, D.K. *Torpedoes at Jutland*. Warship World, Liskeard, Vol 5/2, Spring 1995.
55. CB 47 says 85.
56. CB 47!
57. CB 47 says that there was no deflection as they did not realize *Suvorov* was still moving.
58. Some contemporary accounts state that *Osliabia* and *Borodino* were sunk by torpedo. It is virtually certain that these reports are incorrect.
59. J.S. Corbett. *Maritime Operations in the Russo-Japanese War*. Reprint, NIP, Annapolis, 1994. page 295.
60. Corbett page 296.
61. Corbett's text implies that 87 torpedoes were fired at night. However, the night attacks which he describes only account for about half that figure; I suspect 87 refers to the whole battle.
62. Brown, D.K. *Torpedoes at Jutland*. Warship World, Liskeard, Vol 5/2, Spring 1995.
63. CB 47 for earlier actions, Corbett for Tsushima and *Sevastopol*.
64. Design based on HMS *Majestic*. Mined 1050 on 15 May 1904 about 10 miles off Liau-ti-shan (Amur). Mines were laid 50–100ft apart. Steering and port engine room flooded. At 1130 stern well under water, heel 4°. Another mine exploded below funnel, magazine exploded, sank in 1½ minutes.
65. Design based on *Royal Sovereign*. Hit two mines in same field at 1050, sank 1230.
66. It is believed that the mine caused a torpedo to explode in her forward tube and this detonated 2½ tons of pyroxylin (wet guncotton) in her mine magazine.

67. BROWN, D.K. *Attack and Defence.* Warship 24.
68. There is a note on First Lord's briefing paper for the Parliamentary statement on *Dreadnought.* 'Do not tell the House of Commons about special measures to protect magazine and shell rooms as these are the results of very secret experiments carried out at great cost before she was laid down to test the experience of the Russo-Japanese war in submarine explosions.
69. MACKAY, R.F. *Fisher* quoting Cab 16/3.
70. Photos show *Seagull* with an A frame over the stern and *Speedy* with a somewhat similar device, which may be a derrick.
71. MACKAY, R.F. *Fisher of Kilverstone.* Clarendon, Oxford, 1973.