

A Tale of Two Doctrines: Japanese and American Naval Surface Warfare Doctrine, 1941-1943.

Introduction.

This article examines the tactical surface warfare doctrines that the United States and Japanese navies took into World War II. It examines them in the context of the profound technological changes that started in the inter-war years and continued through the war. In particular, it traces those doctrines --and especially American doctrines -- in the first two years of that conflict. Such a review shows the dynamic play between the development of doctrine and the results of combat. Fundamentally, this interplay is a struggle to predict the future when the signposts of the past lose their meaning.

Technological progress made the old signposts meaningless, and so this is also a story of the need to accurately assess technology in developing doctrine. The naval war fought in the Pacific in 1942 and 1943 was, in its tactical details, so different from previous naval wars as to make irrelevant many previous lessons learned. This was largely due to technological advances in weapons and to the new technology of radar.

No-one can hope to plan for the consequences of a new technology without knowing its capabilities. It is no simple thing to know the capabilities of one's own technology in a war setting. It is much harder -- but just as critical -- to know the capabilities of one's enemy's technologies. This article shows that doctrinal planning without a thorough assessment of enemy capabilities is a dangerous thing.

Doctrine begets weapons, and so this article focuses on the importance of doctrinal decisions in the design as well as the employment of weapons. Bad doctrine can lead to bad weapons; when the weapons involved are as expensive and as elaborate as warships, the price of correcting bad doctrine becomes very steep.

While the tactical doctrines examined here are outmoded and the technologies obsolete, the lessons that emerge will continue to be vital for as long as military thinkers grapple with the problem of integrating untried technology into tactical doctrine. Given the rapidity with which new technologies now bloom, these problems will become more and more central to the development of doctrine. Examples that come to mind include the new night-fighting technologies being used by land forces, the effect of real-time satellite intelligence on planning and combat, and yet unanswered questions of the effectiveness of smart weapons and their counter-measures. All of these new technologies create challenges which will stretch the resources of military planners as they create doctrine for the future. Each of these challenges must be met anew, but each has echoes in the past.

The Navies Between the Wars.

While I focus mainly on the differences between the Japanese and the United States navies, there were many parallels between them as well. Both had last engaged in active

warfare at the turn of the century: the United States fighting Spain and the Japanese fighting the Russians. Both navies won all of the major engagements that they fought -- although the decisive element in the American victories was the naval gun, while the Japanese also recognized the potential of the automobile torpedo and the naval mine. Strategic thinkers in both navies drew inspiration and guidance from Alfred Thayer Mahan's ideas of the primacy of navies and the importance of the "decisive battle." Both navies saw the vast Pacific as the cockpit in which a decisive naval war would be fought, and planned accordingly. Both were relatively open to technological innovations, such as aircraft and aircraft carriers.

Despite these broad similarities, doctrinal thinking varied greatly between the navies. This is demonstrated by the design differences in the ships which the two navies built in the inter-war years. An examination of these designs -- and particularly the design of cruisers and destroyers, which bore the brunt of the surface engagements -- highlights this divergent doctrinal thinking.

To be sure, doctrine alone did not determine the form of the cruisers and destroyers which these navies built between the wars. Inter-war design (and doctrinal developments) took place within the confines of technological, economic and diplomatic constraints. All of these factors weighed heavily on doctrine and design.

Technological constraints resulted in certain constant features between the warships of the period: propulsion usually by oil-fired boilers that used steam power to drive turbines geared to the ship's propellers, steel hulls armored (for the larger ships) with armor arranged in vertical "belts" and horizontal decks, main armaments of guns and torpedoes with the fire of the guns being directed by complex optics and fire control systems. Propulsion was highly developed, with power plants developing tens of thousands of horsepower -- power enough to drive 30 million pounds of cruiser through the water at speeds of better than 35 miles per hour. Guns were measured by the diameter of their shells: a 5" gun (typical armament for a destroyer) threw a 50 pound shell about 18,000 yards, while an 8" gun (a heavy cruiser's main gun armament) hurled a 250 pound shell about 30,000 yards. Guns and their fire control systems together tried to solve a problem equivalent to tossing a marble 75 yards into a moving teacup. Torpedoes were essentially miniature unmanned (and unguided) submarines which traveled a few feet underwater a speeds of up to 50 knots and carried explosive warheads of 500 to 1000 pounds. They could be devastating anti-ship weapons, but because they were unguided they were best used en masse and with surprise. Otherwise, their targets might see them coming, and dodge out of the way.

Economic considerations and diplomatic limitations on warship construction intertwined. After the end of the Great War, the United States, Great Britain and Japan began a naval arms race by planning and starting bigger and bigger battleships. The race ended in Washington in 1922 with an agreement which limited the total tonnage of the major power's battle fleets, imposed size limits on new warships and stopped the building of new battleships. In general, the agreement permitted Japan to build a battle fleet of about

60% the size of the United States fleet. Given the U.S. Navy's need to build and deploy its fleet for the possibility of a two ocean war, this 60% figure was not entirely unfavorable for Japan. In the absence of the treaty, the United States could probably have outbuilt Japan by a greater margin than that merely by dint of its massively superior economy.

This fact was not appreciated in Japan, and neither the agreement nor its successor -- signed in London in 1930 -- were popular with the Japanese public or the Japanese military. Both groups saw the treaty restrictions as a form of foreign meddling with Japan's destiny, and neither clearly grasped Japan's economic weakness compared to the United States or the United States' determination to not give Japan a free hand in Asia. This view resulted in Japan's renunciation of the treaty restrictions in 1936.

Within the constraints of technology, economics and diplomacy, the inter-war United States and Japanese navies set out to design and build the cruisers and destroyers which would fight the Second World War in the Pacific. In doing so, they recognized that any design would be a complex balancing act involving many inter-related variables. Should many small ships be built, or relatively fewer larger ships? Should guns or torpedoes be emphasized, or should ships with balanced armament be built? Should speed be sacrificed for range, or range for speed, or both for armor protection? To resolve these dilemmas, ship designers turned to their navies' conceptions of the battles that these ships would fight. Their designs grew from their doctrines.

Japan's naval doctrines stemmed from the vast distances of the Pacific. These distances are immense: Japan lay 3400 miles from the U. S. fleet base at Pearl Harbor, and the route from Pearl Harbor to the U.S. outpost in the Philippines spans a similar distance. These vast distances suggested to the Japanese strategists a way to win a war against the United States. While the Japanese acknowledged the greater war-making potential of the United States, they had had experience in fighting larger powers to a standstill before. In 1904-05, the Japanese took on Russia in Manchuria and the Yellow Sea by striking a hard sudden blow and then capitalizing on Russia's difficulties in supplying its forces over the vast distances involved. Although Russia's raw war-making potential dwarfed Japan's, the Russians could not effectively concentrate this force to fight a war ____ miles away from Russia's main centers of population.

If Japan could battle Russia to a negotiated settlement in 1905, when the Japanese navy could not even build large warships domestically, then Japanese strategists could imagine a stronger, more self-sufficient Japan doing the same to the United States. Accordingly, Japan's strategic plan was based on the model of 1905: first, strike hard to inflict maximum losses, secure maximum resources and establish an extended defensive perimeter, then wear the advancing Americans down as they struggled at the end of vulnerable and extended supply lines, and finally fight a decisive naval battle against the weakened American forces.

To carry out this strategy, the Japanese developed a doctrine which emphasized the individual superiority of Japanese warships. To them, the choice between fewer bigger ships and smaller larger ones must have seemed obvious. They could always be outbuilt in terms of sheer numbers, but they could hope to maintain a qualitative edge over their opponents. The Japanese pinned their hopes, and their doctrines, on the idea that a few superior ships could defeat a greater number of smaller ships. If that theory was incorrect, the Japanese had lost their war before it began.

Japanese Designs.

The Japanese emphasis on fewer larger ships also meant that no ships could be spared from the essential task of attacking and destroying American warships. Every warship Japan built had to play a major role in striking at American battle power. To inflict unacceptable losses on the U. S. Navy, the Japanese needed to build destroyers capable of sinking battleships.

This need was fully reflected in the Japanese inter-war designs. While other navies viewed destroyers as screening vessels which protected larger ships, the Japanese built destroyers with an emphasis on offensive punch. Conventional doctrine regarded cruisers as multi-role vessels for scouting, trade protection and fleet screening. Japanese cruisers were practically small battleships.

Japanese destroyer design was clearly a function of Japanese doctrine. The Japanese required their destroyers to play a major role in attacking enemy cruisers and battleships - how could they meet their goals?

Their answer was the Fubuki class destroyer -- the design on which almost all subsequent Japanese destroyer designs were based. Built beginning in 1926, the Fubukis represented a radical advance in destroyer design. They also represented a doctrinal bet made on technology.

The Japanese were trying to develop a destroyer which could destroy capital ships at a time when it was unclear whether such a thing was possible. It was destroyers' torpedoes which posed a threat to larger ships -- and in 1926 those torpedoes had effective ranges far shorter than the ranges of the larger ships' guns. As Samuel Elliot Morison has noted, naval authorities of the time commonly thought that advances in naval gunnery -- and particularly due to sophisticated optical range-finding systems -- would prevent destroyers from closing to torpedo-firing range in most normal circumstances. Indeed, the impression left is of a sort of sea-going World War I battlefield, with firepower negating maneuver at all but the longest ranges.

In this envisioned maelstrom of naval gunnery, conventional doctrine gave torpedo-firing destroyers subsidiary roles; they would engage their opposite numbers, finish off cripples, and cover the maneuvers of the battle line by laying smoke and launching torpedo attacks. The Japanese saw things differently.

The appearance of the Fubuki class showed that Japanese had made three assumptions: first, that naval gunfire, although powerful, would not absolutely dominate naval engagements; second, that the effects of gunfire could be reduced further by the cover of darkness; third, that a superior torpedo technology could also decrease the effects of guns by permitting destroyers to attack from greater ranges. The Fubukis were weapons carriers for this new technology.

No destroyers like the Fubukis ever before existed. They were almost 1/3 larger than the destroyers of other navies. They mounted 6 5" guns in enclosed twin gun turrets at a time when most other destroyers had 4 guns in single open mounts. In later versions, their main armament could be used for anti-aircraft fire, a previously unheard of refinement. They carried enough fuel oil to cruise for 4,800 nautical miles -- far further than their contemporaries. And they carried 18 24" torpedoes for their 9 torpedo tubes -- the reloads being yet another innovation.

The essence of the Fubukis was their torpedoes -- 24" monsters which represented a quantum leap in torpedo technology. When the Fubukis were commissioned, they carried Type 90 torpedoes which could make 46 knots for about 7,500 yards or reach out to 16,000 yards at a speed of 35 knots. These torpedoes were markedly better than any others in service, but their successors were so far superior that they made all other torpedoes obsolete. These were the Type 93 Long Lances, weapons which were to become the Imperial Japanese Navy's principal ship-killer. The Long Lance's motor was based upon a previously untested kerosene-oxygen propellant which gave it almost three times the range of the Type 90 --22,000 yards at 49 knots, and more than 20 miles at ___ knots (although the likelihood of hitting a target at such extreme ranges was minimal). Its explosive warhead was twice the weight of the U.S.N.'s 21" torpedo warhead. When the Long Lance came into service in 1933, the potential of the Fubuki was realized.

The Fubukis and their six descendant classes furnished the Japanese destroyer punch in the Pacific war. Others marveled at how the Japanese designers had managed to cram so much into such a small hull. In fact, events showed that the designers had over-reached; storm damage suffered by fleet units in 1934 prompted the removal of some guns and torpedo reloads, and the addition of ballast to improve stability. Even with the modifications, these destroyers were ideally suited to the doctrines which they were designed to put into action.

Japanese cruiser development proceeded in two separate stages. From the end of World War I until 1922, Japanese designers created a series of light cruisers for use as leaders for destroyer flotillas. This reflected Japanese determination to put destroyers in harm's way, and to back them up with effective gunfire support. These light cruisers had a distinctly antiquated look to them with their three or four funnels and their unturreted single gun mounts, but they were all modified to carry the Long Lance, and they proved effective enough in the actual event.

In 1922, the Japanese (and specifically Vice Admiral Hiraga) began building the first Japanese designed heavy cruisers. The result was the Furutaka and Aoba classes. While these cruisers were not as relatively advanced as the Fubukis, they trumped anything then produced from American yards. Their fourteen descendents, built from 1925 through 1939, maintained this Japanese lead and demonstrated Japanese commitment to their philosophy of fewer bigger ships.

Of these heavy cruisers, the Takao class provides a representative example. Built from 1927 through 1932, the four Takaos carried 10 8" guns -- equal to the most carried by any U.S. heavy cruiser -- and 8 24" torpedo tubes. They weighed in at 11,350 long tons standard displacement, or 13% over the maximum displacement permitted by the Washington and London naval conventions, but still achieved the extraordinarily high speed of 35.5 knots.

Two of the class were refit in 1938, with the number of torpedo tubes being doubled, eight torpedo reloads being added, and protection against torpedoes being increased by the addition of larger bulges along the ships' sides. Tonnage increased to 13,400 tons, but speed declined only 1.25 knots. So did the Japanese take pains to maintain their doctrine of ship-to-ship superiority by enhancing the protection and torpedo armament of their cruisers.

The Japanese built 18 heavy cruisers from 1922 until 1940, when they reverted to the construction of light cruiser/destroyer leaders. Not all classes built were uniform; the four Mogami class cruisers originally mounted 15 6" guns before being regunned with the more traditional 10 8 inchers, while the two Tones were built as carrier-accompanying scouts with reduced armament and more reconnaissance seaplanes.

The Japanese combined their premium, multi-threat ship designs with hard, realistic training. To the extent they could in the absence of actual hostilities, the Japanese took their battle doctrine to sea. They emphasized actions at night and in bad weather, constantly searching for ways to even the odds against a numerically superior opponent. The result of their hard training was finely honed destroyer and cruiser forces with their doctrines integrated into both their training and their ship designs. This was admirable, but the Japanese still went to war without any practical assurance that their doctrines would actually work. Prior to the test of combat, this gulf between doctrine and reality could be narrowed only by the intellectual effort by which the doctrine was developed

American Designs.

The U.S.N. designs of the inter-war period reflected a more balanced and traditional view of the relative roles of cruisers and destroyers, but recognized the ways in which technological developments would modify those roles. The U.S. Navy's need to plan for two ocean war -- which became apparent as the 1930s drew to a close -- resulted in greater numbers of ships built to smaller, less capable designs. Although U.S. naval aviation was actively developed, American doctrine still emphasized the decisive clash of

opposing battleships as the *sine qua non* of naval engagements. Destroyers and cruisers were viewed as outriders to the main battle line --important, to be sure, but not decisive weapons.

Like its principal opponent, the U.S. Navy also designed ships based on its surface combat doctrine -- a doctrine markedly different from its Japanese counterpart. The influence of that doctrine can be traced in the ship designs.

The U.S.N.'s first foray into inter-war building (apart from ships completed shortly after the end of the Great War) were the Pensacola class heavy cruisers. These ships were the counterparts of the Japanese Takaos; **as completed** they carried the same 10 8" gun main armament and more anti-aircraft protection in a smaller hull, but no torpedoes.

The absence of torpedoes is key; it shows that the U.S.N. had placed its bet on the dominance of naval gunfire. By concentrating on gunpower, the U.S.N. presumably hoped to match the Japanese in the weapons that really mattered while still building more smaller ships.

The U.S.N. commissioned 16 heavy cruisers during the inter-war years, plus another nine "light" cruisers of equivalent size. Only five of these 25 ships served outside the Pacific, meaning that the Americans managed effectively to outbuild the Japanese in heavy cruisers even before the start of the war. This was a reflection of doctrine as well as economic power; the U.S.N. saw its mission in the Pacific as offensive, and naval offensives require superior numbers of ships.

The Astorias are a representative class of American heavy cruisers from this era. The class was made up of seven ships, all built in the early and mid-1930s. Smaller than the Takaos, they displaced a little less than the 10,000 tons permitted by treaty. Their main punch was provided by 9 8" guns arranged in triple turrets, and they mounted another 8 5" guns for anti-aircraft defense. Their engines were only 80% as powerful as the Takaos', giving them a slightly slower maximum speed of about 33 knots. Like all American heavy cruisers, they lacked torpedo tubes.

The designers of the Astorias should not be overly criticized for omitting torpedoes from the design. Given the performance of the then-current American torpedoes, it was entirely logical to think that they were and would remain too short-ranged to be an effective cruiser weapon. In addition, their deletion would make room for a greater main gun armament -- and the guns, it was thought, were what really mattered -- while eliminating a potential cause of fires and explosions. Had the designers known of the Long Lance they might have figured differently, but Japanese wisely kept the existence of this weapon a closely guarded secret.

The United States produced two vastly different light cruiser designs in the inter-war years. The early 1920s saw the Omaha class -- a classic light cruiser designed for scouting, raiding and trade protection. After that, priority shifted to heavy cruisers. Then,

in the late 1930s, American designers produced a radical new design of light cruiser aimed at dealing with the new Japanese destroyers.

These were the nine Brooklyns, and they were an extreme expression of the gunpower philosophy. Mounting 15 6" guns, they were bigger than any American heavy cruiser of that time. With them came a doctrine of rapid-fire 6" gunfire based on the principal that such fire could destroy any Japanese destroyer before it got within torpedo range. These designs certainly produced the volume of fire expected; after a few experiences with them, the Japanese thought that their 6" guns were capable of fully automatic fire, like huge machine guns.

The doctrine behind them was yet another bet on the potency of naval gunfire. Standard gunfire procedures at that time called for guns to fire slowly until their shells were observed splashing all around the target ship. Despite the relative sophistication of the optical rangefinders in use at the time, an observed "straddle" - shells falling simultaneous in front and behind of the target was the best evidence that the guns were on target. Until then, one salvo (i.e., a volley from all the guns) would not be fired until the preceding salvo had landed. Only when a straddle or hits were observed would the guns begin to shoot at their maximum rate of fire. Up to that point, range (which determined the shells' time of flight) and the delay between a salvo landing and new range information being figured and reported to the guns dictated the rate of fire.

The Brooklyns represented the idea that a combination of improved gunfire control systems and rapid-fire guns would permit rapid fire without the need to engage in a lengthy ranging process. This concept was roughly akin to a giant shotgun -- firing enough projectiles into the target's area that some were bound to hit it. Like the anti-missile Phalanx system of today, the accuracy and volume of fire put down by the Brooklyns was meant to destroy their targets --Japanese destroyers -- before they could get close enough to do harm.

The Americans built no new destroyers from the end of World War I until 1935. In that year, the production of state-of-the-art destroyers for the U.S.N began with the Farragut class. The Farraguts were smaller than their Japanese counterparts and less heavily armed; they mounted 8 21" torpedo tubes and 5 5" guns. One of the guns was later removed in an attempt to improve stability; the Japanese were not the only designers to overbuild. Compared to the Fubukis, the Farraguts were the jacks of all trades but masters of none. They could use their guns or torpedoes to engage other light forces, but with fewer guns and vastly less effective torpedoes than the Fubukis. Like the Fubukis, they could use their main armament for anti-aircraft defense. They could carry more than twice as many depth charges than the Fubukis, making them more effective against submarines. Their range was adequate to the great distances of the Pacific, and they were cheap enough to produce in quantity.

With two exceptions, the American inter-war destroyers followed the "balanced" pattern of the Farragut class. The exceptions were the Porter/Somers class "destroyer leaders" and

the Craven class. The Porters and the Somers were large eight gun destroyers designed for the niche occupied by the Japanese light cruisers. In the event, the ships of these classes were used as conventional destroyers. The Cravens showed that the U.S.N. had not given up on torpedoes entirely -- they mounted 16 torpedo tubes, more than any other destroyer, Japanese or American. Their heavy torpedo armament suited them to accompanying larger ships into surface actions. Their suitability for this role resulted in their extensive use in the Pacific.

Apart from the Cravens, U.S. destroyers carried from 5 to 12 21" torpedoes. Although the U.S.N. did not put the emphasis on torpedoes that the Japanese did, it did not completely neglect the torpedo arm. In fact, U.S. torpedoes had ranges and speeds quite similar to the major naval powers other than Japan. They also were equipped with a "secret weapon" of their own -- a magnetic exploder which was supposed to increase the torpedo's effectiveness by detonating it as it passed under the bottom of its target.

One last critical feature of U.S. ship design spanning all ship classes must be considered. This was radar. Although radar was a relatively new and untested technology when the U.S.N. embraced it in the late 1930s, it was quickly seen to be a potentially enormous aid in two areas. First, it could vastly enhance the ability to spot the enemy at night or in other conditions of bad visibility. Second, it offered a solution to the hardest problem of naval gunnery -- judging the range to the target. The naval radars in use at the time can be divided into two classes: search radars designed to detect the enemy at long ranges, and shorter-ranged fire control radars meant to determine the ranges to targets more precisely. Search radars were generally in use in U.S.N. ships by the end of 1941, and by mid-1942 even destroyers had both search and fire control radars. The Japanese entirely missed the radar bus, not using radar in a surface action until mid-1943. The aggressive development and deployment of radar by the U.S.N. stands out as an outstanding achievement in recognizing and responding to a new technology. It also provides an object lesson in the difficulties of translating a powerful technological breakthrough into an effective combat doctrine.

Neither U.S. radar nor U.S. torpedoes nor U.S. surface combat doctrine generally was given a fair test in peacetime training and maneuvers. Budgetary restrictions both limited training periods and encouraged senior officers to "make training count" by conducting it in good weather when conditions could be controlled and results easily assessed. Here was another balancing act for the peacetime navy -- deciding whether to spend limited funds on new weapons or on learning to use existing ones. In fact, the balancing act was more complicated than that. Money for new weapons was easier to sell to the U.S.N.'s political masters than expenditures for the intangible benefits of training. Also, given that the sailors of the wartime Navy were still mostly civilians in the 1930s, peacetime training would have only limited benefits. Still, curtailed training meant curtailed opportunities for analyzing and improving doctrine, and this was to tell later on.

The Battles.

When war came to the Pacific in December 1941, the Japanese launched on a whirlwind course of conquest. Their objectives were four. First, they sought the mineral and rubber resources of Malaysia and the oil of Indonesia -- then the Dutch East Indies. These resources, and particularly Indonesian oil, were crucial to Japan's ability to fight a protracted war. Second, they aimed at assuring the flow of these resources to the Japanese Home Islands by conquering the Philippines. Third, they occupied islands in the Central and South Pacific, and so built a defensive perimeter which the U.S. Pacific Fleet would have to pierce to relieve the Philippines or attack the Japanese Home Islands. Finally, the Japanese struck at the U.S. Pacific Fleet at its Pearl Harbor base, thus buying time to establish the defensive perimeter.

Java Sea: First Impressions

It was the first of these objectives which brought the Japanese to Dutch Java in late February of 1942, and there, on February 27, the first major surface engagement of the Pacific War was fought. It was fought between the Japanese forces covering the sea-borne invasion of Java and a force of U.S., British, and Dutch ships, commanded by Rear Admiral K.W.F.M. Doorman of the Royal Netherlands. Doorman's mission was to intercept the Japanese invasion force; his means were the ships of the ABDA (American-British-Dutch-Australian) command, battered and weary from three months of incessant battering and ceaseless operating. The American contingent was relatively small: one heavy cruiser and four WW I era destroyers from a total of 14 Allied ships engaged.

The Japanese forces opposing Doorman were commanded by Rear Admiral Takagi. They consisted of the heavy cruisers Haguro and Nachi, an 8 destroyer squadron lead by light cruiser Jintsu, and a 6 destroyer squadron led by light cruiser Naka. Although his forces outnumbered Doorman's by 18 ships to 14, his real margin of superiority was much greater. His ships all carried Long Lance torpedoes -- 122 ready to launch, plus reloads. His two heavy cruisers outgunned Doorman's two by 20 8" guns to 12. And, he had the great advantage of aircraft to spot his gunfire and track Doorman's movements.

The battle was a sporadic affair; spanning seven and one-half hours, it was punctuated by Admiral Doorman's attempts to find the Japanese invasion fleet and by the maneuvers by Admiral Takagi to fend him off. The battle would not have occurred at all but for the Japanese carrier fleet having been sent south to interpose themselves between Doorman and the safe haven of Australia; had they been on the scene, the carrier planes would have swept the Allied ships from the seas. As it was, Japanese land-based aircraft had managed to inflict steady losses on the Allied fleet in the days prior to the battle, but ultimately could not force it to abandon its mission. Thus was the stage set for a daylight surface engagement.

Doorman met the Japanese at 1522. His ships were disposed in a formation that, but for the absence of battleships, would have been familiar to Beatty at Jutland or Togo at Tsushima: five cruisers steaming one after the other, with one group of destroyers between the cruisers and the Japanese and another on his unengaged side. Takagi's

dispositions were looser; his two heavy cruisers made up his "line of battle" and his two groups of destroyers -- each led by a light cruiser -- weaved towards and away from the Allied ships as they launched torpedoes.

The first exchange of fire lasted for one hour and three minutes. It was notable mainly for its lack of result. For 50 minutes, hundreds of 8" shells were hurled back and forth between the contending forces at ranges of 15000 to 25000 yards. At the same time, the Japanese launched 39 Long Lances at the Allied formation at ranges of 13000 to 25000 yards. All this took place without noticeable result until 1638, when a shell from a Japanese heavy cruiser scored a crippling hit on heavy cruiser Exeter's engine rooms. As the Allied cruiser slowed and sheered out of line, the Allied formation became disorganized. In the confusion, a Dutch destroyer wandered into the path of a Long Lance and was erased. So much for the pre-war pundits of modern firepower -- a thousand 8" shells and almost 40 torpedoes had resulted in one damaged cruiser and one sunk destroyer.

The next stage of the battle lasted for 35 minutes. In this phase, Takagi's heavy cruisers continued to pound away at their opposite numbers, while his destroyers charged in to ranges as short as 6500 yards to launch torpedoes. Closing the range did nothing to improve their accuracy; all of the more than 24 torpedoes launched missed their targets. Japanese gunfire did better, as a countercharge by three Allied destroyers was turned back with one destroyer sunk. This action brought the opposing destroyer forces to within 3000 yards of each other, and at these ranges modern gunfire control systems proved to be as deadly as could be hoped.

The third phase of the battle took place in darkness after a hiatus of more than an hour. During its 15 minute duration neither shells nor a Japanese torpedo attack launched at 21000 yards range failed to connect.

Three and one-half hours later, the final act of the drama was played out. This time the stage belonged to the Japanese heavy cruisers, and this time they struck home. After a fruitless 15 minute gunfire exchange, they mortally wounded two Dutch light cruisers with a 12 torpedo broadside launched from 8000 to 14000 yards out. Admiral Doorman went down with the Java. The remaining Allied ships broke off the action, only to be hunted down and exterminated in the succeeding days.

What lessons could be learned from the Java Sea? For the Americans, the lessons were few. The Allies had not fought under American command, and the major U.S. unit engaged, the heavy cruiser Houston, only had two-thirds of her main armament operative. None of the Allied ships had an operating radar set, and all were tired after extensive operations and constant harassing air attacks. Given the disparity of forces, the Allied defeat was hardly surprising. Because of the high Allied losses then and subsequent, few eye-witnesses were available to describe the action. The one piece of valuable intelligence which could have been gleaned -- the long range of Japanese torpedoes -- was missed when the Japanese torpedo attacks were ascribed to submarines which were thought to lie

closer to the Allied ships. This ignorance of Japanese torpedo capabilities was to persist into 1943, with predictably adverse consequences on American doctrinal thinking. In fact, U.S. recognition charts published as late as mid-1943 listed Japanese destroyers as having 21" "or possibly 24.5" torpedo tubes." Likewise, Japanese torpedo reload capabilities went unappreciated. These were major Allied intelligence failures in the Pacific War.

For the Japanese, Java Sea must have been a source of both hope and despair. The relative ineffectiveness of gunnery at all but the closest ranges suggested that the Japanese Navy had made a good bet in wagering that torpedoes could still be effective weapons. The poor showing of the Japanese torpedomen demonstrated a need to rethink torpedo tactics and techniques. The evidence suggests that all or almost all of the 122 Japanese torpedo tubes were emptied during the battle, and most were fired at targets unaware of any torpedo threat. Only once did the Allied ships recognize and deliberately evade a torpedo attack. Despite this, only three Allied ships were struck, and those apparently by the 16 torpedoes launched by the heavy cruisers rather than by the destroyers. While the Japanese might have been happy at the inefficacy of gunfire, they must have been dismayed at the impotence of their torpedoes. Although the final torpedo yielded 3 hits from 12 torpedoes, they must have wondered whether Takagi had been remarkably unlucky until then or remarkably lucky at that point.

Savo Island: Allied Disaster.

Five months elapsed between the Battle of the Java Sea and the next Pacific surface engagement. This period saw the battles of the Coral Sea and Midway -- the first naval battles fought without the opposing ships ever coming into contact. In these battles, the airplane came to the fore as a pre-eminent ship killer. Of the two battles, Midway is the most significant. In that battle, the Japanese lost four of their seven large aircraft carriers then in service, the cream of their aircrews, and the strategic initiative in the Pacific. The direct result of this defeat was the Allied invasion of Guadalcanal.

Guadalcanal is the southeasternmost island of the Solomons chain. It represented one of the furthest extensions of the Japanese defensive perimeter, and an incomplete one at that -- the airfield on its northern coast was only partly finished when the Allies invaded.

And so the U.S. Navy and the U.S. Marine Corps came to Guadalcanal on August 7, 1942 to begin a seven month epic of air, land and sea warfare. The initial assault caught the Japanese unprepared on land and at sea; the unfinished airfield was rapidly taken over and placed in commission by August 17. The airfield -- Henderson Field -- was the key to Guadalcanal and to the campaign; as long as it was operable, its owner could dominate the waters around the island in the daylight, thus assuring both resupply and opportunities to attack any enemy coming too close in daylight or lingering too long at night. The Marine aircraft on Henderson Field forced the Japanese to fight the kind of attritive warfare that they had hoped to force on the advancing Americans.

The Japanese strategic concept for the Guadalcanal campaign had the virtue of simplicity; the Americans were to be subject to attrition by carrier and land-based aircraft while the Japanese navy ferried enough troops to the island to push the Marines off. The operational concept for the surface forces was simple as well. Japanese surface forces operating from the base at Rabaul would dash down the "Slot" -- the narrow channel running down the Solomons chain -- on supply, escort or bombardment missions to Guadalcanal. The range of the effective anti-ship aircraft at Henderson was such that Japanese warships could travel to and from the island under the cover of darkness without much fear of air attack. But woe to any Japanese ship that did not get beyond the range of Henderson's aircraft before daybreak. And woe to the slower Japanese transports and freighters, which lacked the speed to close and clear the island in a night's span.

The first Japanese sortie to Guadalcanal was not encumbered with noncombatants. It departed Rabaul on the afternoon of August__, bound for combat with the Allied invasion fleet and its escort. Led by Vice Admiral Gunichi Mikawa, the oncoming Japanese numbered eight: five heavy cruisers, two light cruisers, and a lone destroyer. In all, Mikawa was bringing 34 8" guns and 44 24" torpedo tubes down the Slot.

Deployed to face the Japanese ships were the Allied forces commanded by Rear Admiral V.A.C. Crutchley, R.A.N. As darkness fell on August 8, Admiral Crutchley's mission was to protect the transports lying at anchor off the northern coast of Guadalcanal from Japanese or surface or submarine attack. North of the transports lay the island of Tulagi; west lay smaller Savo Island. The Japanese could approach by three routes: from the west between Guadalcanal and Savo, from the northwest between Savo and Tulagi or from the east -- the backdoor between Tulagi and Guadalcanal. To cover these three axes, Admiral Crutchley divided his forces into three main groups: a Northern Force and a Southern Force, both consisting of three heavy cruisers and two destroyers, and an Eastern Force containing two light cruisers and two destroyers. The Northern and Southern Forces steamed on station northwest and southwest of Savo respectively; about 10 miles in front of each of these groups steamed a radar picket destroyer to give early warning of a Japanese strike.

Southern Force lost a heavy cruiser before the action began, as Admiral Crutchley was called away to a meeting and went in his flagship. The remaining ships steamed their courses through a hot moonless night studded with rain squalls and thunderstorms.

Mikawa came at them after thoughtful preparation. Timing his arrival off Guadalcanal for about 0130 on the 9th, he launched three floatplanes from his cruisers shortly after 2300 on the 8th. They would play an important role in the coming battle by reporting enemy dispositions and dropping powerful flares to illuminate targets. The Japanese ships came on in a line with heavy cruisers leading, heading for the gap between Savo and Guadalcanal.

Contact first came at 0054 when the Japanese spotted one of the U.S. picket destroyers 16000 yards off. The picket U.S. destroyers had inferior night optics and carried

relatively ineffective SC search radar, which was made even more ineffective by the close proximity of land. As a result, they failed to detect the Japanese ships sweeping by.

Likewise, the Southern Force did not see Mikawa until seconds before his cruisers opened fire, and five minutes after they had launched 13 torpedoes at 5000 yards range. The crucial minute came at 0143 -- an American destroyer got off a sighting report, the Japanese floatplanes dropped flares silhouetting the Southern Force, the Japanese cruisers closed firing keys on their main batteries, and two Long Lances slammed into Canberra, an Australian heavy cruiser. By this time, Mikawa had already run past the Southern Force on his way to the Northern Force. Chicago, the other Southern Force heavy cruiser, searched in vain for a target and, at 0147, took a torpedo in her bows. The two Southern Force destroyers hastily tried to fire torpedoes, but without effect.

Even before he was done with the Southern Force, Mikawa had the Northern Force in his sights. One of his light cruisers had spotted it from 16000 yards away, but squalls, the lack of any communicated warning and unpreparedness kept the Northern Force from realizing its peril. By 0147, the Japanese cruiser guns were in action against the force. Torpedoes followed a minute after. As the engagement range closed down under 10000 yards, the Northern Force heavy cruisers opened fire despite doubts as to whether their targets were friend or foe. Of the three, both Astoria and Vincennes were pinpointed and pummeled when hits set their floatplanes afire. In addition to many shell hits, Vincennes took two or three torpedo hits, and Quincy (the third cruiser in the force) took one. All three were out of action when Mikawa swept by, bound westward after looping Savo.

Mikawa now had to decide whether to regroup and head for the transports or to call it a night. He opted for the latter; his ships had become scattered, he was concerned about airstrikes from Allied carriers (not knowing that they had withdrawn), and he was uncertain about the strength of the Allied forces not yet engaged. Sunset was eight hours before; dawn was but four hours away. Mikawa gathered his ships and steamed back the way he had come. By 0230, the Japanese had cleared the battle zone.

Mikawa left behind four mortally wounded Allied cruisers. Canberra, first to be hit, was last to go -- when by 0800 she could not restore motive power, she was scuttled. Quincy and Vincennes sank within an hour after the action. Astoria lingered longer, finally succumbing to the progressive effects of fires at 1215. The Japanese had sustained little damage: two direct hits on Mikawa's flagship and one on cruiser Aoba, additional minor damage to another cruiser. He had expended a little over 1000 8" bullets and probably 20 to 30 torpedoes for significantly better results than Java Sea, and all in less than three-quarters of an hour.

Well, what lessons from Savo? For the Japanese, the results must have been reassuring. They achieved double the torpedo hits made at Java Sea with an expenditure of one-quarter as many torpedoes. The inclusion of torpedoes in Japanese heavy cruisers was entirely justified. Although the engagement ranges were shorter, Allied gunpower still seemed ineffective while Japanese gunpower was quite satisfactory, accounting for one

cruiser and hastening the ends of three others. And, to the extent that the Japanese were even aware of its existence, Allied radar seemed to be no match for Japanese night optics.

The Allies learned that radar was not a panacea, but required effective night-fighting tactics to realize its full potential. They also learned that better communications and coordination were required for separate groups of ships to engage in a night action. Confusion over target identification made this clear. Not only were the cruisers of the Northern Force hampered by their inability to identify their targets as friendly or hostile, the surviving cruiser of the Southern Force actually fired on friendly ships almost two hours after the battle was over. There were also some lessons left unlearned. The tremendous potential of the Long Lance still went unrecognized, and the ability of the Japanese to detect Allied ships at night was mystifying. Still, the Battle of Savo Island does demonstrate the axiom that more is learned from defeat than from victory.

Cape Esperance: False Dawn.

In the two months following Savo, surface operations around Guadalcanal fell into a pattern. During sunup, Allied transports and warships steamed to and from the island harassed by Japanese airpower and protected by their own. With darkness came the Japanese, bringing troops and supplies down the Slot and occasionally bombarding the Marine positions by Henderson field. The Japanese carriers tried without success to contest Allied air superiority on August 24. On October 11, the Americans tried to disrupt the nighttime "Tokyo Express."

The engagement of October 11-12, which became known as the Battle of Cape Esperance, was occasioned by the Allied detection of a Japanese force barreling down the Slot. In response, Rear Admiral Norman Scott took his cruiser force into the waters north of Guadalcanal to intercept. Scott's cruisers had happened to be in the area after escorting in a troop convoy, Scott had been at Savo (commanding the unengaged Eastern Force), and had given some hard thought to the lessons taught by that battle.

Scott still believed in gunpower, and he made his dispositions to maximize his. Four ships formed the core of his fighting power: two heavy cruisers -- the San Francisco and the Salt Lake City -- and two of the 15 gun light cruisers --the Helena and the Boise. They also formed the core of his formation, steaming in a line with three destroyers in front of them and another two behind. Scott wanted a tightly controlled formation with concentrated power and no problems in telling friends and foe apart. He streamed his flag in San Francisco, but relied on the new SG radars of Boise and Helena to warn him of the enemy's approach. In fact, Scott had ordered that his force's older SC search radars not be used for fear that the Japanese had some means to track him from their emissions.

Approaching Scott were two separate Japanese forces with two separate missions. The first, commanded by Rear Admiral Arimoto Goto, consisted of three heavy cruisers and two destroyers; it was headed in to bombard Henderson Field. The second, under Rear

Admiral Takaji Joshima, contained two seaplane carriers (here pressed into service as transports) and six escorting destroyers.

In another lesson learned from Savo, Scott kept only four of his highly flammable floatplanes aboard his cruisers. He ordered their launch at around 2130, but his forethought backfired when one plane caught fire and burned upon launch and another was dumped due to a foul-up in orders. The flagship's and Boise's planes got safely away, however, and located Joshima's ships along the northern Guadalcanal coast at 2250. Although he did not realize it, Scott was at that time between Joshima's and Goto's forces. He did know from prior sightings that bigger game was afoot than Joshima's makeshift transports, and so he decided to remain on station west of Savo rather than close in on Joshima to the southeast.

Scott's decision was rewarded at 2325 when Helena's SG radar found Goto 27700 yards to the northwest, headed straight for Scott's formation. Once again, Scott did not know of his good fortune, as Helena delayed in making a sighting report. This single delay speaks worlds about the gap between theory and practice in the use of radar -- presumably, the number of false alarms made any captain cautious about crying wolf until he could see for.

Unaware of Helena's contact, Scott ordered his force to reverse course at 2332. This maneuver had the effect of causing Scott's three leading destroyers to pass between his cruisers and Goto's force before regaining their station leading his line. It was as this maneuver was underway that things started to happen. At 2342, Helena finally reported her contact, and Boise, which had gotten a contact at 2338, did the same. Now the second gap between radar practice and theory appeared: Boise's sighting was couched in ambiguous language, and left Scott trying to reconcile it with Helena's report and the positions of his lead destroyers. At the same time, one of the lead destroyers spotted the Japanese 8000 yards off with her fire control radar and started a one destroyer charge with the assumption that everyone else saw the Japanese also.

While Scott pondered, Helena's captain asked for permission to open fire by sending the message "Interrogatory Roger" over his voice radio -- "Interrogatory" meaning "may I" and "Roger" being the pre-arranged code for "open fire." On board San Francisco, Helena's message was interpreted as asking for confirmation that a previous message had been received -- "Interrogatory" meaning "did you" and "Roger" meaning "acknowledge receipt of my message." San Francisco confirmed that it had, sending the usual confirming reply of "Roger." Helena's 15 6" guns tore apart the night as she commenced rapid fire at the head of the oncoming Japanese cruiser column.

Coming towards the center of Scott's line was Goto with three cruisers in line and one destroyer on either flank. Scott outweighed Goto in firepower by 19 8" guns to 18 and 30 6" guns to naught, but he had the even greater advantage of complete surprise. Goto was simply not expecting a fight; even as the American shells sleeted down, he assumed that

he was being fired on by Joshima's force. He was never given a chance to change his mind, for he was mortally wounded in the first minute of fire. Before he died, he ordered his ships to reverse course away from Scott.

When Helena opened the rest of Scott's force joined in, leaving Scott almost as startled as Goto. His first thought was that his cruisers were firing at his lead destroyers, and so he ordered a cease fire at 2247, one minute after the firing began. By then 6" rapid fire had done its work, and the leading two Japanese cruisers had been hit repeatedly. Scott agonized for four minutes as he and his staff struggled to interpret the chaos of radar contacts and visual observations, then ordered firing resumed at 2251. Now the American destroyers, which had closed the Japanese line, did become targets; two were hit hard and taken out of the battle. The Japanese lost a destroyer at the same time when Fubuki, perhaps still believing that Scott's ships were friendly, closed to within 1500 yards of the American battleline and was promptly destroyed.

Now sure of his targets, Scott gathered his force in hand and, at 2355, turned his line right to parallel the withdrawing Japanese. The American cruisers drove northwest, their main guns blazing away at 8000 yards range. If the light cruisers had continued rapid fire, they each would be pumping a 6" shell out once a second, inundating the Japanese cruisers with plummeting steel.

The Japanese cruisers were not out of the fight yet, however; Kinugasa in particular shot accurately at Boise, and forced her out of the battleline at 0012 with two hits on her forward magazines and turret. Boise had been lucky to evade Japanese torpedoes at 0001; now, given the location of the hits, she was lucky again not to be sunk by the resulting magazine explosion.

After further desultory gunfire exchanges, the battle ended at 0020 -- just 34 minutes after it had begun. This was all the time needed to sink a Japanese destroyer, put one Japanese cruiser and one American destroyer in a sinking condition, and badly damage a cruiser on each side. Goto was routed, but Joshima was able to complete his supply mission and retire. Still, despite Joshima's success, the battle could be counted as the first American surface warfare victory against the Japanese.

Esperance taught the Japanese respect for American surface warfare techniques. Another lesson, on the problems of operating widely scattered and uncoordinated forces, seems to have been lost, judging from the continuing Japanese penchant for creating separate covering and bombardment groups. The Americans were reassured with the results of their gunpower, but could not have been too ecstatic if they had reflected on the results which the Japanese had achieved with similar surprise at Savo. The Americans had sunk one of three cruisers at Esperance; the Japanese at Savo went one for two against the Southern Group and three for three against the Northern Group. Still, the 6" cruisers demonstrated their potential against both destroyers and cruisers and SG radar showed its basic effectiveness.

First Guadalcanal: the Bar Fight

Esperance did not slow the Japanese down; the IJN ran bombardment missions against Henderson on four of five succeeding nights, including a devastating bombardment by two battleships on October 14. This the first commitment of Japanese capital ships to active operations showed the level of Japanese determine to drive the Americans from Guadalcanal.

The next major surface action arose in the context of another planned battleship bombardment. At the end of October, a major Japanese effort to take Henderson Field culminated in the carrier battle of Santa Cruz. Now, in mid-November, the Japanese determined to try again. As the combatants' carrier strength had been exhausted by four carrier battles in seven months, the burden would now be carried by surface units and land air forces.

The first of the two engagements which form the Naval Battle of Guadalcanal took place in the early morning of November 13. The Japanese force was commanded by Vice Admiral Hiroaki Abe. Its core was two battleships; screening them were a light cruiser and eleven destroyers. Abe's mission was to pound Henderson into submission while troops and supplies were landed for the decisive land battle.

The potential effectiveness of the Japanese mission can be appreciated by the response which it provoked. When Abe's approach was detected, Rear Admiral Daniel Callaghan was ordered to stop it with the only forces available -- two heavy cruisers, three light cruisers and eight destroyers. Callaghan's force was clearly inferior to Abe's in both gunpower and torpedo power, but the previous battleship bombardment of Henderson had been so destructive that another could not be allowed.

Callaghan himself remains somewhat a mystery. He was previously a staff officer who first went to sea as a task force commander in October when Navy theater commanders changed in the southwest Pacific. With him, but little more than a spectator, was Norman Scott, the victor of Esperance. Callaghan left behind no battle plan, and did not survive long enough to demonstrate his concept of the battle through the orders which he gave. The battle which he began was a messy barroom brawl, and such actions offer little scope to recognize individual brilliance as a commander. Still, given the disparities in fighting power between the sides, a barroom brawl may have been the only type of battle in which the Americans had a chance.

Lessons learnt and lost at Esperance were reflected in Callaghan's dispositions. His ships steamed in a 9 1/2 mile long line, with the cruisers in the center. While this formation was unwieldy, it was viewed as preferable to the risks of operating separate formations which might mistake each other for the enemy. Steaming order was set without regard for radar capabilities; the two cruisers with the best radar were last in line, and only the last of the four leading destroyers had SG radar. Callaghan also ignored radar capabilities in selecting his flagship. Like Scott at Esperance, he flew his flag from San Francisco

and relied on reports from other ships to track the enemy. This sorely tasked the overloaded communications circuits between the American ships.

Abe's dispositions were more flexible as he had to be prepared to meet a variety of threats, including torpedo boats and submarines. He steamed past Savo with his battleships in column and his screening forces spread around them in a rough semi-circle. Two destroyers preceded his main body.

Radar contact came at ----, and was reported by Helena at 0124 -- range 22000 and closing. Six minutes later, Callaghan ordered a right turn which began to swing his line in front of the Abe's main body. This move put the leading American destroyers on a collision course with their Japanese counterparts. These mutually surprised each other at 3000 yards range. Neither took offensive action until 0150, when Japanese searchlights flared into life and both sides opened up. If Callaghan intended to fight a close-in action, he certainly succeeded; engagement ranges closed down to less than 1000 yards -- so close that battleship main batteries could not be depressed far enough to hit small destroyer targets.

The short ranges brought other advantages to the Americans, although they had scant time to appreciate them in the midst of the maelstrom. Short ranges made Callaghan's less powerful guns more effective against the heavier armor of Abe's battleships. The close ranges also meant that hits would be concentrated on the superstructures of the ships. While these hits were not likely to sink ships, they were capable of crippling them. With Henderson intact, crippled Japanese ships risked sinking when day came; crippled American ships would live to fight again. Finally, short ranges would give the relatively anemic American torpedoes their best chance to score.

If this was Callaghan's plan, one consequence was his death, together with the death of Admiral Scott. Scott was in the light cruiser Atlanta, the first American ship to be illuminated. Shells ripped into her superstructure and torpedoes into her hull; she was finished in the first few minutes of the action. Callaghan survived the first five minutes, giving a warning about firing on friendly ships at 0155, but died when Japanese shells wrecked San Francisco's bridge shortly thereafter. Being behind thicker armor and faced with smaller shells, Abe survived, but his flagship, the Hiei, did not. Her topsides had been hit by more than fifty projectiles of various sizes and she may have been torpedoed as well. Morning found her hove to north of Savo Island, immobilized due to steering damage. There she was dispatched by **Marine Corps** aircraft. She was the first Japanese battleship casualty of the war. In addition to Hiei, the butcher's bill included two Japanese destroyers sunk and another three damaged. The Americans had four destroyers and the Atlanta sunk, one heavy cruiser damaged by shellfire and another torpedoed, a light cruiser torpedoed in the action and subsequently sunk by a Japanese sub, and a destroyer heavily damaged. Henderson field was spared.

Lessons from this fight were hard to glean, if only because the pandemonium was so extreme that the combatants could construct no clear picture of what had happened. This

was the last fight in which the American commander sailed in a ship with inadequate radar. It was the second time that American radar had worked better than Japanese optics, but the Americans had yet to take full advantage of their superiority. Utilizing this superiority was a matter of communications and tactics, of ideas which had yet to be fully worked out.

The losses in this first installment of the Naval Battle of Guadalcanal did not slow the tempo of Japanese operations. On the following night, two heavy cruisers threw some 500 8" shells into Henderson Field -- not very helpful, but far less punishing than a battleship bombardment. That the Japanese planned for the following night, when the surviving battleship from the first engagement was slated to return. The second engagement was as different from the first as a bar fight from a chess match.

Second Guadalcanal: the Chess Match.

The protagonists for the second installment were Rear Admiral Willis Augustus Lee, leading a force of two new battleships and four destroyers, and Vice Admiral Kondo, commanding the battleship Kirishima, two heavy cruisers, two light cruisers and nine destroyers. Although Lee was out-numbered 14 to six, his two battleships -- Washington and South Dakota -- were the most powerful pieces on the board. The shells from their 18 radar-directed 16" guns weighed almost twice as much as those used by Kirishima, and more than ten times those of the Japanese heavy cruisers. Kondo was behind on gunpower, but had a great equalizer in his more than 120 torpedo tubes.

Lee knew that Kondo was coming; he circled around Savo in line with his destroyers leading and his battleships behind. Kondo knew he was expected, but did not know what was waiting for him. He came on in three groups: an advance force of light cruiser Sendai and three destroyers, a main body of Kirishima and the two heavy cruisers, and a close screen of the other light cruiser and six destroyers.

The action started at 2210, when Sendai reported "two heavy cruisers and four destroyers" 13000 yards south of her. Of course, her lookouts had seen Lee, headed southeast after making a clockwise circuit of Savo. Sendai followed him with one destroyer in company, and sent the other two looping counter-clockwise around Savo to approach Lee from the opposite direction. Kondo maneuvered to put Savo between Lee and the Japanese main body, and detached the light cruiser Nagara and four destroyers to attack.

At Esperance and again two nights previously, American radar had created the potential for American surprise. Now radar let Lee down. Apparently, his battleships had a radar "blind spot" on either side of their sterns. Sendai was in this blind spot when she sighted Lee, and she stayed there for 50 minutes, until Lee turned his column westward. Lee was fortunate that the Sendai group did not launch a torpedo attack as he turned; their 35 Long Lances could have won the battle for Kondo then and there. In the event, Sendai waited for Kondo's detachment to arrive, and so was spotted eight minutes after Lee's left turn, range 16000 yards. Lee tracked her from 2300 until visual contact was made at 2312.

At 2217, Lee cut loose at her and she promptly went through a radical course change and laid smoke. Five minutes later, Lee's leading destroyers saw Sendai's two detached consorts emerge from behind Savo and run down on Lee's formation, 10000 yards distant. Four minutes after that, at 2226, Nagara's light forces were sighted barreling in after Sendai's destroyers.

The Japanese had acted just as their doctrine had prescribed: destroyers had closed the enemy, supported by light cruisers while the heavier ships moved up in support. The tactics seemed to be working: one American destroyer was out of action due to gun hits even as the first Japanese torpedoes hit the water. These torps, launched at 2335 by Sendai's detachment, sank one destroyer and crippled another. Gunfire from the Japanese light forces scored similarly; by 2238, Lee found himself without a screen.

Now came the turn of light cruiser Nagara and her brood. They carried 59 ready torpedoes, and (after firing some at Lee's destroyers) launched 34 of them across the 6500 yards of water separating them from South Dakota. South Dakota had been unlucky up to this point: she had lost all electrical power for three agonizing minutes at 2233; at 2242, her guns' muzzle blasts had ignited her seaplane; she then wandered out of formation and towards the Japanese at 2248. Now her luck changed -- all of the torpedoes missed.

The Japanese torpedoes had hit the water at 2355, and it was then that Kondo steamed into view from behind Savo Island. The crisis of the battle had been reached -- for the first time in the Pacific, battleships tracked battleships in their range-finders, and fired. The result was a decisive American victory; in just seven minutes, Washington scored 9 16" hits on Kirishima and knocked her out of the battle. While Kondo's force peppered South Dakota with shells and fired more Long Lances, they could not duplicate Washington's feat. South Dakota reeled away, burning and battered but untouched by Japanese torpedoes. As a consequence, she lived to fight another day. Kirishima was not so fortunate. Kondo withdrew behind a final barrage of torpedoes, leaving Kirishima to sink at 0320.

The second part of the Guadalcanal battle should have left the American somewhat concerned over their tactical system, and the Japanese much more so.

American radar had been well employed by Lee, a technologically minded admiral, but had still almost led to serious setbacks on two occasions. The first came when the Sendai saw the Americans while in their radar shadow. This gave the Japanese the initiative -- the Americans were lucky to lose only their destroyers to the coordinated Japanese attacks which followed. The second came when Kondo advanced his queen from behind Savo; for 5 long minutes, Lee withheld fire for fear that Kirishima was really South Dakota. Once again, the culprit was radar shadow. Lee had lost South Dakota in Washington's and did not fire until she emerged. Most likely, these lessons were lost on Lee; he would not have known enough about the Long Lance to appreciate the danger of delay.

Kondo seemed to play a complex chess game, but could not take any piece bigger than a pawn. Japanese torpedo accuracy was reminiscent of Java Sea, but with less excuse as the, ranges were shorter. Kondo's ships probably used almost all of their 120 ready torpedoes during the battle for only two hits --and those on the wrong targets. Even allowing for a healthy dose of American luck, this Japanese ineffectiveness is puzzling. While most of the Japanese destroyers had not seen surface action before, other unseasoned destroyers had done markedly better in the past and would do better in the future.

The whole episode seems another illustration of the difficulties of developing battle doctrine outside of the crucible of battle. Quite simply, the Japanese were given the opportunity to fight the battle which they envisioned in the way that they foresaw, and they failed.

Tassafaronga: Japanese Riposte.

While the Naval Battle of Guadalcanal marked the high point of the Japanese attempt to retake the island, it did not mark the end of Japanese naval activity in the waters off Savo. The Japanese still had large numbers of men on Guadalcanal, and used nighttime runs of the "Tokyo Express" to supply them. Their method was to send destroyers loaded with drummed supplies racing down from their bases in the upper Solomons. Upon arriving off Guadalcanal, the destroyers would use their boats to land supplies or cast the drums overboard in hopes that they would float ashore. One of these runs set the stage for the last surface action off Savo.

This final duel pitted Rear Admiral Raizo Tanaka, with six transport destroyers and two supporting destroyers, against Rear Admiral Carleton Wright, leading a force of four heavy cruisers, one light cruiser and six destroyers. Once again, the Japanese were outgunned; once again, their torpedoes would be their key weapons.

Wright's force was divided into four units: a leading group of four destroyers, followed by three heavy cruisers (including Wright in Minneapolis), followed by one heavy and one light cruiser, followed by two destroyers. With the exception of the last group of destroyers -- a last-minute addition --each of the groups had at least one ship mounting SG radar. Wright himself commanded from an SG-equipped ship, thus avoiding the mistake made by Scott at Esperance and Callaghan at First Guadalcanal. Wright would have information which had been denied to his predecessors; his challenge would to use it effectively.

Tanaka came on moving east in single file along the northern coast of Guadalcanal. One of his ships, the Takanami, he posted as a lookout northeast of his formation. It was this ship which Minneapolis' SG radar picked out 27000 yards distant at 2306 on November __. Wright maneuvered to put his ships on an opposite course, intending to begin a gunfire battle at 12000 yards range. This maneuver he completed at 2314. Two minutes later, the lead destroyers asked permission to attack a target 7000 yards off. Again, this

was probably Takanami steaming in advance of Tanaka's main force. Wright had not considered the possibility of beginning the action with a torpedo attack; American torpedoes could reach to 10000 yards at best, and only 6500 yards effectively. This seemed to let the American destroyers out of any offensive role.

So Wright decided. While Takanami was within range at closest approach, Tanaka's main column was almost 2500 yards further on. This was Wright's main target, and for four minutes he refused to permit a torpedo attack at extreme range. Wright has been criticized for not ordering a torpedo attack promptly, but his decision does seem reasonable, given that an attack from his destroyers on their current course would be of doubtful effectiveness, while ordering them to close the range to Tanaka's main body would expose them to discovery by Takanami, and result in the loss of surprise. American torpedoes to date had set a dismal record for reliability (failing repeatedly even when used to scuttle damaged American ships) and if used then, would not be available if Wright wanted them later.

If Wright was right then, he was wrong in ordering the attack after a four minute delay. This delay meant that the torpedoes were fired as Tanaka was passing by in the opposite direction, giving them a long run to catch him up.

As it was, the first ever coordinated radar torpedo attack was launched by the two SG-equipped lead destroyers at 2321. As Wright feared, the American torpedoes proved unequal to the task and no hits were scored. Wright began the main event a minute after the torpedoes left their tubes, when Minneapolis' guns roared into life.

If Wright intended to fight a gunfire battle at 12000 yards range, he had misjudged. His cruisers found their targets about 9000 yards off as they began to blast away. By 2324, even the SC-equipped cruisers had found targets and muzzle flashes blossomed from the entire American cruiser line.

Even before all of the American cruisers were in the fight, the Japanese responded. By 2322, Takanami had launched her 8 ready Long Lances at the cruiser line. Limned by American starshells, she also engaged with gunfire; this had the effect of concentrating American gunfire on her. She met her end smothered in iron, but her three of her eight torpedoes found American hulls. They struck at 2327 (indicating a run of about 10000 yards) -- two putting Minneapolis out of the battle and one blowing off New Orleans's bow abaft of her forward turrets.

Tanaka used Takanami's last stand to turn his other ships around, and then to bring their torpedoes into play. Thirty-two more knifed into the water between 2328 and 2333. These bore fruit at 2338, when one slammed into Pensacola aft. She reeled away toward the anchorage at Tulagi, aflame and with half of her propulsive power out.

So, just 16 minutes after the opening gun Wright lost three-fifths of his effective gun strength. Nine minutes later, another fifth disappeared when two torpedoes mortally

wounded Northampton. These came from Oyoshio, which launched at the incredible range of 20000 yards. This was the last blow struck in the battle, as Tanaka, uncertain of the size of the opposition, now retired.

This final naval engagement of the Guadalcanal campaign demonstrated that Japanese surface doctrine could work well, if flukily. That doctrine was superbly executed by Tanaka. The Japanese victory came too late to even temporarily reverse the tide of the Allied advance; had the Japanese torpedoes scored as heavily in the Naval Battle of Guadalcanal, the Americans might have lost the island.

For the Americans, the battle showed that American doctrine had evolved, but that it needed to evolve still further. Wright had sighted the Japanese well before they sighted him, and he knew it. His problem was to use that advantage to its full effect. Here he was hampered by two things: a lack of an effective torpedo weapon and a mismatch in ship types. The lack of a torpedo weapon stemmed from the now almost notorious unreliability of the American torpedoes and from the fear that sending the destroyers to attack independently would only sacrifice surprise and make them prospective targets for their own cruisers. The ship type mismatch was more subtle. Essentially, it stemmed from the heavy cruisers in Wright's force. Although their 8" guns fired shells twice the weight of the lone light cruiser's 6 inchers, they fired less than half as quickly. Against light ships, volume of fire counts for more than shell weight -- a 6" hit is almost as destructive as an 8" hit, and two 6" hits are considerable more destructive. Seen in this light, Wright's heavies become large, relatively ineffective targets. A third factor also weighed against Wright's chances -- the Americans were still unaware of the full capabilities of the Long Lance. Thus, Wright felt relatively secure planning to engage Tanaka at a range of 12000 yards when, in fact, that range was well within the capabilities of the monstrous Japanese torpedoes.

Guadalcanal: Summing Up.

This was the last of the surface actions of Guadalcanal, and marks a convenient time to review them all. In terms of tonnage sunk outright -- that is, as a direct result of surface action damage -- the Japanese outscored the Americans by 60 thousand tons to 22 thousand tons. The same applies to tonnage seriously damaged but not sunk: 72 thousand tons to 39 thousand. Only in the category of tonnage subsequently sunk as a result of surface action did the Allies finish ahead -- by 68 thousand tons to 6 thousand. The Japanese were more effective than the Americans in their surface tactics, but were ultimately defeated by the ability of American airpower to kill Japanese cripples before they could withdraw to safety. This ability, and specifically the ability to sink or force the scuttling of the two Japanese battleships damaged on November 13 and 15, put the Americans over the top in total tonnage sunk. Thus the Americans had done to the Japanese precisely what the Japanese had planned to do to the Americans -- attrite their surface forces by luring them into the range of land-based airpower.

Now a long naval hiatus passed as the Japanese slowly lost their hold on Guadalcanal. In February of 1943, they evacuated their surviving troops and braced to meet an Allied advance up the Solomons chain to Rabaul. This came in late June of 1943, when the Allies landed at New Georgia. This and subsequent Allied invasions set the stage for another seven major night surface actions.

These battles had a different cast of characters than the previous six. No battleships were employed by either side, nor were heavy cruisers used -- except by the Japanese on one occasion. This was largely a result of strategic priorities; the Japanese were saving their major fleet units for the planned-for "decisive battle," while the Americans were building their strength up for the upcoming Central Pacific campaign. The Americans had some building up to do, as operations in the Solomons area had resulted in 5 heavy cruisers sunk and 3 more gravely damaged from a pre-war strength of 18.

Kula Gulf:

The first major night surface action of 1943 took place when the Japanese sent a destroyer force to land supplies and reinforcements for the New Georgia garrison. The force consisted of 7 transport destroyers and 3 escorting destroyers, including the large destroyer Niizuki flying the flag of Rear Admiral Teruo Akiyama.

Facing Akiyama was Rear Admiral Walden Ainsworth with a force of three 15 gun light cruisers and four destroyers. All of Ainsworth's ships had SG radar and combat information centers --compartments in which radar reports could be speedily collated and interpreted. Almost all of them had been operating together for some months. Ainsworth had thought about surface tactics, and had developed and practiced two battle plans. Both emphasized naval gunnery. The first envisioned a radar controlled gun battle fought a range of 10000 yards, perhaps with torpedo attacks from his destroyers. The second contemplated a longer ranged gunfire battle directed by radar and starshell illumination. Ainsworth was ignorant of the Long Lance, so neither plan took it into account.

In the wee hours of July 6th, Ainsworth's force was steaming in the Kula Gulf west-north-west of the coast of the island of Kolombangara, prowling for Akiyama's ships. Unknown to Ainsworth, Akiyama had already passed south between the coast and the Americans. It was after he had dropped off 3 of the supply-carrying destroyers and headed north that the battle began.

While Akiyama was got clues to the American presence from radar detection gear carried by Niizuki, Ainsworth got the first hard contact at 0140. Once again, SG radar had come through to pick Akiyama's ships from the Kolombangara shoreline at 27400 yards range. Ainsworth put his ships in the now-standard line ahead formation and turned them individually right towards the enemy. He decided to execute his first plan, a gunfire battle at 10000 yards, and so moved to shorten the range while capping Akiyama's "T". The Battle of Kula Gulf was about to begin.

Unaware of Ainsworth's location or intent, Akiyama decided at 0143 to detach another four destroyers south to unload supplies. Four minutes after the detachment wheeled away to the south, Akiyama spotted Ainsworth's ships as they began to turn leftwards back into line. Ironically, Akiyama's division of his force had thrown the American radar plotters into confusion, and bought him nine minutes in which to close the American line and recall his other ships.

This respite ended at 0156, when Ainsworth decided to engage Akiyama's oncoming ships. The Americans opened at 0157, with the light cruisers going to rapid fire at a 7000 yard range and steaming on straight courses to maximize accuracy and rate of fire. They scored immediately on Niizuki, and soon reduced her to a sinking state. Her two consorts promptly responded with 16 Long Lances, while the detached group came north and added their guns to the din.

The Japanese response bore fruit at 0204, when the first of four torpedoes (including one dud) crashed into Helena. She was just beginning a turn as she was hit -- a victim of steaming too straight for too long. Three of the big Japanese warheads were more than enough to finish her; Helena sank before the last Japanese destroyer had cleared the battle area. This bears some reflection on the essential vulnerability of modern warships to hits below the waterline; 3000 pounds of high explosive easily dispatched 22 million pounds of ship.

Japanese destroyers other than Niizuki took some shell hits, but none proved fatal or even crippling. Once again, radar and rapid fire had not been enough to overcome Japanese torpedo technique.

Like the American admirals before him, Admiral Ainsworth was in part a victim of the Allied ignorance of the Long Lance's capabilities. Still, it is perplexing that this action, plus Tassafaronga, plus other encounters with Japanese destroyers did not tip the Americans off to the existence of this remarkable weapon. If this intelligence failure stemmed from the Americans' belief in their own unvarying technological superiority, it proved exceedingly costly in ships and lives. And the full price of it had yet to be paid.

Kolombangara:

The next surface action followed closely after the first and was fought in almost the same waters. Once again, the clash resulted from a Japanese attempt to run destroyer-transports down the Slot to New Georgia. This time the Japanese force consisted of four destroyer-transports and five covering destroyers -- all led by Rear Admiral Shinji Izaki in light cruiser Jintsu. Facing him was Admiral Ainsworth, this time commanding ten destroyers, the two surviving 15 gun light cruisers from the Kula Gulf action, and the smaller light cruiser Leander of the Royal New Zealand Navy.

Once again, a radar detection device gave the Japanese first notice of the enemy's proximity, but with insufficient certainty to plan offensive action. Ainsworth cruised

west towards the northern tip of Kolombangara, acting on a sighting report from a nocturnal "Black Cat" flying boat. Once again, Ainsworth's SG radar functioned efficiently to give him a contact at 30000 yards, time 0100. Once again, Ainsworth moved to close the range for effective gunfire.

This time, however, the Japanese got in the first shot while the Americans maneuvered. Izaki saw the Americans coming on at 0108, and opened with torpedoes and gunfire at a 16000 yard range. Ainsworth was only a minute behind him, ordering his five leading destroyers out of line to launch torpedoes and opening fire with his cruisers. Here was a first -- American destroyers detached to launch torpedoes in a coordinated attack. A second attack, by the five trailing American destroyers, followed at 0116, but with uncertain effect. Within five minutes, the combined attacks had torn Jintsu apart. Ainsworth then turned his force away from the Japanese as the range had dropped below 9000 yards. This was the right idea executed just a little too late. At 0122, Izaki's torpedoes arrived and found Leander. She was hit only once, but that hit put her out of the battle.

Ainsworth made his next move at 0131 when he sent three destroyers northward in response to a Black Cat sighting report of four withdrawing Japanese destroyers. These four ships had headed northwest while reloading their torpedo tubes. Although the three American destroyers detached to chase them failed to make contact (not having heard the order to pursue), Ainsworth's main body also turned to pursue. They made contact as the Japanese completed reloading and turned back to the south. Then Ainsworth made a fatal error. Uncertain of the whereabouts of his detached destroyers and fearful that the radar contact which he saw to the north were his own ships, he held his fire until he could illuminate his targets. Due to an intervening rainstorm, this entailed a delay of nine minutes and permitted the range to close from 23000 to 7000 yards. Ainsworth illuminated and opened at 0205; the Japanese launched 31 torpedoes at almost the same instant. Again, Japanese torpedoes proved superior to American gunfire -- St. Louis, Honolulu and destroyer Gwin each reeled in turn from the blast of a Long Lance. The cruisers would live to fight another day, but Gwin was a total wreck. Their torpedoes now exhausted, the Japanese destroyers withdrew.

So ended Ainsworth's command. In two actions, he had lost one large light cruiser and one destroyer sunk and one small and two large light cruisers seriously damaged. In exchange, he sunk one light cruiser and one destroyer, and killed two admirals. In neither action did he prevent the Japanese from carrying out their intended missions.

In Ainsworth's defense, it can be said that he was uninformed of both the range and potency of the Long Lances and the existence of reloading gear. Thus, he was unaware of his peril when he planned to engage at 10000 yards and when he chased the Japanese north at Kolombangara. His losses were softened by a genuine belief that the Japanese had suffered worse, the combined Japanese ship losses for the two battles being estimated as between 12 and 14. Time was needed to determine the actual scores of these battles and to recognize and digest their lessons.

Chief among these lessons was the relative superiority of Japanese torpedoes to American guns. Although Ainsworth had had his opponent pinpointed minutes before he himself was sighted, his gunfire was not effective enough to capitalize on his advantage. For accurate radar-controlled fire, he had to close to 10000 yards or less -- about five minutes' commuting time for the Long Lances. At that range, he could not cripple the Japanese before they crippled him. His guns' effectiveness was not helped by his ships' tendency to concentrate fire on the nearest (and so largest) radar blip. This tendency resulted in single ships being overwhelmed by fire while others in their company remained relatively unscathed. Clearly, some other method was needed to capitalize on the undoubted advantage of radar.

A lesser lesson related to force coordination. Although they have been criticized for it, the Japanese were past masters of operating separate forces effectively. Ainsworth was the first American admiral to unleash his destroyers from the cruiser "battle line," and the novelty of this tactic was reflected in its ineffectiveness. Thought would have to be given to techniques of operating separate forces at night if the full potential of American destroyers was to be realized.

Three weeks was all the time available to switch to new tactics but that proved to be time enough; the next battle in these waters was entirely different from any of the actions fought there previously.

Vella Gulf: Real Dawn.

The calm, moonless night of August 6th found Commander Frederick Moosbrugger and the six destroyers under his command cruising off the western coast of Kolombangara, waiting for a Tokyo Express that had been spotted on the way down the Slot that afternoon. Moosbrugger's sortie was the first strike by an all-destroyer American force since before the Battle of the Java Sea. Moosbrugger's ships had been schooled in the tactic of radar-directed torpedo attacks; now, unencumbered by cruisers, they would test their tactic in battle.

Coming south towards Moosbrugger were four Japanese destroyers on a supply and reinforcement run to Kolombangara. The Japanese ships, led by Captain Kaju Sugaira in Hagikaze, steamed in a line, their lookouts scanning the sea and sky for ships, planes and PT boats.

Moosbrugger steamed north towards the Japanese in two parallel lines of three destroyers each. This disposition resulted from differences in his destroyers' armaments and uncertainty about the nature of his opponents. The destroyers in the left-hand column carried 42? torpedoes, and were detailed to engage warships. The right-hand destroyers had sacrificed half of their torpedo armament to carry more automatic cannon; they would engage first if barges and small ships were the target.

Predictably, Moosbrugger spotted the Japanese first, just east of north and 21000 yards away. SG radar having done its job, Moosbrugger began the ticklish task of closing the range to 6000 yards (effective torpedo range) without being spotted in turn. To do this, he first ran his torpedo-armed ships northeast along the Kolombangara coast until he was 4500 yards east of Sugiura's line of advance. He then turned north on the opposite course to close the range. He kept his second column south to finish off the cripples which he hoped he would soon create. For eight minutes he maneuvered, then, at 2341, he launched 24 torpedoes in a near perfect set-up.

Moosbrugger had timed his moment nicely, for it was only at 2342 that Sugiura's flagship spotted him and gave the alarm. This contact was not firmed up until it was confirmed by the trailing destroyer at 2344, and by then the first of the American torpedoes arrived.

They arrived as no previous American torpedoes ever had -- directed with accuracy at a surprised and vulnerable target. Every Japanese destroyer was hit: Arashi took three and was finished by another and gunfire, one in Kawakaze's magazine sufficed for her, two mortally wounded Hagikaze, and lucky Shigure took a dud which passed cleanly through her rudder. Shigure managed a torpedo counter-volley at 2344, but Moosbrugger had already denied her any chance to score by turning his ships sharply away after firing. Shigure whipped around north and returned 26 minutes later with her tubes reloaded, but the scene of burning and exploding Japanese ships which greeted her was so discouraging that she turned for home.

Here was an American tactical innovation which, if it could be replicated, promised to redress the advantage which the Japanese had enjoyed in night surface action. Although the concept of radar directed torpedo attacks was not new -- it was used at First Guadalcanal and Moosbrugger had practiced it since May 1941 -- it had never been recognized as an antidote to Japanese night tactics. Now Moosbrugger made it clear that the Japanese could be defeated at their own game. This is not to say that Moosbrugger's tactics were a panacea; they were not. For success, Moosbrugger had gambled that he could close to effective torpedo range before the Japanese could spot him and retaliate. Because the Japanese torpedoes far outranged his, this maneuver was fraught with considerable peril and helped by the poor visibility on the night of the engagement. Fortune did favor the brave, but it remained to be seen if others could similarly woo her.

Horaniu: Stalemate.

The next captain got his chance on August 17th, when the Japanese mounted an attempt to establish a barge base on the island on Vella Lavella. The troops and supplies shipped in 23 small craft; four destroyers commanded by Rear Admiral Matsuji Ijuin screened them. Opposing them was another four destroyer force led by Captain Thomas Ryan.

Ryan first knew that his adversary was close at 2330 when his lookouts spotted Japanese anti-aircraft fire being put up to ward off an attack by some nocturnal bombers. It was 29 minutes after midnight before he got a radar contact - Ijuin's destroyers 22500 yards west-

north-west and heading away. Shortly afterwards, Ryan found himself with an embarrassment of riches when his radar picked up the Japanese small craft 18000 yards to the west. He chose between targets at 0040, and headed west towards the small fry.

Unknown to Ryan, Ijuin's lookouts had spotted him by the light of a full moon at 0035, 18000 yards distant. Although the Japanese destroyers were disordered by the previous air attack, Ijuin pulled him into a ragged line and turned west. At 0046, his destroyers began to pump out torpedoes at ranges varying from 13000 to 19000 yards.

Before they could score, Ryan turned north in a fruitless attempt to emulate Moosbrugger. It seems odd that Ryan thought to surprise Ijuin, for -- although Ijuin had given no overt sign of having spotted his foe -- Ryan had been dogged by a flare-dropping Japanese floatplane since at least 0040. Nonetheless, Ryan turned north to close the range and then west to parallel Ijuin's course and bring his guns to bear. He began to swap shells with Ijuin at 0056 when the range dropped to about 15000 yards.

The Japanese admiral responded to Ryan's attentions by veering south to cross Ryan's "T," and Ryan countered in turn by turning north and loosing off 4 torpedoes of his own. Although shells and torpedoes flew back and forth, the long ranges and radical maneuvers of the contending forces prevented much damage from being done. The duel went on until 0114, but Ijuin had taken the decision to withdraw 14 minutes previously when his own radar reported more American ships approaching from the south. While these were phantoms, Ijuin's work was largely done by the time he retired; when Ryan turned back, he found that the Japanese small craft had scattered. He caught only five.

So the second destroyer duel ended in a stalemate -- due largely to the extreme range of engagement. Ryan was denied Moosbrugger's opportunity for surprise by the excellent visibility and the ubiquitous Japanese floatplane. Lucky he was to avoid all of the torpedoes which Ijuin launched. Clearly, Moosbrugger's solution was not a panacea.

Vella Lavella: Against the Odds.

The next man to try Moosbrugger's solution was Captain Frank R. Walker, who led a three destroyer force into what would be known as the battle of Vella Lavella. His object was to break up a Japanese attempt to evacuate the troops on that island. The evacuation force was led by Rear Admiral Ijuin, who had broken with the tradition established by his three predecessors by surviving his previous surface engagement. Ijuin commanded 12 small craft, three destroyer-transport and six escorting destroyers.

Walker hoped for reinforcements -- in the form of another three destroyers coming up from the south -- but he elected to engage before they joined. Ijuin got the first contact at 1940 on October 6th when a Japanese floatplane began to dog Walker's ships. By 2058, the Japanese destroyer-transport group withdrew after hearing Walker's ships reported as a cruiser and four destroyers. Their two escorting destroyers steamed south to join the four grouped with Ijuin as he prepared to defend his smaller charges.

Contact came for the American's at 2231, when SG radar picked out Ijuin's ships 20000 yards to the north. Four minutes later, Ijuin's lookouts found Walker by the light of a half-moon. They did almost as well as radar on that night, spotting Walker 19500 yards off. Ijuin, who had been heading north-north-east towards his barge group, now decided to reverse course. This reversal had two objects. First it would help to resolve Ijuin's doubts as to whether the contact was the enemy or his own small craft. Second, it would lead the enemy (if enemy they were) away from his charges.

Walker, who was south-east of Ijuin and traveling on an south-south-east course, gradually altered course to the west to close the range. This must have convinced Ijuin that he had found the enemy, but he was slow to engage. At 2251, with the range down to 14000 yards, he ordered his ships to turn left individually. This maneuver put him in front of Walker (which was good) but with his ships arranged so that those furthest from the enemy could not fire for fear of hitting friends. The consequences of this maneuver became clear at 2256 when Walker opened with guns and torpedoes. Only Yugumo, closest to the Americans, could reply. She tried to reverse course to give her sisters a chance to fire, but she only got halfway through her turn before shell hits wrecked her. Walker began the action at 7000 yards range; Yugumo closed to 3300 yards before she was hulked.

Yugumo's sacrifice was not entirely in vain. She had managed to sluice off eight torpedoes, and one of these dealt destroyer Chevalier a mortal blow at 2301. Not only was she taken out of the battle, but the destroyer following her was knocked out line after colliding with her. Walker swung northwest alone in his flagship Selfridge, firing at the two destroyers from the transport force. These had passed through the battle area headed south-west; they now turned north and, at 2301, launched 16 torpedoes at a range of 12000 yards. These arrived at 2306, and blew off Selfridge's bow. Thus the last of the American destroyers went out of action.

Fortunately for Walker, the cavalry now arrived on the form of the reinforcing destroyers. Spurred by a floatplane report of more "cruisers" approaching, Ijuin withdrew to the north-west at 2313. He loosed off 24 torpedoes before he went, but they failed to score from the long range of 16000 yards. The battle of Vella Lavella was over.

Moosbrugger's triumph was yet unduplicated, but the reasons for that were not too distressing. First, of course, Walker had been outnumbered 2-to-1 in ships and by more than that in combat power. Second, both the Japanese floatplanes and the good visibility prevented Walker from closing to effective torpedo range without being detected. In the event, Walker was lucky that Ijuin's mistimed maneuver prevented the Japanese from launching their usual devastating torpedo riposte. Walker did well to trade one destroyer sunk and another damaged for Yugumo.

Empress Augusta Bay: Doctrine Perfected.

The next surface action confirmed that American doctrine finally had caught up with the promise of radar. This was the battle of Empress Augusta Bay, fought when the Japanese attempted to raid the American transports unloading troops for the invasion of Bougainville. This was the last Allied invasion in the Solomons.

The invasion forces went in on November 1, 1943; the Japanese response followed one night later. Leading the Japanese forces was Rear Admiral Sentaro Omori. His mission was the same as Mikawa's fifteen months previously: sink the American transports before they could finish unloading their cargoes of troops and supplies. His means were slimmer: two big heavy cruisers -- Myoko and Haguro -- two light cruisers, and six destroyers.

Facing him was Rear Admiral A. Stanton Merrill, commanding four new "Cleveland" class light cruisers and eight destroyers. All of Merrill's ships were SG equipped; the Clevelands mounted twelve 6" guns and carried the armor of heavy cruisers. Merrill began the battle with several advantages over his opposite number at Savo Island. He was timely apprised of Omori's movements by night-flying patrol planes, light Allied naval forces and, finally, his superior radar. His destroyers -- ably commanded by Captain Arleigh A. Burke -- were practiced in the tactic of radar directed torpedo attacks, and Merrill was prepared to give them the freedom to carry out such attacks. He was more aware than any prior commander of the capabilities of Japanese torpedoes, with the result that he planned to have his cruisers engage at long range.

Merrill was first informed of Omori's approach by aircraft and light naval forces; he got a radar contact 35,900 yards to the northwest at 0227. Omori was steaming southeast in three columns -- the center comprised of his two heavy cruisers and two flanking columns each made up of a light cruiser and three destroyers. At 0231, Merrill detached half of his destroyers for a torpedo attack. Eight minutes later, he reversed his course to the south to cap Omori's "T".

Omori had no inkling of Merrill's presence until 0245, when a floatplane dropped flares on the American cruiser line 18,000 yards distant. His forces did not pick up the attacking American destroyers until 0248, two minutes after they had launched 25 torpedoes at Omori's left-hand column. Now things happened quickly: Omori's left column sluiced off torpedoes at both the American destroyers and the American cruiser line, Merrill's cruisers opened fire at 0249, and Omori ordered a turn to the south at 0250.

While Omori's right turn thwarted the American torpedoes, his left column suffered nonetheless. First to be struck was the leading light cruiser, the initial target of Merrill's guns. This was Sendai, and she began to smoke and burn from repeated 6 inch hits. As she reeled out of line with a jammed rudder, the last two destroyers in her column collided and retired. The remaining destroyer joined the heavy cruisers.

The remainder of the action consisted of Merrill's cruisers blasting away at ranges of 16000 to 20000 yards while Omori responded with guns and torpedoes. Both Merrill's and Omori's fire was lessened in effect by Merrill's radical maneuvering and his liberal

use of smoke. The 45 minute fight was punctuated by three duds hitting Denver, seven or eight hits on Omori's heavy cruisers, a collision between heavy cruiser Myoko and destroyer Hatsukaze, and a torpedo hit on destroyer Foote which blew off her stern. Omori gave the order to retire at 0329, leaving Sendai and Hatsukaze to the eager attentions of Burke's destroyers. Burke sunk them both, but command and control problems -- combined with the fear of firing on friendlies -- hampered his pursuit of Omori's main body.

The contrast between Savo and Empress Augusta is striking. Merrill had effective radar and used it effectively, launching his destroyers on a surprise attack and directing his gunfire in conditions of low visibility. The American destroyers were employed offensively; their opening torpedo attack was frustrated only by Omori's unrelated order turning his ships south. Merrill kept his cruisers constantly turning beyond effective Japanese torpedo range, and although this minimized the effectiveness of American gunnery, it did not stop Merrill from frustrating Omori's mission.

By contrast, Omori was robbed of the initiative by the American radar advantage. He battled for 45 minutes, but saw his enemy only intermittently. He broke off the action convinced that he was facing seven cruisers and twelve destroyers, and that he had sunk two.

The net result of the battle showed the adaptations of American tactics. Gunfire still remained the backbone of American battle capability, but the radar torpedo attack showed that the Americans had recognized an effective way to combine their excellent radar with their mediocre torpedoes. Effective command and control measures (such as C.I.C.'s and P.I.P.'s) permitted Merrill to direct a radar-controlled battle. Although American gunfire did not in itself inflict decisive damage to the Japanese ships, it was effective within the operational context to frustrate Omori's mission. Put another way, Omori could not press on to the transport in the face of Merrill's fire with a reasonable chance of attacking the transports and disengaging before daylight. Disorganized and battered, Omori had little choice but to disengage.

Cape St. George: the Perfect Battle.

The last battle to be examined shows the American naval forces giving battle to the Japanese at the gates of Rabaul. This was the battle of Cape St. George, fought on November 25, 1943. The battle resulted from a Japanese reinforcement/evacuation mission to Buka, the next island up the Solomons chain from Bougainville. The Japanese force consisted of five destroyers -- three acting as transports and two escorts -- commanded by Captain Kiyoto Kagawa. Opposing them was Arleigh Burke with five destroyer veterans of Empress Augusta.

Burke was not informed of Kagawa's sortie in time to intercept him on his outward trip, but found him on his return leg. Burke made radar contact at 0141 at a range of 22,000 yards. At the time, he was athwart Kagawa's escape route, steaming north with the

Japanese coming at him from the east. Burke promptly headed towards the Japanese for a radar controlled torpedo attack on Kagawa's two screen destroyers. Helped by poor visibility, he got fifteen torpedoes away at 0156 without being detected. They arrived four and one-half minutes later, sinking Omani outright and knocking Makanami out of the battle.

Burke had turned south after launching his torpedoes; he now came north with three destroyers to pursue the transport destroyers which had been following the screen. He closed the range to 8000 yards and then, at 0215, swerved right on a hunch. Burke's hunch proved to be an excellent one; a salvo of torpedoes from destroyer Yugiri exploded in his ships' wakes. By 0222 Burke was back after the transports and his guns began to talk. It took only three minutes of firing to persuade the Japanese to split up. Burke followed Yugiri, hounding her to death by 0305. Now perilously close to Rabaul and daylight, Burke withdrew. He had replicated Moosbrugger, sinking three destroyers and suffering absolutely no damage in return.

Once again, well-executed American doctrine produced an American victory. The effectiveness of radar-controlled torpedo attacks (at least when low visibility conditions negated the excellent Japanese night optics) was confirmed. Radar-controlled American gunnery also proved superior, accounting for a Japanese destroyer in a running gun fight. After almost two years of painful efforts, American surface-fighting doctrine had finally come of age.

Conclusions

The battles described above happened fifty years ago, but they still contain lessons which are valuable today. They demonstrate the interplay between technology and doctrine. While this interplay has increased in complexity and importance since they were fought, the basic issues which the Americans and the Japanese faced half a century ago remain.

1. Mere technology is not enough.

Effective technology requires effective doctrine. Technological superiority itself is no guarantee of battlefield success. It must be used intelligently. Intelligent use of technology is hard to improvise; it should stem from doctrine developed in advance. Both the Japanese and the Americans learned this lesson the hard way: the Japanese with their torpedo tactics after Java Sea and the Americans with radar.

The American experience with radar best demonstrates this axiom. After Savo Island (and with the fluky exception of First Guadalcanal), radar always gave Americans the first sighting of the enemy. Despite this advantage, it took them until August 1943 and Vella Gulf to reap the maximum benefits from that advantage. Unfamiliarity radar's capabilities, insufficient facilities to effectively use the information which it gave and the absence of an entirely satisfactory

doctrine to capitalize on its abilities all combined to stunt its potential. Its effective use required enhanced ship-to-ship communications, the installation of combat information centers and the development of radar-directed torpedo doctrine.

2. Be careful what you wish for; you might get it.

Weapons design represents a gamble on technological and doctrinal effectiveness. The Americans gambled on the supremacy of gunfire and the power of radar; the Japanese gambled on their Long Lances. The Japanese gamble on their torpedoes paid off early. The American gamble on gunfire yielded low returns, but the bet placed on radar proved to be the biggest winner. Had any of these bets gone bad, the navy placing them would have been in a difficult position.

All this demonstrates the absolute necessity of thinking through doctrinal issues and testing technology before making investments in new weapons systems. This is a difficult task, and one which can be imperfectly performed at best. Nonetheless, it is critical to any investment in new technology.

A case in point are the American 15 gun light cruisers. An extreme bet on the effectiveness of naval gunnery, they never met expectations as surface combat ships. To use their 6 inch guns to full effect, they had to expose themselves to Japanese torpedo counter-thrusts. At Kolombangara and Kula Gulf, these ships came off the worst in actions against the Japanese destroyers which were meant to be their prey. Although they were far from being totally ineffective, they represented investments in resources which could have been better used elsewhere.

3. Do not stint on training.

Nothing comes for free, and dollars spent on training must come at the expense of weapons development, weapons procurement and a host of other urgent demands. Nevertheless, the experience in the Pacific shows the importance of hard, realistic training. Obviously, training benefits those being trained. Less obviously, realistic training benefits the development of technology and doctrine. It does this by subjecting them to stress, and so by seeing what works and what does not. Testing to destruction is expensive, but it still seems the best way of judging the true capabilities of weapons and doctrine.

4. Weapons and doctrine cannot be developed in a vacuum; knowledge of enemy capabilities is essential.

The American radar-controlled gunfire system was an outstanding technological achievement that could deliver effective gunfire at nighttime ranges out to 10,000

yards. Unfortunately for the Americans this system was up against the Long Lance, which could hit and cripple the Americans at a five mile range before their gunfire could fairly take effect. The Americans took no account of the Long Lance in their doctrinal development for the simple reason that they were ignorant of its existence.

This ignorance extended through twenty months of war; even in August of 1943, the superiority of Japanese torpedoes was a matter of speculation. Many lives and much treasure could have been saved if American doctrine had been originally developed or promptly modified to take the Long Lance into account. It was not until Empress Augusta Bay that tactics were developed to permit American cruisers to engage without undue risk of being torpedoed.

Of course, there is a flip side to discovering the enemy's capabilities, and that is preserving one's own secrets. Nowadays, we expect to read about the latest NATO weapons systems in Jane's; the Russians are more close-mouthed. They have learned the lessons of secrecy and doctrinal development.

5. Doctrinal development must be dynamic.

The most successful American tactic of the Pacific battles -- radar-controlled torpedo attacks -- was hardly a desperate innovation, but neither was it the primary American doctrine. Less successful was radar-controlled gunfire, despite the pre-war American emphasis. To be effective, American doctrine had to be dynamic enough to recognize the shortcomings of gunfire and the importance of torpedoes. This it did, after twenty-one months of war, with the results being the victories of Vella Lavella and Cape St. George. Japanese doctrine was more completely formed at the start, but less dynamic -- the Japanese missed the significance of radar and never incorporated it into their surface tactics. Thus, they better practiced the first four axioms, but stunted on the last. In a long war, it proved their undoing.

Each succeeding generation of military thinkers has developed convincing rationales for concluding that their wars would be shorter and more decisive than those before. Today, given both the effectiveness and high cost of modern weapons, they may actually be right. If they are, accurate assessment of technology and effective development of doctrine will become even more important. In a war fought with modern weapons, victory will sway toward the side that has thought best and deepest about its doctrine.