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Thomas G. Mahnken

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# ASYMMETRIC WARFARE AT SEA

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## The Naval Battles off Guadalcanal, 1942–1943

*Thomas G. Mahnken*

**D**uring the six months between August 1942 and February 1943, the waters around the island of Guadalcanal witnessed an almost constant struggle between the Japanese and American navies. The campaign included more than a half-dozen major battles, many of which occurred at night. Although the U.S. Navy enjoyed a technological advantage over the Imperial Japanese Navy, including its widespread adoption of radar, it lost all but one of the campaign's major engagements.

The Guadalcanal campaign demonstrates that technology alone is no guarantor of victory. In order to exploit advanced technology, military organizations must first develop appropriate operational concepts and organizations. The Japanese navy possessed a coherent tactical system for night fighting, a system that gave it a tremendous advantage over the U.S. Navy despite the latter's widespread use of radar. Both sides suffered from faulty intelligence and poor communication throughout the campaign, yet Japanese forces prevailed in battle after battle, because their concepts gave them a superior awareness of the tactical situation.

*Thomas G. Mahnken is currently Jerome E. Levy Chair of Economic Geography and National Security at the Naval War College and a visiting scholar at the Philip Merrill Center for Strategic Studies at Johns Hopkins University's Paul H. Nitze School of Advanced International Studies. Dr. Mahnken served as the Deputy Assistant Secretary of Defense for Policy Planning from 2006 to 2009. He serves as a commander in the Navy Reserve.*

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The Guadalcanal campaign is highly relevant today, as the U.S. Navy once again focuses its attention on the western Pacific. First, the service believed before the start of the Pacific War, as it apparently does today in planning a strategy to influence China, that it enjoyed a decisive advantage. In the event, it was surprised by an adversary who was at least as skillful in sea battles as it was during all of 1942. Second, the

campaign demonstrates that tactical competence and technology are both key constituents of competence in battle.

### THE PREWAR MILITARY BALANCE

The American and Japanese navies that clashed during World War II were similar in a number of important respects. Because the United States and Japan saw each other as their most probable adversaries in the years leading up to the war, their navies came to resemble each other. Each planned to fight a war at sea that would culminate in a decisive fleet engagement between battleships. Such similarities, however, masked important differences in the tactics and technology of the two forces. Whereas the U.S. Navy planned to conduct daylight battles, the Imperial Japanese Navy emphasized the tactics and weapons needed to conduct night surface engagements. This approach would give the Japanese a considerable advantage over the Americans during the Guadalcanal campaign.

Geography dictated that any war between Japan and the United States would primarily be maritime. The length of sea lines of communications in the Pacific meant that the side operating nearer its home waters would enjoy a considerable advantage. Although the expanse of the Pacific would render a Japanese attempt to seize Hawaii or attack the west coast of the United States untenable, it would also complicate American efforts to cross the Pacific. The award of Germany's territories in the Marshall, Caroline, and Mariana Islands to Japan at Versailles and Washington's agreement not to fortify its island possessions further as part of the Washington Naval Agreement compounded the difficulty of the task. Japan thus enjoyed a significant geographic advantage in the Central and western Pacific. In the words of the U.S. Joint Army and Navy Board,

The position of Japan is such as to form a continuous strategic barrier of great strength covering almost the entire coast of Eastern Siberia and of China, while the position of its Mandate forms a barrier of considerable depth between the United States and the Philippines. The geographic strength of Japan is its interior position as regards to its outlying possessions, its interior position with regards to Eastern Asia, and its insularity.<sup>1</sup>

Although Japan enjoyed a considerable geographic advantage, the economic balance favored the United States, which possessed an economy nine times larger than Japan's.<sup>2</sup> Moreover, while the United States enjoyed a diverse and robust industrial infrastructure, Japan's was much more limited. In 1940, for example, the United States produced sixty-one million metric tons of ingot steel, compared to 7.5 million tons for Japan.<sup>3</sup> Whereas the United States was largely self-sufficient in key resources, Japan depended heavily on foreign sources of raw materials. Tokyo imported 55 percent of its steel, 45 percent of its iron, and

all of its rubber and nickel.<sup>4</sup> Indeed, approximately 80 percent of its crude and refined oil stocks came from the United States.<sup>5</sup> Whereas Japan received much of its war-supporting materials from the United States, America had no such dependence on Japan. As the Joint Board put it, “The United States is economically strong and well able to prosecute war against Japan, while Japan is exposed to precarious economic conditions in such a war through her vulnerability to economic disruption of her industrial life.”<sup>6</sup>

Several sectors of Japanese industry made considerable strides between 1918 and 1941. By 1937, for example, Japanese dockyards were building more than 20 percent of the world’s ships, second only to Great Britain’s.<sup>7</sup> Tokyo also developed a substantial aircraft industry, first through licensed production of foreign engines and airframes and then by manufacturing a number of increasingly capable indigenous designs.<sup>8</sup> By the outbreak of the Pacific War, Japan was producing military aircraft as good as or better than those of its Western counterparts.<sup>9</sup>

Although the Japanese economy was much smaller than that of the United States, Japan’s armed forces enjoyed much greater access to their nation’s resources than did the American armed forces. Japanese defense expenditures rose steadily throughout the 1930s.<sup>10</sup> In 1934, for example, defense spending accounted for nearly 44 percent of the national budget, compared to nearly 18 percent for the United States. Arms procurement accounted for nearly two-thirds of the Japanese government’s spending on durable goods during the 1930s.<sup>11</sup>

The interwar naval arms-limitation regime constrained the size and shaped the composition of both the American and Japanese navies. The 1922 Washington Naval Agreement limited the United States to eighteen battleships and battle cruisers totaling 525,000 tons and allowed Japan ten battleships and battle cruisers totaling 315,000 tons. The treaty was designed to give Japan sufficient strength to defend itself without threatening U.S. possessions in the Pacific. It forbade the construction of capital ships displacing more than thirty-five thousand tons and mounting guns in excess of sixteen inches. It allowed the United States to possess carriers totaling 135,000 tons and Japan eighty-one thousand tons and either to convert two ships displacing thirty-three thousand tons or less to carriers. While the agreement did not constrain overall tonnage of cruisers, it limited their displacement to ten thousand tons and main armament to eight-inch guns.<sup>12</sup> The United States would retain enough naval power to protect its possessions in the Pacific but not enough to challenge Japan in its home waters.

The 1930 London Naval Agreement completed the Washington treaty’s arms-limitation framework, establishing tonnage limits for cruisers, destroyers, and submarines. It allowed Japan to build 70 percent of the cruiser and destroyer

tonnage of the United States, and accorded it parity in submarines. It limited light cruisers to six-inch armament, destroyers to 1,850 tons and 5.1-inch armament, and submarines to two thousand tons.<sup>13</sup>

The possibility of a war with Japan dominated U.S. naval planning during the interwar period.<sup>14</sup> Planners expected that Japan would seize America's possessions in the Far East at the outset of a war, forcing the United States to fight its way across six thousand miles of ocean to reclaim them. The U.S. Navy spent the interwar period trying to solve the operational problems associated with a transpacific naval campaign. As early as 1928, war games at the Naval War College, in Newport, Rhode Island, showed the balance in a war between the United States and Japan shifting in Tokyo's favor. Over time, the growth of Japanese naval power forced the U.S. Navy to modify its plans: originally envisioning a rapid transpacific lunge as the best way to relieve the Philippines, in 1935 it had adopted a strategy that foresaw the need to wage a long and incremental campaign through the Japanese-held islands of Micronesia.<sup>15</sup>

U.S. naval doctrine emphasized the need to win command of the sea by defeating an enemy fleet in a decisive battle. The battleship was the centerpiece of the interwar navy. In part, this was a by-product of the dominance of the "gun club" of battleship admirals and captains. It was also a reflection of the fact that the battleship was the best way to transport firepower across the Pacific and bring it to bear upon the Japanese fleet. Battleships were able to strike their targets with greater accuracy and at longer range than smaller surface combatants or submarines firing torpedoes. Aircraft of the day lacked the payload to do serious damage to capital ships. As a result, the U.S. Navy judged that its battleships had the greatest opportunity to sink the battleships that formed the core of the Japanese fleet.<sup>16</sup> Other surface combatants supported the battle line: cruisers acted as scouts and protected it against air and surface attack, while destroyers guarded it against submarines and torpedoes. Submarines conducted reconnaissance and attacked enemy combatants.<sup>17</sup>

The U.S. Navy initially used aircraft carriers as scouts and spotters for the battle fleet. It also looked to them to protect the battle line against air attack. Beginning in the late 1920s, however, it began to experiment with using aircraft carriers as the core of an independent striking force. In Fleet Problem IX, of 1929, the carrier *Saratoga* launched two successful strikes against the locks of the Panama Canal. During Fleet Problem X the following year, independent carrier groups operated against battleships.<sup>18</sup> It was not until the destruction of much of the U.S. battle fleet at Pearl Harbor, however, that the U.S. Navy as a whole reluctantly accepted the independent use of carrier air power.

American naval tactics emphasized daylight gunnery battles between capital ships. Navy regulations called on units to deploy in a single tightly spaced

column, which would gain a tactical advantage over an adversary by bringing all of its guns to bear across the enemy's axis of approach, "crossing his T." Ships would open fire at ten thousand yards, a distance that the navy judged to be outside the range of enemy torpedoes and optimum for its own guns.<sup>19</sup>

The U.S. Navy possessed some of the world's best warships. Its battleships were fast and well protected. American cruisers sacrificed speed and armor protection to stay within the ten-thousand-ton limit prescribed by the Washington Naval Agreement while maintaining the ability to wage a transpacific campaign.<sup>20</sup> U.S. submarines were among the best in the world but were armed with torpedoes with defective detonators and with speeds, ranges, and warheads markedly inferior to those of the Japanese.<sup>21</sup>

Funds for naval research and development were scarce before World War II. Research on new technology took second place to maintaining and improving existing equipment.<sup>22</sup> Despite funding limitations, the Naval Research Laboratory designed, and American companies produced, a family of capable surface-search and fire-control radar models in the years before World War II.<sup>23</sup> The Navy's first surface-search radar was installed on the destroyer *Leary* in 1937. The next year, the navy installed the XAF search-radar prototype on the battleship *New York* for operational testing during its 1939 fleet maneuvers in the Caribbean.<sup>24</sup> The XAF became the prototype for a family of long-range air-search sets deployed aboard U.S. warships beginning in 1941 and used throughout much of the war. Over the next two years, the navy installed an improved version of the XAF, the CXAM, on all American carriers, six battleships, five heavy cruisers, and two light cruisers.<sup>25</sup>

The navy also deployed fire-control radar that allowed surface combatants to attack targets at night.<sup>26</sup> The service fielded the CXAS prototype, followed by the FC and FD continuous-tracking radars designed to control both main-battery and antiaircraft fire. By Pearl Harbor, the navy had taken delivery of ten FC and one FD systems.<sup>27</sup> As a result, the United States had operational radar systems that allowed its ships to identify approaching enemy air and surface forces and to direct fire against them at night and in all weather.

The Japanese navy, for its part, placed supreme faith in the decisive fleet encounter as the ultimate arbiter of naval power. The Washington Naval Agreement's ban on new battleship construction forced it to reconsider its heavy emphasis on capital ships and seek ways to offset the U.S. Navy's quantitative advantage. As a result, it adopted a tactical system that emphasized the contribution of cruisers and destroyers.

Because the U.S. Navy enjoyed a 30 percent advantage in tonnage, Japan formulated a strategy of "interception-attrition operations" (*yogeki zengen sakusen*) to wear down the American battle fleet before annihilating it in a decisive battle.

At the outset of hostilities, the Japanese navy would destroy the U.S. Asiatic Fleet and occupy the Philippine Islands and Guam. It would then sortie submarines into the eastern Pacific to monitor the movements of the relief force and harass it on its voyage westward to recover the American possessions. Naval aircraft based in the Marshall, Mariana, and Caroline Islands would join the battle as soon as U.S. ships steamed into range. When the Japanese fleet had reduced the Americans to parity or less, it would seek a decisive battle near Japanese home waters. An advance body of cruisers and destroyers supported by fast battleships would conduct a night attack using salvos of long-range torpedoes to weaken and confuse the enemy. At daybreak, the Japanese commander would throw the full weight of his battle line against the American fleet in a bid to annihilate it.<sup>28</sup>

The Japanese navy sought to improve the quality of its fighting forces to offset the U.S. Navy's quantitative superiority. The navy leadership believed that the toughness, morale, and fighting spirit of the Japanese fighting man would give a marked advantage in a war with the United States.<sup>29</sup> To hone their skills, Japanese forces trained ten months out of the year in exercises that were arduous and sometimes fatal.<sup>30</sup> Because exercises emphasized combat at night and in poor weather, crews learned to operate effectively under even the harshest of conditions.

A second way the Japanese navy sought to negate the U.S. Navy's quantitative and technological advantage was by developing a unique tactical system emphasizing long-range gunnery, torpedo firing, and night operations. The Japanese naval staff believed that its ability to defeat the American fleet required ships that could outrange opponents. Striking U.S. ships from beyond their capability to return fire would allow the Japanese force to inflict damage without taking losses of its own. The navy therefore expended considerable effort to increase the range and accuracy of its gunnery, culminating in the design of the *Yamato*-class battleships.<sup>31</sup> By the mid-1930s, for example, the Japanese navy believed that its main-force units had a range advantage of between four and five thousand meters over their American counterparts. With the advent of *Yamato*, the Japanese Naval Staff College estimated that Japan's battleships could track the American fleet at forty thousand meters (21.5 miles) and open fire at approximately thirty-four thousand meters, more than three times the preferred U.S. combat range.<sup>32</sup>

The navy also developed the Type 93 oxygen-propelled torpedo, also known as the Long Lance, a weapon with a larger warhead, greater speed, and longer range than contemporary American and British models. The weapon was very large, with a weight of 2,700 kilograms (nearly three tons), a diameter of sixty-one centimeters (twenty-four inches), a length of some nine meters, and a payload of nearly five hundred kilograms (over a thousand pounds) of

explosive. The torpedo was capable of speeds up to forty-eight knots and ranges up to forty thousand meters. Fueled by high-pressure oxygen, it left virtually no wake.<sup>33</sup> In the mid-1930s, the navy equipped all eighteen of its heavy cruisers, some light cruisers, and destroyers from the *Hatsuharu* class on with launchers for the Long Lance. Beginning in 1938, it reconstructed the light cruisers *Oi* and *Kitakami* as “torpedo cruisers,” carrying forty and thirty-two torpedo launchers, respectively.<sup>34</sup>

The Japanese navy also perfected a tactical system for night fighting.<sup>35</sup> In 1924, it began to form dedicated night-attack units composed of destroyer squadrons led by light cruisers. In 1929, the Combined Fleet created a night-battle force under the control of a heavy-cruiser-squadron commander.<sup>36</sup> In contrast to American tactics, which called for ships to deploy in a single column, Japanese ships formed multiple short columns, often with destroyers positioned ahead of the main force to prevent ambush. On detecting the enemy, the Japanese destroyers would close, pivot, fire torpedoes, and then turn away.<sup>37</sup> To exploit the characteristics of the Long Lance, the Japanese navy developed the tactic of long-distance concealed firing (*enkyori ommitsu hassha*), which called for cruisers to launch between 120 and two hundred of the torpedoes at a distance of at least twenty thousand meters from the enemy battle line.<sup>38</sup> Only after the torpedoes had been launched would ships resort to gunfire, and when they did they would minimize use of searchlights, to prevent enemy ships from spotting them.<sup>39</sup> Such tactics could be extremely effective. During the battle of the Java Sea, Japanese torpedo attacks dealt Allied forces a severe defeat.<sup>40</sup> During the Solomons campaign, Japanese torpedo barrages hit their targets as much as 20 percent of the time.<sup>41</sup>

The Japanese navy’s doctrine and training produced a cadre of officers and enlisted men who were skilled in night torpedo combat. The navy trained sailors with superior night vision to be lookouts. Equipped with powerful specialized binoculars, they could detect a ship at eight thousand meters on a dark night.<sup>42</sup> Many of the navy’s top officers were torpedo experts, including admirals Nagumo Chuichi and Ozawa Jisaburo. At the outbreak of the war, most torpedo craft were under the command of qualified experts. As Rear Admiral Tanaka Raizo later wrote, “My division commanders and skippers were brilliant torpedo experts, and from top to bottom the training and discipline of crews was flawless. Operational orders could be conveyed by the simplest of signals, and they were never misunderstood.”<sup>43</sup>

U.S. naval intelligence understood the Imperial Japanese Navy’s emphasis upon night combat. The Office of Naval Intelligence’s monograph on Japan noted that

the Japanese Navy places great emphasis on training for night operations. The Japanese are of the opinion that, at night, many of the disadvantages of having inferior materiel disappear and that spirit and morale—in which they believe they excel—combined with training and the ability to cooperate and coordinate will give them a decided advantage over an enemy fleet.<sup>44</sup>

Moreover, war games held at the Naval War College demonstrated the devastating effect of night torpedo attacks. During one such game, two ORANGE (Japanese) night attacks resulted in the loss of a BLUE (American) battleship and aircraft carrier, damage to two more battleships, and loss of or damage to twelve heavy cruisers, three light cruisers, and thirty-one destroyers.<sup>45</sup>

Despite these warnings, the U.S. Navy remained largely unprepared for night combat. Its 1934 *War Instructions* warned, “At night the superior or equal force risks forfeiture of its superiority or equality of its most valuable asset, its coordinated hitting power.”<sup>46</sup> However, the navy lacked the doctrine and organization necessary to conduct operations at night. It concentrated upon defensive combat at night, in stark contrast to the Japanese navy’s emphasis upon offensive operations.<sup>47</sup>

During the 1920s the Japanese navy, like its American counterpart, planned to employ carrier aircraft for air defense of the battle fleet, for reconnaissance, and as a means of wearing down the U.S. fleet in preparation for a major surface engagement. In the 1930s, however, naval air doctrine began to shift away from aerial scouting and reconnaissance and toward the idea of using aircraft to attack enemy fleet units. By the middle of the decade, a preemptive strike upon the enemy carrier force had become the focus of naval air exercises.<sup>48</sup> In April 1941, the Japanese formed the First Air Fleet, to centralize control of the carrier force and to separate carrier aviation from land-based naval air force.<sup>49</sup>

Japan’s naval shipbuilding industry grew to maturity in the decades before World War II. Before 1915, British yards built most of the Japanese navy’s ships. By the late 1920s, however, Japanese shipyards began to launch a series of innovative ship designs.<sup>50</sup> Faced with the Washington Naval Agreement’s ban on capital-ship construction, the Japanese devoted considerable effort to achieving qualitative superiority over the United States. As one former naval constructor noted, Japan “labored to produce vessels that would, type for type, be individually superior to those of the hypothetical enemy, even if by a single gun or torpedo tube or by a single knot of speed.”<sup>51</sup>

Japan built cruisers that were fast and heavily armed. They were designed to be all-purpose ships, a substitute for the battleships the Washington Naval Agreement limited. Unlike their counterparts in the U.S. Navy, for example, Japanese cruisers mounted torpedo tubes. The seven-thousand-ton *Furutaka* class,

for example, was armed with six eight-inch guns and twelve twenty-four-inch torpedo tubes.

Japanese destroyers were the largest and most powerful in the world. The units of the *Fubuki* class, built between 1926 and 1931, were the most advanced of their day. With a 390-foot length and official displacement of 1,680 standard tons, they were considerably larger than their American and British counterparts. Moreover, they were armed with six five-inch guns mounted in weather-proof housings and eighteen twenty-four-inch torpedoes arranged to allow rapid salvo fire.<sup>52</sup> Whereas American destroyers were designed to perform a mixture of defensive and offensive missions, Japanese ships were optimized for attack. Destroyer flotillas, positioned ahead of the van or abaft the rear of the main fleet, were to break through an enemy screen and attack the main body of the fleet to sink, cripple, or confuse as many capital ships as possible.

Japanese designs tended to pack too much armament, speed, and protection into small hulls. Cruiser and destroyer designs often suffered problems with structural integrity. Indeed, the navy had to reconstruct the ships of several classes to improve their seaworthiness.

Limited technological resources and fiscal stringency forced the Japanese navy to focus its research and development efforts upon technologies associated with its concepts of operations. These fields included optics, illumination, and torpedoes, where Japan led the United States. However, it trailed in others. Communication among aircraft was one shortfall: Japanese airborne radio was unreliable and prone to interference. As a result, fighter pilots often relied upon hand semaphore or prearranged signal flares to coordinate their action.

Radar was another weakness. Japan conducted little research or development on radar before the outbreak of the Pacific War. Official indifference, haphazard mobilization of scientific talent, and an absence of interservice cooperation further delayed its introduction. As a result, the navy had no search or fire-control radar at the outset of the war.<sup>53</sup> It produced radar sets during the war, but they were relatively unsophisticated and suffered from low power.<sup>54</sup>

High-quality manpower was essential if Japan was to offset the quantitative superiority of the U.S. Navy. The armed forces were a respected part of society, and military service was popular. The navy was manned mostly by volunteers, and reenlistment rates were high. As a result, the navy maintained a cadre of seasoned veterans.<sup>55</sup> It also trained hard, following a seven-day workweek.<sup>56</sup> On the other hand, the Japanese naval officer corps displayed a number of serious weaknesses, including the absence of independent judgment in the average officer, lack of assertiveness, and a promotion system that emphasized seniority over capability.<sup>57</sup>

## THE GUADALCANAL CAMPAIGN

The Guadalcanal campaign was the first sustained series of battles between the American and Japanese navies. Beginning one month after the United States turned back Japan's attempt to invade Midway, the invasion of Guadalcanal was the first American effort to reoccupy Japanese territory. The campaign represented a clash between fleets trained and equipped to execute very different tactical systems. U.S. commanders were often unable to translate their advantage in radar technology into an understanding of the tactical situation. Japanese units, by contrast, repeatedly achieved a high level of tactical situational awareness—not because they possessed superior technology but because they had a coherent system of night-fighting tactics.

The campaign began with the Japanese occupation of Tulagi, near the southeast corner of the Solomon island chain, on 2 May 1942, for use as a seaplane base. In mid-June, the Japanese dispatched a force of some two thousand engineers and laborers to neighboring Guadalcanal to build an airfield.<sup>58</sup> By occupying the islands, they would be able to disrupt the sea lines of communications connecting the United States and Australia. The island also represented a stepping-stone toward Australia. The Americans learned of the Japanese occupation of Tulagi and Guadalcanal, and on 2 July the Joint Chiefs of Staff decided to launch Operation WATCHTOWER to recover the islands. Vice Admiral Robert L. Ghormley, commander of the South Pacific Area (COMSOPAC), was given command of the effort. Vice Admiral Frank Jack Fletcher led an expeditionary force that included three of the navy's four aircraft carriers, the battleship *North Carolina*, and a force of cruisers and destroyers. Rear Admiral Richmond Kelly Turner commanded the amphibious force, which included Major General Alexander A. Vandegrift's 1st Marine Division, embarked upon fifteen transports.<sup>59</sup>

On 7 August, eleven thousand Marines landed on Guadalcanal and Tulagi, taking the Japanese defenders by surprise. By evening the Guadalcanal invasion force had overrun the defenders and occupied the unfinished airfield. Two days later the Marines wrested control of Tulagi from the Japanese. Although Fletcher had promised to remain in the area for forty-eight hours, he withdrew to the southeast on the afternoon of 8 August due to concern over the possibility of an air attack.

Vice Admiral Mikawa Gunichi, commander in chief of the newly formed Eighth Fleet of the Imperial Japanese Navy's Outer South Seas Force, at Rabaul, was responsible for dislodging the U.S. force. Mikawa's fleet consisted of the heavy cruisers *Chokai*, *Aoba*, *Kako*, *Kinugasa*, and *Furutaka*; the light cruisers *Tenryu* and *Yubari*; and the destroyer *Yunagi*. Mikawa planned to launch a night attack on the Guadalcanal invasion force, breaking through the enemy screen and sinking Turner's transports.<sup>60</sup>

Suspecting a Japanese response to the assault, on 8 August American and Australian patrol aircraft reconnoitered the waters around Guadalcanal. An Australian aircraft spotted Mikawa's force but incorrectly reported that the column included three cruisers, three destroyers, and two seaplane tenders. Another sighted the force as it headed south through the Bougainville Strait but incorrectly identified it. No aircraft patrolled New Georgia Sound, the avenue through which Mikawa's force advanced. American radio intelligence intercepted a message from Mikawa stating that he was planning to attack an enemy convoy near Guadalcanal, but analysts did not decrypt the message until 23 August.<sup>61</sup> Possessing inaccurate and conflicting intelligence, therefore, Turner concluded that a Japanese seaplane-tender force was somewhere to the north. He assumed—reasonably, though incorrectly—that such a force would not make a night attack.

Three groups of ships patrolled the western entrance of the sound between Florida and Guadalcanal Islands, where Turner's transports lay at anchor. The Northern Force, composed of three heavy cruisers and two destroyers, blocked the western approaches of the sound. The Southern Force, consisting of three heavy cruisers and two destroyers, was stationed to prevent the Japanese from entering the sound between Cape Esperance and Savo Island. The Eastern Force, of two light cruisers and two destroyers, covered the eastern approach to the sound. Two destroyers equipped with radar, *Blue* and *Ralph Talbot*, formed a picket line to the northwest.

None of these vessels spotted Mikawa's column as it steamed southeast through intermittent squalls on a dark, humid night. The Japanese ships passed unseen through the radar picket and entered the sound south of Savo Island. Mikawa, aboard *Chokai*, spotted the silhouettes of the American cruiser *Chicago* and the Australian cruiser *Canberra* of the Southern Force and opened fire, first with torpedoes and then with guns. The ships, illuminated by flares dropped from Mikawa's floatplanes, took heavy fire. Two torpedoes and more than twenty-four shells struck *Canberra*, which was barely able to fire two torpedoes and several shells before stopping dead in the water, aflame and sinking. A torpedo severed part of *Chicago*'s bow, and a shell knocked off part of its foremast. The ship's commanding officer completely miscalculated the location of Mikawa's force, steering his ship away from the battle, and failed to alert the Northern Force.

Mikawa's column next swung left around Savo Island and headed for the Northern Force. Although the engagement had been going on more than five minutes, the Northern Force was completely unaware that it was under attack until the heavy cruiser *Aoba* illuminated the cruiser *Quincy* with its searchlights. The cruiser *Astoria*, hit amidships by one of *Chokai*'s eight-inch shells, burst into

flames. *Quincy* and *Vincennes* also sustained heavy damage. With burning ships silhouetting the American force, the Japanese turned off their searchlights, making it difficult for the Americans to locate them. The Northern Force's screening destroyer, *Wilson*, chased what appeared to be an enemy ship for some time, only to discover it was the destroyer *Bagley* of the Southern Force. The force's other destroyer, *Helm*, never sighted any enemy ships.

After savaging the Northern and Southern Forces, Mikawa elected to retire rather than attacking Turner's exposed transports. His ships had expended their torpedoes and were scattered. He was also concerned about exposing his force to daylight air attack, unaware that Fletcher's carriers were too far to the south to strike his ships. As Mikawa withdrew, his ships encountered and damaged *Ralph Talbot*. He left behind four Allied cruisers sunk or sinking and two destroyers and one cruiser damaged. The U.S. Navy's losses included 1,023 killed and 709 wounded, its worst defeat since the War of 1812.

The occupation of Guadalcanal marked only the beginning of the campaign. The battle for the island went on for almost half a year, exacting heavy tolls upon both sides. Neither the Americans nor the Japanese proved willing to give up Guadalcanal, nor was either strong enough to defeat the other. The Japanese believed that the island had to be reinforced and held, while the Americans had to eliminate the Japanese army units there and supply and reinforce the Marine garrison.

In this campaign the U.S. forces, although they enjoyed technological superiority, lacked continuity of leadership. No American officer ever commanded the same force in more than two battles. As a result, there were few opportunities to incorporate lessons into operations. Indeed, the navy repeatedly employed tactics that put it at a considerable disadvantage in night engagements. The Japanese navy not only possessed a coherent tactical system for night combat but also enjoyed much greater continuity of command. As a result, it was able to use combat experience to modify and improve upon its prewar doctrine.

The Japanese began launching frequent air raids on Guadalcanal from Rabaul. Mitsubishi A6M Zero fighters, operating at the very edge of their performance envelopes, escorted long-range bombers on missions against the island's airstrip, dubbed Henderson Field by the Americans. Rear Admiral Tanaka's 2nd Destroyer Squadron also began making nighttime runs down "the Slot," the channel between Santa Isabel and New Georgia Islands, to land small detachments and bombard the airfield. These missions, known as the "Tokyo Express," were a constant feature of the Guadalcanal campaign. During one of these runs, on the night of 21–22 August, a torpedo from the destroyer *Kawakaze* struck the destroyer *Blue*, which had to be scuttled. Although *Blue* possessed an SC surface-search radar, the Japanese lookouts spotted the American destroyer first.<sup>62</sup>

At his fleet's anchorage at Truk, Admiral Yamamoto Isoroku began to prepare for a major battle against the U.S. Navy. His plan called for the Combined Fleet to escort a convoy carrying General Kawaguchi Kiyotake's 35th Brigade to Guadalcanal. It would also attempt to engage and defeat Allied naval forces so as to remove the threat to future reinforcement attempts. Yamamoto's plan called for Admiral Nagumo's carrier force, under the protection of Rear Admiral Abe Hiroaki's Vanguard Force, to strike Allied surface combatants. Nagumo's aircraft, together with the Vanguard Force and Vice Admiral Kondo Nobutake's Support Force, would then mop up any survivors.

On 23 August, the Combined Fleet sortied from Truk. The next day, it met Fletcher's Task Force 61 in the battle of the Eastern Solomons.<sup>63</sup> Fletcher had received reports indicating that Japanese carriers were nearby, but he had not believed them. Moreover, atmospheric conditions hampered radio reception throughout the battle, complicating his ability to control his task force. The battle opened when aircraft from the small carrier *Ryujo* struck Henderson Field. Warned by coast watchers, the Marines decimated the attackers. Aircraft from *Enterprise* and *Saratoga* located and struck *Ryujo*, which sank that evening. Meanwhile, the carriers *Shokaku* and *Zuikaku* launched a counterstrike against the American carrier force. Although *Enterprise* sustained three bomb hits, it suffered no hull damage. A second Japanese attack failed to locate the task force, due to a pilot's plotting error. Spared further damage, Fletcher withdrew to the south with his carriers.

An American PBY flying boat spotted Rear Admiral Tanaka's convoy carrying the Yokosuka 5th Special Landing Force in the early morning hours of 25 August.<sup>64</sup> Aircraft from Guadalcanal and B-17 bombers from the island of Espiritu Santo surprised the convoy, damaging the light cruiser *Jintsu* and the transport *Kinryu Maru*. A second wave of B-17s bombed the destroyer *Mutsuki* as it attempted to rescue troops from the damaged transport. Tanaka found the air attack so intense that he withdrew his remaining ships to their anchorage in the Shortland Islands.

Over the next two months, each side tried to reinforce its garrison on Guadalcanal. The Japanese army brought in troops from China, the Dutch East Indies, and the Philippines. The U.S. Joint Chiefs of Staff, for its part, decided to commit a regiment of the Americal Division to defend the island. At night, Tanaka's Tokyo Express brought in supplies, bombarded Henderson Field, and attacked U.S. naval forces. During daylight hours, aircraft from Guadalcanal dominated the sea around the island. Nonetheless, Japanese planes from Rabaul launched bombing raids on the island almost daily; during September, for example, they flew an average of twenty-nine missions per day.<sup>65</sup> U.S. Marine F4F Wildcats and Army Air Forces P-40 Warhawks were no match for the Zeros.

Moreover, the army was reluctant to allocate P-38 Lightnings to the South Pacific. Marine aviators, often cued by coast watchers, employed hit-and-run tactics to inflict heavy casualties on the Japanese.

On the night of 11–12 October, Japanese and American reinforcement convoys clashed in the battle of Cape Esperance.<sup>66</sup> The Japanese force, commanded by Rear Admiral Goto Aritomo, consisted of three heavy cruisers and two destroyers escorting two seaplane carriers and six destroyers with a considerable part of the Imperial Japanese Army's 2nd Division embarked. Goto planned to bombard Henderson Field with the guns of his cruisers and destroyers while also landing the 2nd Division to reinforce the Japanese garrison on the island. Lying in wait was Rear Admiral Norman Scott, who sought to derail the Tokyo Express while delivering the 164th Regiment of the Americal Division to Guadalcanal. Scott's force included the aircraft carrier *Hornet*, the new battleship *Washington*, and a force of cruisers and destroyers. Scott had studied previous engagements with the Japanese and had carefully trained his force in night-fighting tactics. His preparations paid off in the ensuing battle.

Goto was unaware of the presence of the American fleet as he steamed toward Guadalcanal. By contrast, long-range air reconnaissance gave Scott accurate intelligence regarding the position and advance of the Japanese force. He did not, however, fully exploit its advantage. The light cruiser *Helena* detected Goto's force with its SG surface-search radar at a range of fourteen nautical miles but failed to report its location for nearly twenty minutes, until it was within six nautical miles of Scott's ships. As the fleets closed to two and a half miles, *Helena's* commanding officer asked permission to open fire. Scott misinterpreted the request and unknowingly gave the go-ahead. *Helena's* fire took both the Japanese and the rest of the American force by surprise. During the ensuing engagement, Scott's force sank the cruiser *Fubuki* and badly damaged *Furutaka* and *Aoba*. One shell struck *Aoba's* bridge, killing Goto and most of his staff. The Japanese force withdrew, covering its retreat by pouring heavy fire on the cruiser *Boise*. Both the Japanese and the American convoys landed their troops on Guadalcanal. The battle was one of the few night engagements the Japanese lost. Only confused communications among Scott's ships kept the battle from becoming a Japanese disaster.

With its 2nd Division on Guadalcanal, the Japanese high command determined to recapture the island. Beginning 13 October, the army and navy launched a coordinated attack on Henderson Field. During the day the field was attacked by bombers and shelled by howitzers that had been landed during the battle of Cape Esperance. That night, the battleships *Kongo* and *Haruna* fired some nine hundred shells on the airfield. The next night Mikawa's cruisers joined the fray, firing 752 eight-inch rounds onto the island, followed by 926

heavy-caliber rounds the following evening.<sup>67</sup> Although the situation at the airfield was desperate, the Marines held. Indeed, the few aircraft that survived the bombardment, backed by B-17s flying from rear bases, sank six of Tanaka's supply ships. On 22 October, the Japanese launched a ground offensive designed to envelop the airfield. After four days of bitter fighting, it halted without having dislodged the Marines.

With the army's failure to recapture Guadalcanal, Yamamoto made another attempt to destroy U.S. naval forces supporting the island. He dispatched several task forces from Truk, including a battleship force and the carriers *Shokaku*, *Zuikaku*, *Zuiho*, *Junyo*, and *Hiyo*.<sup>68</sup>

Yamamoto faced a new group of American commanders. Admiral Chester Nimitz had found Ghormley wanting and replaced him with Vice Admiral William F. Halsey as COMSOPAC; Rear Admiral Thomas C. Kinkaid took Fletcher's place as carrier commander. Kinkaid's Task Force 16 included the carrier *Enterprise* and a support force composed of the battleship *South Dakota*, heavy cruiser *Portland*, anti-aircraft cruiser *San Juan*, and eight destroyers. Rear Admiral George D. Murray's Task Force 17 included the carrier *Hornet*, heavy cruisers *Northampton* and *Pensacola*, anti-aircraft cruisers *San Diego* and *Juneau*, and six destroyers. The Japanese outnumbered the Americans in warships, tonnage, and aircraft, but the Americans possessed the advantages of Henderson Field and superior intelligence information.

Allied aircraft first sighted the Combined Fleet at sea on 13 October. These flights located four different forces, three of which were a carrier group, a scouting force of cruisers and destroyers, and a battleship force sent to bombard Henderson Field. Aircraft spotted the task force again on 15, 22, and 24 October. As a result, the Americans possessed an accurate view of the basic tactical disposition of the Japanese force.<sup>69</sup>

The two fleets met in the battle of the Santa Cruz Islands on 26 October.<sup>70</sup> The engagement began when two pilots from *Enterprise* located and attacked the unsuspecting light carrier *Zuiho*. One bomb penetrated its flight deck, forcing it to return to Truk for repairs. The Japanese, however, had learned some of the lessons of Midway. Although the Americans struck first, the Japanese this time were able to launch two waves of planes in the time it took the Americans to launch one. The first Japanese attack wave concentrated upon *Hornet*, causing damage that left the carrier dead in the water; subsequent attacks sank it. The second wave struck *Enterprise*. That carrier, however, equipped with newly installed anti-aircraft guns, took only two hits and remained in service.

The Japanese did not escape *Hornet's* air group, which discovered and attacked *Shokaku*, hitting its flight deck with four thousand-pound bombs. Such damage had been sufficient to sink carriers at Midway, but the Japanese had now

learned to secure ordnance, drain gasoline lines, and keep fire hoses at the ready. As a result, while the carrier's flight deck was disabled and communications were lost, its engines remained functional and its hull intact. *Hornet's* second attack struck the Vanguard Force, crippling the heavy cruiser *Chikuma* and damaging the destroyer *Teruzuki*.

The U.S. Navy sustained heavy damage, with a carrier and a destroyer sunk and another carrier, battleship, heavy cruiser, and anti-aircraft light cruiser damaged. With the loss of *Hornet*, *Enterprise* became the only carrier capable of staging aircraft bound for Guadalcanal. The Japanese had also suffered extensive losses, with three carriers damaged and a heavy cruiser and two destroyers damaged. During the battle, the Americans had been handicapped by poor communication: they had possessed all the information they needed to make a successful strike, but the right people had not received it. On the other hand, the growing anti-aircraft defenses of U.S. combatants had prevented further damage. In the months to come, the navy would further increase the anti-aircraft armament of its ships.

Between August and November, the two sides carried out massive troop buildups on Guadalcanal. On 7 August there were ten thousand Americans and 2,200 Japanese troops on the island. By 12 November, twenty-nine thousand Americans faced thirty thousand Japanese.<sup>71</sup> In early November, U.S. intelligence began detecting preparations for another Japanese attack. The Japanese planned to launch heavy aircraft strikes and a naval bombardment before landing reinforcements on the island. On 9 November, American intelligence intercepted and decrypted Yamamoto's operations order for the attack.<sup>72</sup> Halsey dispatched Rear Admiral Daniel J. Callaghan's Support Group of five cruisers and eight destroyers to meet the Japanese.

On 13–15 November, the two fleets met in the naval battle of Guadalcanal.<sup>73</sup> The Bombardment Force, under Abe (now a vice admiral) had passed through an intense tropical storm as it steamed south toward Guadalcanal on the night of 12–13 November. His force included the battleships *Hiei* and *Kirishima*, a light cruiser, and six destroyers. The ships' guns were loaded with anti-personnel high-explosive shells, with which to bombard Henderson Field; their armor-piercing shells for surface engagements were stored at the back of the magazines. When the destroyer *Yudachi* spotted the American force, Abe ordered his ships to reload their guns with armor-piercing rounds, a process that took eight minutes.<sup>74</sup> Soon after, the light cruiser *Helena's* surface-search radar detected the Japanese force. The cruiser sent Callaghan continuous contact reports, but these were only partially intelligible, because the group's voice circuits were congested. As a result, the Japanese managed to fire the first shot. Shell fire and torpedoes from *Hiei* and the destroyer *Akasuki* knocked out the cruiser *Atlanta* and

killed Admiral Scott. As the battle continued, the American force took heavy gun and torpedo fire at close range. The stern of the cruiser *Portland* was almost blown off, *San Francisco* was badly damaged, and Callaghan was killed. *Hiei* soon attracted the attention of the American ships, however; gunfire riddled the battleship's topside, and fires broke out across its deck. Blinded by his flagship's fires and unable to determine the disposition of his forces, Abe ordered his ships to withdraw. The Japanese lost two destroyers during the battle. *Hiei*, lacking a working rudder, sank the next day after sustaining heavy damage from U.S. aircraft from Guadalcanal and *Enterprise*.

Despite the loss of *Hiei*, Yamamoto was determined to land the 38th Division on Guadalcanal. To support the landing, Mikawa sortied a bombardment force containing the heavy cruisers *Suzuya* and *Maya* from the Shortlands anchorage. On the night of 13–14 November, the ships poured 1,370 rounds onto Henderson Field but failed to knock it out.<sup>75</sup> The next morning, American planes struck the force, sinking the cruiser *Kinugasa* and damaging three other cruisers and a destroyer.

Yamamoto planned to bombard Henderson Field one more time before landing the 38th Division. He ordered Admiral Kondo's Strike Force, reinforced by Abe's surviving ships, to shell the airfield. Radio intelligence warned the Americans in sufficient time for Kinkaid to detach Rear Admiral Willis A. Lee's battle-ship force, which included *Washington* and *South Dakota*, to meet the Japanese.

The final phase of the battle of Guadalcanal was the first battleship action of the Pacific War. Expecting opposition, Kondo had deployed a screen of cruisers and destroyers around his bombardment force. The screen spotted the American battle line and began stalking it. *Washington*'s radar detected the Japanese screen and opened fire, forcing the Japanese to withdraw. *Washington* and *South Dakota* then engaged the Japanese task force. *South Dakota*, however, soon experienced a power failure that knocked out its tactical radios and radar and separated it from the rest of the force. Despite sustaining forty-two large-caliber hits, it continued steaming at full speed. *Washington*, in turn, locked onto the battleship *Kirishima* and smothered it with gunfire from its sixteen-inch main battery. *Kirishima* burst into flames and began to sink. The cruisers *Takao* and *Atako* and the light cruiser *Nagara* also sustained damage that forced them to return to Japan for repairs. Besides the badly damaged *South Dakota*, Lee lost three destroyers in the melee.

The surface battle over, every American air group within range pounced upon Tanaka's convoy. Land-based aircraft from Guadalcanal and Espiritu Santo and *Enterprise*'s air wing sank all but four of the transports. Those ships that survived caught fire and beached. Aircraft from Henderson Field continued to bomb and strafe the remnants of two regiments and one battalion of infantry

and a regiment of engineers—some two thousand men out of ten thousand that had embarked.<sup>76</sup>

In the weeks that followed, the ships of Tanaka's 2nd Destroyer Squadron continued to make runs to Guadalcanal at night, with supplies in rubberized metal containers lashed to their sterns. The crews cut the supplies free off Tassafaronga Point, where they drifted ashore or were brought in by swimming soldiers. The navy also used submarines to resupply Guadalcanal. Despite these efforts, the condition of the Japanese army continued to worsen; disease and malnutrition took their toll. Virtually everyone was on the verge of starvation. The sick rolls grew, and even the healthy were exhausted. The American situation, by contrast, improved in December as fresh Marine and army units relieved the original Marine detachments after four months of duty. By 9 December, twenty-five thousand Japanese faced forty thousand soldiers on the island. The Marines enlarged Henderson Field, and the navy built a torpedo-boat base on Tulagi.<sup>77</sup>

In late November, Halsey received intelligence indicating that Yamamoto was preparing to launch another attempt to reinforce Guadalcanal. Halsey dispatched Rear Admiral Carleton H. Wright with a force of cruisers and destroyers to stop him. Wright was determined not to repeat the mistakes American commanders had committed in past engagements. To ensure that his forces would spot the enemy before they themselves were sighted, he placed a ship equipped with improved surface-search radar in each cruiser group. To avoid confusion in the heat of battle, he reserved the use of communication circuits for orders and established a set of unambiguous commands. He also abandoned the standard single-column attack formation in favor of tactics better suited to night combat. Upon engaging the enemy, Wright's destroyers would launch a massive torpedo attack and then peel off to allow his cruisers to fire on the enemy ships. Instead of using searchlights, which would betray their locations, his ships would rely upon flares dropped from floatplanes to illuminate their quarry.<sup>78</sup>

As it turned out, Wright faced not another force attempting to land more troops on Guadalcanal but Tanaka's flotilla on one of its runs to bring food and ammunition to the existing Japanese garrison. The two met on 30 November, in the battle of Tassafaronga.<sup>79</sup> The SG radar aboard the cruiser *Minneapolis* detected Tanaka's screen at a range of thirteen miles, but Wright waited four minutes before approving a torpedo attack. By the time his destroyers launched their torpedoes, they were firing on the Japanese from astern.

The veteran Tanaka would not allow the American force to ambush him. Indeed, he had trained his crews to wheel and fire torpedoes if surprised. The destroyer *Takanami*, closest to the U.S. force, launched a salvo of torpedoes but immediately drew fire from Wright's force and sustained fatal damage. The remainder of Tanaka's destroyers released their cargo containers and paralleled

the American ships. The Japanese launched nearly fifty torpedoes, some of which tore into the U.S. cruiser line, sinking the cruiser *Northampton* and battering *Minneapolis*, *New Orleans*, and *Pensacola*. To make things worse, Wright's two rear-guard destroyers took friendly fire because they lacked the task force's recognition code.

Tassafaronga was the most successful torpedo attack of the war and a textbook example of night fighting. Tanaka not only delivered supplies to the troops on Guadalcanal but dealt a crushing blow to a superior American force. By avoiding the use of searchlights and employing torpedoes instead of guns, his force made itself difficult for the Americans to locate and engage. Even after the battle, the U.S. Navy was unsure of the size and composition of the Japanese force.<sup>80</sup> The battle also exposed American weaknesses. For one thing, Wright's force had been thrown together under inexperienced leadership. Nor could the U.S. Navy's technological advantage compensate for poor night-fighting skills. Indeed, the use of radar caused U.S. ships to train all their heavy guns on the closest Japanese ship, *Takanami*, leaving the others untouched.

Despite Japanese victories at sea, however, the condition of the fifteen thousand Japanese troops on Guadalcanal continued to worsen. Much of the force was at the point of starvation, and malaria was rampant. Even the healthy were practically ineffective due to exhaustion. On 31 December, the Japanese Imperial General Headquarters decided to evacuate Guadalcanal. U.S. intelligence detected the buildup for the operation but misinterpreted it as preparations for another offensive.<sup>81</sup> The evacuation occurred over three different nights between 2 and 8 February, but the American forces on Guadalcanal were unaware that no Japanese remained on the island until the afternoon of 9 February.<sup>82</sup>

The Guadalcanal campaign marked a turning point in the Pacific War. It improved the strategic position of the United States in the southwest Pacific. By occupying Guadalcanal and its airfield, the United States could control the sea lines of communications to Australia. The campaign also exacted a considerable toll upon the Japanese. By its end, Japan had lost two-thirds of its 31,400 troops on the island. The United States, by contrast, had lost fewer than two thousand of the approximately sixty thousand Marines and soldiers it had deployed. While the Japanese navy was the clear victor in many of these battles, it could not afford to pay the price in ships that the United States could. The campaign also decimated the strength of Japan's elite corps of naval aviators. In trying to hold Guadalcanal, Japan considerably diminished the fighting power of its fleet. By the time it was decided to withdraw from Guadalcanal, Japan's naval strength had been so eroded that it was unable to stop the subsequent American advance north toward the home islands.

## TRANSLATING INFORMATION ADVANTAGE INTO TACTICAL SUCCESS

The Guadalcanal campaign shows that technological superiority does not inevitably yield victory. Instead, the weapon systems, doctrine, and organization of opposing forces interact, in ways that are often complex. The campaign also demonstrates the importance of situational awareness and friction in warfare. Finally, the case shows that technology may be employed under operational conditions previously unforeseen by its developers. Victory lies with the force that is better able to adapt its weapon systems to local conditions.

Throughout the campaign, American forces enjoyed a marked tactical advantage over the Japanese during daylight hours. Because the United States controlled Henderson Field, American aircraft were able to dominate the seas around the island. Moreover, radar gave U.S. commanders an advantage in carrier battles in open waters. During the battle of the Eastern Solomons, U.S. air-search radar detected the approaching Japanese air strike at a distance of eighty-eight miles, giving Fletcher sufficient time to launch fifty-three fighters with full fuel tanks to meet the incoming attack. It also allowed American air controllers to vector fighters to attack the Japanese force without fear of being ambushed by Japanese fighters.<sup>83</sup>

Rather than contesting U.S. superiority during the day, the Japanese navy chose to conduct the majority of its operations at night. Indeed, it saw night combat as an asymmetrical strategy to circumvent the strength of the U.S. Navy. It possessed a coherent tactical system for night fighting as well as weapon systems optimized for such operations, and it had conducted decades of realistic training to hone its skills.

Radar gave U.S. forces the means to detect, track, and target Japanese surface forces before they spotted the Americans. Yet the United States proved unable to exploit its advantage in radar technology during the campaign. First, radar technology had yet to mature.<sup>84</sup> The sets deployed aboard U.S. ships had limited range and resolution. Moreover, interpreting radar returns took considerable skill. Early sets could provide a general view of objects in the vicinity of the observing ship or an accurate range and bearing to any one object but not both simultaneously. As a result, it was easy for a commander to lose sight of a rapidly changing tactical situation.

Second, the navy had not developed techniques to exploit the potential of radar. Instead, it treated radar as an overlay to operational concepts designed for daylight engagements between capital ships. Nor did the navy possess adequate tactics for torpedo defense. In battle after battle, U.S. forces deployed in lines that offered little protection against Japanese torpedo barrages. The navy was

also slow to learn from its mistakes, a trend magnified by the frequency with which it replaced its tactical commanders.

Finally, the geography of the theater limited the effectiveness of radar. The U.S. Navy had developed radar in anticipation of battle on the high seas. Because many of the Guadalcanal campaign's battles took place in confined waters surrounded by mountainous islands, American radar operators often had limited warning of the approach of enemy ships. Islands or heavy rain squalls often obscured returns from surface ships. Indeed, surface-search radar routinely failed to detect destroyers in confined waters beyond five thousand yards.<sup>85</sup>

In each of the campaign's battles, the side that possessed a superior awareness of the tactical situation prevailed. It was, in other words, the ability to collect, interpret, and act upon information rather than technology that marked the difference between victory and defeat. Japanese naval commanders were usually able to discern the location and disposition of U.S. forces faster and more accurately than their adversaries. They also acted upon that information more rapidly and effectively than their American counterparts. Because the Japanese navy had developed and regularly practiced concepts for night combat, its commanders and their crews possessed a common frame of reference. This tactical system usually gave the Japanese a considerable advantage in situational awareness over the Americans, while long-range weaponry like the Long Lance torpedo gave them the ability to translate their information advantage into tactical success. During the battle of Savo Island, for example, Mikawa Gunichi managed to identify and engage Kelly Turner's warships before they spotted his force. Moreover, because Turner had divided his forces, Mikawa was able to defeat them piecemeal. The commanders of the American and Australian ships, by contrast, had little understanding of the battle as it unfolded.

In the few instances where U.S. forces obtained superior situational awareness, they were victorious. At Cape Esperance, Norman Scott's ships mauled Goto's reinforcement force, largely because the American commander was able to achieve surprise and prevent the Japanese from employing their preferred concept of battle. Still, though the U.S. force had a tremendous information advantage over the Japanese, Scott used his radar and radio poorly. As a result, he failed to achieve what should have been a complete victory. Never again in the campaign would the Americans catch the Japanese so unprepared.

Just as the campaign illustrates the value of situational awareness, it also demonstrates the enduring importance of "friction." In his masterwork of strategic theory, *On War*, Carl von Clausewitz developed the concept of friction to encompass the multitude of "factors that distinguish real war from war on paper."<sup>86</sup> These include the effects of danger, combat's demands for physical exertion,

imperfect or uncertain information, chance, surprise, the physical and political limits of force, and unpredictability stemming from interaction with the enemy. By and large, there is an inverse relationship between friction and situational awareness: the higher the level of general friction one side experiences, the lower its situational awareness.<sup>87</sup>

Friction influenced the outcome of nearly every battle in this campaign. The terrain and weather of the theater of operations affected the course of many of the clashes. Both sides were plagued by imperfect and inaccurate intelligence throughout the campaign, increasing the potential for surprise. Moreover, both experienced communication problems that multiplied the opportunity for misunderstanding. American forces in particular often overloaded tactical voice circuits, degrading communication between ships. Because the Japanese generally did a better job of mitigating the effects of friction, they nearly always prevailed in battle.

In the months that followed the campaign, the U.S. Navy began to learn from its defeats. Studying the battles off Guadalcanal closely, Commander Arleigh Burke blamed American losses on insufficient drill in night combat. In the spring of 1943, Rear Admiral A. Stanton Merrill began to train his destroyers in that discipline. At first, they trained during the day, simulating night operations. As his force became more skilled, he shifted to training at night, under harsh conditions.<sup>88</sup>

The navy also developed more effective operational concepts and organizational arrangements for night combat. It began detaching destroyers from cruisers to allow them to employ to full effect the offensive power of their torpedoes and guns. At the same time, Burke developed new tactics for destroyer combat. He split his destroyer squadron into two mutually supporting divisions. Instead of deploying in long lines, as they had during the Guadalcanal campaign, they began to operate in compact divisions of three to four ships each. Upon making contact with the enemy, one division would close, fire its torpedoes, and turn away. When the first salvo of torpedoes hit and the Japanese began returning fire, the second division would attack from another direction. Burke believed that the tactic would be well suited to the Solomons, because the islands themselves would prevent the Japanese from detecting his destroyers before they opened fire.<sup>89</sup> It was a brilliant innovation, one that capitalized upon the geography of the theater—as the Japanese had been doing all along.

Finally, the navy developed methods to use radar more effectively. Over time, the radar plot—the room that contained the scope displaying contacts from the ship's radar—became the location where information from radio and lookouts was correlated. The combat information center (CIC), as it was to be known, thus became the hub of tactical decision making aboard ship.

The combination of improved tactics and organization came together when American and Japanese destroyers met in the battle of Vella Gulf on 6–7 August 1943. During the battle, the six destroyers that constituted Frederick Moosbrugger's Task Group 31.2 used Burke's tactics to deadly effect. Moosbrugger's surface-search radar detected the Japanese before they became aware of the presence of U.S. combatants. Indeed, U.S. destroyers launched torpedoes three minutes before the Japanese force sighted the Americans. Moosbrugger's force sank three Japanese destroyers and escaped unscathed.<sup>90</sup>

American forces also enjoyed considerable success at the battle of Empress Augusta Bay.<sup>91</sup> The setting for the battle was in many ways reminiscent of that before Savo Island: Merrill's cruisers and destroyers had been assigned to protect the Marine landing at Cape Torokina on Bougainville, much as Kelly Turner's force had been responsible for protecting that on Guadalcanal. This time, however, U.S. scout aircraft provided extremely accurate reports on the approach of Vice Admiral Omori Sentaro's cruiser and destroyer force. The Japanese, by contrast, operating in poor visibility and with no radar, had no idea of the size and composition of the force they faced. Merrill used his situational-awareness advantage to fire a salvo of torpedoes before the Japanese force knew it was under attack. As a result, Merrill sank one light cruiser and damaged another, while sinking one destroyer and damaging two others.

The U.S. Navy repeated its success at the battle of Cape Saint George, which was to be the last surface battle in the Solomons.<sup>92</sup> During the battle, Burke's two destroyer divisions won a decisive victory over five destroyers attempting to reinforce the Japanese garrison on Buka. Burke's force spotted the Japanese force first and launched its first torpedo salvo before the Japanese knew they were under attack. Employing the same tactics that had yielded victory at Vella Gulf, Burke's force sank three destroyers while sustaining no casualties.

The naval battles off Guadalcanal illustrate vividly that technological superiority does not guarantee victory. At the outbreak of World War II, the Japanese navy lacked surface-search and fire-control radar. It had, however, developed and practiced a coherent tactical system for night combat. The United States, by contrast, possessed radar but had yet to develop concepts and organizations to exploit its potential fully. As a result, the Japanese won victory after victory against the Americans. It was not until after the campaign that the U.S. Navy learned how to combine radar with new concepts and organizations; when it finally did, the result was deadly for the Japanese.

The U.S. Navy preferred engagements between opposing battle lines in the open sea. There, radar would allow the American fleet to spot its opponent at long range and smother him with precise—and lethal—gunfire. During the Guadalcanal campaign, however, the navy found itself operating in conditions

markedly different from those envisioned by prewar strategists. Radar was of little use in battles waged in confined waters bounded by mountainous islands. It was not until Arleigh Burke and Stanton Merrill developed concepts and organizations that suited local conditions that the navy began to take advantage of the possibilities of radar.

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  21. Torpedo testing was unrealistic and evaluation inadequate. Moreover, torpedo production was geared toward small-scale manufacture, not mass production. See Buford Rowland and William B. Boyd, *U.S. Navy Bureau of Ordnance in World War II* (Washington, D.C.: U.S. Government Printing Office [hereafter GPO], 1953), pp. 90–91.
  22. *Ibid.*, pp. 20–21.
  23. On the development of radar in the U.S. Navy, see David Kite Allison, “The Origin of Radar at the Naval Research Laboratory: A Case Study of Mission-Oriented Research and Development” (PhD diss., Princeton University, 1980); Louis A. Gebhard, *Evolution of Naval Radio-Electronics and Contributions of the Naval Research Laboratory* (Washington, D.C.: Naval Research Laboratory, 1979), chap. 4; and Rowland and Boyd, *U.S. Navy Bureau of Ordnance in World War II*, chap. 17.
  24. During the exercise, the equipment detected aircraft at nearly fifty miles and the splashes caused by surface-fired projectiles at up to eight miles. See James L. McVoy, Virgil Rinehart, and Prescott Palmer, “The Roosevelt Resurgence (1933–1941),” in *Naval Engineering and American Seapower*, ed. Randolph W. King (Baltimore: Nautical and Aviation, 1989), pp. 192–95.
  25. Gebhard, *Evolution of Naval Radio-Electronics and Contributions of the Naval Research Laboratory*, p. 183.
  26. Rowland and Boyd, *U.S. Navy Bureau of Ordnance in World War II*, pp. 413–14, 422–23.
  27. Evans and Peattie, *Kaigun*, p. 394.
  28. Rear Adm. Yoichi Hiram, JMSDF (Ret.), “Japanese Naval Preparations for World War II,” *Naval War College Review* 44, no. 2 (Spring 1991), p. 64.
  29. Arthur J. Marder, *Old Friends, New Enemies: The Royal Navy and the Imperial Japanese Navy*, vol. 1, *Strategic Illusions, 1936–1941* (Oxford, U.K.: Clarendon, 1981), p. 294.
  30. Spector, *Eagle against the Sun*, p. 46.
  31. Hiram, “Japanese Naval Preparations for World War II,” p. 72.
  32. Evans and Peattie, *Kaigun*, p. 262. The U.S. Navy believed that it would be at a disadvantage in engagements beyond twenty-one thousand yards. See *General Tactical Instructions, United States Navy*, FTP 142 (1934) [hereafter FTP 142], World War II Command File, Chief of Naval Operations, box 108, OA/NHC, p. 239.
  33. A subsurface version of the weapon, the Type 95, was adopted in 1935. An aerial version of the weapon, the Type 94, was also developed. In 1940, an improved version began to be installed on Japanese destroyers. Jiro Itani, Hans Lengerer, and Tomoko Rehm-Takahara, “Japanese Oxygen Torpedoes and Fire Control Systems,” in *Warship 1991*, ed. Robert Gardiner (Annapolis, Md.: Naval Institute Press, 1991), pp. 121–33. See also John Bullen, “The Japanese ‘Long Lance’ Torpedo and Its Place in Naval History,” *Imperial War Museum Review*, no. 3 (1988), pp. 69–79.
  34. Hansgeorg Jentschura, Dieter Jung, and Peter Mickel, *Warships of the Imperial Japanese Navy, 1869–1945*, trans. Antony Preston and J. D. Brown (Annapolis, Md.: Naval Institute Press, 1992), p. 106.
  35. For an overview of Japanese night-fighting tactics, see Evans and Peattie, *Kaigun*, pp. 273–81.
  36. Hiram, “Japanese Naval Preparations for World War II,” p. 67.
  37. Hughes, *Fleet Tactics*, p. 119.
  38. Evans and Peattie, *Kaigun*, p. 270.
  39. Paul S. Dull, *A Battle History of the Imperial Japanese Navy (1941–1945)* (Annapolis, Md.: Naval Institute Press, 1978), p. 60.
  40. *Ibid.*, pp. 76–88.
  41. Hughes, *Fleet Tactics*, p. 120.
  42. Dennis Warner and Peggy Warner, with Sadao Seno, *Disaster in the Pacific: New Light on the Battle of Savo Island* (Annapolis, Md.: Naval Institute Press, 1992), p. 55.
  43. Vice Adm. Raizo Tanaka, with Roger Pineau, “Japan’s Losing Struggle for Guadalcanal,”

- part 1, U.S. Naval Institute *Proceedings* 82, no. 7 (July 1956), p. 698. Japanese names are given with surname first.
44. "Night Training and Operations," ONI Report 261, 18 October 1934, 907-3000, box 77, ONI Monograph Files, RG 38, NA.
  45. Capt. R. B. Coffey, "Tactical Problem V-1933-SR (Operations Problem IV-1933-SR)," 16 January 1934, RG 4, Naval Historical Collection, Naval War College, Newport, R.I., p. 25.
  46. FTP 143, p. 37.
  47. The U.S. Navy's 1934 *General Tactical Instructions*, for example, described evasion as the primary form of night torpedo warfare. If evasion proved unsuccessful, the American commander would employ destroyers, cruisers, and—if necessary—battleships to destroy enemy destroyers before they closed to firing range. FTP 142, pp. 143–44.
  48. See Minoru Genda, "Evolution of Aircraft Carrier Tactics of the Imperial Japanese Navy," in *Air Raid: Pearl Harbor! Recollections of a Day of Infamy*, ed. Paul Stillwell (Annapolis, Md.: Naval Institute Press, 1981), pp. 23–27.
  49. Hirama, "Japanese Naval Preparations for World War II," p. 70. Despite these changes, the Japanese navy did not consider the carrier as the prime combat element of the fleet. It was not until March 1944 that the Japanese navy would create the First Mobile Fleet, a true carrier task force, to which all other fleet units, including battleships, were considered subordinate. Evans and Peattie, *Kaigun*, p. 501.
  50. Marder, *Old Friends, New Enemies*, p. 296.
  51. Quoted in *ibid.*, pp. 296–97.
  52. Evans and Peattie, *Kaigun*, p. 228.
  53. The first air-search set was installed on board the battleship *Ise* in May 1942. The navy was unable to produce an effective fire-control radar during the first two years of the war. *Ibid.*, pp. 414–15.
  54. Norman Friedman, *Naval Radar* (Greenwich, U.K.: Conway Maritime, 1981), pp. 96–97.
  55. Boyd, "Japanese Military Effectiveness," p. 139.
  56. Hirama, "Japanese Naval Preparations for World War II," pp. 66–67.
  57. Marder, *Old Friends, New Enemies*, pp. 285–87.
  58. Dull, *Battle History of the Imperial Japanese Navy*, p. 182.
  59. Vice Adm. George Carroll Dyer, USN (Ret.), *The Amphibians Came to Conquer: The Story of Admiral Richmond Kelly Turner* (Washington, D.C.: GPO, 1971), vol. 1, pp. 290–93.
  60. This account of the battle of Savo Island is taken from Dull, *Battle History of the Imperial Japanese Navy*, pp. 187–96, and Bruce Loxton and Chris Coulthard-Clark, *The Shame of Savo: Anatomy of a Naval Disaster* (Annapolis, Md.: Naval Institute Press, 1994).
  61. Spector, *Eagle against the Sun*, p. 193.
  62. Dull, *Battle History of the Imperial Japanese Navy*, p. 196.
  63. *Ibid.*, pp. 197–208.
  64. Tanaka, "Japan's Losing Struggle for Guadalcanal," part 1, pp. 693–94.
  65. John Prados, *Combined Fleet Decoded: The Secret History of American Intelligence and the Japanese Navy in World War II* (New York: Random House, 1995), p. 375.
  66. Dull, *Battle History of the Imperial Japanese Navy*, pp. 215–21.
  67. Prados, *Combined Fleet Decoded*, p. 379; Vice Adm. Raizo Tanaka, with Roger Pineau, "Japan's Losing Struggle for Guadalcanal," part 2, U.S. Naval Institute *Proceedings* 82, no. 8 (August 1956), pp. 815–16.
  68. *Hiyo* suffered a fire in its engine room shortly thereafter and had to withdraw.
  69. Prados, *Combined Fleet Decoded*, p. 382.
  70. Dull, *Battle History of the Imperial Japanese Navy*, pp. 227–35.
  71. *Ibid.*, p. 238.
  72. Prados, *Combined Fleet Decoded*, p. 391.
  73. Dull, *Battle History of the Imperial Japanese Navy*, pp. 237–49; Tanaka, "Japan's Losing Struggle for Guadalcanal," part 2, pp. 820–22.
  74. Dull, *Battle History of the Imperial Japanese Navy*, p. 239.
  75. *Ibid.*, p. 243.

76. Ibid., p. 247.
77. Ibid., p. 254.
78. Russell Crenshaw, *The Battle of Tassafaronga* (Baltimore: Nautical and Aviation, 1995), pp. 25–29.
79. Dull, *Battle History of the Imperial Japanese Navy*, pp. 255–60; Tanaka, “Japan’s Losing Struggle for Guadalcanal,” part 2, pp. 825–27.
80. Crenshaw, *Battle of Tassafaronga*, p. 88.
81. Prados, *Combined Fleet Decoded*, p. 395.
82. Dull, *Battle History of the Imperial Japanese Navy*, p. 259.
83. Hughes, *Fleet Tactics*, p. 116.
84. See Crenshaw, *Battle of Tassafaronga*, chap. 10.
85. Warner and Warner, *Disaster in the Pacific*, pp. 103–104.
86. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton Univ. Press, 1976), p. 119.
87. Barry D. Watts, *Clausewitzian Friction and Future War*, McNair Paper 52 (Washington, D.C.: National Defense Univ. Press, 1996), pp. 32, 94–95.
88. E. B. Potter, *Admiral Arleigh Burke* (New York: Random House, 1990), pp. 63, 75.
89. Ibid., pp. 83–84.
90. Dull, *Battle History of the Imperial Japanese Navy*, pp. 278–79.
91. Ibid., pp. 288–90; Potter, *Admiral Arleigh Burke*, pp. 95–98.
92. Dull, *Battle History of the Imperial Japanese Navy*, pp. 294–95; Potter, *Admiral Arleigh Burke*, pp. 103–106.