



When Intelligence Made a Difference

— WORLD WAR II —

Strangling the Empire

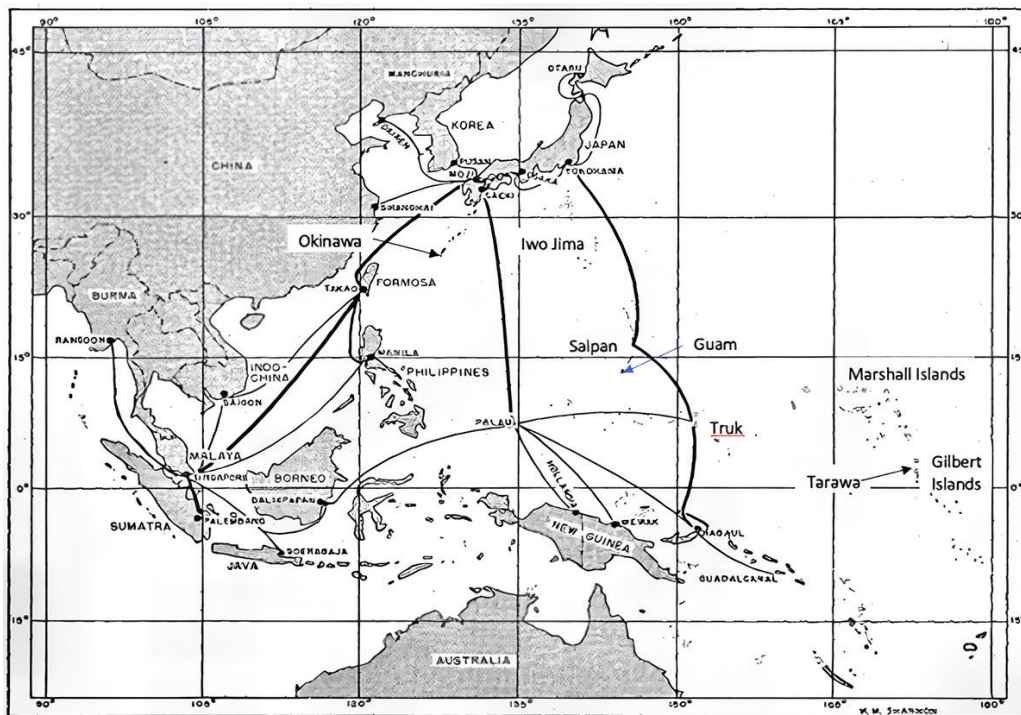
Peter C. Oleson

In parallel with the campaigns in the Solomons, New Guinea, and the Pacific Islands, allied strategy, taking advantage of the expansive geography of the Pacific and Japan's need to import oil and materials for its economy and war industries, embraced the concept of strangling the Empire by disrupting its lines of communication and commerce. "Within hours of the Pearl Harbor attack, Admiral Thomas C. Hart, Commander in Chief of the U.S. Asiatic Fleet in Manila, radioed his command to "execute against Japan unrestricted air and submarine warfare." Hart knew that Chief of Naval Operations Admiral "Betty" Stark would do the same within hours.¹

"American war planners recognized that Japan's empire was tenuous at best; spread across thousands of miles of open water and sea lanes, its far-flung

islands were difficult to reach and even harder to maintain." "America's submarine war boiled down to simple economics. Japan's merchant ships served as the lifeblood of an empire that stretched across 20 million square miles and seven time zones. Merchant ships not only hauled the precious oil, iron ore, and rubber needed to fuel the nation's larger war effort, but the toilet paper, tooth powder, and rice necessary to sustain fighting troops."²

The start of unrestricted submarine warfare was slow. Although USS *Gudgeon* (SS-211) sank the Imperial Japanese Navy (IJN) submarine *I-73* west of Midway on 27 January 1942, having been tipped to nearby enemy submarines by a communications intelligence (COMINT) intercept, the US submarine fleet was largely ineffective.³ Early in the war strategy assigned Japanese capital ships as primary targets for the US Navy, and submarines were to be used defensively as pickets for the surface fleet.⁴ Furthermore, many of the old S-class submarines, built during and after World War I, were obsolete and armed with a defective torpedo. Tactics were too reliant on sonar detection, which had limited range, and many sub-



Japanese supply and convoy network map.
Map by W. M. Shannon. Taken from Major Y. Hori, "The failure of the Japanese convoy escort," *US Naval Institute Proceedings*, Vol. 82, No. 10, October 1956, p. 644. Annotated by author.

1. William P. Gruner. *US Pacific Submarines in World War II*, Historic Naval Ships Association, 2010. See <https://maritime.org/doc/subsinpacific.php>; <https://www.historynet.com/american-subs-were-a-far-more-lethal-force-in-the-pacific-war-than-previously-known/>; and https://en.wikipedia.org/wiki/Allied_submarines_in_the_Pacific_War.

2. James M. Scott. "America's Undersea War on Shipping," *Naval History Magazine*, Vol. 28, No. 6, December 2014.

3. Station Hypo, the US Navy's COMINT center on O'ahu, through an ULTRA decryption, confirmed the sinking. <https://stationhypo.com/2023/02/02/first-kill-of-wwii/>.

4. Gruner, *US Pacific Submarines in World War II*.

marine skippers showed a lack of aggressiveness due to fear of Japanese anti-submarine warfare (ASW) destroyers and aircraft. US command relations were also fragmented.⁵

In January 1943, at the allied Casablanca Conference, there was a change in strategy to have a two-prong offensive in the Southwest and Central Pacific. “The submarine force, in a major change in tactics from the prewar ‘eyes of the fleet’ role, now concentrated on exerting pressure on Japanese lines of communication and a gradual sea blockage of the Empire.”⁶

ULTRA – THE EARLY COMINT CONTRIBUTIONS

In early January 1942 the initial cryptologic breaks against the IJN naval operational code, JN-25, were made by Station Cast on Corregidor, OP-20-G in Washington, and soon thereafter by the British Far Eastern Combined Bureau (FECB), an outpost of Britain’s Government Code and Cipher School at Bletchley Park, and Station Hypo on O’ahu.⁷ By May “it was estimated that 60 percent of IJN radio traffic was being intercepted and 40 percent read, although the content recovered from the typical message averaged only about 10-15 percent.”⁸ Traffic analysts also broke the IJN’s call-sign system and could then identify the intended recipients of messages. “The complementary nature of these two basic forms of [COMINT] analysis became more and more apparent as the Pacific war progressed.”⁹

The normal procedure was for the Commander of Submarines in the Pacific (COMSUBPAC) to for-

ward “ULTRA” messages to a submarine when that submarine might be able to execute an attack. The source of the intelligence was not revealed. When a message starting with “ULTRA” was received from COMSUBPAC only the communications officer was allowed to decrypt it, and only the captain of the boat and his executive officer (XO) were allowed to read the Top Secret message.¹⁰

1942

In early May 1942 Station Hypo directly tracked the IJN invasion force headed for Port Moresby on Australian New Guinea. The ensuing Battle of the Coral Sea gave Admiral Chester Nimitz, the Navy’s Pacific commander, confidence in COMINT. A month later on June 4-7, due to the cryptologic achievements of Station Hypo, ADM Nimitz knew that the Japanese attack on Midway would commence on June 4 and from what direction, allowing him to position his carriers for the strategically important defeat of the IJN.¹¹

Japanese submarines had scored numerous successes. On September 15, 1942, the Japanese submarine I-19 sank the aircraft carrier USS *Wasp* and seriously damaged USS *North Carolina*, one of the newest and most powerful battleships. The previous month, the aircraft carrier USS *Saratoga* had been torpedoed and put out of action for months. These losses, along with that of *Wasp*’s sister USS *Hornet*, to air attack on October 27, seriously crippled U.S. naval airpower in the weeks that the Battle for Guadalcanal hung in the balance.¹² By contrast, for most of 1942 only a handful of US submarines were on patrol in the Pacific. “[O]nly about one-third of submarines could be on station and patrolling eight million square miles of ocean—an area more than twice the size of Europe—at any given time.”¹³ A “submarine searching for targets in large oceans was mainly a continuous random process to try to make contact or achieve target detection, even

5. Clay Blair. *Silent Victory: The US Submarine War Against Japan*, Annapolis, MD: Naval Institute Press, 2001, p. 439.

6. Captain Paul Schratz (USN Ret.). *Submarine Commander: A Story of World War II and Korea*, The University Press of Kentucky, 1988, p. 51.

7. See Peter C. Oleson. “The Breaking of JN-25 and its Impact in the War Against Japan,” *The Intelligencer*, Vol. 26, No. 2 (Winter/Spring 2020-21), pp. 79-84. See also “The Silent War Against the Japanese Navy,” in four parts, Station Hypo, <https://stationhypo.com/2023/01/02/the-silent-war-against-the-japanese-navy-part-1-of-4/>. “The British had partly broken the principles behind JN-25 and had shared this knowledge with the United States in 1939.” (Colin B. Burke. “It wasn’t all magic: the early struggle to automate cryptanalysis, 1930s–1960s,” *United States Cryptologic History*, special series, Vol. 6, Fort George G. Meade, MD: Center for Cryptologic History, 2002, http://www.governmentattic.org/8docs/NSA-WasntAllMagic_2002.pdf)

8. *Naval War College Review*, Vol. 48, No. 4 (Autumn 1995). Also, John Winton. *Ultra in the Pacific: How Breaking Japanese Codes and Ciphers Affected Naval Operations against Japan, 1941-45*, Annapolis, Md: U.S. Naval Institute Press, 1994.

9. Station Hypo, <https://stationhypo.com/2023/01/05/the-silent-war-against-the-japanese-navy-part-4-of-4/>.

10. Admiral I. J. Galantin, USN (Ret.). *Take Her Deep: A Submarine Against Japan in World War II*, Chapel Hill: Algonquin Books of Chapel Hill, 1987, pp. 33, 108.

11. Peter C. Oleson. “The Breaking of JN-25 and its Impact in the War Against Japan,” *The Intelligencer*, Vol. 26, No. 2 (Winter/Spring 2021), pp. 79-84. Also, <https://stationhypo.com/2018/08/19/wwii-and-comint-reporting/#more-10094>. At the beginning of December 1941 the IJN changed codes to the JN-25b version that was unreadable for many weeks. (Ken Kotani. *Japanese Intelligence in World War II*, New York: Osprey Publishing, 2009, p. 137.)

12. <https://stationhypo.com/2018/08/19/wwii-and-comint-reporting/#more-10094>.

13. Pearl Harbor submarine data, Bowfin Museum, Pearl Harbor National Park. Scott, *Naval History Magazine*.

THE TORPEDO PROBLEM

The Navy's Mk-14 torpedoes were never adequately tested in the R&D phase and had only a 20% success rate from the beginning of the war until late 1943.¹ "[On far too many occasions, an accurate shot from an American submarine resulted in a hit without any detonation."² The Mk-14 "ran deeper than set causing them to run beneath the target." And there was a "problem with the exploder mechanism." "...some exploded prematurely on their way to the target." Some failed to explode at all.³ Three US submarines are known lost to their own torpedoes: USS *Tulibee* (SS-284) to a MK-14 in March 1944, USS *Tang* (SS-306) in October 1944, and USS *Grunion* (SS-216) earlier in July 1942 in the Aleutians.⁴ In September 1943 the US Navy finally resolved the technical problems of the Mk-14 torpedo... with the reliable Mk-18.⁵

1. David F. Matthews. "Mark XIV Torpedo Case Study" (<https://apps.dtic.mil/sti/citations/ADA550699>), April 19, 2019.

2. Dr. Gary E. Weir. "Silent Victory 1940-1945," *US Naval Historical Center*.

3. Gruner, *US Pacific Submarines in World War II*.

4. [https://en.wikipedia.org/wiki/USS_Tullibee_\(SS-284\)](https://en.wikipedia.org/wiki/USS_Tullibee_(SS-284)). USS *Tang* was credited with 33 ships sunk, the most of all subs, and the most tonnage of 116,454 (<https://www.history.navy.mil/research/histories/ship-histories/danfs/t/tang-i.html>). Post-war analysis added USS *Grunion* to those lost to defective torpedoes (https://en.wikipedia.org/wiki/USS_Grunion, and Peter F. Stevens. *Fatal Dive: Solving the World War II Mystery of the USS Grunion*, Regnery History, 2012).

5. Ian W. Toll. *Twilight of the Gods: War in the Western Pacific, 1944-1945*, WW Norton, 2020, p. 324.

if ocean areas for shipping or convoy routes" were known.¹⁴ And these were hampered by lack of radar and errant torpedoes.

14. Romney B. Duffy. "Submarine warfare and intelligence in the Atlantic and Pacific in the Second World War: comparisons and lessons learned for two opponents," *Journal of Maritime Research*, 12 Jan. 2018. <https://www.tandfonline.com/loi/rmarzo>.

Despite these handicaps "the situation for... America's submariners was slowly improving by late 1942:" U.S. subs sank 62 IJN warships and 229 merchant vessels ("marus") and others for a total of 725,000 GRT."¹⁵

1943

1943 saw "major enhancements to the submarine campaign." In the spring, Allied codebreakers fully mastered the Japanese Water Transport Code (i.e., the merchant ship codes, JN-40), as well as the Fleet Auxiliary System (JN-11 related to troop convoys). In February 1943, in a command change, Rear Admiral Charles Lockwood, was placed in charge of all Pacific submarines, including those relocated from the Philippines to Australia. His "energy and enthusiasm revamped submarine tactics..."¹⁶ Additionally, by September, the defects in the Mark 14 torpedo were largely cured.^{17,18}

The broken codes provided critical intelligence. The Water Transportation Code revealed shipments to various Japanese strongholds and the strength and conditions of Imperial Japanese Army (IJA) garrisons. This was crucial in allied decisions to bypass many Japanese strongholds and let them wither due to lack of resources.¹⁹ "Once the Army's transportation code was broken US submarines were alerted to where individual ships and convoys would be and at what time."²⁰ USS *Silversides* (SS-236) was one of the first submarines to capitalize on receiving ULTRA tips and in January sank the large tanker *Toei Maru* off Truk, and days later a passenger cargo ship and three freighters, killing more than 800 Japanese soldiers.²¹ Until the end of the war US Navy codebreakers deciphered Japanese sailing dates, courses, speeds, and routes of

15. National Park Service, "War in the Pacific: The Pacific Offensive – The Silent Service: Submarines in the Pacific," https://www.nps.gov/parkhistory/online_books/npswapa/extContent/wapa/guides/offensive/sec6.htm. Also, <https://www.history.navy.mil/research/library/online-reading-room/title-list-alphabetically/j/japanese-naval-merchant-shipping-losses-wwii.html#pageiv>.

16. National Park Service. https://www.nps.gov/parkhistory/online_books/npswapa/extContent/wapa/guides/offensive/sec6.htm.

17. <https://www.historynet.com/american-subs-were-a-far-more-lethal-force-in-the-pacific-war-than-previously-known/>.

18. "Early in the war the Navy armed torpedoes with TNT, changing later to the far more powerful Torpex." Weir, "Silent Victory 1940-1945."

19. Peter Donovan & Jack Mack. *Code Breaking in the Pacific*, Switzerland: Springer, 2014, p. x. For a technical explanation of the cryptanalytic approach to Japanese codes see Donovan and Mack.

20. Review of Ian W. Toll, *Twilight of the Gods*, in *The Intelligencer*, Vol. 26, No. 2, pp. 110-3.

21. Scott, *Naval History Magazine*.

TRAGEDIES

Successful attacks against marus at times resulted in tragedies. The *Montevideo Maru* was transporting approximately 1,060 prisoners from 16 countries, including 850 Australian service members, from the captured Australian territory of New Guinea to what was then the Japanese-occupied island of Hainan, when on 1 July 1942 the USS *Sturgeon* (SS-187) torpedoed and sank the ship — which had not been marked as transporting prisoners of war.¹ It was not the only case of allied POWs being killed in submarine attacks.

1. Heather Law. "World War II shipwreck of SS *Montevideo Maru*, which sank with over 1,000 POWs, found in South China Sea," 27 April 2023, <https://stationhypo.com/2023/04/23/world-war-ii-shipwreck...>

naval convoys and formations, unbeknownst to the Japanese. "The information furnished made possible the assignment of submarines not only to the most profitable patrol areas but also to specific locations at particular times where contacts were made with convoys of known composition and importance, and frequently with enemy course and speed known exactly." "[W]hen enemy code changes temporarily cut off the supply of Communication Intelligence, its absence was keenly felt."²²

As the war progressed the aging S-class boats were replaced with new Gato-Class submarines, equipped with radar, and having a greater radius of action, higher speeds and larger payloads of torpedoes. Sub skippers and XO's were briefed prior to patrols on "forthcoming major campaigns, on ULTRA information on Japanese shipping, and on recent but scanty information on the vast new minefields laid in primary submarine operating areas."²³ However, much geographic data was unknown, for example, "charts of the China coast were inadequate, with many unexplored areas left totally blank."²⁴ And it became routine that, "[u]pon completion of a patrol,

22. "A Sense of Urgency Continues (1941-1945)," <https://stationhypo.com/2018/08/19/wwii-and-comint-reporting/#more-10094>.

23. Schratz, *Submarine Commander*, p. 96.

24. *Ibid.*, p. 147.

naval intelligence would brief the skipper of results" as reflected in SIGINT.²⁵

"[T]he American submarine fleet increased to 75 boats by 1 January 1944, as compared to only 53 one year earlier..."²⁶ The scorecard of sunken or damaged Japanese vessels climbed dramatically in 1943. In that year 15 US submarines were lost to enemy action but they sank 335 marus, and 93 IJN combatants, including the escort carrier *Chuyo*.²⁷

In addition to interrupting Japanese sea lines of communication, the US submarines supported Australian coast watchers and Special Forces operating deep behind enemy lines throughout the Pacific.²⁸ Strategically, Japanese outposts in the Gilbert and Marshall Islands, weakened by the failure of supplies to get through submarine infested waters, by late 1943 were falling victim to Admiral Nimitz's carrier task forces and Marine and Army amphibious assaults.²⁹

1944

Besides the rapid increase in the number of US submarines in the Pacific,³⁰ "[c]odebreaking, much of it done by now highly proficient women, showered the patrolling submarines with intelligence that set up fatal rendezvous with targets, including many troop-bearing ships."³¹

By April 1944, in response to heavy losses, the Japanese moved convoys close to shore. Shallow waters, often uncharted, were dangerous for US submarines. Often protected by minefields, subs had limited depth to avoid depth charge attacks.³² Document exploitation also helped the allies. On 1 April 1944 a briefcase with IJN codebook and the "Z Plan" was recovered and copied by Philippine guerrillas from two IJN flying

25. Gallantin, *Take Her Deep*, p. 88.

26. Weir, "Silent Victory 1940-1945."

27. *Ibid.* Note: The number of recorded ships sunk varies depending on source. In October 2021 *Historynet.com* published a study refining many of the historically accepted numbers. The refined numbers are used here.

28. John Perryman. "USN Submarines Based in Brisbane during World War II," *Royal Australian Navy History*, <http://www.navy.gov.au/history/feature-histories/usn-submarines-based-brisbane-during-world-war-ii>.

29. Gruner, *US Pacific Submarines in World War II*. See also Peter C. Oleson, "Across the Pacific: The Role of Intelligence in the Island-Hopping Campaign from Tarawa to Okinawa," *The Intelligencer*, Vol. 28, No. 2 (Fall 2023).

30. In February 1943 the US Navy had 47 submarines active in the Pacific. By June 1944, it had over 100. By early 1944 American shipyards were producing 10 submarines a month. (Toll, *Twilight of the Gods*; Scott, "America's Undersea War on Shipping.")

31. <https://www.historynet.com/american-subs-were-a-far-more-lethal-force-in-the-pacific-war-than-previously-known/>.

32. Ruhe, *War in the Boats*, p. 194.

SIGNIFICANT WW II SINKINGS OF IMPERIAL JAPANESE NAVY VESSELS BY US SUBMARINES IN THE PACIFIC BASED ON ULTRA COMINT ¹		
Date	Submarine	Comment
Jun. 1943	USS <i>Trigger</i> (SS-237)	Tipped by ULTRA, inflicted severe damage on IJN carrier <i>Hitaka</i> returning from Truk to Honshu, putting her out of commission for a year.
Aug. 1943	USS <i>Pogy</i> (SS-266)	Tipped by ULTRA, sank aircraft transport <i>Mogamigawa</i> headed for Truk.
Dec. 1943	USS <i>Sailfish</i> (SS-192)	Based on ULTRA sank IJN escort carrier <i>Chuyo</i> southeast of the IJN base of Yokosuka. First IJN carrier sunk by a US submarine.
Mar. 1944	USS <i>Tunny</i> (SS-282)	Sank the IJN submarine <i>I-42</i> near Palau based on COMINT analysis.
Jun. 1944	Wolfpack of USS <i>Pintado</i> (SS-387) & USS <i>Shark II</i> (SS-314)	Based on COMINT reporting destroyed a large convoy trying to reinforce the Marianas just prior to the landing on the island of Saipan by the US Marines and Army.
Jul. 1944	USS <i>Sawfish</i> (SS-276)	Sank the IJN submarine <i>I-29</i> in the Luzon Strait based on ULTRA intercept. <i>I-29</i> was returning from Nazi-occupied France with German technologies including rocket engines and jet-powered aircraft plans.
Sep. 1944	USS <i>Sea Devil</i> (SS-400)	Sank the IJN large cargo submarine <i>I-364</i> enroute to Wake Island 450 miles east of Honshu based on ULTRA intercept.
Nov. 1944	USS <i>Spadefish</i> (SS-411)	Based on COMINT sank the IJN escort carrier <i>Shin'yo</i> in the Yellow Sea, west of Korea. Also damaged the accompanying tanker.
Dec. 1944	USS <i>Redfish</i> (SS-395)	Based on COMINT reporting sank the newly built IJN carrier <i>Unryu</i> bound for the Philippines in the East China Sea.
Dec. 1944	Based on COMINT either USS <i>Redfish</i> or USS <i>Sea Devil</i>	Tipped by COMINT severely damaged the IJN carrier <i>Junyo</i> , being used as a transport and returning to Japan from Manila, putting it out of commission for the remainder of the war.
Feb. 1945	USS <i>Batfish</i> (SS-310)	Sank three IJN submarines within four days based on ULTRA intelligence (<i>RO-115</i> , <i>RO-112</i> , <i>RO-113</i>). Also used on-board ELINT radar detector to pinpoint IJN submarines for attacks.
Apr. 1945	USS <i>Sea Owl</i> (SS-405)	Damaged the IJN submarine <i>I-372</i> near Wake Island based on ULTRA.
Apr. 1945	USS <i>Gabilian</i> (SS-252) & USS <i>Charr</i> (SS-328)	USS <i>Charr</i> sank the IJN light cruiser <i>Isuzu</i> near Taiwan that had been damaged previously by USS <i>Gabilian</i> .
Apr. 1945	USS <i>Threadfin</i> (SS-410) & USS <i>Hackleback</i> (SS-295)	Tipped by COMINT, located, tracked and reported the location of the IJN battleship <i>Yamato</i> and her escorts. <i>Yamato</i> , the cruiser <i>Yahabi</i> , and destroyers <i>Hamakaze</i> , <i>Isokaze</i> , <i>Asashino</i> , and <i>Kasumi</i> were sunk the next day by carrier air forces.

1. Note: This chart is based on multiple sources. Only significant sinkings or damaging attacks based on COMINT are included. Various sources, however, including post-war analysis of Japanese records, disagree on details of sinkings claimed by US submarines. Of course, Ultra was significant in planning lucrative submarine patrol areas. ("A Sense of Urgency Continues (1941-1945)!)" <https://stationhypo.com/2018/08/19/wwii-and-comint-reporting/#more-10094>).

boats that crashed during a tropical storm off Cebu in the Philippines. The Z Plan contained Japanese war strategy. After being copied the briefcase was returned to the crash site and recovered by the Japanese, who did not suspect its compromise.³³

In May ULTRA revealed the gathering of IJN warships at Tawitawi, off the coast of Borneo, preparing to engage the US Navy in a decisive battle according to the Z Plan. US submarines were positioned off Tawitawi and harassed the IJN. ULTRA also revealed the IJN execute order to attack the US fleet invading Saipan.³⁴

During the course of the Battle of the Philippine Sea (19-20 June 1944) USS *Albacore* (SS-569) torpedoed *Taihō*, "the largest and newest carrier in the IJN," and USS *Cavalla* scored 3 hits on the carrier *Shōkaku*, which sank north of Yap.³⁵ The IJN fleet was never an offensive threat after this.

By 1944 IJN operations were constrained often by a lack of fuel. "...oil was scarcer than ever. For the most part this was due to American submarines, which savaged the Japanese tanker fleet, sinking twenty-one tankers in the first five months of 1944."³⁶ The maru

33. Kotani. *Japanese Intelligence*, pp. 88-9.

34. John Prados. *Combined Fleet Decoded: The Secret History of American Intelligence and the Japanese Navy in World War II*, Annapolis, MD: Naval Institute Press, 1995, pp. 569-82.

35. "World War II Submarine Warfare," *United States History*, <https://www.u-s-history.com/pages/h1710.html>.

36. Craig L. Symonds. *World War II at Sea: A Global History*, New York: Oxford University Press, 2018, p. 542.

OTHER INTELLIGENCE-RELATED SENSOR DEVELOPMENTS

“Only two submarines were equipped with the SD non-directional anti-air-craft radar early in the war, but by about late summer to fall of 1942 all submarines were so equipped. That usually provided warning prior to attack from the air allowing submarines to run on the surface during daylight. Tactical use of the SD radar varied with the Commanding Officer. Some CO’s used it intermittently when on the surface to reduce the probability of interception of the emitted radar signal. Others used it continually.”¹ The SD radar was a simple device, providing an “echo-spike” indicating range but not direction. Its detection range was approximately 20 miles, but not against low-fliers.²

The SJ surface search radar was first installed August of 1942. By the end of 1943 all submarines were so equipped. Normally the SJ was used continually when on the surface. It could be used for tracking targets when submerged at shallow keel depths of about 48 feet. In 1944 and 1945 the SJ antenna was improved and mounted on an extensible mast allowing the submarine to expose the antenna while running submerged.³ The SJ provided directional information, provided highly accurate distance information, and provided information about surface contacts as well as low-flying planes. However, IJN warships demonstrated an ability to intercept a submarine’s SJ surface search radar.⁴

“The ST periscope radar was introduced about 1944. It provided good range and fair target bearing information.”⁵

Invented at sea on patrol was a directional ELINT receiver to track IJN submarine radars and shore-based radars for navigational purposes. As the skipper of the USS *Atule* (SS-403) noted “German U-boats and Japanese I-boats... had directional radar receivers, which they used with excellent success.”⁶

Critically important was the development of the bathythermograph (BT) by Woods Hole Oceanographic Institute, which provided submarine commanders with critical intelligence about a submarine’s susceptibility to sonar detection. It allowed subs to chart seawater temperature versus depth and find thermal layers that deflected active sonar “pings,” which “sharply reduced the detection capabilities” of Japanese antisubmarine vessels. “The submariners soon learned to go deep” (often beyond the test crush depths of the sub) “and get below a layer to screen their movements while evading the surface pursuer.”⁷

In late 1944 and 1945 several submarines were fitted with a newly developed FM (frequency modulated) sonar that was intended for detection of submerged mines. USS *Tinosa* (SS-283) surveyed and mapped the minefields around Okinawa prior to the US invasion, and others used the sonar to map and penetrate the minefields of Tsushima Strait prior to operating inside the Sea of Japan.⁸

These tactical intelligence enhancements made US submarines extraordinarily effective against both IJN warships and marus.

1. Gruner, *US Pacific Submarines in World War II*.

2. Captain William J. Ruhe, (USN Ret.). *War in the Boats: My World War II Submarine Battles*, Washington, CD: Brasseys, 1994

3. Gruner, *US Pacific Submarines in World War II*.

4. Ruhe, *War in the Boats*, p. 148; also https://en.wikipedia.org/wiki/SJ_radar.

5. *United States Navy Radar Operator’s Manual* - April 1945, San Francisco Maritime National Park Association, <https://www.maritime.org/doc/radar/part4.php>

6. Schratz, *Submarine Commander*, p. 159.

7. *Ibid*, p. 66. See also https://en.wikipedia.org/wiki/Allied_submarines_in_the_Pacific_War

8. [https://en.wikipedia.org/wiki/USS_Tinosa_\(SS-283\)](https://en.wikipedia.org/wiki/USS_Tinosa_(SS-283))

Japanese ASW

“Despite an awareness that shipping was vital, the Japanese military seriously underestimated the (eventual) threat from Allied submarines. This overconfidence was reinforced by the ineffectiveness of Allied submarines in the early part of the war.”¹

The Japanese Navy did not introduce organized merchant convoys and escort protection until 1943, and did not focus at all on anti-submarine warfare.²

“The Japanese were not well equipped for anti-submarine warfare (ASW), nor did they use their equipment in a tactically effective manner during most of the war... Japanese escort vessels and anti-submarine aircraft were not equipped with radar until the fall of 1944... Japanese escorts were well equipped with directional radar intercept receivers early in the war... It was learned after the war that Japanese aircraft had never reached the stage of consistently homing in on our submarine’s radar emissions.”³

“A Japanese radio direction finder net was well established at the start of the war. The Commander of a submarine which transmitted a radio message could pretty well be assured that his position was immediately known to within about 10 miles.”⁴

Surprise ASW attacks from aircraft suggested Japanese implementation of magnetic anomaly detection (MAD) gear. No intelligence was available on this. On 4 May 1945, a Japanese survivor of an aircraft shot down, carrying two MAD traces and notes, confirmed MAD capabilities very similar to US MAD equipment.⁵

For the US “[r]ecent submarine technology had made great progress in silencing the equipment aboard to reduce transmitted noise that might tip off the sub’s location to a hostile vessel.”⁶

“The standard Japanese depth charge at the start of the war contained an explosive charge of 240 pounds. By depth charge design or tactical usage these charges were at first usually set to explode at depths of less than 300 feet. By early 1944, however, king sized charges were in service. They contained an explosive charge of 1,000 lbs. and could be set to explode at depths exceeding 600 feet. Early US fleet type submarines were designed for a crush depth of 250 feet. This was gradually increased in later boats to 400 feet.”⁷ But US submarines often went deeper to take advantage of isothermal layers and escape depth charge attacks.

1. Mark P. Parillo. *The Japanese Merchant Marine in World War II*. Annapolis: Naval Institute Press, 1993.

2. Duffy, “Submarine warfare and intelligence...” Also, Atsushi Oi. “Why Japan’s anti-submarine warfare failed,” *United States Naval Institute Proceedings*, Vol. 78, 1952, pp. 587–601.

3. Gruner, *US Pacific Submarines in World War II*.

4. *Ibid.* Also, the historian Ken Kotani notes that IJN SIGINT focused on DF and not codebreaking. (Kotani. *Japanese Intelligence*, p. 73.)

5. Schratz, *Submarine Commander*, pp. 124, 161.

6. *Ibid.*, p. 93.

7. Gruner, *US Pacific Submarines in World War II*.

war left the Japanese homeland critically short of essential materials for its industries.³⁷ Repeatedly, ULTRA decrypts put submarines in the planned routes of Japanese merchantmen, critical tankers, and high value warships. USS *Cravelle* (SS-291) received a high priority “burn notice,” based on ULTRA, for

an IJN submarine (*I-29*) that was headed for Japan from Germany with a “shipload of the latest German technology... its ballast tanks carried mercury which was in short supply in Japan and necessary for their gyros and other instruments.” *I-29* was to be sunk “at

37. Gruner. *US Pacific Submarines in World War II*.

all costs.” It eventually was by USS *Sawfish* (SS-276) on 26 July 1944.³⁸

American submarines flexed their might following the recapture of Guam in July-August 1944. Forward based submarines on Guam and Saipan imposed a virtual blockade of Japan. Few ships entered or left Japanese waters without being attacked or sunk. Japan ran out of oil for her naval armada, gasoline for aircraft and tanks, steel and aluminum for industry, and food for her people. By August 1944, the sea war was no longer in doubt — three of Japan’s remaining five fleet carriers had been sunk, and Japan’s navy ceased thereafter to be a factor in the outcome of the war.³⁹

With the Japanese trying to reinforce its bastions in the Pacific, and especially the Philippines after General MacArthur’s landing on Leyte in October, the oceans were packed with Japanese troopships. American submarines inflicted heavy losses on the IJA, killing at sea some 79,004 Japanese soldiers.⁴⁰

With the capture of the Marianas in August and subsequent capture of airbases in the Philippines, aerial reconnaissance, often cued by COMINT, became a more significant factor in isolating the Japanese home islands from its overseas posts. While long-range aerial reconnaissance had been an important factor since the early Southwest Pacific campaigns in 1942, by 1944 it covered the entire South China and Philippine Seas. This resulted in increased interdiction and sinking of Japanese vessels by both US Navy and Army Air Force aircraft.⁴¹

In 1944, 19 US submarines were lost. US submarines and Navy and Army Air Forces, sank 603 marus, 12 fleet and escort carriers, 3 battleships, and 2 heavy and 7 light cruisers.⁴²

38. Ruhe, *War in the Boats*, p. 245.

39. National Park Service, “War in the Pacific...”

40. HistoryNet, <https://www.historynet.com/american-sub-were-a-far-more-lethal-force-in-the-pacific-war-than-previously-known/>.

41. The Navy’s PBY amphibious patrol bomber was used even before Pearl Harbor. Its 1,600-mile range allowed for distant reconnaissance of enemy task forces and strongpoints. It could drop torpedoes, depth charges, and bombs and sank six IJN submarines. The Navy also employed B-17 and B-24 aircraft for long-range reconnaissance. Other reconnaissance aircraft included the Navy’s PBM Mariner with a 3,000-mile range; the PV-1 Ventura, equipped with a surface search radar; and shorter-range aircraft, including the F-4 (a version of the P-38 Lightning fighter), the A-20 Havoc, and in August 1944 the carrier-based F8F-1P Bearcat. (John Clement. “A brief PBY History,” The Catalina Preservation Society, <https://pbycatalina.com/pby-6/>; and <https://www.history.navy.mil/content/dam/nhhc/research/histories/naval-aviation/dictionary-of-american-naval-aviation-squadrons-volume-2/pdfs/Appen3.pdf>).

42. <https://www.history.navy.mil/research/library/online-reading-room/title-list-alphabetically/j/japanese-naval-merchant-shipping-losses-wwii.html#pageiv>. Note: various sources use different numbers for Japanese ships sunk and how – by submarines, aircraft, surface engagement, mines, etc.

“In the final months of the war, American submarines had difficulty finding targets because the Japanese had virtually no ships left to sink.”⁴³ By March 1945, British boats had gained control of the Strait of Malacca, preventing supplies from reaching Japanese forces in Burma by sea,⁴⁴ and oil imports to Japan had virtually stopped.⁴⁵ At the end of May 1945, “a nine-submarine wolfpack... left Guam... for the first major penetration of the Sea of Japan.” Traversing “the Tsushima Strait... they destroyed 27 merchant ships...” “In the end, Japanese ships had no safe haven. There was nowhere to hide.”⁴⁶ The following month US subs sank 46 cargo ships while aircraft and mines sank 70. In July subs sank 14 vessels; aircraft and mines 129.⁴⁷

The numbers for June and July reflect the impact of the airbases in the Philippines and Okinawa and carrier aircraft that “exacted a terrible toll on Japanese shipping” “But the most lethal threat to Japanese

shipping that year was the aerial mining campaign, mainly around the home islands.”⁴⁸

ULTRA intelligence became less important. Operational experience exposed the remaining Japanese sea lines of communication, which were

mined by aircraft, including by B-29s. American tactical intelligence sensors and command and control innovations provided overwhelming advantages to US air and naval forces which continued to multiply.

“As the war progressed submarines were assigned to lifeguard stations in areas where Navy Carrier Task Force operations, and Army Air Corps bomber raids

MODERN FLEET SUBMARINE CONSTRUCTION	
1942	39
1943	50
1944	80
1945	32
Total	201

43. David Vergun. “Submarine Warfare Played Major Role in World War II Victory,” *DoD News*, Mar. 16, 2020. Analyses, however, show this statement to be a bit of hyperbole. <https://www.defense.gov/News/Feature-Stories/Story/Article/2114035/submarine-warfare-played-major-role-in-world-war-ii-victory/>

44. https://en.wikipedia.org/wiki/Allied_submarines_in_the_Pacific_War.

45. Augustine Kobayashi. “America’s Submarine War – How the ‘Silent Service’ Quietly Brought About the Downfall of Japan,” *MilitaryHistoryNow.com*, 25 July 2016, <https://militaryhistorynow.com/2016/07/25/americas-submarine-war-how-the-silent-service-quietly-brought-about-the-downfall-of-japan/>.

46. Weir, *Silent Victory 1940-1945*.

47. Gallatin, *Take Her Deep*, p. 258.

48. HistoryNet, <https://www.historynet.com/american-sub-were-a-far-more-lethal-force-in-the-pacific-war-than-previously-known/>.

were planned.” “... 380 airmen were rescued in 1945” alone; 504 in total before the war’s end.⁴⁹

In 1945, 8 US submarines were lost but they sank 66 IJN-related vessels and 156 marus.⁵⁰

CONCLUSIONS

The Joint Army-Navy Assessment Committee (JANAC) after the war concluded Japan lost to submarines 686 warships of 500 gross tons (GRT) or larger, 2,346 merchantmen, and a total of 10.5 million GRT. The IJN lost 128 submarines.⁵¹ By the end of the war in August 1945, the Japanese merchant marine had less than a quarter of the tonnage it had in December 1941. Despite ship construction of three and a quarter million tons during the war, replacement tonnage amounted to only about a third of Japanese losses due to all causes.⁵² Some estimate that that up to 7,000 Japanese vessels of all types, including fishing boats and barges, were lost. According to Japanese historian Sadae Ikeda, some 176,000 Japanese soldiers and paramilitary personnel perished in ships sunk from all causes over the course of the war.⁵³

The US lost 52 submarines during World War II; 41 to enemy action. 350 officers and 3,194 enlisted sailors perished.⁵⁴ Japanese records indicated 468

sinkings of US subs as “confirmed.”⁵⁵ The wide discrepancy is testament to the effectiveness of US submarine evasion tactics and the tactical value of the bathythermograph sensor.

William Friedman, the American cryptologist, in some lectures to National Security Agency staff in 1959 noted that while the high level of US Naval communications security in World War II was adequate for the times, Japanese naval communications security was quite inadequate, and the IJN lacked the “experience and knowledge” to rectify it.⁵⁶

Admiral I. J. Gallatin in his book, *Take Her Deep*, noted that the “navy’s pre-World War II leaders did not foresee the great impact which submarines would have on the war at sea, not only on seaborne commerce, but on naval forces as well.” Submarines would become the “most decisive single factor in the collapse of the Japanese economy and logistic support of the Japanese military and naval power.”⁵⁷

Winston Churchill’s *The Second World War* makes it clear that Japan would have been defeated by submarine action alone. The United States Navy successfully utilized intelligence, mostly from analysis of intercepts of several Japanese codes, including JN-25, JN-40 and JN-11 and the important IJA Water Transport Code, to strangle the Empire.⁵⁸

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49. Gruner, *US Pacific Submarines in World War II*.

50. <https://www.history.navy.mil/research/library/online-reading-room/title-list-alphabetically/j/japanese-naval-merchant-shipping-losses-wwii.html#pageiv>; HistoryNet, <https://www.historynet.com/american-subs-were-a-far-more-lethal-force-in-the-pacific-war-than-previously-known/>.

51. https://www.nps.gov/parkhistory/online_books/npswapa/extContent/wapa/guides/offensive/sec6.htm.

52. Gruner, *US Pacific Submarines in World War II*. Gruner’s numbers are based on multiple sources including *US submarine World War II patrol reports*, many archived at the Bowfin Museum, Pearl Harbor National Park; Theodore Roscoe, *United States Submarine Operations in World War II*, Annapolis, MD: Naval Institute Press, 1949, and United States Strategic Bombing Survey, *The War Against Japanese Transportation 1941-1945*, Washington, DC: Government Printing Office, 1947.

53. HistoryNet.com.

54. Gruner, *US Pacific Submarines in World War II*. Note: Although most sources list 52 US submarines as lost during World War II, two others, *Halibut* and *Lancetfish* were damaged beyond economical repair and subsequently scrapped without returning to active service. At least 11 of the submarines were lost due to accidents, including

1 (*S-26*) by a collision, 3 (*R-12*, *S-28* and *Lancetfish*) by flooding, 4 (*S-27*, *S-36*, *S-39* and *Darter*) by groundings and 3 (*Tang*, *Tullibee* and *Grunion*) sunk by circular runs of their own torpedoes. Two other submarines, *Dorado* and *Seawolf*, were probably sunk in friendly fire incidents. A complete listing of US submarine losses can be found at https://en.wikipedia.org/wiki/List_of_United_States_Navy_losses_in_World_War_II

55. Schratz, *Submarine Commander*, p. 179.

56. Peter Donovan & Jack Mack. *Code Breaking in the Pacific*, Switzerland: Springer, 2014, p. x.

57. Gallatin, *Take Her Deep*, p. 13; also, the US Strategic Bombing Survey.

58. Donovan & Mack. *Code Breaking in the Pacific*, pp. ix-x.