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Transformation and the Officer Corps: Analysis in the Historical Context of the U.S. and Japan Between the World Wars

William D. O'Neil

4825 Mark Center Drive • Alexandria, Virginia 22311-1850

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Contents

Summary

The performance of military forces is a matter of great complexity, notoriously difficult to predict accurately. Of the many factors that affect it, most would put the performance of the commander and his or her staff officers high on the list, both in importance and assessment difficulty.

Most military services rely to a greater or lesser extent on professional military education (PME) to prepare officers for command and staff responsibilities. From an analytical perspective, we must wonder how PME affects performance. This report examines PME's effect in an extended historical case in which the opponents were generally evenly matched as regards resource inputs: that of the United States and its Allies against Japan in the first two years of the Pacific War, extending from 7 Dec 1941 through the end of 1943.

While it may seem surprising to view this as a case of closely comparable resource inputs, quantitative comparisons clearly show this to have been so. In the critical force categories of air forces, aircraft carrier tonnage, shipping, and engaged ground forces the Allied cumulative inputs to the Pacific did not begin to significantly outstrip those of Japan until close to the end of 1943.

One of the reasons this surprises many is the widespread impression that America and the Allies were well ahead of Japan in terms of forces engaged by 1943. While this impression is not entirely without foundation in fact, we will see that such Allied preponderance as existed was due far more to disproportionate losses sustained by the Japanese than disproportionate force inputs.

For the U.S. and Allied forces to have inflicted disproportionate losses with equal or lesser force numbers bespeaks either some consistent "good luck" or significant qualitative advantages. The only engagement of the early years of the Pacific War in which American or Japanese historians have seen any great good luck has been in a single incident, the so-called "five fateful minutes" at the Battle of Midway. [1] The notion

of extraordinary good fortune at Midway has now been thoroughly undermined by serious historical research. [2] Even if we were to cling to this view, however, it could explain very little of Allied preponderance over the course of the first two years of the war.

In examining factors of matériel quality, historians have suggested few areas of seeming Allied superiority in the 1941-43 period – and several of seeming Japanese superiority. The evidence is reviewed briefly to show that none of these imbalances could have made a great difference in favor of the Allies. The Japanese are generally credited with greatly superior torpedoes, of course, and American naval forces were afflicted with major torpedo problems throughout this period – clearly not factors operating in Allied favor, regardless of how we evaluate them. American forces did enjoy real superiorities in radar and, in the latter half the period under study, fighter performance. But neither superiority can account for more than a small portion of overall Allied preponderance, at most.

Historical accounts that take a broad view of the Pacific War's first two years generally emphasize that the key to Allied superiority lay in concentrating superior forces at crucial points and keeping them much better supported and supplied than the Japanese were able to do – which in more concise terms is to say that the Allies were superior at the operational level of war.[1] Since they did not have superior overall resources, this must mean that they were more *efficient* at the operational level – they managed to get more operational outputs out of a broadly comparable base of operational resources.

At the operational level, the direction of the Allied war effort in the Pacific was almost entirely in American hands. This was something of a

[1] From the DoD Dictionary, Joint Publication 1-02, *operational level of war* means, "The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or other operational areas. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events. These activities imply a broader dimension of time or space than do tactics; they ensure the logistic and administrative support of tactical forces, and provide the means by which tactical successes are exploited to achieve strategic objectives."

sore point with our Allies – particularly the Australians, who contributed major force components and had a number of able and experienced officers – but it clarifies the analytical issue. It allows us to say clearly and unambiguously that the Americans conducted matters more efficiently than the Japanese at the operational level of war.

Superiority in management of operations might stem from superior underlying aptitude, superior skill based on experience, or superior preparation through PME.

We can quickly dismiss superiority of skill based on experience as a hypothesis, since American officers had in fact very little relevant experience – as is shown in more detail in the body of the report. The Japanese were at least equal in all areas of prior experience.

As this study lays out in detail, there is no question whatever that American PME focused on operations (as contrasted with tactics) to a far greater extent than did Japanese PME, and that the American services generally treated the subject far more seriously than did the Japanese.

While this lends strong support to the hypothesis of superior preparation through PME, it does not fully settle the issue. Were there also factors of culturally-conditioned underlying aptitude? Could the asymmetry in PME programs, indeed, have been no more than an overt manifestation of underlying cultural patterns? Examination of the differences in Japanese and American military service cultures, in the context of overall national cultural differences shows how the choices in PME focus and structure related to and reflected cultural factors.

What does this tell us about understanding and predicting differential military performance generally? To judge from this example, careful analysis of PME curricula can be expected to yield insights that are clearly worth the effort involved and should be considered for routine employment in net assessment studies. Deeper analyses of military cultures appear to offer prospects of even greater payoffs but will require significantly greater resource commitments that may be difficult to sustain in our culture.

Recommendations

On the basis of these findings it is recommended that

- Prototype protocols for PME assessment should be developed and tested both for historical cases and for present-day cases where the results can be compared with those of other forms of intelligence analysis. Care should be taken to include cases in which military services have used on-the-job training as far as possible in place of PME, thus limiting the inferences to be drawn from PME curricula.
- Further historical studies of military culture and its operational impacts should be conducted in order to provide a clearer picture of how much value might be gained from present-day efforts of this nature and how much resource commitment might be necessary to realize such value. Of particular interest would be historical studies involving major potential opponents and allies, since these could provide background for current studies.

The first two years of the Pacific War

In order to lay out the evidence regarding Japanese military performance it is necessary to outline the sequence of events, at least broadly.

The complex story of how and why Japan involved itself in a war which eventually arrayed virtually every major nation in the world against it must be left to full-length treatments [3][4], as any condensed summary here would necessarily be severely distorted. A very minimal sketch is provided in [5]. Here I will simply outline the events necessary to an understanding of purely military performance.

In the late 1920s, the Empire of Japan included, in addition to metropolitan Japan, the territories of Taiwan (annexed in 1895) and Korea (formally annexed in 1910, although under effective Japanese occupation for some years prior). Under a League of Nations "trusteeship", dating from the aftermath of World War I, Japan occupied islands in a broad swath of the Central Pacific, including the Marianas (less the U.S. territory of Guam), the Carolines, and the Marshalls. Like several European countries, Japan had also carved out "concession" territories from a congenitally weak and divided China. These included the Kwantung Leased Territory, comprising the tip of the Liaotung (Liaodong) Peninsula, including the port of Darien (Dalian), and the right-of-way of the Japanese-owned South Manchuria Railway, which led north from Darien to the Manchurian city of Mukden (Shenyang) and beyond, as well as to the Korean border.[2] Japan also had a share of the large International Settlement in Shanghai, as well as scattered concession territories in China, again like European states (and the United States, to a more limited extent).

Japan garrisoned all of the territories it controlled. Of particular interest here, it had a "Korea Army," "Kwantung Army," and "North China

[2] Where commonly-accepted place names (or at least their representations in English) have changed since the period under review I have tried to give the contemporary version followed by the modern equivalent in parentheses. I follow a similar practice with respect to the names of some people.

Army." While is it conventional to denominate these as "armies," it would be more realistic to call them garrisons, for none approached the strength of a field army. The strongest, the Korea Army with two divisions and support troops as well as gendarmerie, served not only to protect Korea from possible Soviet incursions but to guard against revolt by Japan's resentful Korean subjects. The Kwantung Army, with about 10,500 troops in 1931, had detachments at major points of the railway [6]. The small North China Army was one of several foreign forces stationed at Tientsin (Tianjin) under the terms of the treaty which had followed the suppression of the Boxer Rebellion in 1900.

On a fabricated pretext, the Kwantung Army launched an offensive against local Chinese forces in Manchuria in Sep 1931 and by early 1932 had gained full control of the three Chinese provinces that comprise the region. It set up a nominally independent state of "Manchukuo" on 1 March 1932, but it was apparent to all that it was simply a front for the Kwantung Army and Japan.

Next the North China Army set out to gain control of the remainder of northern China, including Mongolia. Chinese resistance was generally ineffective and over the next few years the Japanese largely succeeded in establishing effective control.

Although the Japanese Army's "China hands" prided themselves on their knowledge of Chinese conditions, they were blind to the hardening of Chinese public opinion against foreign domination generally and Japanese domination in particular that occurred at this time. A random incident at the Marco Polo Bridge (Lugouqiao, or Lugou Bridge), ten miles southwest of Peiping (Beijing) on 7 July 1937 led to limited fighting with Chinese troops. Japanese civilian leaders and some officers strongly favored efforts to avoid broadening or deepening the conflict. Key Japanese Army leaders, however, assumed that a show of force and firmness would lead once again to a Chinese back-down and cession of more control to the Japanese.

But instead a tipping point had been reached. The Nationalist government leader, Chiang Kai-shek, had been intent on crushing the communists under Mao Tse-tung (Mao Zedong) and was at the point of do-

ing so.[3] But popular sentiment impelled him to turn his forces instead against the Japanese. Chiang's troops were, in varying degree, ill-led, ill-armed and equipped, ill-trained, ill-fed and supplied, and ill-supported. The Japanese prevailed in the great majority of engagements, even when fighting at numerical odds. Very soon the Chinese must give up the struggle and come to terms, the Japanese kept telling themselves, but the war ground on and on. The story of the war is told in [7].

The most capable of Chinese forces, both Nationalist and communist, were expended or eroded in futile early efforts to halt the Japanese advances. The last serious attempt to displace or defeat the invaders was mounted by the communists in their "hundred regiments" campaign late in 1940. After it had been crushed and the areas that had supported it had been brutally ravaged, no further significant offensive action was taken by either Chinese faction for the remainder of the conflict.

Contrary to official propaganda, then and since, guerilla warfare behind Japanese lines was relatively sparse [8]. But while the Japanese did find collaborators, the great majority of Chinese were hostile and uncooperative. Logistical problems and rear-area security demands placed limits on how far Japanese forces could go in occupying China. They held the coastal regions and most of the major cities, but much of the interior lay beyond their grasp.

While fighting in China the IJA continued to regard the Soviet Union as the real threat.[4] Japanese-dominated Manchuria thrust northward like a balled left fist, palm down on the map, into a grasping Soviet right hand. The thumb of the hand, between Manchuria and the coast to the west, was the narrow Soviet Maritime Province with the port of Vladivostok at its tip. To the north lay the palm of Soviet Siberia and to the west were curled the fingers of Outer Mongolia, then a Soviet satellite. The geographic juxtaposition implied mutual vulnerability, and a

[3] In general, normal western order is used for names in this report – surname or family name comes after personal name(s). I depart from this practice in cases such as Chiang and Mao, who are conventionally referred to in Asian order, surname first.

[4] Following widespread practice, I will make free use of the abbreviation "IJA," short for "Imperial Japanese Army."

long heritage of expansionist rivalries and current mutual political detestation made for a very unstable situation. The frontier was ill-demarcated in many regions, allowing much scope for border clashes. After Japan's Manchurian takeover, the U.S.S.R. had greatly reinforced its military strength in the region and stationed heavy bombers near Vladivostok, within range of Japanese cities.

In July 1938 Soviet probings at Changkufeng Hill near Lake Khasan in the southern part of the "thumb" of the Maritime Province, not far from the Korean border, brought an aggressive (and unauthorized) response from the local commander, leading to a two-week conflict with a total of about 2,500 casualties. Despite some setbacks and the heavy casualties, the IJA was very pleased with its performance against the Soviets at Changkufeng.

On the other side of Manchuria, where the "fingertips" of Soviet-controlled Mongolia curled into Manchuria, lay a broad area between the village of Nomonhan and the Halha River (Khalkin Gol, to the Russians) where Mongolian (Soviet) and Manchuokan (Japanese) territorial claims overlapped by ten miles and more.

A sequence of gradually escalating incidents in this disputed region starting on 11 May 1939 led to a Japanese attack on 1 Jul in reinforced divisional strength. By the end of July, a Japanese force of 18 infantry battalions with supporting artillery but very little armor held most of the disputed region. Early in August, however, the Soviets launched 35 battalions with more than 800 tanks and armored cars in a double-envelopment counterattack. The Japanese fought with skill and tremendous tenacity, but simply did not have the strength to resist the Soviet forces.

Although the Japanese forces were fully encircled, the war ended through negotiation following the outbreak of war in Europe early in September. Japanese casualties amounted to about half of troops engaged, with about half of all casualties having been killed. The conflict is particularly well documented and revealing in many ways. Reference [9] is the most definitive treatment, although [10] and [11] also are valuable and important.

The beginning of the Pacific War

Figure 1 shows the situation in Asia and the Western Pacific on the eve of war, as well as the Japanese plans for conquest. Because the evidence to be presented largely concerns actions of American and Japanese forces in operations against one another, this section will emphasize the U.S. role in the war, recognizing that other Allied combatants played significant roles as well. Some defects notwithstanding, the best concise treatment of the American Pacific War as a whole is provided by [12], on which considerable reliance has been placed here.

Allied preparations for war in the Pacific were in bad state in late 1941. For the British and Dutch there was no hope of remedy so long as the war continued in Europe, but America was rearming rapidly and each month brought added military resources. For this reason, American leaders hoped that if war could not be avoided it could at least be delayed. In mid 1941 they believed that at the then-current pace of negotiations with Japan, war could be deferred until spring of 1942.

From Tokyo, however, delay appeared undesirable for exactly the same reasons that it seemed attractive from Washington. Japanese power relative to that of the Americans would peak in late 1941 and decline thereafter. The U.S. decision to cut off oil exports late in July, 1941, intended to put pressure on the Japanese, sealed their decision; barring a prompt satisfactory settlement – satisfactory, that is, to the Japanese military – Japan would attack. The Japanese prepared for their initial campaign of conquest with great thoroughness. As was the usual practice of the Japanese services, planning was concentrated within the operations sections of the Army and Navy central General Staffs, other sections playing no more than ancillary roles. Intelligence was carefully gathered, with heavy reliance on clandestine assets under commercial cover. In some cases, operations officers were inserted under commercial cover to conduct on-scene reconnaissance. Overflights by commercial and military aircraft also provided important information. After careful analysis of available information unit assignments and composition were tailored to anticipated tasks. Where necessary, units were reformed, specially equipped, and trained in similar environments.

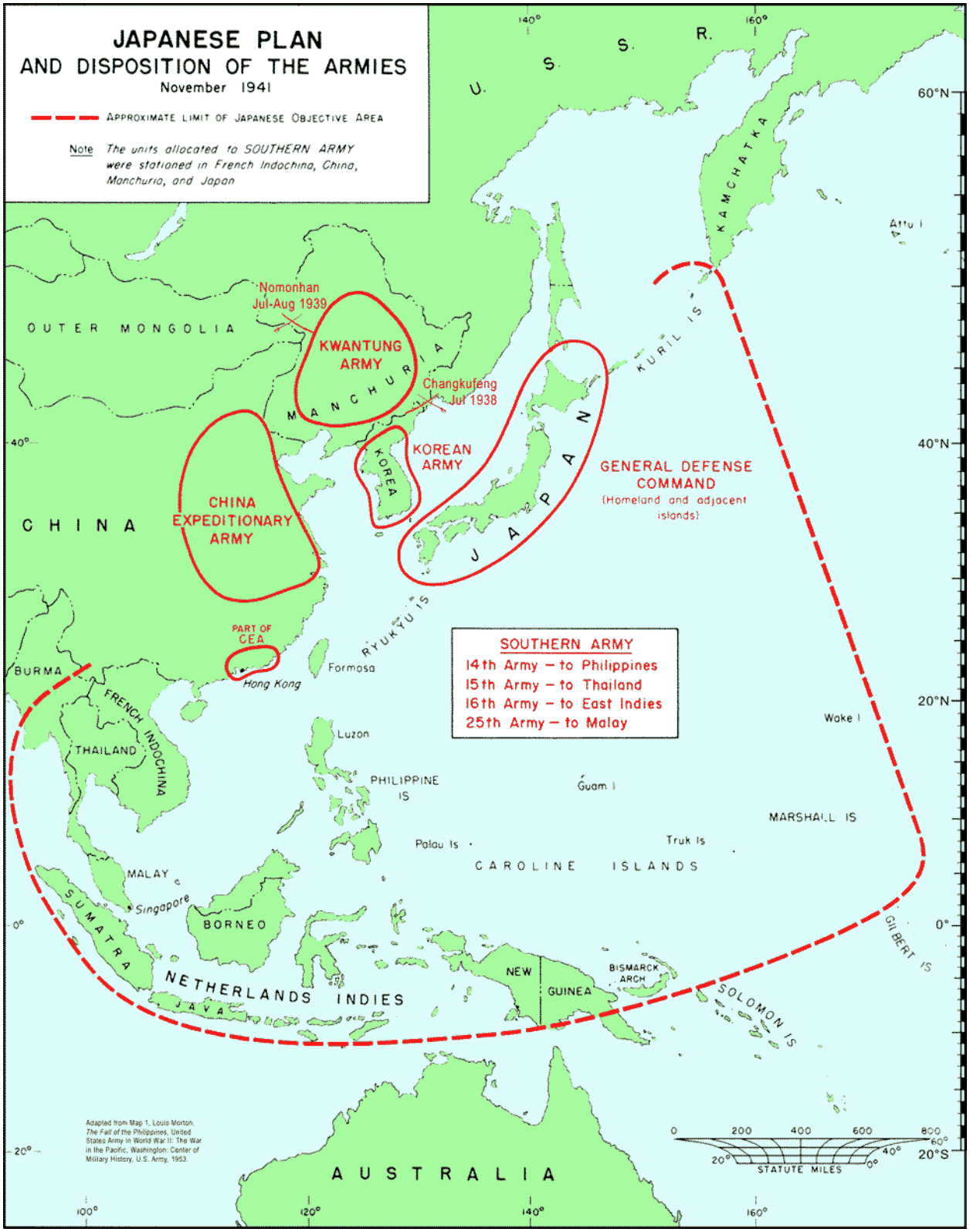

Figure 1: Japanese situation and plans on the eve of the Pacific War

Planning was very spare in the sense that margins of safety were all but nonexistent. Forces and logistics were only just adequate for the planned tasking. Forces were employed sequentially in two or more campaigns in rapid succession, leaving no slack in schedules. However, events were to prove that, with few and non-critical exceptions, Japanese assessments were soundly based. Overall, the plan was executed without significant hitch. The Japanese began with accurate information on enemy orders of battle and knew that their ground and air forces were outnumbered by those they were attacking and that the naval forces they were employing in critical theaters also were stretched thinly. However, they recognized that the defenses they were facing were poorly coordinated, often of low quality in terms of training, doctrine, and matériel, and generally fragile. They calculated that these defenses would fracture and crumble under swift and coordinated blows, and this proved generally correct. While we may marvel at its daring, there is no question that the campaign was brilliantly conceived and executed, a truly remarkable feat of arms.

It opened with a landing on the Malay Peninsula followed very swiftly with carrier strikes on Pearl Harbor. The Pearl Harbor strikes were delivered early in the morning, local time. Attacks on U.S. forces in the Philippines followed as day broke there, some hours later.

Because Malaya (Malaysia) and Singapore were defended by forces from Britain, India (then under British control), and Australia, this story will get limited attention here. (The reduction of the British colony of Hong Kong, involving hard-fought but small-scale action, will not be treated at all.)

The heavy ships sent out from Britain to strengthen British defenses, H.M.S. *Repulse* and *Prince of Wales,* were caught at sea without air cover by IJN long-range twin-engined land-based torpedo bombers and promptly sunk. This tragedy was largely the fruit of gross miscalculation by the Allies (and in particular Britain) of IJN air capabilities.

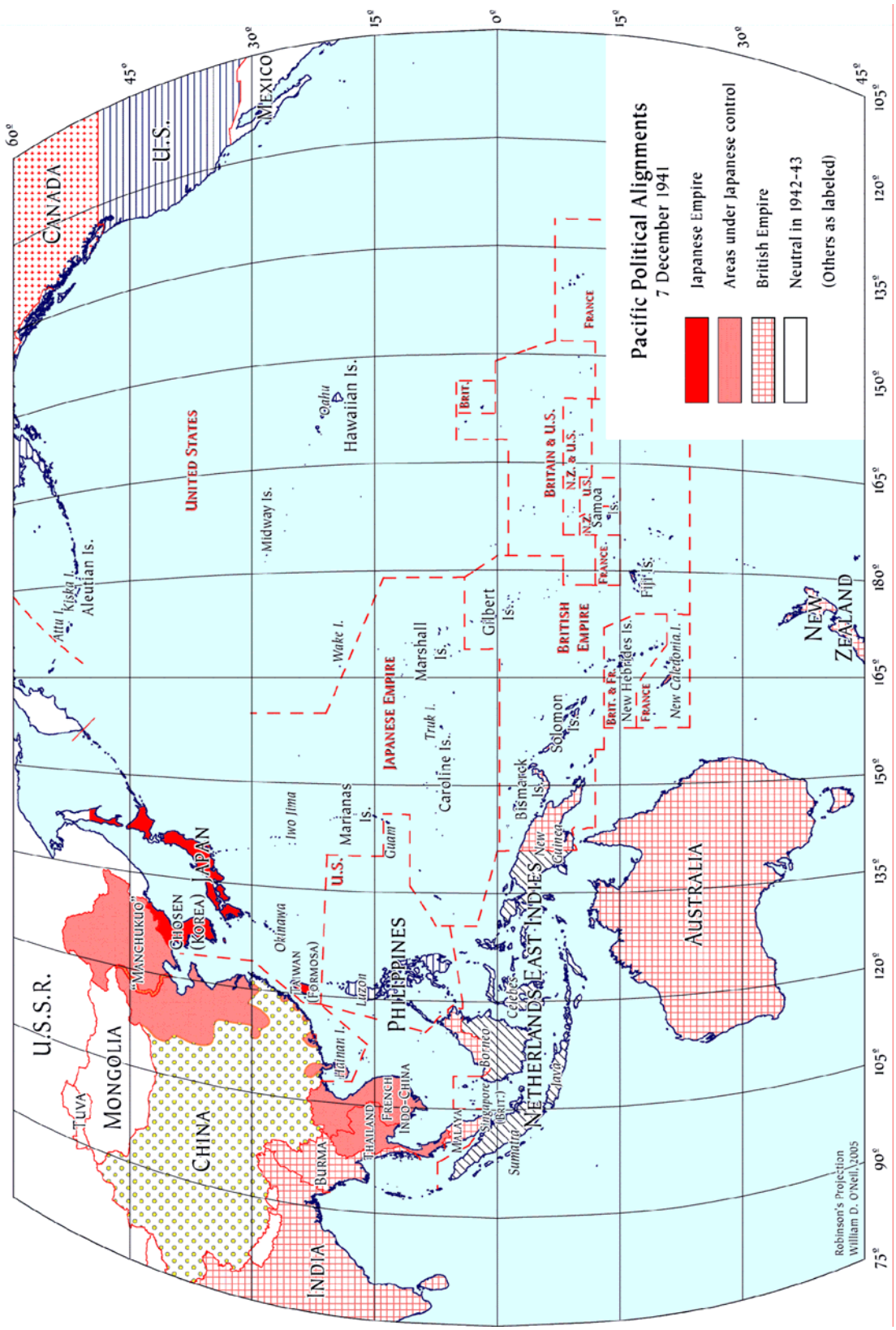

Figure 2. Pacific political alignments on the eve of war.

While the Japanese on land were outnumbered by the defenders they advanced down the Malay peninsula quite rapidly, outmaneuvering the defenders. Tactical execution by the defenders was inadequate, but their difficulties were greatly compounded by their lack of armor or adequate anti-tank capabilities in the face of an armor-heavy IJA force. Japanese armor was relatively light, but effective in these circumstances. Defenders had problems of morale, cohesion, force integration, and leadership. Once isolated, Singapore itself was in a very difficult position and defense quickly crumbled.

Pearl Harbor

Oahu was the site of the U.S. Army's strongest unit, the Hawaiian Division, later to be split into the 24th and 25th Infantry Divisions. The army commanders of the Hawaiian Department had done much to prepare the division to defend the island either against an invasion or against feared internal subversion carried out by members of the island's large and somewhat resentful Japanese immigrant population. (The members of this community were targets of considerable economic, political, and social discrimination, and those born in Japan were barred from gaining American citizenship.)

The Hawaiian Department had been provided with a number of early-model radars and the technical aid necessary to set up an air defense network modeled on British experience. Energetic officers had built the skeleton of an effective system and had demonstrated its effectiveness in exercises. Top-level efforts to integrate and activate this system had been very laggard, however, and it was not operational. No interceptor forces were routinely held on alert status. [13]

Although the base facilities in Oahu were inadequate, the U.S. main striking forces of the U.S. Fleet had been moved there in an effort to deter Japanese aggression in Southeast Asia. While the Fleet commander had cordial relations with the Hawaiian Department commander, there was little coordination or integration of defense efforts.

Both army and navy had limited forces of long-range aircraft that could be used for patrol. The air commanders did not work closely together but they agreed that they lacked the forces necessary to maintain a per-

fect 360 degree patrol to the depth that was desirable. They called upon Washington to provide fully adequate forces (which were not available) and in the meantime mounted no regular patrols at all.

Washington had some indications that it failed to provide to commanders either in Hawaii or Manila. But these were of a vague and nonspecific nature that would have done little to aid in defense planning. It was commonly expected that the Japanese would attack soon and the newspapers were full of stories to that effect, so only the location, nature, and exact timing of the attacks can truly be said to be surprises. Washington had virtually nothing to help with these issues. There were ample "indications" but no real "warnings." [14]

The Japanese had planned the attack thoroughly, dealt effectively with special weapons considerations, and trained the forces specifically for the mission. The tactical execution was all but flawless. American opposition was a matter of individual and unit-level improvisation and initiative, with no overall command or coordination, and the damage inflicted on the attackers was minimal. The U.S. was very fortunate that its carrier forces happened to be at sea, but command can take no credit for this happenstance.

There has been retrospective criticism of the Japanese commander for failing to follow up with attacks on maintenance and logistics facilities. (Later claims by a participant that he recommended such attacks at the time are very questionable.) Detailed examination of the options available suggests that there was little realistic possibility of mounting such attacks. [15] Moreover, in light of later experience with American carrier strikes, it is doubtful whether the weight of attack that could have been delivered could have inflicted sufficient damage to delay fleet reconstitution significantly.

An assault to take Oahu was even less a realistic option, no matter how much preparation had been laid. Japan simply did not have the lift for a force large enough to have any reasonable chance of prevailing against the relatively large and well-prepared island garrison.

However one may evaluate the strategic worth of the Pearl Harbor raid (which was intended to delay an American thrust into the Western Pacific) there can be no question that its operational planning and tacti-

cal execution were of a very high order. American defensive measures were very weak and reflect poorly on the commands involved.

There is a vast literature on this operation. Especially comprehensive accounts include [16] and [17]. Writing exposés of "newly-discovered" intelligence failures and/or cover-ups has become an ongoing industry. None of these so far has stood up well under critical scrutiny. [18] New perspectives about the attack continue to emerge from analyses of the existing knowledge, however. [19]

Philippines

The Japanese saw quite limited strategic value in the Philippines for themselves (and less even in economic terms) but were eager to deny the U.S. the use of the islands as a potential base for attacks on sea lines of communication between Japan and Southeast Asia. Thus early seizure of the islands became an element of Japan's war plan. The principal target was the northernmost and most developed island, Luzon, where the bulk of American and Philippine forces was located.

The strategic background and the course of the campaign are outlined in Appendix A: Philippines.

Operational lessons from the Philippines campaign

The strategic decisions about the Philippines – that of the U.S. regarding its overall defense and strength of garrison and that of Japan about whether and how to attack it – lie beyond the scope of this study. The same is true of the tactics of the two sides and of their tactical performance, except insofar as they bear on operational lessons.

American operations

The U.S. commanders had a reasonably good idea of the likely Japanese course of action on the ground (but not in the air), derived not from secret intelligence but from clearsighted pre-war analysis of the operational and tactical situation. This had been used to lay sound contingency plans for the retreat down the central plain from Lingayen to

Bataan, plans which contributed a great deal to the remarkably effective way in which this difficult and hazardous operation was executed.

Unfortunately, most of the remainder of the defense suffered from far less adequate planning or execution. The Army's Philippine Department had issued a new war plan, WPO-3,[5] on 1 April 1941. [20] As a result of aggressive Japanese moves in mid 1941, coupled with developments in Europe, the U.S. view of the importance of the Philippines changed drastically, however. General MacArthur was given command in the Far East, and the commander under whom WPO-3 had been cast was reassigned to duty in the United States. MacArthur changed the focus of ground defense in two important ways:

- MacArthur decided to place his faith exclusively on forward defense – the Japanese were to be kept off of Luzon entirely, regardless of what might be required. WPO-3 had also stressed forward defense but had also provided for preparing and stocking a citadel on the Bataan Peninsula in the event that the forward forces were unable to prevent establishment of a beachhead.
- MacArthur decided to call the reserves of the Philippine Army to federal service in division formations and to give these divisions a leading role in his plans. WPO-3 had envisioned calling up battalions and companies and brigading them with U.S. Army formations.

WPO-3 had made little provision for air defense. This was partly understandable if clearly undesirable inasmuch as the Philippine Department had no modern fighter forces and only token antiaircraft forces. After July 1941, however, MacArthur began to receive substantial air forces and antiaircraft assets.

Another significant change was the arrival of substantial forces of modern heavy bombers – indeed, the largest portion of such forces. These were intended primarily to deter the Japanese, but without adequate security against attack they served at least as well as a temptation. Yet the effort simply to accommodate the bombers drew attention away

[5] Not to be confused with the obsolete national level war plan generally referred to as War Plan Orange, which had by then been superseded by the Rainbow Plan.

from the effort to improve the air defense posture. (This was an error for which responsibility was shared between the Philippines command and Washington.) [21]

The net result was a disaster rivaling that which had taken place a few hours earlier in Oahu, for ultimate consequences if not immediate personnel casualties. While much historical attention has focused on the destruction of the bomber force, from which so much had been expected, the real tragedy was the destruction of the fighter forces and what warning and control services had yet been put in place. If the fighters could have been preserved longer as an effective force they would have presented a serious threat to the invaders and would have helped somewhat to neutralize the Japanese fighter forces that did so much to undermine the ground defense.

Yet it was the ground defense to which MacArthur and his staff had paid closest attention, leaving preparation of air defenses largely to his air and coast artillery commanders.[6] Both had other pressing responsibilities as well and neither appears to have put air defense first, or to have been prompted to do so by higher direction. Indeed, the air commander was absent from the Philippines most of the time on missions assigned by MacArthur. [22] Air defense thus suffered from command neglect, high and low. This reflected neither its real nor its reasonably foreseeable importance for Philippine defense generally.

One major mystery is MacArthur's apparent continuing faith in the capacity of the Filipino soldier to somehow transcend all of the severe deficiencies of the Philippine Army. It does not seem that anyone else shared this view, or at least not nearly so thoroughly. Absent this blind spot it would have been possible to choose better options for ground defense. It is certainly true that nothing could save the Philippines in the end, but the Japanese might very well have been made to pay a materially higher price if the defense plans had been laid on more realistic lines. Detailed exploration of this, however, lies beyond the scope of this study.

[6] The Coast Artillery Corps was at that time responsible for anti-aircraft forces.

Also seriously inadequate were U.S. Navy operations in support of Philippine defense. Naval action against the Japanese amphibious forces was markedly weak and ineffectual. This reflected lack of preparation for night surface operations, defective doctrine for submarine employment, and inadequate development of critical weapons – most notably of torpedoes.

Japanese operations

The Japanese emerged victorious in the Philippine campaign and the price they paid was not excessive, but it was from their standpoint the least satisfactory portion of their initial offensive, and it brought professional ruin to Lieutenant General Homma, the Japanese commander. Indeed it was almost the only element of the offensive which failed to exceed expectations.

This is all the more remarkable in that the critical initial phases went particularly well. The American air forces were eliminated more quickly and at lower cost than had been anticipated. The landings at Lingayen Gulf north of Manila and Lamon Bay to the southeast involved division of already lean forces, and were bedeviled by bad weather (as was common at that season of the year), but the defenders made no effective use of the opportunities thus presented and Japanese resourcefulness and determination at lower levels overcame all problems.

Following the remarkably successful U.S. retirement from the landing areas, the Japanese stumbled from lack of clarity about the real objective. When the U.S. forces wheeled into the Bataan Peninsula the Japanese charged on by to take the undefended capital city, thus giving the Americans a bit of much-needed breathing room. American defense planning had centered on the Bataan citadel for at least three decades and by 1941 this was an open secret. For the Japanese the prompt taking of Manila was purely a symbolic victory, and a hollow one.

The ease and speed with which this empty objective was achieved prompted the Japanese Army General Staff to strip Homma's force of a major portion of its combat power earlier than planned, without having first defeated the defenders. While the Japanese had genuine need of the troops elsewhere, this was nevertheless a miscalculation. If the defense had been better prepared – as for all the Japanese high command

knew it might have been – it could indeed have had catastrophic consequences. Even as it was, however, further miscalculations by the Japanese command on the scene combined with this weakening to subject their forces to a stinging defeat that was costly in terms of casualties if not in accomplishment of overall campaign objectives.

This came as a direct result of the decision to press on with an offensive against the U.S. forces on Bataan, using the inadequate forces that remained under Homma's command. Japanese doctrine placed a high value on aggressiveness and momentum, which of course is inherently sound in itself. But here the doctrine became dogma, applied uncritically in very unfavorable circumstances. The error was compounded by gravely inadequate intelligence preparation. The net result was a battle in which U.S. advantages and Japanese disadvantages both were maximized. Despite high levels of tactical performance at lower levels, the attackers were very severely mauled, even though most of the forces they faced were of very distinctly inferior quality in every respect. Again, if the U.S. forces had been better prepared to follow up their defensive victory with a counteroffensive the results could have been disastrous rather than merely costly.

The Japanese problems were compounded by another too-rigid application of doctrine. Japanese Army practice was to deploy forces with rations for 30 days, intending that they should live off the land thereafter. [23] This was clearly not realistic in the case of a campaign that was expected to last 50 days, as it implied that troops would have to be diverted from offensive operations to find food and forage.[7] Worse still, the 30-day rule was applied also to medical supplies. This was disastrous in a place such as Bataan, which was rife with malaria, dengue fever, and other severely debilitating tropical diseases. It was very fortunate for the Japanese that bad command decisions had left the Americans no better prepared with respect to supplies.

The remaining major Japanese decisions are not so open to criticism. It is true that they might have waited to starve the Americans out rather

[7] The Philippines was an agricultural nation but much of its production was of fiber and other non-food commercial crops; in peace it normally was a net importer of food. Thus there were no readily-accessible stocks of food, and certainly none of forage.

than launching the April attack on Bataan and the May assault on Corregidor, but the issues of time versus cost seem to have been consciously addressed and from a military standpoint it is difficult to find fault with the choices made. There were tactical choices in the Corregidor assault that arguably were unduly costly, but that lies outside the scope of this investigation.

Lessons unlearned

Neither side learned all that it might have from the Philippines campaign. American learning was of course handicapped by the circumstances of the defeat, which resulted in the loss of many records and of many important figures in the defense. But learning also was impeded by unwillingness of commanders at all levels (starting with MacArthur) to acknowledge error and by official hesitation to probe into sensitive matters.

The Japanese too did poorly at learning the lessons of the Philippines. It is always harder, of course, to learn lessons from victory in any event. The blame for what did go wrong was laid at the feet of Homma and once he had been sent off to premature retirement the problems were officially taken as having been adequately addressed.

But there was a great asymmetry between the errors of the two sides, and as a result the consequences of overlooking the lessons differed. For the most part, the failings of the Americans had been fatal but not, ultimately, serious. Those of the Japanese, on the other hand, had in many cases been non-fatal but very serious.

That is, the American errors had mostly been those of judgment, while the Japanese errors in many cases reflected defects in doctrine. To have addressed the American errors of judgment better might have helped to improve the future performance of those who had erred, but without great systemic implications. By passing over their doctrinal errors, the Japanese helped to ensure repetition.

The principal exception here was American naval performance in the Philippines, where doctrinal and systemic errors were prominent. Naval failure to recognize and correct these errors promptly when first revealed was costly, in just the same way that the corresponding Japanese failures were.

Other aspects of the initial campaigns

The meager American naval forces in the Western Pacific joined with equally meager Dutch and British Empire forces in an almost entirely fruitless attempt to impede the Japanese seizure of the Netherlands East Indies (NEI) (Indonesia). These forces suffered from largely-similar failings in doctrine, general preparation, and tactical execution, and also of course from lack of doctrine for combined multi-national operations. The naval defenders were defeated with no delay and little material loss to the Japanese.

While efforts were made to reinforce the defenses of the NEI with a few American and Australian forces they remained entirely inadequate to meet the Japanese attack. As before, the IJA moved swiftly, striking hard blows before the Allies had time to re-form their defenses. Thus the islands fell one by one, in quick succession.

The Japanese had also struck eastward into the Central Pacific. The U.S. territory of Guam was defended by purely nominal forces and fell to a much larger Japanese force within a few hours. Much the same story was repeated in the British Imperial possessions and trusteeships in the Bismarck, Solomon, and Gilbert Islands.

Wake

A small but not altogether insignificant exception to this pattern occurred in the case of Wake, a small U.S. owned atoll defended by a contingent of U.S. Marines. (Except as noted, this account is based on [24] and [25].)

Wake is isolated, lying hundreds of miles from the next islands. It was much closer to the Japanese island bases in the Marshall and Caroline Islands than to the U.S. bases of Oahu and Midway. Nevertheless its remoteness and clear lines of communication to the east made it possible to conceive of defending it successfully. Because of its position it was well suited to serve the U.S. as a base for bombers and reconnaissance

aircraft. In such a role it would have presented a significant threat to the Japanese and useful opportunities for the U.S.[8]

By December 1941, Wake was defended by a 422-man detachment of the 1st Marine Defense Battalion, together with a portion of Marine Fighting Squadron 211 (VMF 211) and a few small support units. All told, the three islands of the atoll had 523 military personnel plus 1,146 civilian contract construction workers. Nearly 400 of the civilians volunteered to support the defense. [26]

The defense battalion was fundamentally a seacoast artillery unit, with an anti-aircraft component. Armament included six 5"/51 breech-loading naval guns on pedestal mounts, twelve 3" Army-model M3 anti-aircraft guns, a number of .50 cal anti-aircraft guns, and many .30 cal machine guns. There was no radar and provision of fire control systems was inadequate. All of the 449 ground and air marines were trained and equipped to fight as infantry if necessary, and many of the more senior officers and NCOs had extensive past experience with infantry units in limited wars.

The key problem of defense was simply shortage of manpower. The three islands cover a total of 1,750 acres of land surface and a seacoast frontage of more than 16,000 yards.[9] It was out of the question for so small a force to defend so large an area against an assault in strength. In fact there were not even enough troops to fully man the available weapons, let alone provide infantry to fight off landing forces.

For the Japanese, conquest of Wake was a Navy responsibility, assigned to the local area commander headquartered at Truk. A series of bombing attacks was first launched to beat down the defenses, with unescorted bombers flying from Roi in the Marshalls, 600 nmi south of Wake. Lacking radar warning, interception of these was a matter of hit or miss, although both fighters and anti-aircraft took a considerable toll

[8] It was not suitable, however, for use as a fleet base due to its lack of any potential harbor or good roadstead.

[9] Author's measurements from large-scale nautical charts. Frontage on the lagoon side not included, as assault forces could not gain entry to the lagoon. Other sources quote a surface area of 2,600 acres, but this appears inconsistent with the charts.

overall. Cumulatively, the bombing did serious damage, particularly to Wake's ill-protected aviation facilities.

Concluding that three days of air attacks provided sufficient preparation, an assault was planned for 11 December. Even though the defenders were estimated to number 1,000 men (more than twice the actual figure) only 450 Special Naval Landing Force (SNLF) troops were allotted, although crews from the accompanying destroyers were told off to reinforce the assault force if need be. The amphibious task force consisted of one light cruiser, two old light cruisers for fire support, six destroyers, two destroyer-transports, two transports, and two submarines. Approaching Wake at 0300 on 11 December, it was spotted visually and the defenders prepared. When well in range the task force was taken under fire by the 5"/51 batteries, which began hitting almost at once. The result was a rare modern illustration of the Nelsonian adage that "a ship's a fool to fight a fort," ending in the destruction of a destroyer and loss of all her crew as well as more or less significant damage to several other ships.

In the meantime, the landing preparations were running into problems of their own. The Japanese employed standard cargo ships as amphibious transports, with no assault features such as were found in U.S. assault ships (AKA and APA). In particular, landing craft were carried as deck cargo and had to be swung out with ordinary cargo gear. This was a slow operation at best, and distinctly hazardous in any sort of seaway. Ordinarily it was to be carried out in sheltered waters near the objective area, but there was no shelter within 600 nmi of Wake. Swells off Wake were heavy – as they ordinarily are at that season – and several landing craft were caught by waves and overturned in lowering away before the operation was terminated.

As the Japanese force retired it was attacked by Marine fighters, which sank another destroyer with light bombs and damaged a transport. All in all it was a good lesson in the dangers of mounting an amphibious assault without thorough preparation and local dominance. The Japanese force had lost two destroyers, several landing craft, and several hundred men with nothing to show for it.

While they gathered stronger forces for a second assault, the Japanese continued their attacks on Wake, both with land-based bombers and

with planes from two carriers detached for the purpose. Gradually these eroded the defenses, eventually knocking out the last of Wake's fighter force.

The U.S. Navy in the meantime was making efforts to dispatch a ship laden with reinforcements, to be covered by a carrier task force which would also launch added fighters for Wake. With significant portions of the Japanese carrier force unlocated, there was understandable nervousness immediately in the wake of Pearl Harbor about hazarding a carrier. Nevertheless, the decision was to take the risk.

The relieving force sortieed from Pearl Harbor in the evening of 15 December, with the covering force following the next day before noon. If the forces could have maintained a speed of advance of 14 kt – the highest feasible for such a transit for these ships – it would have taken them 143 hours, or 6 days, to transit the 2,000 nmi to Wake, arriving in the afternoon of 22 December, east longitude date. This was not a feasible unrefueled radius for such a force, however. Refueling en route was essential, particularly for the destroyers and particularly as combat would have required that the destroyers steam at high speed.

The only oiler available was U.S.S. *Neches* (AO 5), an old ship capable of no more than 12 kt. With allowance for zig-zagging her best speed made good would be little more than 10 kt. The force fueled from the oiler on 22 December, about 500 nmi from Wake. Fueling underway was a relatively new evolution at that point and it did not go very smoothly, taking most of the day. Thus on the morning of 23 December the relieving force was still more than 400 nmi from Wake.

At that point the Japanese were assaulting Wake, with cover provided by two carriers. They had come in much greater force and this time they were able to approach the atoll very closely in the dark before being detected. The Marines exacted a considerable toll, but once the invaders had secured a lodgment there was no possibility that the meager defense forces could eject them. After several hours of fighting the island commander surrendered, concerned that further resistance would gain nothing but wholesale slaughter of the civilians as well as the troops.

Learning of the fall of the islands, the Pacific Fleet commander ordered the relieving and covering forces to retire.

Inevitably, there has been some recrimination over the failure to reinforce the Wake defenders. It is difficult to see how things could have been different, however. Even had the relieving force arrived a day before the assault force, rather than vice-versa, it is doubtful that the reinforcements would have made enough immediate difference to affect the outcome.

Ultimately, it seems, there were only two possibilities for changing the final outcome. Most desirable would have been a more adequate defense force on Wake to begin with. The defense forces in fact had been built up rapidly – from nothing in June – but not rapidly enough. The lack of radar and of manpower were crucial. A force of 2,000 or more marines, with armor, substantial fighter forces, and above all radar, would have been necessary to ensure that the defenses could not have been worn down. This of course would have implied substantial ongoing resupply operations, whose cost would have needed to be assessed against the value of the atoll.

The other would have been dispatch of the Pacific Fleet's three carriers to cover Wake. Since the Japanese had only two carriers, with little more than half of the air strength the three American carriers could have mounted, this might have led to inflicting a very sharp and highly valuable reverse, destroying the two carriers and much of the invasion force. However, at this point intelligence of Japanese fleet movements and dispositions was very sketchy, making such a move highly risky. And if it had proven necessary for the American force to loiter in the area for any period of time it would have run a serious risk from Japanese submarines. All in all it is not too surprising that such an option seems to have been given no serious consideration.

The initial attacks on Wake and the Bataan citadel were the only two notable setbacks encountered by the Japanese in their great initial expansion. In neither case did the consequences extend much beyond the immediate losses in personnel and matériel – there were virtually no strategic costs associated with either defeat. Yet they were significant as signposts of a systemic problem that we will encounter time and again in this survey, eventually with far more serious consequences for Japan. In attempting to maximize utilization of their slim resources the Japanese employed them in ways that invited defeat in detail. It was an

invitation that the Americans would soon learn to respond to with vigor.

The carrier campaigns up through June 1942

The first six months of the Pacific War brought two of the most dramatic episodes in the history of war, to be compared with the campaigns of Alexander of Macedon. The first was the initial Japanese offensive, sweeping through Malaya, Singapore, and the Philippines, to the NEI, Eastern New Guinea, the Gilberts, and the Solomons, as well as Burma.

Over much the same period naval task forces built around aircraft carriers roved the Pacific and Indian Oceans, delivering devastating air strikes at widely separated points. The culminating event was the Coral-Sea/Midway campaign, involving two of history's most momentous naval battles, which changed the direction of the war decisively.

For the Pearl Harbor attack the IJN had formed the *Kido Butai,* the First Carrier Fleet, comprising six of the navy's largest aircraft carriers and escorting surface ships. These ships then swung south to support the Japanese advance with heavy strikes, followed by a sortie into the Indian Ocean in April to attack the British Fleet and its bases and clear the flank of the Japanese forces advancing into Burma. Throughout this the IJN carrier force suffered only light aircraft losses while inflicting heavy damage on the Allies. In large measure this reflected its generally good aircraft flown by experienced and superbly trained and motivated aircrews according to a sound doctrine.

Although smaller in numbers relative to the enemy's carrier forces and handicapped by some distinct inferiorities in air group aircraft, weapons, and doctrine, the U.S. Navy's carriers were employed actively in raids on Japanese islands from the first. The damage they inflicted was of little direct consequence but the raids served both to gain experience and to unsettle the Japanese.

All of these operations were made possible by refueling the ships while underway. There had long been experiments in doing this (at least in the USN) but its operational use was new and techniques were not fully developed. Limited quantities of general stores also could be trans-

ferred underway, but techniques for large-scale transfer of stores and ordnance would not be developed until late in the war. [27] In order to take on ordnance it was necessary to lay the ship alongside the ammunition ship while at anchor or moored in sheltered waters. Thus carrier forces could operate at quite long distances from base if provided with sufficient oilers, but were limited in the ordnance they could deliver.

The President desired at least a symbolic strike against Japan and the Army and Navy cooperated in devising a novel scheme, involving flying medium-range land-based bombers from the deck of an aircraft carrier. This difficult and hazardous operation was carried into effect on 18 April 1942 with the launch of 16 B-25B twin-engined medium bombers from the deck of U.S.S. *Hornet* (CV 8) from a position about 600 miles to the east of Tokyo. The raids on Tokyo and Nagoya did no significant damage but they greatly upset and embarrassed the Japanese Navy, which had so signally failed to protect the homeland. This provided motivation for an attempt to take Midway Island, preparatory to a hoped-for seizure of Oahu, thus foreclosing any U.S. options for further offensive action in the Western Pacific. [28]

The Coral-Sea/Midway campaign

In the meantime, however, the IJN had embarked on an effort to support an Army landing at Port Moresby, a place on the southern coast of Eastern New Guinea, close to Australia's northern coast. The planned support was originally to have been light, but in the meantime the USN had conducted a raid with two carriers in the area. Thus it was decided to dispatch two of *Kido Butai*'s carriers to provide cover.

USN cryptanalysts had been working literally night and day in an effort to recover the plaintext of IJN coded messages. The IJN employed a two-part superenciphered code which in principle was potentially quite secure. Their cryptological security practices were weak, however, and this had permitted a partial penetration of the code and its additives. While the bulk of the code groups could not be broken, enough had been achieved by April to give some very valuable clues. When combined with other sources of intelligence, this enabled the staff of the Commander-in-Chief of the Pacific Fleet (CINCPACFLT) in Hawaii to gain a reasonably accurate idea of the IJN's overall intentions. With

Washington encouragement, CINCPACFLT dispatched two carriers to meet the Japanese force.

The Japanese force was brought to action in the Battle of the Coral Sea, fought 7-8 May south of the Solomon Islands. Tactically, the results seemed slightly unfavorable to the U.S., which lost a large carrier while sinking only a very small Japanese light carrier. But strategically it was a double victory:

- The invasion of Port Moresby was prevented, thus relieving the threat to Australia and greatly aiding the forthcoming counterattack against the Japanese in New Guinea.
- Although neither large Japanese carrier was sunk, neither was left in shape to participate in the operation against Midway, thus cutting Japanese strength there by more than one-third. While the surviving U.S. carrier was damaged, Herculean efforts successfully made it ready to take its place at Midway.

Again, his intelligence staff were able to provide CINCPACFLT with the information needed to make a correct assessment of Japanese intentions to attack Midway. Although he knew his forces would be outnumbered, he dispatched his three operational carriers to engage the Japanese fleet.[10] In part his calculation was based on the existence of the Midway base itself. The motley collection of air units he was able to gather for Midway ultimately accomplished little in a tactical sense, but Midway and its air forces provided a distraction that proved fateful, for while the main Japanese carrier force was concentrating on attempts to knock Midway out it was discovered and attacked by carrier-based dive bombers. Within a few minutes three of the four IJN large carriers were consumed in uncontrollable conflagrations. The Japanese succeeded in launching a counter-strike which, in conjunction with a later submarine attack, eventually led to the loss of one USN carrier. But the fourth Japanese carrier was shortly caught by more dive bombers and sunk as well. The Japanese fleet perforce called off any plans to invade Midway and retired to the west.

There are myths about the Midway action which need to be addressed. It is a battle which lends itself to dramatic presentation and this has

[10] One carrier was under repair following damage from a submarine attack.

prompted a number of books of varying worth. Some books – including one particularly influential account by a prominent Japanese participant – have exaggerated the uncertainties in the battle for heightened dramatic effect. [29] That there was an element of chance in the victory is clear enough, but sober research and analysis makes it clear that the element is smaller than it is frequently made out to be. [30][31] The natural corollary is that the Japanese operational planning for the operation was even more deeply flawed than is usually allowed.

An important related myth is that if the battle at sea had gone the other way then the Japanese assault force could readily have taken the atoll's two islands. Careful examination (beyond the scope of this report to present) shows that the invasion plans were poorly laid and would most likely have resulted in blood-drenched failure.

This is to say that the defeat of the Japanese in this great battle, while not foreordained, was essentially what their operational planning had merited. Lack of thorough preparation for a complex operation, "best-case" intelligence estimates and planning, and thin operational margins left far too little margin for contingencies.

Inasmuch as the U.S. was building carriers and carrier-based air forces at a substantially faster rate than Japan could, their defeats in the Coral-Sea/Midway campaign extinguished any further hope for offensive operations by the IJN.

Switching roles

In the initial phases of Japan's war against the West it found its low opinion of Western forces generally justified by experience. Allied troops and commanders alike proved very inadequately prepared to withstand the IJA's skillful, fast-moving attacks, even in those cases where the Japanese enjoyed little or no advantage in numbers. At sea the story was not much different, with the IJN proving to hold a distinct advantage in tactical doctrine and execution, particularly in the air. The only significant departures from plan came in the Philippines and at the tiny atoll of Wake in mid-Pacific, where resistance was stronger than anticipated. In both cases, however, renewed attacks with rein-

forcements brought victory without excessive loss of forces or disruption to overall schedules.

The Japanese high command was well aware at the outset that it lacked the resources to inflict a decisive strategic defeat upon the Allies in general and the United States in particular. Its plan essentially was to secure a defensible perimeter and allow the Allies, if they chose, to wear themselves out assaulting it, in the expectation that sooner or later a negotiated settlement would be reached on terms favorable to Japan. They foresaw formidable logistical challenges for the U.S. in attacking the expanded Empire, and the lackluster performance of Allied forces in the early phases of the war further heightened expectations that there would be a significant interval before a counterattack, if any, could be mounted.

These perceptions were less affected than might be imagined by the losses and reverses in the Coral-Sea/Midway naval campaign of May-June 1942, which were largely attributed to the fortunes of war rather than any particular strength on the part of the Americans. The Japanese accurately perceived that their carrier air groups were in some respects tactically superior to those of the U.S., and substantially superior to U.S. shore-based air forces. Of course they were unaware of the American achievements in cryptology which contributed heavily to the success of U.S. arms, but in any event the Japanese Navy's main codes were (routinely if belatedly) changed following Midway.

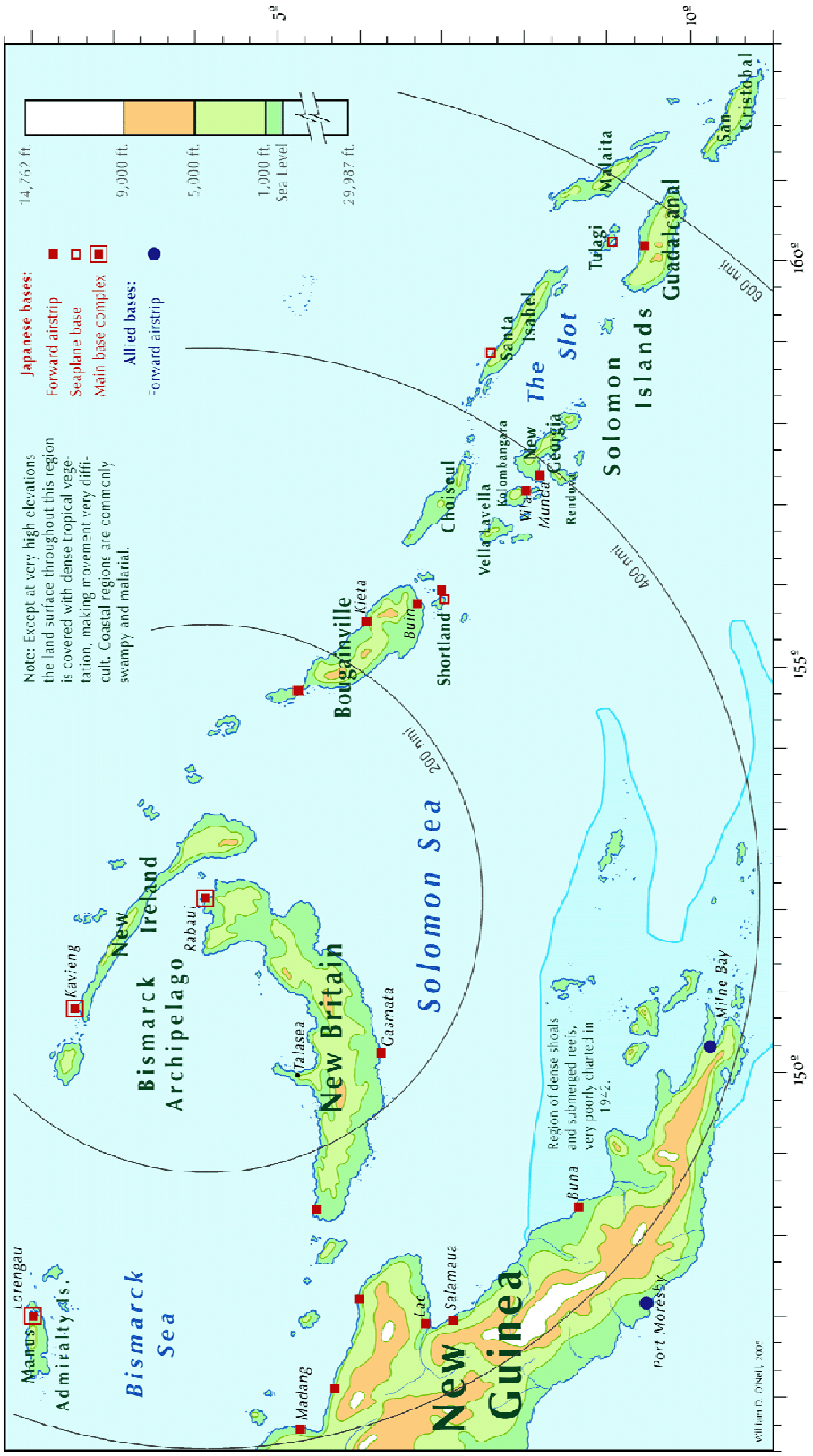

Figure 3. New Guinea and Solomons theater of operations, Aug 1942.

The defensive perimeter: Fenceposts without rails

While in principle the Japanese subscribed to the necessity of establishing a perimeter which could resist American attack, in practice relatively little progress was made. Prior to the initial phase of the war, very careful and intensive preparations had been made, preparations which served Japanese arms very well indeed. No such efforts were lavished on preparing for the next phase, however.

In essence, the Japanese defensive plans called for a network of strongpoints backed by mobile reserve forces. The islands of the Central and South Pacific would be fortified and garrisoned as strongpoints. As U.S. forces approached a sector in this network long-ranged land-based air forces would be quickly deployed to the sector and to nearby bases while IJN ships steamed to further reinforce the defense.

Thus stated, this can be seen to be a straightforward analogy to a classical land-warfare scheme for defending territory, an analogy which clearly suggests the key elements necessary for success. In particular, the strongpoints should present overlapping fields of fire so that an attacker can neither pick them off one by one nor slip through gaps to attack the rear, leaving the forward strongpoints cut off – two classic modes of attack against strongpoint defensive schemes. In some areas the islands simply were not dense enough or suitably located to support a strong defense network. In these cases it was critical that the IJN retain strong mobile sea striking forces. Midway serves as an example of how even a very isolated bastion can interact fruitfully with mobile striking forces – the Japanese were caught in a fork. Midway had evened out the odds in carrier forces, but also showed that numerical superiority was not essential to defense success.

But a carrier is not a weapon system – it is simply the box that the real weapon system, the carrier air group[11], comes in. It can be no more effective than its air group. In the years prior to World War II the IJN made strenuous efforts to develop the best possible air groups. Along with the IJA it fostered the development of a domestic aircraft industry, which it successfully pressed to develop and produce aircraft of gener-

[11] *Carrier air group* (CAG) was then the current terminology for what today is denominated a *carrier air wing* (CVW).

ally excellent performance by contemporary standards, notwithstanding significant technical and industrial limitations of the industry. It trained its pilots to extremely exacting standards and carefully developed doctrine for maximal effectiveness. While the USN's aviation force was quite professional, it failed to match the Japanese in many aspects of quality at the start of the war. Most of the IJN's highly-proficient aircrews had survived Midway, and their aircraft were quickly replaced, so the force remained formidable despite the loss of carriers

Limited offensive – Target: Rabaul

After Midway the United States still lacked forces strong enough for a thrust against the principal centers of Japanese power but concluded that a near-term limited offensive was needed. Japanese efforts to expand into the southern parts of New Guinea and down the Solomon Island chain had been impeded by the results of the Coral Sea battle but had resumed in the meantime. Thus it was this area that became the focus of the Allied limited offensive, carried out by American, Australian, and New Zealand forces together with locally-recruited auxiliaries, all under U.S. strategic direction.[12] (For a summary of Australia's contributions see [32]; for New Zealand's see [33].)

Figure 3 is a map of the theater, showing Japanese and Allied bases at the outset.[13] It was recognized that seizure or neutralization of the main Japanese base at Rabaul would undermine the enemy's whole position in the region, but the Allies lacked the military resources in the region to be able to attack Rabaul directly with much chance of success. Aus-

[12] Although the Australian contribution to the Pacific War is somewhat recognized, that of New Zealand is often neglected entirely. By late 1942 approximately 30% of the nation's small workforce was under arms (at a time when demands for its food production were very high) but New Zealand's armed forces were heavily committed in Europe. New Zealand land, sea and air forces played significant roles in the Solomons campaign but their size was limited by the country's small population and participation in the European War. Australian forces initially dominated in New Guinea and remained a major factor right to the end of the Pacific War. A variety of special units recruited from local native populations filled highly critical combat and support needs.

[13] Some of the Japanese bases shown here were not in commission until later in 1942 or early 1943, and the base on Guadalcanal was not completed until after its capture by U.S. forces.

tralia could not supply most kinds of military needs; most things had to come from American West Coast ports, more than 5,000 nmi away, or through the Panama Canal from the East Coast, a journey of more than 9,000 nmi. The difficulties of these long routes were compounded by a severe shortage of shipping, which was desperately needed for many other high-priority uses as well.

The Japanese also had shipping and resources limitations. Although Rabaul is only about 2,600 nmi from Japan there was a shortage of shipping, and Japan had much more limited ultimate military resources.

As indicated in Figure 3, the natural obstacles to military operations in this region were formidable. The islands are the tops of geologically young submerged mountains and except for the narrow coastal plains are extremely rugged. Much of the coastal regions are swampy and malarial. Dense tropical vegetation impedes movement. Roads were few and poor, and many areas were accessible, if at all, only on foot (or even hands and knees). Topographic maps and nautical charts were very limited in coverage and accuracy. The entire region is rife with tropical diseases and parasites. Military equipment typically deteriorates quickly under the stresses of the climate and attack by insects and microorganisms. Frequently, the environment seemed a more formidable opponent than the enemy; there is no doubt that it caused the greater portion of casualties on both sides. [34] The side that could better cope with the natural environment thereby gained a very telling advantage.

During May, the Japanese had moved into Tulagi Island, near the end of the Solomon chain, and set up a seaplane base. Shortly, they crossed the narrow strait to nearby Guadalcanal and began work on an airstrip. As may be seen in Figure 3, this was the last of a series of airstrips down the ladder of the Solomons. Consolidation of the Japanese position there would put them in a strong position to threaten the lines of communication between the United States and Australia.

In mid-1942, the Japanese landed at Buna, on the northeastern coast of New Guinea, and began to push overland to attack the Allied base at Port Morseby, on the other side of the island. It has been argued that the Southwest Pacific Command could and should have forestalled this, but it was deterred by its limited intelligence of enemy intentions and a

great shortage of resources that impelled it to caution. [35] The profile of the narrow trail between the two places, Figure 4, gives some idea of the difficulties involved – difficulties which contributed to SWPAC's skepticism about a Japanese thrust – but this was the only route open to the attackers after the failure of the attempted amphibious operation in May. If they took Port Moresby, virtually the last Allied foothold in New Guinea, they would be in a good position to threaten the northeastern portion of Australia.

Guadalcanal, tenuous and tenacious

With the approval of its allies, the U.S. decided to counterattack at both of these places, with the intention of developing convergent offensive axes leading to Rabaul. While the Australians, with American support, strengthened their position in Port Moresby and built up a base at Milne Bay, at the southeastern tip of New Guinea, U.S. Marines were landed at Tulagi and Guadalcanal. (Since the Allies lacked the means to rapidly shift substantial forces between Guadalcanal and Eastern New Guinea, this convergent attack represented a rational employment of the forces that were available.) Both efforts provoked prompt counter-attacks, but in neither case were these successful. An important reason for the failure of the counterattacks was that the simultaneous moves by the Allied forces had put the Japanese in a fork, forcing a division of their efforts.

Determined to dislodge the Americans from Guadalcanal, the Japanese attacked repeatedly. The strong Japanese column advancing on Port Moresby was halted abruptly late in September and ordered to return to Buna so as to be available for further attempts. But the attackers were greatly hampered because the U.S. forces on Guadalcanal had put the captured airstrip in operation in a few days. Although it was provided only with a motley assortment of fighter and attack aircraft that was all that the Americans could scrape together, this airfield posed a major problem for the enemy.

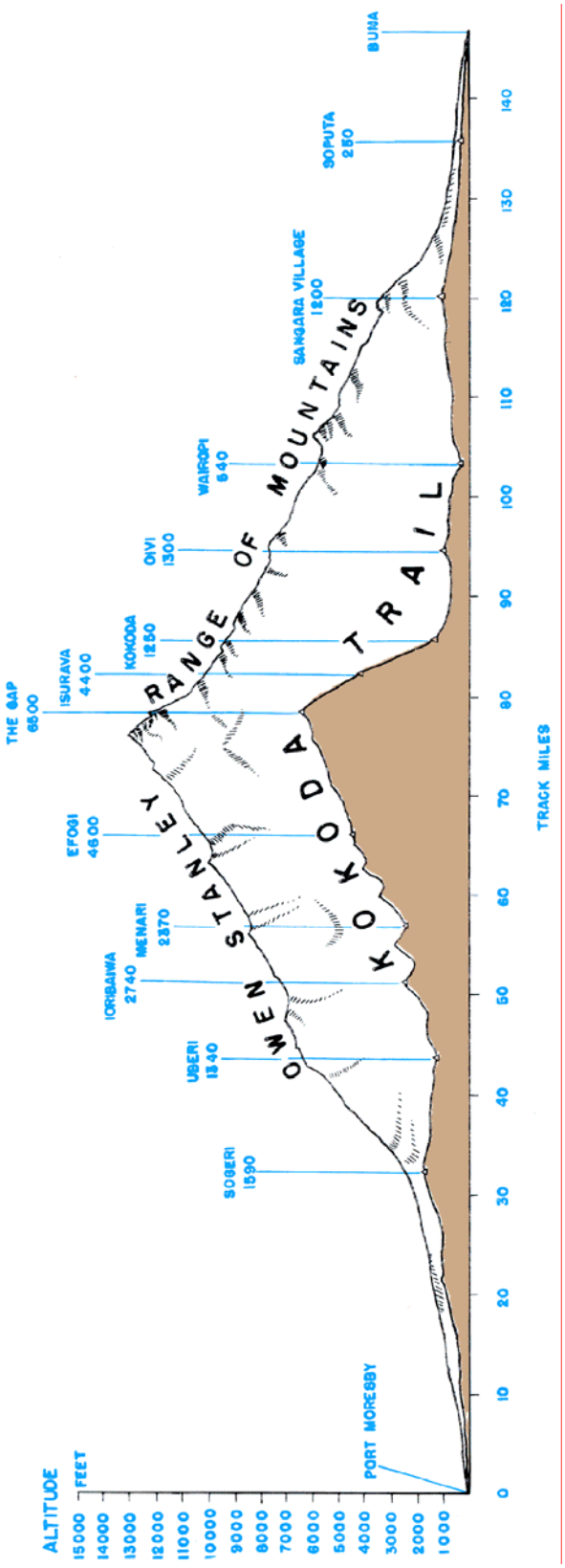

Figure 4. Profile of Owen Stanley Mountains projected into plane of Kokoda Trail.

While airstrips had been carved out on Bougainville and various of the Solomon Islands, they had no facilities to support operations in force. The nearest real base was at Rabaul, which was roughly as far from Guadalcanal as Chicago is from Washington, D.C. – nearly 600 nmi. Unique among fighters of its time, the Zero could operate at this radius, but from Rabaul to Guadalcanal was then a flight of four hours. In terms of today's much faster aircraft the nearest equivalent in time taken and toll on flight crews would be daily raids mounted on Hawaii from San Francisco. Intelligence generally gave Guadalcanal warning of approaching raids and they were picked up and tracked by radar on the island, allowing interception in strength. American planes suffering combat damage could often make it back to base, and their pilots had good chances of survival, but damaged Japanese bombers and fighters faced long flights to reach safety. Ordinary mechanical problems also put the Japanese at risk, and they organized no service to rescue downed pilots, as the Americans did. The successful Japanese pilot reached his home base after more than eight hours in the air, but he and his plane would be called upon to fly again the following day. Men and matériel were quickly worn down even if not lost, and the Japanese rule amounted to "fly until you die" – there was no rotation or reconstitution. Instead of massing their forces for a major effort the Japanese command, taken very much by surprise not only by the assault on Guadalcanal but by the tenacity of the American defense, fed reinforcements in piecemeal.

The Japanese command felt driven to these desperate measures by the situation they found themselves in. To allow the Allies to consolidate their hold on Guadalcanal would put their whole position in the area at risk ultimately. But to put an adequate and well supported force on the ground to re-take the island required a naval force, and no naval force could hope to succeed if the U.S. controlled the air. So they fell into a cycle of daylight air attacks and nighttime runs by fast naval forces down The Slot (New Georgia Sound) to deliver a trickle of troops and supplies and to harass the defenders. The American position was tenuous and the American naval forces in particular were ill-prepared to fight the IJN at night, both by doctrine and training, but the Japanese never were able to gain superiority overall. [36]

In effect, Guadalcanal had become an open wound through which the lifeblood of the Japanese Navy and especially its air arm spurted. The

climax was reached in November 1942 when the Japanese made an all-out attempt to knock out the airfield and land a strong force, and the Americans responded with a convulsive effort which succeeded in throwing back the attack, despite heavy losses. The Japanese command finally accepted that to drive the Americans from the island lay beyond their strength. Their one bright spot was their success in covertly extracting their remaining forces. By February 1943 the island was secure.

While Japanese had given up on holding the island they remained determined to deny its use as a base to the Americans. This led to sporadic renewals of the air offensive. Exuberant reports from inexperienced attacking aircrews combined with lack of cross-checking intelligence fed optimism which led commanders to commit additional forces despite costly losses. In fact, however, little of significance was accomplished.

In retrospect, Guadalcanal was the high-water mark of the Japanese expansion, and its loss sped Japan down toward defeat. Not only was Guadalcanal's strategic position very valuable to the Allies but Japan's losses of naval forces, shipping, and aircraft were of very serious proportions, while its troop losses also were significant. Above all, Guadalcanal was the altar on which the Americans cut the heart from the Japanese naval air arm, for in a period of nine months it lost a large proportion of its highly trained and skilled aircrews.

The problem of the aircraft carriers

Much discussion of Guadalcanal and New Guinea, both then and ever since, has centered on the U.S. Navy and its role. Unfortunately, it is often couched in terms of personalities, which serves to obscure the real issues.

By mid 1942 there could be no rational doubt about the importance of air forces. While air forces had proven somewhat less flexible and mutable than earlier envisioned, it was clear that with equipment and training suited to their particular missions, air forces could dominate at sea and exert considerable pressure against ground forces. Thus it was important to maintain effective control of the air so as to close opportunities to the enemy and open them for one's own air forces.

In 1942-43, however, the effective radius of aircraft striking forces was short, and that of interceptors shorter yet. Large (by the standards of the day) high-flying horizontal bombers such as the U.S. B-17 *Flying Fortress* and B-24 *Liberator* or the somewhat smaller Japanese BETTY could reach targets 600 nmi and more away, but were not very effective in attacking anything other than large fixed targets such as airfields or industrial facilities.[14] Aircraft such as the U.S. B-25 *Mitchell* and TBF *Avenger,* as well as the Australian *Beaufighter,* could deliver close-in, accurate attacks against tactical targets at sea and ashore out to practical effective radii of 300 nmi or so.[15] Fighters such as the U.S. P-39 *Airacobra* also were widely used to attack tactical targets on the ground and at sea but were even more restricted in practical radius.

The Japanese *Zero* was widely employed in ground attack and of course had longer range than the early Allied types. But whether this really meant longer *effective* radius is another issue. In this period, military aircraft were generally unreliable, temperamental, and operationally limited by the standards we are accustomed to today. When operating in the arduous and primitive conditions prevailing in this region, they could attain only limited rates of availability and operation. Statistics are available for operations of the U.S. Army Air Forces (USAAF) commands responsible for operations in and from the New Guinea theater, Fifth Air Force, and the Solomons theater, Thirteenth Air Force. Examination of these shows clearly that in 1942-43 [37][38]

- Generally no more than 75% of assigned aircraft were able to participate in combat operations at any particular time, with the remainder down for more or less extended maintenance action.
- For aircraft which were combat operational, monthly utilization rates rarely exceeded 120 hours per aircraft per month, and more often were nearer half that rate.

[14] Japanese aircraft used a complex designation scheme. Here I use the codewords assigned to them by the Allies.

[15] The Japanese BETTY and the earlier NELL were unusual among heavier aircraft in being able to deliver torpedo attacks against ships as well as horizontal bombing attacks, and could do so at much longer ranges than any Allied torpedo bomber. In practice, however, these capabilities proved of limited value due to the great vulnerability of these aircraft if opposed by fighters.

None of what is known about the other U.S., Allied, or Japanese land-based air forces operating in the region suggests that they were able to improve upon these figures.[16]

Thus under these conditions aircraft of 1942-43 could fly approximately one four-hour sortie per day or one eight-hour sortie every other day when in operational status. Attempts to exceed this would lead to an accumulating maintenance deficit which would ultimately result in fewer and fewer aircraft in operational status. While fighters of this period could reach speeds of approximately 300 kt and large bombers could reach 200 kt, the speeds for best cruise range were generally of the order of 150 kt and 135 kt, respectively. Somewhat higher cruising speeds could be used when shorter cruising range was acceptable. (For instance, see [39], [40], and [41].) Thus, allowing for combat, a four-hour sortie implies a radius of approximately 300 nmi, while an eight-hour sortie implies a radius of approximately 600 nmi. These considerations applied equally to aircraft such as the *Zero* whose maximum range was large.[17]

In order to mount heavy, sustained strikes at a rate of two or more per day, it was necessary not only to have a strong force of aircraft but also to be less than 300 nmi from the target. Under the conditions obtaining in the Pacific the only feasible way to accomplish this in most cases was to employ aircraft carriers, floating airbases which could rapidly close the intended target. But for carriers to operate for more than a day or so in a given area tended to be highly hazardous, as the enemy was sure to dispatch submarines in an effort to torpedo them. Indeed, a number of carriers were lost for just this reason. Thus carriers needed to move in, deliver their strikes, and get out.

Some ground force commanders had difficulty in seeing how risk to a carrier differed in principle from risk to other force components. But because the U.S. Navy had only two fleet carriers remaining (with one out of commission for repairs for an extended period), and because to be completely lacking in carrier forces would give the Japanese tre-

[16] Indeed, these figures remained generally representative of what could reasonably be expected of combat aircraft into the 1980s.

[17] They suggest one reason why American military authorities, who laid stress on sustained weight of attack, had not specified longer ranges.

mendous freedom of action, it was essential not to risk them unduly. This was all the more true because it took much longer to build a carrier than to replace most other kinds of matériel, and the first of the newer carriers could not reach the Pacific before the middle of 1943 at earliest. Loss of even one of the remaining carriers would have greatly undermined the whole Allied position in the theater.

New Guinea

The Japanese thrust against Port Moresby was halted abruptly in mid September, only 30 miles short of its objective, so that the troops could be used in an effort to re-take Guadalcanal. In the meantime, a Japanese amphibious assault against the Australians and Americans at Milne Bay had been thrown back, the first such defeat the Japanese had suffered.

Southwest Pacific Command's Fifth Air Force, which supported operations in New Guinea, flew bombing missions against Rabaul from mid 1942. These had the advantage, as can be seen from Figure 3, that the bases through which they staged, in Southern New Guinea, lay closer to Rabaul than Rabaul did to Guadalcanal. Nevertheless, the Americans did not bend every effort to knock out Rabaul, as the Japanese did to knock out Guadalcanal. Instead, the Fifth Air Force, lacking forces with anti-ship capabilities, developed modified matériel and tactics locally that made its existing planes efficient for this purpose. Whenever it was learned that the Japanese sent a convoy from Rabaul to New Guinea, the USAAF planes attacked it all out. While the results varied a great deal, the efficiency of the air forces improved with time, resulting in heavy Japanese shipping losses and severely affecting the supply and troop position of Japanese forces in New Guinea. When no targets were offered at sea, the main air effort was turned toward attacking Japanese forces and logistics in New Guinea itself. The Japanese Army's air forces, responsible for New Guinea, were too weak to drive off the Americans, in part because of the logistics problems presented by the American anti-shipping offensive.

Although American movement and logistics were little subject to air attack, there were problems aplenty. Overland movement was extraordinarily difficult and required a great deal of effort. Movement by sea was

far the best way to move substantial quantities of troops and matériel, but the northeastern coast of New Guinea was surrounded by waters which were very poorly charted and dense with shoals and submerged reefs. The Navy was unwilling to send scarce ships into this area until it was adequately charted, and all the more so as it was subject to Japanese air attack. Small shallow-draft craft were used, but there were not enough of them to meet the full need.

The USAAF improvised, using C-47 transport aircraft for some of the first large-scale airlift operations in military history. The C-47s were in fact simply civil Douglas DC-3 airliners without interior furnishings and provided with a wide door for cargo. They were not inherently particularly well suited to military airlift duties, but they were available and adaptable and provided very valuable service.

Japan had acquired a license to build DC-3s before the war and nearly 500 were built for the Japanese Navy as L2D transports, codenamed TABBY by the Allies.[18] Several other types of this general class also were built in Japan, with total numbers exceeding 1,500. [42] Some use of this substantial fleet was made early in the war for parachute assaults, but the Japanese seem never to have contemplated emulation of American use of airlift for large scale resupply and troop movement in New Guinea. No more than a total of 80 aircraft were ever assigned to transport duties by the Japanese Army, and they were almost exclusively employed in aviation logistics functions. [43] Instead the Army relied exclusively on coastal shipping and overland movement in New Guinea.

Thus it was now the Japanese who were cut off, defending their positions as they starved and fell to disease. Their positions were strong and their troops would not yield, but without food, medicine, or ammunition men can do only so much. Tens of thousands were rendered ineffective, or even died outright, from lack of sustenance. [44]

The Allied forces available for New Guinea were weak in almost every respect. The troops who were called upon to take strong Japanese positions at Buna and Sanananda were almost entirely lacking in the artillery forces that had served the Japanese so well in attacking Bataan.

[18] Ostensibly the license had been purchased for civil production and the U.S. producer was unaware that the aircraft were actually intended for military use.

Tragically, many men were lost in all out attacks on strong positions manned by defenders who would soon have perished of starvation had American high commanders not insisted on immediate gains regardless of cost. [45]

By early 1943 Allied forces had established footholds in New Guinea's extreme southeastern tail and on the bottom rung of the Solomons Islands ladder. It had taken them six months of some of the most desperate fighting of the war, under truly hellish conditions, to re-take tiny parts of the vast island network that had fallen to Japan in a comparable period of time so very recently.

Grimly, the Americans, with their Australian and New Zealand allies, set out to trudge the next steps on a road toward victory that seemed to extend off into the infinite distance.

Yet hard as it was to see from the front, the Allies were gaining the upper hand over the Japanese. If their territorial gains remained slight, they were creating the conditions that were soon to permit great strides.

The end of the beginning or the beginning of the end?

In a sense, it seemed that the progress made in the six months following the Guadalcanal invasion was of a very discouraging sort. The results of the succeeding six months would superficially seem scarcely more encouraging, leading many to fear that it would take a grim, grinding struggle of a decade or more to recapture all that had been lost and bring Japan to defeat.

We know now of course that the pace at which the area under Allied control would advance accelerated very sharply after the end of 1943. There are some obvious reasons for this, particularly in that new-construction aircraft carriers began to appear in the Pacific late in 1943, continuing in a steady stream thereafter. Other kinds of matériel and forces also reached the theater in greater numbers, notwithstanding the higher overall priorities accorded to Europe. Many authors, including some Americans as well as many Japanese and others, credit the ultimate victory solely to this "brute force" of vast material superiority applied lavishly and (so it is often argued) with but little skill. [46]

Yet, without in any way underplaying the ultimate importance of America's application of its superiorities in economic strength and organization, or of its considerable (if scarcely overwhelming) resources of military manpower, it is crucial to look squarely at how far the Japanese position had been eroded well *before the Allies enjoyed any real superiority in material inputs.*

In such matters, of course, there can be nothing better than intelligent analysis of quantitative data. Historical analyses are usually lacking in quantification while those of social scientists generally fall short in the breadth of context necessary to qualify as truly intelligent. Without wanting to make too sweeping a claim for my efforts here, I do feel that they point in more productive directions.

Carrier forces

The Pacific War was the first oceanic war – and may very well forever stand as the sole example. As such, naval forces played a uniquely pivotal role.

Regardless of their pre-war doctrinal views, all responsible naval authorities on both sides very quickly came to see aircraft carrier forces as the key denominator of naval power in the Pacific.

The two navies had begun the war with small numbers of carriers, all built within the preceding fifteen years. There had been no prior experience to guide development and each had worked to devise appropriate doctrine, with somewhat different results. For a succinct summary of differences, together with an analysis of early-war carrier operations, see [47].

Because of the differences between and among the carrier fleets, the best simple measure of potential is aggregate displacement of the carrier force, when fully loaded for war. Carriers are counted for the purpose of this analysis as of their date of first readiness for war in the Pacific, typically several months after formal commissioning. Carrier tonnages are compiled from data in [48]. Dates of readiness for war of IJN carriers are estimated from data contained in [49]. For USN carriers commissioning during the war, the readiness date is taken as that on which the carrier first sortied for a strike mission, usually from Pearl Harbor, as determined or estimated from data contained in [50]. The small carrier U.S.S. *Ranger* (CV 4, commissioned 1934) is excluded as it was never employed in the Pacific throughout the war and was considered unsuitable for fleet operations. Also excluded are converted merchant ships unable to steam at the high speeds necessary for fleet operations.

On 7 December 1941, this figure stood at 220 thousand long tons (klt) for Japan and 156 klt for the USN. By early April 1942 the IJN had 234 klt of carriers in service in the Pacific versus 181 klt for the USN, or nearly a 1.3:1 Japanese advantage. By the end of October, after a series of battles, the balance stood essentially equal at 78 klt to 69 klt. This remained unchanged for nearly a year, throughout which the few sur-

viving carriers (some of which needed extensive repairs) saw very limited action. These trends are depicted in Figure 5.

Overall, up until late in the summer of 1943 the Japanese had put 29% more carrier tonnage into service in the Pacific. But this advantage was gone after less than six months of war, having yielded Japan little in the meantime. We cannot read too much into the specifics of ship sinkings, which often depended on quite circumstantial details only loosely related to overall command decisions. Yet is it certainly clear that after the initial bold stroke of the Pearl Harbor raid the Japanese command failed to make much of its powerful carrier force.

Only twice did Japan attempt genuinely strategic thrusts with its carrier forces: in the effort to force the Australians from their last toehold on New Guinea by assaulting their base at Port Moresby in May 1942 and again a month later in the attempt on Midway. Both were parried by American forces which had superior operational intelligence (largely due to COMINT) and more reconnaissance aircraft (due to deliberate and long-established American doctrinal choice). In the Midway operation, of course, the IJN not only failed to achieve its objective but also suffered very severe losses. But the important point is that by failing to mass and concentrate its forces well it ran needless risks to its missions.

Finally, in mid August of 1943, the new carriers U.S.S. *Essex* (CV 9) and *Independence* (CVL 22) cleared the Pearl Harbor channel bound for their maiden missions. By early October seven more new carriers had been added to the U.S. Pacific Fleet, bringing its carrier tonnage total to 282 klt, more than 3½ times that of the IJN. With that, the initiative in the oceanic war passed finally and irretrievably to the United States, marking the beginning of an entirely different phase.

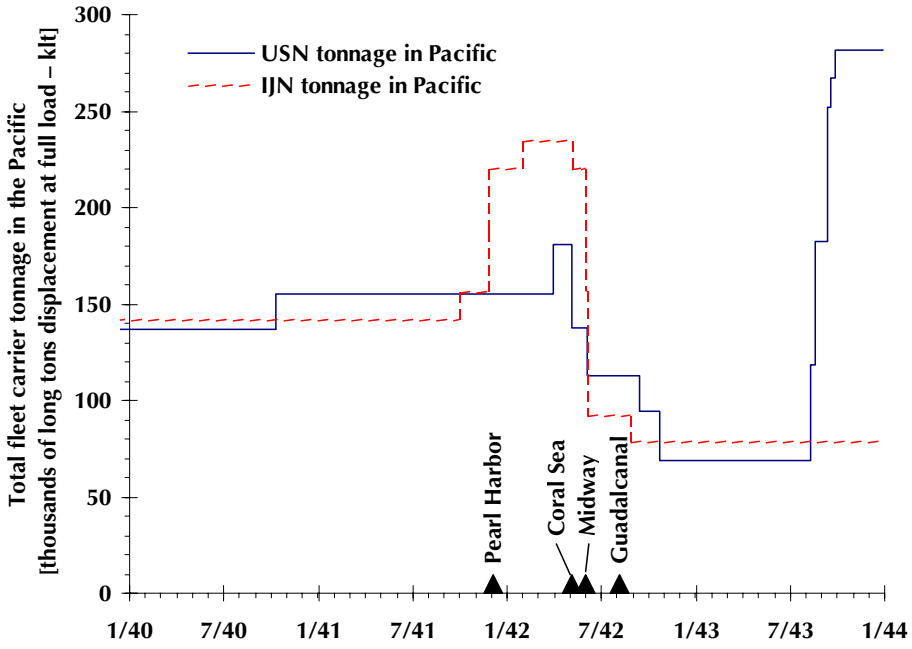

Figure 5. Fast fleet carriers operational in the Pacific through end of 1943.

Aircraft forces

Nothing in the Pacific War was more critical to combat success than attaining and maintaining superiority in the air. Air superiority could not guarantee victory, but loss of it would put victory out of reach. Gaining an overall quantitative picture of the air force balance in the war presents challenges which few previous studies have even attempted to surmount, but there can be no substitute for doing so. This study advances knowledge of the air force balance, yielding insights that help much to illuminate the central themes of the overall study.

The main sources and methods behind this analysis are briefly outlined below, in the section on Sources and methods for *Aircraft forces*.

Immediately prior to the outbreak of war, combat aircraft (including reconnaissance and patrol aircraft, as well as bombers and fighters) assigned to Japanese tactical units and pools in the Pacific numbered about 2,675, about 1,565 IJN and 1,110 IJA. The corresponding total for

the U. S. Army Air Forces (USAAF)[19] in the Pacific was 596 (including 283 aircraft officially classified as *second line* or *miscellaneous*). For the USN and USMC the Pacific area total was 870 (counting 71 aircraft officially classified as *obsolescent*). Even the up-to-date U.S. models were generally inferior to their Japanese opponents except for heavy bomber types.

Many of the Japanese aircraft were initially deployed against non-American targets. [51] But this changed very quickly, and well in excess of 90% of all Japanese combat losses in the Pacific War fell to American forces. [52] [53] As a result, the great majority of aircraft produced by Japan had to go to forces fighting the Americans.

As is well known, the U.S. aircraft industry very early outstripped Japan's in production rate. [54] In the first two years of the war, however, a significant portion of American production went to Allies. Only a fraction of the remainder went to the Pacific. Even the USN sent only a little more than half of its share of combat aircraft production to the Pacific, with the remainder divided between training and the war against Nazi Germany and its U-boat force. The rate of American deliveries to the Pacific only slightly exceeded Japan's up through the end of 1943, just about enough to close the large gap between forces in place at the beginning; a little less than 17,000 for Japan (roughly 7,000 IJA and 9,700 IJN) to a little under 18,000 for the United States (6,813 USAAF plus nearly 11,000 USN, with USMC aircraft coming from USN production). Thus it was not until the end of 1943 that the cumulative American matériel *inputs* of combat aircraft to the Pacific caught up with those of Japan.

The initial Japanese onslaught essentially wiped out USAAF and allied air strength in the Pacific with relatively light losses to Japanese forces. USN/USMC air forces were only moderately eroded, but initially were much weaker than those of Japan in any event. The Japanese Navy lost several dozen aircraft in its initial offensives, nearly 100 at the Battle of the Coral Sea, and more than 250 at the Battle of Midway, but that still did not equalize the air force ratio. Moreover, Japanese losses of highly-trained aircrew were fairly light up through mid 1942. [55]

[19] The USAAF was the operating command under which all U. S. Army air units fell. The USAAC remained the relevant administrative command.

After June 1942, however, the locus of action shifted to the South and Equatorial Pacific. For more than a year, the focus of everything was Rabaul, on the northeast end of the island of New Britain, a key strategic point seized by Japan early in the war.

The environmental stresses in the region were exceptionally severe. The exceptionally hot, moist, sun-drenched climate is very stressful both for personnel and equipment, and neither side had the technical ability to create climate-controlled environments for health care, accommodation, maintenance, or storage. Moreover, the generally rugged, geologically young terrain covered with frequently poorly-drained tropical soils and dense tropical vegetation presented great obstacles to overland movement and to construction of adequate aeronautical facilities.[20]

High intensity air operations across the long distances of the theater imposed tremendous stresses on personnel and matériel alike. Neither side was at all prepared for these challenges. Shipping was in very short supply on both sides and severely constrained support. Many needs had to be met by local improvisation.

The Japanese focused relentlessly on offensive operations, regardless of logistical and support considerations. Even fairly simple problems got short shrift if they did not immediately effect offensive operations. While the Americans and their Australian and New Zealand allies also were very concerned to keep pressure on the enemy, they pursued a more balanced operational approach. If the Japanese method may be summed up as *attack, attack, attack!* that of the Americans was more like *attack, build, attack.*

The stresses told most swiftly on the complex and delicate structure of air power. No detail of its health was beneath American attention. Many problems could not be resolved with the resources available, but none was forgotten. The Japanese operations staffs were consumed with operations and there was no one with the ability and authority to address support problems. Jewel-like airplanes and engines decayed into cor-

[20] The difficulties of the environment are summarized in Eric Bergerud, *Touched With Fire,* pp. 55-118.

roded hulks. Dauntless, exquisitely trained and skilled men were reduced to malnourished, disease-racked husks.

Aware that the environment was in many ways the most difficult enemy and that logistical support was tenuous, the Americans made interdiction of Japanese logistics a priority only just below that of offensive counter-air attack. The Japanese made little effort to interdict American lines of communication.

Aircraft quality and its influence

In evaluating loss data it is necessary to consider the impact of changes in the quality of aircraft matériel. Throughout this period the main air forces opposing the U.S. in the Pacific were those of the IJN, whose fighters were almost all various series of the Zero. (*Zero* is the name commonly used for the Mitsubishi model A6M, designated Type 0 Fighter by the IJN and code-named *Zeke* by the Allies. See [56].) Initially, the principal fighter models flown by the USAAF were various series of the Curtiss P-40 and Bell P-39, while the USN and USMC generally flew various series of the Grumman F4F. [57] In general, each of these early American fighters were somewhat deficient in tactical performance compared to the Zero. The deficiencies were not decisive but did put the Americans at some overall tactical disadvantage, all else equal (which it seldom was in actual combat). In addition, the Zero had a significant advantage in operating radius. The overall effect of this was to limit the American fighters largely to defensive counterair (DCA) operations, while allowing the Japanese more scope for offensive counterair (OCA). [58]

In Jun 1942 USAAF forces in the Pacific began to receive small numbers of Lockheed P-38 fighters. [59] By Sep 1942 there were 105, representing ten percent of USAAF fighter forces in theater. By mid 1943 USAAF forces in the Pacific had begun to receive Republic P-47 and North American P-51 fighters as well. [60] By Jun 1943 these three more modern models accounted for twenty percent of USAAF fighters arrayed against Japan, while by Dec the proportion had risen almost to fifty percent. [61] Similarly, by the early months of 1943 Vought F4U fighters were beginning to replace Grumman F4Fs in land-based action,

while the new aircraft carriers reaching the Pacific from mid 1943 onward were all equipped with Grumman F6Fs. [62] [63]

These newer fighters held margins of tactical performance over the Zero that were broadly comparable to those that the Zero held over the earlier U.S. fighters. (For some specifics see [64], [65], and [66]. Inconsistencies among these and other assessments reflect sample variations in aircraft performance and differences in assessment criteria, among other causes.) That is to say that all else equal, the pilot in one of these aircraft would have a small margin of tactical advantage. It is easy to overstate the significance of these margins, however. For the most part the speed margins were no greater than ten percent, for instance. Differences in tactical circumstances and in particular in pilot skill could easily be far more significant. Perceptions of the significance of the newer aircraft are probably considerably exaggerated by the concurrent changes in the balance of pilot skills, owing largely to the established disparities in operational as well as combat loss rates together with differences in pilot production and in the efforts made to preserve pilots.

In any event, air-to-air combat was only one source of aircraft losses, and by no means a dominant one. Allied forces claimed a total of more than 31,000 air-to-air kills against the Japanese. [67] However, the most comprehensive assessment of Japanese air forces estimates that combat losses from all causes totaled only about 20,000. [68] Inasmuch as anti-aircraft gunners claimed many thousands more kills, and claims of kills on the ground by air attack by U.S. forces alone total 8,903 (6,153 for USN and USMC [69] and 2,750 for USAAF [70]),[21] it is apparent that claims provide only an very rough guide to actual destruction. Moreover, there is reason to weight claims of aircraft destroyed on the ground especially heavily, since they were normally verified by post-strike imagery. Thus it seems that actual air-to-air kills can have numbered no more than about 10,000, less than a quarter of the 44,000 aircraft Japan is estimated to have lost from all causes other than training accidents.

[21] A total of 6,153 for USN and USMC, and 2,750 for USAAF. See Office of Naval Intelligence Air Branch, *Naval Aviation Combat Statistics*, p. 67 and *Army Air Forces Statistical Digest,* pp. 265-8.

Of this quarter, what proportion can be credited to improvements wrought by the introduction of the second generation of U.S. fighters in 1943? To begin with we note that in general, about one third of U.S. air-to-air kill claims were made by defending gunners aboard bomber aircraft, suggesting that U.S. fighter air-to-air kills accounted for no more than one-fifth to one-sixth of total Japanese non-training losses. The USN tabulates loss exchange-ratio figures for various model aircraft for the 1944-45 period (while recommending that they be used with caution). [71] From these it would appear that the second-generation F6F and F4U enjoyed exchange ratios of 22.0:1 and 21.3:1, respectively. However, the first-generation F4F[22] was still employed from escort carriers in this period and claimed an exchange ratio of 44.9:1! If we restrict our attention to loss exchange ratios against the Zero alone in this period we find ratios of 13.3:1 for the F6F, 12.1:1 for the F4U, and 43.5:1 for the F4F. From these figures it certainly seems very difficult to make a case that the introduction of the second-generation fighters, per se, can have had a truly major influence in increasing Japanese losses. Most of what influence they did have probably was due to their greater ability to force an engagement.

Less remarked but probably of the same order of importance as second-generation fighters was the U.S. superiority in air warning, which allowed both interceptors and antiaircraft artillery to be more effective in opposing Japanese air raids. This was in part due to the technological factor of superior American radar, but the operational factors of superior communications intelligence, a better observer network, and better operational intelligence organization also were significant.

Operational disaster in the air

The statistics tell a story more dramatic and meaningful than most tales of combat. By the final day of 1943, 10,209 first-line American combat

[22] The aircraft used in this period actually were designated FM rather than F4F, but were of the same design. The difference in designation resulted from their manufacture in a plant operated by General Motors rather than one operated by Grumman. For this purpose, the FM was simply another series of F4F.

aircraft opposed approximately 4,050 Japanese aircraft.[23] The Americans had lost approximately 45% of the aircraft they had sent to fight against Japan, while the Japanese had lost nearly 80%. Before America won the war of aircraft production for the Pacific, Japan had already lost the war of aircraft attrition.

Truly, the Americans went into the revolving door well behind the Japanese and came out well ahead, as graphically portrayed in Figure 6 and Figure 7. Given the crucial role of tactical airpower in the conflict, this could only bring catastrophe for Japanese arms.

The difficulties of precise enumeration notwithstanding, we can say with some confidence that the major causes for this disparity had to do with operational factors. As shown above, the factor which is most usually cited as having made the great difference – that of the introduction of second-generation U.S. fighters – can have had at most only limited influence. Other factors each of at least equal individual importance included U.S./allied superiorities in:

- Protection of the health of aircrew and ground crew.
- Secure delivery of aircraft to the combat theater with minimal losses.
- Recovery of downed aircrew, which preserved the skills base.
- Provision of spares.

[23] USAAF, 3,182 aircraft; USN and USMC Pacific air forces, 7,027 aircraft. Corresponding figures for the end of 1942 are 3,778 for the Americans (1,749 USAAF plus 2,029 USN/USMC) against 3,200 Japanese. Thus the U.S. entered 1943 about even with Japan in combat aircraft (having begun 1942 at a major disadvantage) and ended it decisively superior. In the American case, losses included substantial numbers of aircraft retired for obsolescence or "war weariness."

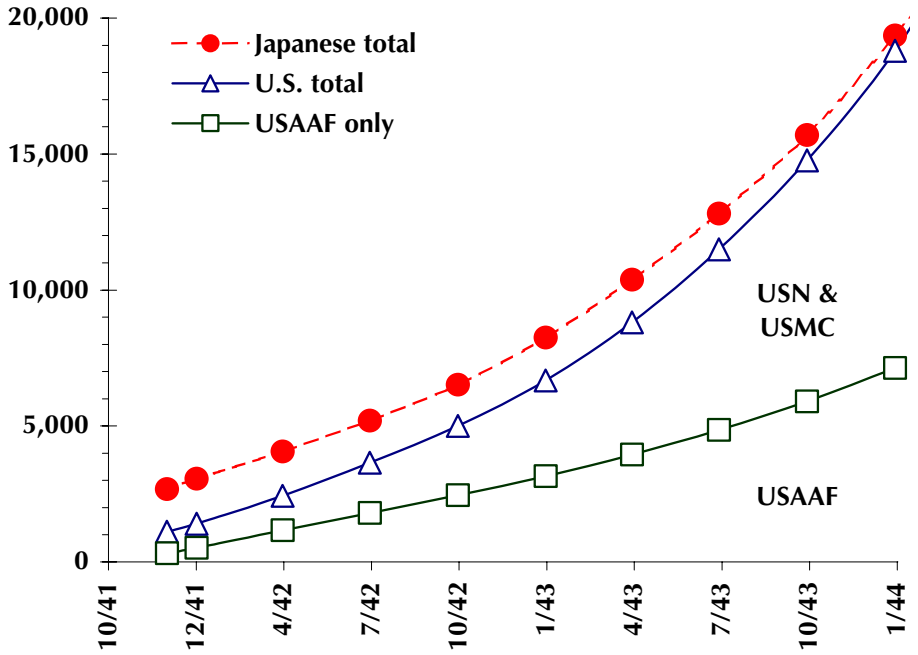

Figure 6. First-line combat aircraft present in Pacific theaters as of 1 Dec 1941 plus cumulative numbers of first-line combat aircraft dispatched to Pacific theaters through dates as shown.

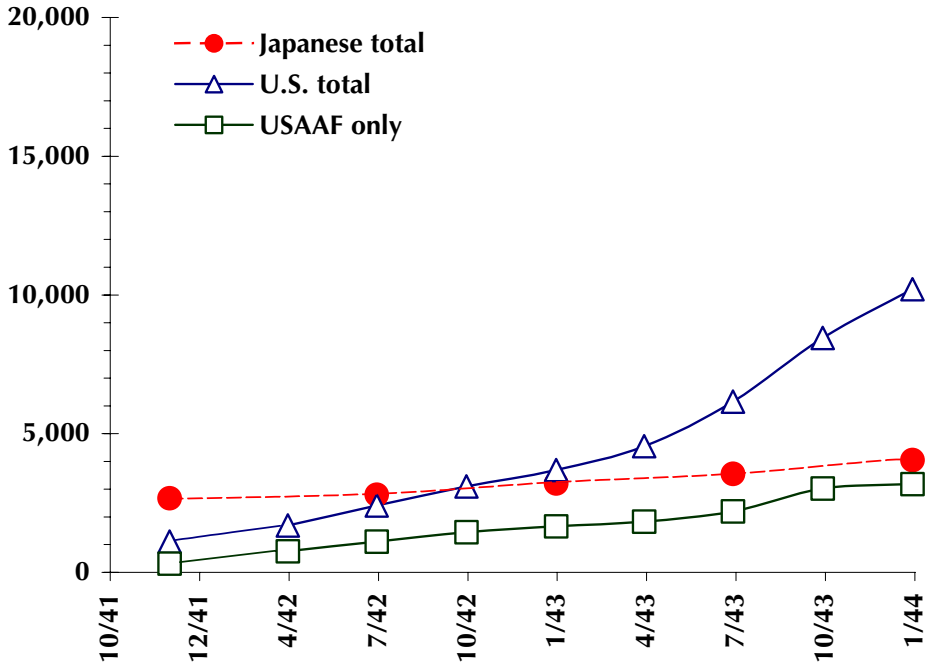

Figure 7. Operable first-line combat aircraft actually present in Pacific theaters on dates as shown.

- Protection of aircraft maintenance and logistical systems.
- Intelligence, which increased opportunities for destroying Japanese aircraft on the ground.
- Allocation of resources to training replacement and augmenting aircrew.

All of these areas of superiority reflected superior American operational planning and execution.

Shipping

The main Pacific fighting theaters for the period through 1943 lay in regions far from Japan and still farther from the U.S., regions where modern infrastructure was almost wholly absent. Except for oceangoing naval vessels and aircraft large enough to self-deploy, all movement of forces and supporting units to the theater was by ship (since strategic airlift was virtually entirely undeveloped at this time). And except for foodstuffs, virtually all supplies had to come by ship. Thus the availability of shipping was a major constraint on military operations of all kinds.

If not quite so challenging as analysis of the air force balance, the analysis of the shipping resources balance presents formidable challenges of its own, which have, if anything, been even more neglected. Again, substantial and useful advances have been made here. See Sources and methods for *Shipping*, below, for a brief résumé of such matters.

Both sides began the war deeply concerned about shipping, and it continued to be a focus of concern throughout. Comparison of their shipping positions is complicated by their quite different geo-strategic situations. Japan's interests and commitments were largely confined to East Asia and the Pacific, with Japanese ships rarely going beyond Rangoon, Burma on the west; Batavia (Jakarta), Java or Rabaul, New Britain on the south; or the Marshall and Gilbert Islands on the east. America was the hub of a world-wide alliance system that was deeply concerned about Nazi Germany and its domination of Western Europe, and a major supplier of military matériel to all of its alliance partners, making heavy demands on shipping. Moreover, by late 1942 substantial American forces were in Europe and North Africa, considerable numbers of

whom were heavily engaged in combat, making further demands. Both opponents had also to allocate shipping to meet the needs of the civilian economy at home.

Japan depended on food imports from overseas, which America did not, but this had only a limited impact on shipping needs inasmuch as the great majority came via short sea voyages from Korea and Manchuria. Much the same can be said of imports such as coking coal, iron ore, bauxite, and other industrial raw materials in short supply in Japan proper.[24]

In the first years of the war the principal strategic sealift routes for Japan were to South China (1,600 nmi), Singapore (2,900 nmi), and Rabaul (2,500 nmi). For the U.S., the principal Pacific strategic sealift routes were to Brisbane, Australia (6,200 nmi) and Noumea, New Caledonia (5,400 nmi). (Direct route distances from [72]; wartime operational factors would add at least 10% and perhaps substantially more.)

Except for bulk liquids and for personnel, almost everything was in those days transported in a ship that has now all but disappeared from the world's oceans, the break-bulk dry cargo freighter. There was then virtually no unitization of cargo in the modern sense. Individual parcels and packages were packed into the ship's hold as if it were a huge general shipping box. Additional cargo, including bulky items such as disassembled aircraft or large vehicles, were secured on deck, covered to provide some protection from wind and wave. Loading and offloading were very labor-intensive and time-consuming.

Japan entered the war with 7.6 million deadweight tons (DWT) of dry cargo and passenger shipping. (For an explanation of tonnage terms see the section, Sources and methods for *Shipping*, below.) Through the end of 1943, it added a further 1.0 million DWT though capture and salvage, and 1.1 million through new building, for a grand total of 9.7 million DWT of shipping (excluding tankers). Offsetting this was 3.8 million DWT lost to Allied action and marine casualty, leaving a net of 5.8 million DWT available for further service – a net loss of 1.8 million DWT.

[24] The U.S. relied a great deal on internal shipping, on domestic rivers and the Great Lakes, for comparable needs.

By Dec 1941, the U.S. cargo fleet had been "at war" for many months, delivering essential supplies to as-yet unofficial allies. Efforts had been put in hand to increase ship production, although as yet with little effect. The U.S. non-tanker DWT came to 6.7 million DWT in Dec 1941, including more than 1 million DWT in foreign vessels which had been acquired by negotiation, requisition, and seizure in American ports. Through the end of 1943, 3.4 million DWT was lost, chiefly to U-boats in the North Atlantic and off the U.S. East Coast. With new construction of 22 million DWT, the U.S. finished this period with 23.4 million DWT.

Figure 8 and Figure 9 present the data on Japanese and U.S. shipping in a form which lends itself to ready comparison. As Figure 8 indicates, Japanese shipping was divided into three categories for control purposes, "A ships" under the Army, "B ships" under the Navy, and "C ships" under a civilian Shipping Control Association. The services could requisition "C ships" and make them into "A" or "B" ships as they saw fit. In the U.S. system (effective from mid 1942) the services continued to have certain ships under their direct control – chiefly ships modified to serve as amphibious assault shipping or for other special purposes – but all the rest were centrally managed by the civilian War Shipping Administration. In effect, the WSA voyage-chartered ships to the Army and Navy, and other agencies, in response to prioritized requisitions for shipping services. Thus the shaded band for shipping serving the Pacific represents an estimate of that portion of military-controlled shipping dedicated to Pacific commands plus the average (over each quarter) number of WSA voyages allocated to Pacific shipping requirements.

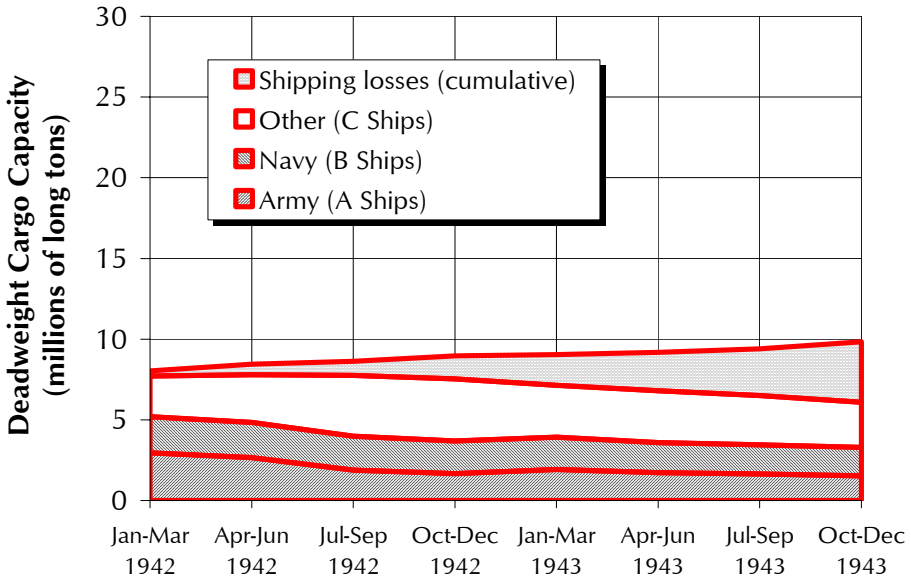

Figure 8. Japanese shipping, 1942-43, by quarters.

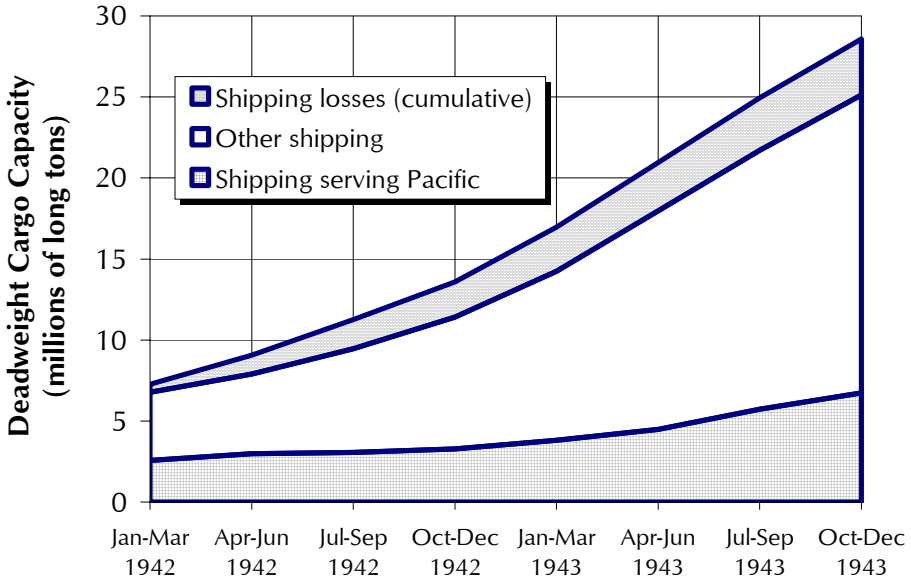

Figure 9. U.S. shipping, 1942-43, by quarters.

Assessing the implications for the combat theaters in the South and Southwest Pacific presents some complexities, but an objective comparison is offered in Figure 10, which is derived from the data presented above on the following bases:

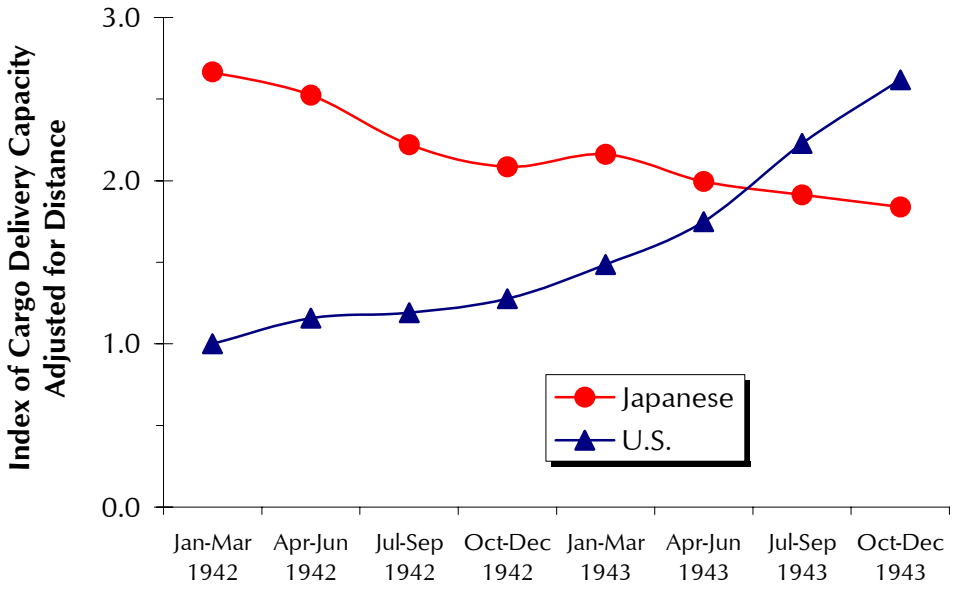

Figure 10. Relative indices of capacity to deliver military cargo to forces in the South and Southwest Pacific, U.S. and Japanese, 1942-43, by quarters.

- Shipping capacity is measured by deadweight tonnage. (The effect of changing the basis to gross tonnage would be slight, however.)
- American ships make three round-trip voyages per annum while Japanese ships make six. This is in line with observed actual round-trip times and reflects the much greater distances which American ships had to steam.
- All ships configured for carrying general cargo and assigned to the services or to supporting them are counted, regardless of categorization. In particular, U.S. Navy attack transports and cargo ships (APA and AKA) are included. Specialized beaching craft such as LSTs are not included since they rarely served strategic sealift roles. In any event, their aggregate cargo-carrying capacity was not great in this period.
- Japanese figures are not increased to reflect the fact that, owing to the shorter distances and availability of intermediate bases, many aircraft and smaller sea craft self-deployed, whereas their American equivalents had to be carried as deck cargo on sealift ships. Making a suitable adjustment would increase the index for the Japanese by perhaps 5% to 10%.

Because the fighting theaters in the South and Southwest Pacific were quite isolated and lacking in sources of most categories of military material, the trends shown in Figure 10 relate directly to military capacity. With only very limited exceptions, material came by ship or was not available at all.

The sole major exception to the rule that all material had to come from far away was that both sides endeavored to feed their forces from the resources of the region in which they were fighting. Characteristically, this was managed far more effectively on the Allied side. Japanese armies were essentially left to fend for themselves, which could and did lead to severe privation and even mass starvation in unfavorable cases, such as New Guinea. U. S. Army and Navy logistical organizations worked closely with Allied governments throughout the region to procure and distribute adequate rations to the troops. There were some instances of American troops having to go on short rations, most notably in the early phases of the Guadalcanal operation, but after the initial debacle in the Philippines (where American forces were very severely weakened by starvation and nutritional deficiencies) there were no instances of hardship to an extent that significantly undermined health or military effectiveness, as so often happened to Japanese forces. That is to say that neither side devoted much shipping to foodstuffs, but that U.S. forces suffered far less from their want. Note that the Japanese could perfectly well have induced or compelled the local inhabitants in Indonesia and/or the Philippines to have provided food for their forces, much as the Americans got Allies and local populations in the region to do for them. And note that the Japanese had access to at least as much shipping capacity for food, as shown by Figure 10.

Before we can fully understand the factors at work in the first two years of the Pacific War, it will be necessary to trace what quantities of material actually were shipped to the theaters by each side and what happened to it, a task yet to be undertaken. Figure 10, however, makes a strong case that Japanese deficiencies did not stem so much from want of material flowing into the theater (at least not relative to its opponents) as from failure to ensure that it got put to good use.

Ground forces

Neither side had ever made any serious preparation for ground combat in jungles or other tropical landscapes, even though both had opportunities and reasons to do so.[25] The Japanese in general were distinctly quicker to adapt in a tactical sense. U.S. Army forces in New Guinea and earlier in the Philippines suffered from a certain amount of "chateau generalship," leading to insistent demands from the rear for action of a sort not well suited or even feasible for the circumstances. Japanese general officers usually paid a lot of attention to tactics and the tactical situation, which aided and speeded tactical adaptiveness. Much the same was true of the USMC.[26]

But formidable as they were at the tactical level, Japanese forces did not often do well against the Americans. Japanese doctrine emphasized the initial attack above all, intending to overwhelm the opposition at a stroke. This rarely worked against the Americans, even early in the war – even when lacking in tactical maneuver abilities, American forces tended to be tenacious and resourceful in defense. In a bulletin dated Mar 1943 and evidently intended to brief leaders of troops headed for combat with the Americans, the Japanese Army said of American performance in defense of the Philippines, "The fighting spirit of the U. S. troops was unexpectedly high. … [W]e thought that the U. S. forces might surrender if we broke through their front-line positions. However, they did not stop resistance until the last stage of the fight." [73] Yet the Japanese never again had so great a success in fighting the Americans.

After the initial attacks, the Japanese quickly found themselves severely embarrassed by lack of logistical support. This told against them with

[25] Between the wars, the Philippines and the Panama Canal Zone had been important American outposts, with relatively substantial garrisons. The Japanese had maintained forces on Taiwan.

[26] Some of this may have been situational, inasmuch as Marine Corps forces were generally relatively limited in size and scope of operations. It does appear, however, that in leaving much of the responsibility for logistics and support to the Navy, senior Marines may have felt freed and impelled to stay closer to tactical issues.

special severity in the stressful environments of the South and Equatorial Pacific regions.

American attacks against Japanese logistics were a factor in this, but by no means the root cause. Like their air forces, Japanese ground forces never made anything like adequate provision for logistical support. American attacks simply exacerbated underlying inadequacies. [74] Japan's well led, keenly motivated, highly disciplined, finely trained, and adequately armed and equipped troops were undermined by disease, starvation, and lack of munitions to the point where they could not withstand the American onslaught. In many cases, they simply perished of want without direct attack.

Nor was this the only deficiency in Japanese command at the operational level. While Japanese operations officers often were quite adept at deducing what the enemy might do on the basis of military logic, the Japanese in general did poorly at collecting and processing intelligence. [75] [76]

Emphasis on economy of force combined with over-optimism (fed, in part, by faulty intelligence) to prompt inadequate force commitments that were anything but economical in the end. Sometimes this led to absurd operations, as when a battalion task force landed expecting to "wipe out" the Marine division that had just landed on Guadalcanal, and was itself wiped out instead. [77] [78] Even when not carried to such extremes, it fed a penchant for piecemeal serial attacks or inadequately coordinated attacks on multiple axes that invited defeat in detail.

The Americans were by no means immune to operational deficiencies of their own. The Guadalcanal invasion in particular entailed very high operational risks. But to a considerable extent these were calculated; the time value of seizing the island before the Japanese could establish an operational airfield was high enough to justify acceptance of a great deal of risk. Moreover, U.S. commanders and staffs were rarely complacent or fatalistic about operational deficiencies; once a gap had been revealed, strenuous efforts were usually mounted to close it and prevent repetition.

Troop quantities

For Japanese troop inputs and levels in the theater, good data are, as always, hard to come by. The best available for the Japanese Army as a whole are: [79]

	Pacific & South-east Asia	Manchuria	China	Japan, Taiwan & Korea	Total
Dec 1941	155,000	700,000	680,000	560,000	2,095,000
1942	500,000	700,000	680,000	500,000	2,380,000
1943	920,000	600,000	700,000	680,000	2,900,000
1944	1,630,000	460,000	800,000	1,210,000	4,100,000
1945	1,640,000	780,000	1,200,000	2,780,000	6,400,000

The totals for the IJA as whole in this table are consistent, up to 1945, with those presented by Jerome B. Cohen, who cautions strongly throughout his book about the weaknesses of Japanese statistics generally. [80] Cohen states that his figures are for the end of the year, although he does not specify whether this is the calendar year (i.e., 31 Dec) or Japanese fiscal year (31 Mar – e.g., JFY 1942 would end on 31 Mar 1943).

Another source, based in Japanese official figures like the foregoing, provides a more detailed breakdown of Japanese Army force dispositions, but is very vague as to what dates these are for. [81] Also shown are casualty statistics.

Region	Strength	Combat deaths			Disease deaths		
		1942	1943	1942-3	1942	1943	1942-3
Asian Continent	2,596,000	24,300	20,711	45,011	36,750	40,950	77,700
Outer Japanese islands	75,000	0	0	0	0	0	0
Central and Northern Pacific islands	88,000	0	9,500	9,500	1,000	4,000	5,000
Philippine Islands	230,000	12,000	0	12,000	3,000	3,000	6,000
NEI plus Borneo	235,000	11,000	10,240	21,240	10,150	12,150	22,300
New Guinea	80,000	5,450	2,450	7,900	1,500	2,000	3,500
New Ireland and New Britain	100,000	2,200	2,800	5,000	400	1,000	1,400
Solomon Islands	80,000	6,000	9,000	15,000	2,000	2,000	4,000
	3,484,000	60,950	54,701	115,651	54,800	65,100	119,900

It is reasonably certain that these figures do not include those for the IJN. There was no Japanese Marine Corps, but some naval infantry formations were employed in defense of islands in the Central Pacific, as

well as for some roles in the South and Southwest Pacific. Also neglected in these tables are the Navy aviation personnel manning and supporting land-based aircraft. Given the considerable uncertainties in the Army figures, however, the generally small scale of naval infantry forces, and the overall numerical of land over air force personnel, however, it is scarcely likely that inclusion of these would change the picture in any meaningful way.

Unsurprisingly, it is not so difficult to find firm data for U.S. forces. The following table, compiled from several sources, summarizes the situation up to the end of 1943, including personnel lost to death, capture, or unfitness for further service to that date [82] [83] [84] [85] [86]

Inputs to end 1943	Pacific (not Aleutians)			Aleutians		
	Army	USMC	Total	Army	USMC	Total
In theater	712,328	159,376	871,704	114,344	1,034	115,378
Died in action or of wounds	6,718	3,611	10,329	775	2	777
Died of disease	8,311	1,860	10,171	1	0	1
Died of accident & other	2,336	523	2,859	38	0	38
POW + MIA	30,447	1,150	31,597	30	0	30
Discharged	3,562	1,029	4,591	572	5	577
Total	763,702	167,548	931,250	115,760	1,041	116,801

These figures, like those for the Japanese, include the personnel of Army Air Forces in the region, and in this case those of Marine Corps air forces as well. Navy personnel manning and supporting land-based Navy aircraft are not included, but their numbers were too small to matter significantly in any event.

Australia made a major contribution to Allied ground forces in the Pacific as well. In a sense, of course, all forces in Australia were in the Pacific – just as all in Japan were as well. More immediately and relevantly, by mid 1943 about 35,000 Australian ground force troops were engaged in New Guinea.[27] [87] Recognizing that there would also have been Air Force personnel (a separate service in the Australian organization) and that Australians served elsewhere in the Pacific at this time as well, we may estimate that something on the order of 100,000 Australian forces

[27] Assuming that the ratio of Australian and American troop strength was in proportion to the numbers of brigades (or regiments, in the case of Americans) in each force, 5:3.

(exclusive of the nation's small naval contingent) could reasonably be counted in the Pacific column.

From first to last, nearly one million Australians served in the war and more than 39,000 perished in the course of serving [88], impressive figures for a nation of only 7 million. [89] New Zealand's contributions were comparably impressive relative to its still smaller population of 1.6 million, but like Australia's they were split between the Pacific, the Middle East, and Europe. Both nations reduced manpower in uniform later in the war in order to release labor for war production in support not only of their own forces but those of Britain and the U.S. (In much of the Pacific, American troops were fed and provided with other basic necessities very largely out the produce of these two nations.)

Regardless of which set of strength figures we take for the Japanese forces and which portions of Allied forces we count among those engaged in the Pacific theaters it is clear that up through the end of 1943 the Japanese and the Allies had sent roughly equal numbers of ground and land-based air troops to the Pacific. The Japanese had lost somewhat more men, and had somewhat fewer available.

Patterns of force utilization differed markedly. The Japanese placed great stress on achieving the highest possible "tooth-to-tail ratio" in forward areas, relying on defeating the enemy before he had time to build up and respond, and before Japanese fighting strength was sapped by lack of depth of support. While this policy had generally worked well for the Japanese during the war's first six months (the reverses initially in the assaults on Bataan and Wake Island being the only significant exceptions, and of slight ultimate consequence) the failures to take Port Moresby and to re-take Guadalcanal left Japanese forces in the region facing a protracted campaign in an extremely difficult environment with very inadequate support. [90]

American forces also were undermined by support inadequacies. Serious as these sometimes were, however, they were neither so grave nor lasting as those that drained Japanese strength. [91] [92]

The war of intelligence and communications

Radio communications were essential to widespread military operations such as those in the Pacific. For short-range line-of-sight tactical communications each side deployed tens of thousands of voice radio sets. At the outset of the war these were largely in the HF (high frequency) band, but as the war went on the Allies in particular brought to the field increasing numbers of VHF (very high frequency) and UHF (ultra high frequency) sets. Point-to-point transmissions over longer distances were usually at HF and usually in Morse code, although the U.S. made great use of radio teletype (RTT) systems as the war progressed. Broadcast message services usually transmitted in several bands, from HF down to low frequency (LF) or even VLF (very low frequency) and might use Morse and/or RTT.

The traffic volumes of line-of-sight systems were vast beyond measure. Traffic on point-to-point and broadcast long-haul circuits amounted to tens to hundreds of thousands of messages per month.

The potential vulnerabilities posed by this dependence on radio communications were obvious and recognized by all. Disruption of vital communications through jamming could easily disrupt operations. On the other hand, intercepting enemy communications could give very valuable information regarding enemy locations, actions, and even intentions. On the whole both technical and strategic factors tended to argue against jamming and for interception and exploitation. Various terms were used at the time for these activities, but I shall use the term *communications intelligence,* or *COMINT*.

Literature on COMINT, especially for this period tends to focus on the decoding of enemy messages, but this was but one aspect of it. In general, major COMINT functions widely conducted in World War II included:

- Interception and recording of enemy radio traffic externals.
- Direction finding, D/F, for geolocation of transmitters.
- Traffic analysis, consisting of a myriad of analysis functions to extract information from the signal externals regarding the patterns of traffic.

- Cryptanalysis, or development of methods for extracting plaintext and other message internals from message ciphertext.
- Large scale application of these methods to produce raw information from decryption.

Finally, inputs from these various COMINT activities (each of which of course interacted with and supported the others) had to be analyzed together with inputs from many other sources to form a final intelligence estimate. Sources of importance in the Pacific War included geographic intelligence, aerial photo intelligence, tactical unit reporting, agent reporting, exploitation of captured or salvaged documents and matériel, interrogation of enemy prisoners of war (EPWs), and imaginative mirroring of known or inferred enemy patterns of thought and operation. Because all of these factors could interact in highly nonlinear ways in producing final estimates it is difficult sometimes to isolate the effects of COMINT *per se*. In the period under review here, however, COMINT was frequently so much the dominant source for certain classes of assessments as to make evaluation fairly straightforward.

Both the U.S. services had built small but capable COMINT organizations before World War II, as had the Japanese services. In neither case had the army COMINT services had much opportunity to collect against one another, and for this reason they had to build their knowledge of their enemies from scratch. The navy groups on both sides were in somewhat better position and each already knew something of the communications procedures and crypto systems of the other on the basis of peacetime intercept activities. [93]

On the whole, however, the Americans were much more successful at COMINT than the Japanese, and this superiority became marked early in the war. One reason was American superiority in maintaining the security of their own communications, thus making the challenges for Japanese cryptanalysts far more difficult. This and other factors will be explored below, but first I will note some of the implications.

Fruits of COMINT success and failure

The Japanese Navy's cryptological security was in general not as good as that of the Army. Together with the head-start gained by the U.S. be-

fore the war, this permitted American cryptanalysts to gain considerable success by the spring of 1942. They could decipher only parts of messages, and by no means of all, but this combined with D/F and traffic analysis to reveal much about IJN plans and movements, often allowing the USN to give battle on favorable terms, or to refuse it.

Success against Japanese Army systems was slower in coming. The main tactical systems were quite secure and generally used in ways that provided little opportunity for cryptanalysis. Major successes did not come until 1944, initially with the aid of captured codebooks and key materials.

Other Army systems were weaker, however. In particular, the IJA's Water Transportation Service employed a crypto system for shipping movement messages that had significant technical defects, allowing American cryptanalysts to solve it by April 1943. [94][95] When combined with COMINT of naval systems this very frequently gave the precise location and timing of shipping movements for troop movements as well as tactical, operational, and strategic logistics movements. The result was a great improvement in the efficiency with which these could be intercepted by air and naval forces. Moreover, it was often possible to infer concentrations of air and ground forces from these sources.

Because of this, American forces were able to inflict savage losses on the shipping that the Japanese were utterly dependent upon to transport forces and supplies. Nor was this simply a matter of ship losses. Whole divisions were shattered at sea. The Japanese estimated that more than 2,000 were drowned in 1943, with many more to follow in 1944 and 1945. [96] Even those who survived their voyages often were left without arms, equipment, or even rations.

Nothing at all comparable befell American forces after the loss of the Philippines. As has often been remarked, the Japanese might have done well to employ their long-range submarines in attacks on American shipping. In the absence of COMINT tip-offs, however, the results of such attacks could scarcely have been nearly so devastating as the American campaign against Japanese shipping.

In effect, COMINT became a winner-take-all game. The Japanese did have some significant successes, particularly through traffic analysis. Yet

the U.S. almost inevitably learned of them quickly through its successes in cryptanalysis, and was able for the most part to stop the leaks, or minimize their effects.

Reasons for COMINT success and failure

The reasons for the large and consequential differences between code-making and code-breaking on the two sides are worth examining in detail.

At the phenomenological level we can observe that:

- Both sides had crypto systems that were inherently capable of high levels of security, and these included the systems most widely used for operational messages.
- Both used mechanized as well as hand crypto systems, although mechanized systems became much more common in the American forces as the war went on.
- Both had an adequate supply of people with the necessary mathematical and engineering skills to do high quality work in making and breaking systems.
- Both had established and capable, but quite small, cryptanalytical and cryptological organizations at war's outset.
- Both had state-of-the-art equipment for signal interception and direction-finding.
- Each navy had been collecting and analyzing the other's communications for 15 years or more by 1941, mostly in connection with large exercises.
- Neither army had any significant pre-war background in collecting or analyzing the other's communications, due to lack of ready opportunity and competing demands on their small COMINT capabilities.
- All forces of both sides were well aware of the need for communications security.

- Both sides used mechanized equipment, such as punched-card sorters and tabulators, to aid in analyzing enemy communications. The U.S., however, had an advantage in much better access to sources of such equipment (being a major manufacturer and the nation in which the technology had first been developed, in conjunction with census processing), an advantage which came progressively more into play as the war went on.

- Translation of written military Japanese was an essential part of the exploitation process as well as support of cryptanalysis itself, and presented a host of serious problems. The U.S. services had trained only a handful of officers in the relevant skills pre-war and struggled with translation issues throughout the war.[28] The Japanese, although having some inherent difficulties in English pronunciation and in achieving fluency in speaking and writing English due to differences in phonemic values as well as syntactical structure between the two languages, had many people who were well qualified to translate messages.

From this it is not obvious why the U.S. should have enjoyed so great an edge in COMINT and communications security (COMSEC), especially so early in the war. In practice it had a great deal to do with COMSEC – probably more so than with COMINT. That is, Japanese weaknesses in COMSEC greatly aided U.S. COMINT and particularly cryptanalysis, while U.S. strengths in COMSEC, and particularly in crypto security, greatly impeded Japanese COMINT.

This may seem to contradict the point made earlier regarding the security of Japanese crypto systems. The important distinction is between

[28] Although the U.S. had a substantial population of Japanese-Americans with varying levels of Japanese-language skills, the help they were able to lend was limited. Not only did they lack knowledge of the specialized vocabulary of military messages but the sort of household Japanese that they had been exposed to at home was very different from the kind of Japanese used in such contexts, even in structure. Moreover, because of the marginalized socioeconomic status of most immigrant families and limited opportunities available to them, those with the best Japanese-language skills largely lacked the kinds of formal education in America which would have made them most useful in COMINT functions. These factors combined with prejudice and suspicions (quite unfounded in most cases) regarding the loyalties of Japanese-Americans to sharply limit utilization of them.

the *potential* security of the system if used well and properly and the *actual* security in practice. Seemingly small lacunae in system implementation and application can provide opportunities for cryptanalytical attack. The Japanese were well aware of this and endeavored to guard against such chinks, but their responses were usually late and incomplete, and frequently failed to address the underlying problems. They tended to focus almost exclusively on the lapses of individual code clerks and cryptological security personnel, and treated them as essentially disciplinary problems. The American code-makers, on the other hand, were more foresighted and, while not neglecting disciplinary issues, worked much harder on making their systems "idiot proof."

Not only were the Americans pragmatic – in just the way that Americans like to tell themselves they are – but they did not allow preconceptions about the enemy to cloud their judgment. They strove to make their systems robust against the most effective attacks they could conceive of, without regard to whether they believed the Japanese or any other particular enemy to be capable of mounting such attacks. The Japanese, by contrast, were prone to wishful thinking about what the Americans *would* or *might* do, even when they knew that more serious threats were possible in principle. Indeed, so much is this true that even today many prominent "experts" in Japan continue in insisting that the Americans were able to penetrate the crypto systems of World War II Japan only through physical acquisition of Japanese crypto materials, abundant evidence to the contrary notwithstanding.

The Japanese equally were vulnerable to wishful thinking about how far they could rely on the dutifulness of their personnel. The record of course is clear that Japanese military personnel generally showed exceptional loyalty and fortitude, and were willing to sacrifice their interests and even lives for the sake of duty to a remarkable degree. Yet there were instances in which crypto personnel in dire circumstances, fearing for their lives and beyond immediate official scrutiny, took shortcuts that resulted in grave compromises. In other cases, unmotivated or overburdened code clerks and communications personnel were slipshod in applying precautions. Worse still, in such cases some personnel concealed their actions rather than facing disciplinary sanctions, thus promoting unwarranted complacency.

Finally, note that the initial weak link in the Japanese Army's cryptological structure was its Water Transportation Service. Notwithstanding its crucial importance, formidable challenges, and very great dangers, this service was regarded as despicable by "real" soldiers, including staff-gods – scarcely one notch above civilians. It is easy to imagine that no one in the operations section of the General Staff (which controlled the IJA's primary cryptological resources) gave a second thought to the possible consequences of allowing the WTS to go its own cryptological way.

There were other factors, of course. American cryptanalytical efforts were better organized and integrated, enjoyed better access to high-quality personnel, and benefited from more cross-service cooperation than did their Japanese counterparts. They also were far better integrated into other intelligence activities, for the Japanese tended to downplay the importance of intelligence generally and put little emphasis on it except as a direct part of operational planning. Finally, the logistical fragmentation of the Japanese forces – fragmentation that American COMINT successes did so much to help force on them – and the consequent difficulties in distribution of cryptographic materials prompted them to workarounds that worsened their vulnerabilities.

Early-War Japanese vs. U.S. military performance

At the most superficial level, the first two years of the Pacific War present an image of Japanese military success overall, despite some reverses. True, Japan lost heavily in the Coral Sea and Midway campaign, but that did no more than narrow its advantage in the single force component of aircraft carriers. It failed to stop Allied advances in New Guinea and the Solomon Islands, but those were slow and costly, not to be compared with the brilliantly successful initial Japanese sweep. Moreover, both at Midway and Guadalcanal the margin of American victory appeared slim indeed, and it seemed that the Japanese might well have won instead.

As has been demonstrated here, however, by the latter part of 1943 Japan's strength in the Pacific had been severely eroded and its defenses hollowed to a brittle shell. American losses had been severe also, of course, but far less so. Even though America had poured no more mili-

tary resources into the region than had Japan, its lower losses and superior force conservation had transformed its position vis-à-vis that of Japan from one of distinct and anxious inferiority in mid 1942 to one of distinct superiority a year later. In the crucial category of air forces in particular, the Americans had clearly gained the upper hand.

It must be emphasized once again that the United States did *not* gain these advantages on the basis of greater force *inputs*. Nor did the U.S. enjoy any significant advantages in many categories usually regarded as critical:

- Geostrategically, the Japanese were fighting in a region where they had shorter, interior lines of movement and supply and where they had already established a base structure.
- On the whole, tactical performance of Japanese forces was at least equal to that of the Americans and often superior. The Japanese tactical edge was eroded in 1942-43, while that of the U.S. forces was honed, but this proceeded quite slowly.
- At least well into 1943, neither side had any definite advantage in technology *as fielded*. Each was superior in some major weapons systems and inferior in others. [97] The U.S. of course had superiorities in many underlying technical and manufacturing capabilities, but the effect of these was not felt much until later.

Operations: The American advantage

Where the U.S. excelled and gained its critical advantages over this period was at the operational level of war. Important elements of this included

- The functions that are today included under the rubric of *combat service support:* supply, maintenance, transportation, health services, and other services required permit forces to accomplish their missions in combat on a sustained basis. American commands planned and provided for CSS more realistically from the start and were much more active in identifying and correcting deficiencies than were their Japanese counterparts.

- Force security. Risks and costs were carefully calculated and weighed against potential gains. This was true in large scale, in operational-level movements, for instance, but also in a host of detailed matters. Examples included communications security, combat search and rescue of downed aircrew and men lost at sea, and public health measures.

- Force recovery and retraining. Systematic efforts were made to identify forces on the verge of drastic decline due to losses and fatigue, withdraw them from combat (even at the cost of temporarily slowing the pace of operations), reconstitute them and retrain and reequip them as necessary to enable them to return to effective service.

- Intelligence and counterintelligence. This extended to collection, analysis, and interpretation activities, all of which were carried on more systematically and intensively than was the case on the Japanese side.

In the view of the Japanese these were all "luxuries" whose lack was to be compensated by the tactical capabilities and spirit (*seishin*) of their forces. But while Japanese forces were (at least in the earlier periods) very highly trained for tactical combat and displayed unexampled fortitude and determination, experience was to demonstrate that these qualities were not in themselves sufficient for the kinds of operations that prevailed in the Pacific after mid 1942. It is a measure of Japanese operational deficiencies that they failed to recognize and respond to this. U.S. commands generally displayed far more vigor in recognizing and responding to operational problems.

Why did the Japanese military system, which had built superb military forces, serve them so ill in operational leadership and command? And why should the American forces have shown such remarkable abilities in these matters? That is the subject of the following section.

Staffs and superiority

"Staff" is a term of opprobrium in many lexicons. Capable commanders and stalwart shooters are all that is needed, the myth goes; staffs are only dead weight.

Naturally, no commander can truly be omnicompetent. The commander may know and do *anything*, but no individual can know and do *everything* involved in modern military operations. The commander must depend on the staff for many things. Of course staff officers with unaccountable authority and a taste for meddling are rightly abhorred, but these ills do not require throwing the baby out with the bathwater in seeking to cure them.

In practice, it was normally impossible in any of the services involved on either side in the Pacific War to gain command at the general or flag officer level without having first qualified and served as a general staff officer[29] – in whatever guise the general staff might take in the service in question.[30] Thus in studying staff development we also are studying command development, at least for command at the general/flag officer level.

Ordinarily the commander pays closest personal attention to the central function of the command – whatever that might be at the time in the commander's view – and relies most heavily on the staff for important supporting functions. Staff inadequacies thus tend to be mani-

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[29] The term *general staff* is defined by the *DoD Dictionary of Military Terms* as meaning, "A group of officers in the headquarters of Army or Marine divisions, Marine brigades, and aircraft wings, or similar or larger units that assist their commanders in planning, coordinating, and supervising operations.…" Note here that a general staff is essentially simply an operations staff that serves a general officer in command.

[30] Then as now, the U.S. Navy had no general staffs as such, but flag officers in high command had staffs of highly qualified officers who in practical effect were general staff officers.

fested most immediately in supporting functions that are not receiving direct attention from the top.

It is clear that the picture we have seen for the Japanese – exclusive focus on tactical excellence, with severe and costly neglect in other areas – is what we should expect in a case where the staff system has broken down. By contrast, the American case, with action and innovation across the board, seems to suggest that the staff system worked better.

Building staff capabilities

Generally speaking, the American armed services between the two world wars are not held in very high regard, the Army least of all. Starved of funds, with no clear missions, the story goes, they were populated with aging, stagnantly-minded officers who thought only of their afternoons on the polo field or golf links and spent their evenings in the bar or tippling in their quarters. When their minds turned to war they thought only in terms of horses and battleships.

These views are not altogether wrong, but they overlook some very important things that also were going on in the American services, things that were to have a major impact in the war to come.

In fact, all of the services involved on both sides had deliberately and consciously sought to develop staff systems to serve what they envisioned the needs of command to be in wars to come. In each case the service's vision of desirable staff characteristics and capabilities was shaped by its own experience and its interpretation of it. So also were its choices about how to develop capable staff officers.

Examination of how and why the services formed the visions and choices that they did, and how they implemented them, goes far to explain why events proceeded as they did in the war, and particularly in its early phases where, as we have seen, there was no great imbalance in material factors for a year or more after June 1942. It also will tell us quite a lot about success in modern war generally, and how we can make better net assessments of the capabilities of likely opponents in comparison with our own.

For a brief outline of the status and views of the various services in the period between the wars see [98]. As it shows, there was considerable symmetry in naval expectations in that the two navies understood one another's strategies with reasonable clarity and cast their plans in that light. There was symmetry of another sort between the armies, both of which envisioned infantry as the principal force, fighting a war of movement. All this resulted in forces which in certain respects resembled one another.

PME and military doctrine in Japan and America

(Sources for this section are described in Sources for *Building staff capabilities* at the end of this paper.)

Generals have been served by operations staffs time out of mind, but systematic of staff arrangements emerged from the wars of Gustavus Adolphus of Sweden (1594-1632). There was considerable development, especially in France and Prussia, over the course of the 17th and 18th centuries and in 1765 Friedrich II der Grosse of Prussia (1712-86) established an *Académie des Nobles* under his personal supervision, perhaps the first institution to offer formal instruction in the duties of the staff officer.

The 19th century brought the rise of education for the professions. The Prussian Army was a pioneer military example, founding a modern war college, the *Kriegsakademie*, in 1810. Thus the example of the 19th successes of Prussian arms on the battlefields of Northwestern Europe gave great impetus to the spread of professional military education (PME). The U.S. services took up this idea in the 1870s-1880s. In a way this seems strange, as both the Army and Navy were all but moribund as military forces in the decades following the Civil War. The Navy began to awaken in the 1880s, but for the Army the process had to await the difficult experiences of the Spanish-American War, where the Army's inefficiency and the inability of the two services to cooperate fruitfully were far more costly than the feeble efforts of the Spanish foe.

Yet the Army and Navy both entered World War I with a core of mid-grade officers who had received PME of a kind that was relatively strong by the standards of the day. This owed a good deal to the perception,

within the Army especially, that American military needs were unique. It might be necessary at any time, the Army believed, for it to suddenly expand from a frontier and colonial constabulary to a great and modern army. This after all was precisely what it had experienced in the Civil War and to a lesser extent in the Mexican and Spanish-American Wars. It was essential that as many as possible of its small cadre of professional officers be equipped to carry general-officer stars in their musette bags. Since there was little opportunity for them to gain experience of war through peacetime exercises, PME was the Army's chosen instrument for preparation.

The case of the U.S. Navy (USN) was somewhat different. Once a modern naval force was in the water, as it was in the first decade of the 20th century, naval officers had an opportunity to practice their profession on a scale denied to the peacetime Army. In effect, the Navy had more "hands-on" PME. Formal PME, however, continued to occupy an important role in a naval officer's development.

American interest in economic expansion and the 19th century view that "trade follows the flag" prompted the nation to acquire a number of Pacific island territories, culminating in the wake of the Spanish-American War with the Philippines and Guam. The ultimate goal was to secure access to what was assumed to be a huge potential Chinese market for American goods. This led directly to increased interest in and concern about Japan.

Since the early 1600s Japan's post-feudal shogunate had pursued a policy of very tightly-regulated and limited contact with foreign influences. By the 19th century, strains accumulated over more than two centuries of economic and social change had undermined the political bases of the shogunate, however, and concerns about the dangers posed by European and American penetration into the region helped to trigger its overthrow at the end of the 1860s. The rise to power of the new Meiji regime brought a sharp *volte-face*: Rather than shunning almost all foreign influences Japan would now selectively embrace them in an effort to develop its national power.

Most dramatically, Japan shed its traditional military structure, a feudal relic, turning instead to European models for an entirely new army and navy. Both services quickly developed general staffs and staff colleges on

an entirely up-to-date pattern. Many Europeans and Americans tended at first to smirk at the earnest efforts of the "little yellow men," but the smirks slipped when Japan decisively defeated much larger China in 1894–1895 and bested Russia in a hard-fought war a decade later.

American military thought was decisively influenced by the experience of participation in World War I, and especially so for the Army. The huge expansion between April 1917 and November 1918 – from 200 thousand men to 3.6 million – found the Army short of nearly everything. So far as General John J. "Black Jack" Pershing was concerned, however, few shortages were so critical as the lack of qualified officers to fill staff positions in his American Expeditionary Force (AEF). Graduates of the General Service and Staff School at Leavenworth and Army War College (AWC) at Washington were highly valued, but there were not nearly enough of them. Nor, in any case, were they trained in a tactical and operational doctrine that was at all adequate for the circumstances the Army found itself fighting in.

Borrowing from the British and (especially) French experience, staff structures were re-shaped (including establishment of the familiar G-1, G-2, etc., system) to meet the demands of combat of a scale and intensity without precedent in then-recent American experience. Instruction in staff doctrine was the focus of an intensive twelve-week course with the impressive title of General Staff College set up at Langres, France to produce staff officers. Its 537 graduates helped, but there were not enough of them soon enough to avert many costly problems. Parallel problems bedeviled the mobilization effort at home. After the war the Army's leaders freely expressed their service's great and well-justified pride in its accomplishments, but in private they reflected as well on the cost of the lessons it had learned. The Army would not find itself so ill-prepared again, they resolved, so far as it was in their power to prevent.

The Navy's lessons had not been so painful as the Army's, but the service had plenty to think about in the wake of the war. It had seen its own share of chaotic mobilization effort and its command arrangements had proven at least as unsatisfactory as those of the Army, bringing on a bitter and public post-war row. While it had done little fighting, it had been close enough to Britain's Royal Navy – even sending a battle squadron to reinforce the Grand Fleet – to gain considerably from Allied experience. Neither Army nor Navy was prepared to ac-

knowledge any need for integrated joint command to meet the demands of modern war, but the need for closer coordination and cooperation was recognized.

Japan's involvement in World War I was very limited. The Imperial Japanese Army (IJA)[31] resisted sending troops to fight alongside the nation's allies, limiting itself to the dispatch of observers to Europe. Its sister service, the IJN, was more active, sending a destroyer squadron to the Mediterranean for antisubmarine duties. But in fact the IJN continued to show very little interest in antisubmarine warfare (ASW) and the officers who had been involved in ASW operations with the British exerted no particular influence. Like the USN, the IJN regarded the great battleship action between British and Germans at the Battle of Jutland (31 May – 1 Jun 1916) as a prototype for the future.

For the Japanese – and especially the IJA – the principal point of reference for doctrine and PME was its own Russo-Japanese War of 1904–05 rather than the European conflict which had followed a decade later. In terms of the modes and intensity of tactical combat, the two conflicts were not too dissimilar. In 16 months of combat Japan lost more men killed in action than America did in any 20th century conflict outside of World War II – more than 60,000 battle deaths out of a population of 47 million. Although dwarfed by European death rolls in World War I, this toll – and the grinding war of muddy sieges and sanguinary assaults that brought it –made a strong impression in Japan.

Doctrinal orientations: the armies

Military leaders in both countries interpreted the "lessons" of the conflicts in terms of their own views of war. Table 1, below, summarizes the lessons as seen by the two armies.

	U.S. Army	Japanese Army
Arm of decision	Mass maneuver infantry backed by strong combined-arms team	All-elite maneuver light infantry

[31] Although the Japanese Army did not become "Imperial" until about 1930, I will follow widespread practice and refer to it as the IJA throughout.

	U.S. Army	Japanese Army
Tactical essentials	Rifleman marksmanship and firepower Strong artillery, plus limited organic light artillery Organic armor for assault	Self-sacrificing determination and offensive spirit (*seishin*) Ultimate troop hardening Intensive tactical training for day-night offensive; emphasis on night and cover to negate enemy firepower Vigorous and patrolling; probe for enemy flanks and gaps Small-unit leadership initiative in accordance with doctrine Close artillery support, including organic light artillery Armor support as needed
Operational essentials	Clear and uniform doctrine at all levels Operational maneuver with mass forces and logistics Emphasis on principle of mass in both space and time Operations overseas and in remote areas Operational intelligence, with emphasis on COMINT	Clear and uniform doctrine at all levels Light, swift, decisive operations, with minimal forces and logistics Strong emphasis on convergent operations and economy of force Prompt, decisive victory Coordinated Army-Navy landing operations
Force bases	Standing volunteer regular forces as cadre for wartime expansion by 10× or more Regular and reserve forces heavy in officers for mobilization Expansion via reserve mobilization plus wartime volunteers and/or draftees Motivation – national patriotism and duty, with legal sanctions in extreme cases Standardized "all-purpose" combined-arms formations Industrial mobilization to expand/sustain matériel	Two-year conscript forces with regular officer and NCO core in peacetime Mobilize and fill out reserve units as necessary to meet needs Raise and train new formations when necessary Units formed on territorial basis Motivation structure combining religious national patriotism, traditional authority structures, local ties, and severe informal sanctions Little TO&E standardization; force packages tailored for task
Operational planning concept	Multi-echelon planning led and coordinated by ops sections Opportunity for feedback from executing echelons Planned margins and fallbacks for uncertainties	Top-echelon planning under *very close direction of ops section* Plan allows executing echelons flexibility in means, but *must* adhere to plan Strongly success oriented – no margins or fallbacks
Issues	*Bombardment aviation as arm of decision?*	

	U.S. Army	Japanese Army
Areas of *relative* neglect	*Strategy and strategic objective*	*Operational level of war*
	Control of air as crucial factor	*Strategy and strategic objective*
	Tropical-region operations	*Control of air as crucial factor*
	Armor tactics and operations	*Tropical-region operations*
	Night combat	*Armor tactics and operations*
	Command relationships in joint operations	*Logistics*
		Intelligence

Table 1. Doctrinal orientations of the two armies.

While these principles were not all enunciated explicitly and did not all emerge at once, they formed the main substance of PME throughout the period between the wars in the respective armies. Although both armies emphasized maneuver infantry, their approaches diverged and contrasted sharply in most respects across the board.

Naval doctrines and PME programs

For the navies it is difficult to encompass doctrinal views quite so clearly and succinctly. Like all navies since the middle of the 19th century onward they were very conscious of an important and even dominant role of technology and technological change as an influence on naval operations. In neither navy was there a uniform and unchanging consensus regarding the nature and significance of changes in technological factors. In the armies, officers who advocated divergent views generally were isolated and marginal. But some of the USN's highest-ranking and most prestigious leaders vigorously questioned prevailing views from the early 1920s onward. In the IJN the internal debate emerged somewhat later and less publicly but was still quite vigorous.

In both navies the mainstream view emphasized the battle line as the force of decision. It was universally recognized, however, that the battleship had been under threat from torpedo craft for decades. In addition to technical measures to harden battleships against torpedo damage (particularly in the USN) both navies had developed a multilayered defense concept against surface and, more recently, subsurface torpedo craft. The IJN, however, counted on overwhelming the USN's torpedo defenses in order to attrite the enemy's battle line before the climactic battleship duel. This was to be accomplished by four main means:99

- Large, long-range submarines would intercept the U.S. fleet as it sortied and make repeated attacks en route to the Western Pacific, using high surfaced speed to sprint ahead after each attack.
- Long-ranged land-based torpedo bombers would attack en masse as the enemy came in range of their island bases.
- Heavy torpedo flotillas would deliver a massive attack at night prior to the main engagement, relying on very intensive training in night operations.
- As the main fleets closed, flotilla forces with long-range torpedoes would attack in concert with carrier-based torpedo bombers.

The USN had a very different view. It believed that defensive measures could restrict torpedo attacks to circumstances in which hit rates would be quite low. Night engagements, in particular, were to be avoided altogether. The Americans joined their Japanese counterparts in emphasizing long-range daylight gunnery, but differed in placing exclusive reliance in it.[32] U.S. naval officers were unaware of the advanced technical capabilities of Japanese torpedoes and unreceptive to intelligence suggesting it, but it is questionable whether such knowledge would have caused them to alter their doctrinal views.[33]

Just as was the case with land forces, those naval officers who became aviators early developed enthusiasm for aviation's military potential that far outstripped the vision of their surface colleagues as well as the immediately foreseeable technical possibilities. Again like their army colleagues, however, the majority of surface naval officers quickly grasped the possibilities offered by aircraft for reconnaissance and observation. In particular it was evident that adjustment of fires on the basis of airborne spotting could increase the effectiveness of the long-range gun action favored by existing doctrine.

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[32] This was in part because the USN had solved certain technological problems in gun fire control which they believed (correctly, as it turned out) the Japanese and others had not. The value of these innovations was, however, overestimated.

[33] Trent Hone, "The Evolution of Fleet Tactical Doctrine in the U.S. Navy, 1922-1941," *Journal of Military History*, 67, No. 4 (Oct 2003): 1107-48.

In the USN, a group of quite senior officers developed considerable enthusiasm for naval aviation by the late 1920s. Corresponding developments in the IJN took somewhat longer to materialize and did not spread quite so widely, but in both services officers who saw air forces as prominent among the decisive factors in naval warfare held many key positions by the outbreak of war in 1941. The aircraft carrier was the principal object of their enthusiasm, but not the only one. The IJN placed great stress on the role of long-ranged land-based antiship strike aircraft, intending to base them on Central Pacific islands as a primary element of defense against American thrusts to the westward. The USN was denied such options not only by geography but by political factors stemming from bureaucratic clashes with Army aviators.[34] Up through the later 1930s the leaders of U.S. naval aviation saw great promise in long-ranged rigid airships for wide-area surveillance as well as flying boats for both surveillance and antiship attack. By war's outbreak, however, the consensus was that airships no longer held any material promise and that flying boats were valuable only for surveillance, a role for which the IJN also employed them – albeit on a far smaller scale.

A final and pivotal area of uncertainty lay in the specifics of weapons effectiveness. By the late 1930s, both navies had concluded that horizontal free-fall bombing was relatively unattractive for antiship attack due to low hit rates. Aviators anticipated high hit rates from both dive bombers and aerial torpedoes, with low losses to delivery aircraft. Many surface officers, however, believed that intense and accurate antiaircraft fire would prevent effective attacks.

Both navies saw submarines as largely ancillary to fleet action. The USN believed that submarines would be quite vulnerable both to air and surface ASW forces and inculcated a cautious tactical doctrine to avoid high losses.

A Pacific clash between Japan and the United States had been widely foreseen and explicitly forecast since America's acquisition of the Philippines and Japan's victory over Imperial Russia at the beginning of the 20th century. [100] Both navies and both armies acknowledged a Pacific war as a leading threat scenario. For the IJA, however, Japan's des-

[34] Notably, of course, the divisive and inflammatory Brigadier General William "Billy" Mitchell.

tiny lay on the Asian Continent; America was only a distracting nuisance. So far as it was concerned, the United States was the IJN's problem, and it relied on the IJN to take care of it (aside from the acknowledged need for army troops to conquer the Philippines in order to deny it to the U.S. fleet). That was, after all, why the IJA put up with the Navy's expense and airs.

The U.S. Army garrisoned the Philippines with several thousand American troops (plus several thousand more Filipinos enlisted as Philippine Scouts) both for colonial security and as a symbol of American sovereignty. [101] This was a source of strategic irritation and concern inasmuch as it was apparent that the garrison was not nearly strong enough to stand for long against a determined Japanese attack. The nearest American base was in Hawai'i, 4,000 miles away, and the Japanese occupied a great many Central Pacific islands between it and the Philippines. Generations of planners agonized over how the Philippines garrison might hold out until relief could be pushed through, with most coming to the conclusion that there was no real solution to the problem. [102] [103] [104] [105] As there was political support neither for strengthening the garrison nor withdrawing it, the Army hoped for the best and turned its attention to places other than the Pacific.

The USN, in the meantime, continued to probe for a way to get across the Pacific soon enough to relieve the garrison and ensure continued access to Philippine bases. A Pacific war was overwhelmingly the dominant focus for scenarios studied by students at the Naval War College (NWC) in Newport, Rhode Island. [106] [107] And so it was also for the scenarios studied by Japanese naval officers at the Navy Staff College. Making intensive use of war games, both came to strikingly parallel overall concepts. The USN would advance across the Central Pacific to intervene against Japan, the IJN would seek to block it, and the culmination would come in a great clash of battleships, somewhere in the Western Pacific. Conscious of their inferiority in numbers if not quality of ships, Japanese officers worried about being overwhelmed. At the same time American navy men were concerned that the toll exacted by a long transit through enemy-dominated waters would leave them at a disadvantage in the final exchange. Both spent endless hours seeking ways to gain advantage.

In short, the navies saw a prospective Pacific war as a duel, while the armies envisioned themselves as seconds.

Doctrinal orientations: the navies

We can summarize the navy views along the following lines:

	U.S. Navy	**Japanese Navy**
Arm of decision	The battle line, supported and screened by strong light surface forces and carrier- and sea-based air forces	The battle line, supported by a multi-layered defense to exact preliminary attrition
Tactical essentials	Emphasis on striking in mass, particularly in air	Self-sacrificing determination and offensive spirit (*seishin*)
	Aggressive and comprehensive air and surface search to locate enemy forces first	Heavy reliance on individual skill and qualitatively superior matériel
	First strike against enemy carriers	First strike against enemy carriers
	Long-range surface daylight gunnery	Long-range surface daylight gunnery
	Torpedo flotillas as a credible threat	Torpedo flotillas as a major striking force
	Avoidance of night action	Deliberate employment of night action
Operational essentials	Clear and uniform doctrine at all levels	Clear and uniform doctrine at all levels
	Emphasis on concentration, principle of the objective, and mass	Strong emphasis on convergent operations and economy of force
	Operational intelligence, with emphasis on COMINT	Coordinated Army-Navy landing operations
Operational planning concept	Multi-echelon planning	Top-echelon planning under *very close direction of ops section*
	Opportunity for feedback from executing echelons	Plan allows executing echelons flexibility in means, but *must* adhere to plan
	Planned margins and fallbacks for uncertainties	Strongly success oriented
Issues	*Carrier-based aviation as arm of decision?*	*Carrier-based aviation as arm of decision?*
Areas of *relative* neglect	*Night combat*	*Logistics*
	Command relationships in joint operations	*Submarine tactics*
	Submarine tactics	*Antiaircraft defense*
	Antiaircraft defense	*Intelligence*
	Shore bombardment in support of amphibious assaults	
	Ship-to-shore movement in amphibious assault	

Table 2. Doctrinal orientations of the two navies.

Marines and air forces

Both navies had their own ground forces. The IJN had no marine corps in the American sense but did have Special Naval Landing Forces (SNLF), which were navy-manned. [108] They were primarily a light infantry force almost entirely lacking in supporting arms. Their mission was to seize and defend advanced bases as well as acting as reconnaissance elements in landing operations conducted by the army. While they generally employed army weapons, equipment, and tactical doctrines, they strove for elite status and had a reputation for ferocity and tenacity in fighting. There was no separate PME program for SNLF officers.

The U.S. Marine Corps (USMC) was not yet officially recognized as a fully separate and equal armed service but had always been separately organized and not a part of the navy. It had filled a variety of roles throughout its history, but by the 1930s had come to see its principal mission as seizure and defense of the island bases the USN would need to prosecute a war across the Pacific. Between the world wars it devoted a great deal of attention to the specialized (and largely unprecedented) techniques of amphibious assault against fortified islands and beaches. The USMC incorporated its own supporting arms, to a limited degree, including an air force.

The U.S. Army Air Corps (USAAC) was at this time a somewhat distant and reluctant branch of the army. In common with military and naval aviators elsewhere, its officers had tense and sometimes conflictual relations with those who lacked their enthusiasm for the air weapon. By the 1930s the USAAC's senior leadership had strongly embraced a doctrine which identified high-altitude daylight precision bombing of the critical nodes of an enemy's industrial infrastructure network as the unique key to immediate and decisive victory by knocking out his capacity to wage industrial war. Because such strategic bombing was held to be swift and final in its effects there was little need for other branches of aviation, let alone ground or sea forces. USAAC leaders endeavored to walk a line between promotion of this bright vision of quick, certain, and relatively inexpensive victory and maintaining cooperative relations with yet-unconvinced comrades in arms.

PME programs and institutions

Army PME

In both armies, those who completed commissioning programs generally went on to a specialized branch-oriented school within their first few years of commissioned service. The pattern of these schools varied but in the main they taught the fundamentals of branch-related tactics and administration to qualify officers for company/battery/troop-level command. In most cases there was an additional tier of branch schools at a higher level intended to qualify officers for command at the level of the battalion/squadron and regimental levels. In the U.S. Army, officers normally completed this second-tier branch school before entering combined-arms command and staff PME schools or other PME at equivalent level. In the Japanese Army, however, those selected for staff college attendance normally did not take advanced branch courses.

Table 3, below, offers capsule descriptions and analyses of the main American and Japanese army institutions of combined-arms staff and command PME.

Service	U.S. Army		IJA
Institution	Command & General Staff School C&GSS	Army War College AWC	Army Command College ACC[35]
Students			
Typical age	35-40	40-50	25-35
Typical grade	captain/major	colonel/lieut. colonel	captain/major
Selection process	Branch chief recommended	Branch chief recommended	Command (regt. & divn.) selection + written exam + multi-part oral exams.

[35] The Japanese term is probably best translated as "Army War College," but I use "Army Command College" here (my own coinage) to avoid confusion with the U.S. institution. "Army Staff College" is often seen, but confuses the real focus of the institution.

Service	U.S. Army		IJA
Institution	Command & General Staff School C&GSS	Army War College AWC	Army Command College ACC[35]
Selectivity	Broad – all officers thought able to master general staff duties	Intended to be quite selective, but somewhat uneven in practice.	Intense competition for slots. Average of less than 6% selection opportunity.
Background	Assumed collegiate level, regardless of actual degree.	C&GSS grads with high standings – but some exceptions.	All were grads of IJA Military Academy – subcollegiate.
Other service attendance	USMC	USMC, USN	None
Career influence	Important	Important	Crucial
Course			
Duration (yrs)	Varied: 1 or 2	1	3
Main themes	Qualification as general staff officers for war, and preparation for wartime command of combined-arms formations	Qualification for War Dept. General Staff, and preparation for high command in war.	Preparation for division and corps command in war; qualification as general staff officers
Subjects of study			
Main subjects	Combined-arms tactics & operations; General staff functions – all aspects at operational level.	High command general staff functions and issues.	Spiritual development, higher tactics.
Secondary subjects		Joint operations, national policy, mobilization planning.	Military theory and history, general collegiate.
Little or no coverage	Technology & innovation; air operations; joint operations.	Technology & innovation; air operations.	*Operational level of war*; *logistics*[36]; technology & innovation; air operations; joint operations.
Method	Applicatory	Modified applicatory	Didactic

[36] However, no more than ten students per class received limited supplementary instruction in operational logistics and other operational-level subjects, using closely-held materials not available to others. See Drea, "U.S. Army and Imperial Japanese Army Doctrine During World War II," p. 71.

Service	U.S. Army		IJA
Institution	Command & General Staff School C&GSS	Army War College AWC	Army Command College ACC[35]
Instruction	Lectures and readings to impart substance and doctrine, individual exercises to develop understanding, group exercises to build mastery in realistic staff settings.		Lectures and readings, class discussions
Curriculum structure	Modules dealing with individual aspects of staff functions, integrated in final phase of course	Generally included a large-scale wargame and campaign planning exercise as well as smaller and more limited group projects	[Evidence lacking]
Examination and ranking	Solve tactical and/ or operational problems in form of completed staff work; graded but no public class ranking	No formal examinations or rankings	Formal examinations (evidence lacking regarding specific nature, but said to demand recall of material) and class rankings
Qualities emphasized and rewarded	Precision Clarity Efficiency Collaboration Doctrinal mastery Diligence	Broad knowledge and understanding Clarity of thought and expression Leadership Diligence	Bold decisiveness Emphatic and forceful expression of authority Unwavering determination Pugnacity

Table 3. Army higher PME institutions.

All of these institutions were rigorous, at least for those motivated to do well. In the U.S. Army program, the C&GSS (the direct ancestor of today's C&GSC) functioned somewhat like a civilian professional school, along the lines of a law school or graduate business school. That is to say that it concentrated on inculcating a given body of knowledge and the methods of its application rather than fostering intellectual development and inquiry, in the spirit of an academic graduate school. The USAWC, attended generally by the higher-ranking C&GSS graduates, was somewhat more like an academic program. Both, of course, served to acculturate the student to the command and general staff culture of the Army, whose elements were outlined earlier in this paper. The graduates of these programs constituted an elite within the U.S. Army, but not a particularly narrow or self-conscious one. Their promotion prospects were better and their spectrum of potential assignments were

broader than those of other army officers, but there was considerable overlap in these respects between graduates and non-graduates. In the circumstances of the pre-war army, even top graduates were likely to finish their careers in field grades. To a large extent, their elite status was established and known before their assignment to the courses, particularly the AWC.

The evidence leaves little room for doubt about the practical importance of higher PME in the U.S. Army. Of the 645 graduates of the AWC between 1934 and 1940, 65% were to serve as general officers. [109] Of the 34 army officers who commanded corps in combat in World War II, 33 had graduated from the C&GSS, 14 had returned or remained to teach there, and 29 graduated from the AWC. [110] In a study of a sample of 25 from the men who commanded divisions in combat, all had graduated from the C&GSS and 19 were AWC graduates. [111] While many general staff positions had to be filled by non-graduates, chiefs of staffs and operations officers, along with some others, generally were C&GSS graduates. Clearly, the Army believed that staff-oriented PME was very important for its higher commanders and staff officers.

So far as that went, so did the Japanese Army. Its higher staff positions were exclusively reserved for ACC graduates, and so were its command positions at division level and above.[37] It could manage this both because it did not have to build an army large enough to cover two halves of the globe and also because its staffs were far smaller than those of its foe.

Unlike their American counterparts, Japanese who wore the insignia of command college graduation formed a narrow and sharply-defined elite, each with a good chance at high rank even in peacetime. Moreover, induction into this elite, through ACC selection came very early and led to a career path very different from that of the regimental officers. This was so marked, indeed, that a member of this elite might regard command of a division in the field not as a professional fulfillment

[37] There were a few exceptions late in the war, when the IJA reached its maximum expansion.

but as a diversion from the path of power and perhaps a signal of official disfavor! [112]

Moreover, while American PME sought – not always successfully, to be sure – to imbue students with an ethos of the staff working as a team in service to the commander and command, the Japanese system seemed all but calculated to produce men who, not yet 35 in most cases, were ill-suited to staff work as the U.S. Army saw things. It was an IJA truism that the ACC was much more aligned toward producing division and army commanders – and commanders in an especially proud and imperious mold.

An additional PME institution had been established by the U.S. Army following World War I, reflecting one of the major lessons of the war. This was the Army Industrial College (AIC), located in Washington, D. C. The AIC was intended to prepare Army officers to plan and execute massive procurement programs upon mobilization for war – something which they had no more opportunity to practice in peace than they did large warlike operations. USN and USMC officers also attended the AIC in some number.

The partial estrangement between the USAAC and its parent service showed in PME. Treatment of air operations at the C&GSS and AWC was very limited and incomplete. Air Corps officers at first felt distinctly out of place at these institutions and perceived little professional benefit. One reason is simply that these officers generally did not expect or aspire to gain command or top staff assignments with large combined-arms formations, as most other Army officers did. For many AAC officers, the service's own branch school, the Air Corps Tactical School (ACTS) at Maxwell Field, Alabama, provided a more desirable PME opportunity. Overall it appears that the senior Air Corps officers in World War II may have been somewhat less likely to have attended the senior PME institutions than their non-flying Army contemporaries.

Navy PME

In the navies, early post-commissioning PME tended to be technical in nature. Both had established courses to train officers as aviators, submariners, gunnery officers, and torpedo officers. More traditionally

seamanlike skills generally were learned aboard ship. In the U.S. Navy, after a few years of service unrestricted line officers might go to an engineering school for graduate study of such subjects as ordnance, electrical, or aeronautical engineering, while not becoming specialists. In Japan, where candidates for line commissions did not receive undergraduate engineering education, such matters were left to specialists and line officers generally had quite limited knowledge of the engineering principles of naval equipment.

The U.S. Naval War College (NWC) and the Japanese Naval Staff College (NSC)[38] were the predominant institutions of broad military-oriented PME for their respective services. Each offered both upper and lower courses, but the lower courses at the JNSC were basic technical courses for junior officers. Table 4, below, summarizes the principal naval PME courses:

Service	U.S. Navy		IJN
Institution	Naval War College NWC		Navy Staff College NSC
Course	Junior	Senior	"A" or Main
Students			
Typical age	35-40	40-50	29-35
Typical grade	lieutenant/ lieut. commander	commander/ rear admiral	lieutenant/ lieut. commander
Selection process	Detailed by BuNav[39]		Special selection board
Selectivity	Limited and erratic selectivity		Highly selective
Background	Naval academy grads		All were grads of IJA Naval Academy
Other service attendance	?	USMC, Army	None
Career influence	Modest	Important	Very important
Course			

[38] Its title might better be translated as *Higher Naval College*, but Naval Staff College (or Naval War College) is more commonly seen.

[39] The Bureau of Navigation (BuNav) had the functions of a personnel bureau.

Service	U.S. Navy		IJN
Institution	Naval War College NWC		Navy Staff College NSC
Course	Junior	Senior	"A" or Main
Duration (yrs)	1	1	2
Main themes	Command and staff assignments in fleet; preparation for Senior Course.	Higher command and staff assignments in fleet.	Qualification for IJN General Staff, major sea command, and flag rank.
Subjects of study			
Main subjects	Naval tactical warfare doctrine.	Naval operational warfare doctrine.	Higher naval tactical doctrine, spiritual development.
Secondary subjects		Joint operations, naval strategy, national policy, international law, afloat logistics.	Land war, Army-Navy cooperation, technology, military & naval history, international law.
Little or no coverage	Logistics, innovation.	Shore support functions, innovation.	Shore support, logistics, operational level of war, innovation.

Table 4. Navy higher PME institutions.

A table section on methods has not been included because the information is limited, particularly on the Japanese side. It is certainly clear that wargames played a central role in these programs.

The U.S. Naval War College also offered an Advanced Course for senior officers, somewhat along the lines of today's Senior Study Group. The first Advanced Course did not meet until 1934, by which time fleet expansion was putting pressure on officer assignments. Thus the total output of the course up to the beginning of World War II mobilization was quite small.

The NWC Junior Course was something of an oddity. The College had originally envisioned it as a stepping stone to the Senior Course, somewhat in the pattern of the C&GSS–AWC sequence, but Bureau of Navigation detailing practices never consistently reflected this. Moreover, there was no very clear distinction between the two courses. Students of both attended many of the same lectures by outside experts and participated in the same war games.

NWC Senior Course attendance neither consistently reflected nor bestowed elite status. Some of those detailed to attend the course were in fact at the end of their careers and retired soon after completion. Graduation opened no particular doors. In practice, however, all the men who served in senior line posts in the Navy were NWC graduates.

Selection for the Japanese NSC was more consistently rigorous than that for the USNWC and came earlier in an officer's career. However, it was neither so rigorous nor so early as selection for the Japanese Army's equivalent, and the elite of NSC graduates was not as narrow or exclusive as that of ACC graduates. It was very rare for an officer to gain assignment to the IJN General Staff, its central governing institution, without having graduated from the NSC, and unusual for non-graduates to be assigned to the Navy Ministry. Non-graduates could sometimes gain flag rank, however, and some rose to high levels.

It will be noted that each of the American war colleges had students of other services. In fact, several of the men who rose to high command in World War II attended the war college of the other service in addition to that of their own.[40] Such cross attendance was unknown in Japan.

Also apparent is that Marines attended all of the principal American PME institutions. In addition, the USMC had its own equivalent of branch schools, including an officer Basic Course and Field Officers Course. Finally, the service regularly sent students to the premiere French PME institution, *L'Ecole Supérieure de Guerre*. Marine Corps in-house PME institutions played a prominent role in developing doctrine for amphibious assault. [113]

PME and performance

If we were to look strictly at the staff and command PME in the various services and try to envision the effect on performance in war we would certainly expect the Americans to show better logistical and intelligence efforts and to better articulate army and navy efforts. These represent straightforward projections of curricular differences, and as we have

[40] Fleet Admiral William F. Halsey and General Walter Krueger are two prominent examples.

seen earlier, they were indeed manifested in ways that played an important role in the Pacific War.

A somewhat closer examination of the details of the courses might have prompted suspicion that the IJN would be readier to engage successfully in night surface engagements than would the USN, a suspicion that would have been deepened by consideration of the exercise and fleet training programs of the two.[41]

All this is to say that a first-order or linear sort of net assessment focusing on higher-level PME would have been valuable in foretelling and understanding some of the important operational-level differences between the forces.

Other differences, however, would not emerge from net assessment on this level. That would require a deeper consideration of PME in relationship to other factors.

Behind the PME differences

PME programs are both expressions and shapers of military culture generally. And military culture is in turn both an expression and shaper of the broader culture in which it is rooted.

Of course the culture of the United States is in no sense "more normal" or "given" than that of Japan. Only because it is more familiar to most readers of this report will I focus primarily on Japanese cultural traits. In order to do effective net assessment, however, it is necessary always to look objectively at both sides.

The influence of social structure

A distinctive cultural feature of modern societies throughout the Western or European-influenced world is their mass social structure, in which most social bonds are horizontal and voluntary (rather than vertical and ascriptive). This seems closely related both to more or less

[41] Of course understanding of the grave matériel defects of American torpedoes would not have emerged from such an training-oriented analysis.

democratic political structures (because it fosters development of political parties based on shared conviction and interest rather than ascriptive status) and modern economic structures (because it allows the bonds within an economic structure to be relatively readily made, reshaped, or dissolved in the quest for economic efficiency).

Modernization

The process by which societies take on more mass characteristics has been called "westernization," "globalization," "Americanization," or simply "modernization." It is a subject of intense emotionalism which many people have difficulty addressing at all objectively.

In this sense Japan and the United States were both "modernizing" societies in the 1930s – both were more massified in social structure than they had previously been, and less than fully massified. (Whether it is desirable or even possible for a society ever to be truly fully massified is a question lying far beyond the scope of this discussion; here I merely take it as an abstract pole to serve as point of reference.)

It is clear, however, that generally the United States was much farther toward being a truly mass society than was Japan. The phenomena referred to here under the label of mass society were after all first remarked by the pioneer political scientist Alexis de Tocqueville (1805–1859) in connection with his study of the social and political institutions of the United States. At the time Tocqueville wrote, Japan was a post-feudal – early modern society just beginning to grapple with the challenges of western material superiority.

After much turmoil and soul-searching in Japan, political power passed in the late 1860s to a newly-arisen "Meiji" elite (its title taken from the reign name of the emperor who was its titular head) committed to modernization of the political and economic structure of Japan and to making their nation a full member of the European state system.

The attitude of the Meiji elite toward social massification was deeply ambivalent. They clearly recognized it as a correlate of modernization generally and perceived that to some extent it was necessary for Japan to accept massification in order to enjoy modernization. At the same time, they were concerned both that rapid social change might undermine the basis of their political dominance and that they and other

Japanese might find its emotional costs too heavy a burden.[42] They thus were impelled to proceed cautiously, yet having come to power as the vanguard of Japanese "strength" through modernization they were both politically and emotionally committed to proceed.

Others, seeking both what they perceived to be a better life for Japanese and an increased share of political power for themselves, wished to go faster and farther. As the oligarchs of the ruling elite aged and finally passed from the scene the new men made use of the political institutions that had been established to gradually transform political life. By the time that the last of the oligarchs died in the early 1920s, Japan had become a reasonably modern constitutional democracy, not so different in over all political complexion from, say, the France of that day.[43] It was a remarkable development and one which, not unnaturally, struck many people as highly auspicious.

The reaction against modernization

There were, however, strong countervailing forces. The most widely noted are the Japanese armed forces, and particularly the army. In the mid 1920s military influence in Japanese political life was relatively low, no greater than in some European democracies of the time. By 1941, however, the armed services leadership had acquired effective control over the political process.

Yet this was something other than a military putsch, for there were underlying trends of social reaction that helped underlie and support it. It must be borne in mind that by the 1930s the movement toward social massification was no more than six decades old. Thus most Japanese adults were the grandchildren or even children of people who had grown up within the older social order. As is true everywhere and always when people fear that the affairs of their society were not going well, they turned to a re-imagined past, a supposedly simpler and more virtuous era. In the circumstances of 1930s Japan that past was inevitably

[42] Here of course I am paraphrasing and interpreting the actual language they employed, which focused largely on issues of "stability" and propriety.

[43] One of the men anointed by the original oligarchs to assume their role, Kimmochi Saionji (1849–1940), lived on and retained his faculties until 1940. But while he retained a good deal of respect and influence, his hold was far weaker than that of the oligarchs had been.

pre-modern, an era in which Japan had (in imagination) been ruled by wise, virtuous, benevolent, courageous military men. Troubled military men strove to reclaim these characteristics and the leadership that went with them, and a troubled public bought their claims.

This was no sudden development. It is perhaps not be regarded as surprising that the members of the original Meiji elite who played the greatest part in developing its military institutions were precisely those least reconciled to the social and political aspects of modernization. Their leader was Aritomo Yamagata (1838–1922), a self-conscious exemplar and promoter of ancient martial virtue. Yamagata was equally a masterful politician and a charismatic leader – and he was especially durable, remaining active into the 1920s. It was he who had set the tone, particularly for the army, from the very beginning. Japan's successes in major wars with China and Russia under his guidance had helped convince him and most other Japanese of the rightness of his path.

This was particularly so of Japan's 1905 victory over Russia, a European power (more or less) with resources that far exceeded Japan's. It was a victory of Japanese spiritual strength over Western material mass as many army men saw it, a harbinger of what could be accomplished in the future. Weaknesses in support and intelligence had not been a major obstacle, as Russia had been even weaker in these areas. The war had largely been conducted by siege, but that was not how it was remembered. The legends of the war featured dauntless "human bullets" and cold steel as its decisive elements. Japanese historiography of the time did little to correct these rosy memories.

Ties that bind

A less obvious element of social reaction was the clinging to old forms of social linkage. Like pre-modern societies everywhere, Japan before the 1870s had been a land of more localized and binding ties than those we are used to. These were not so pervasively or broadly familial as in China. The Japanese felt very strong ties to his household (*ie*) but the household was for the most part conceived in terms of the nuclear family unit.

As everyone knows, the social order of traditional Japan was dominated at its top by *samurai* or *bushi*,[44] members of a hereditary class (or really a number of minutely divided classes) of warriors. In the mid 1800s these amounted to some 6% to 7% of the whole population, but they figured scarcely at all in the lives of the great majority of Japanese. During the Tokugawa period, from about 1650 to 1868, administration of the country was divided up among several hundred domains (*han*, as they are usually called today) of widely varying size. Each domain was assigned to a nobleman, a *daimyo*, who was served by a household band of samurai, functioning as the daimyo's administrative bureaucracy. For purposes of control and security against insurrection the samurai were obliged to reside directly in the daimyo household[45], while the daimyo himself was obliged to dance attendance at the Tokugawa court in alternate years. The mass of Japanese living on the land only occasionally even saw a samurai and many city-dwellers had little more contact with them. Very few Japanese ever spoke with samurai, save in ritualized ways. While a random sample of, say, 20 Japanese was statistically likely to include one or two samurai, actual Japanese social groups tended strongly either to be all samurai or all non-samurai in composition.

Factions and clans

Thus the social hierarchy as lived by the great majority of pre-modern Japanese, the non-samurai commoners, was composed entirely of other commoners. In principle there were divisions within the commoner class, but despite official efforts the distinctions among them eroded a great deal over time in response to economic pressures. Links within social groups took on a distinctive form which has been called the Λ relationship – a leader at the apex of the Λ and his followers arrayed at the termini of its legs. The leader in general will himself lie at the terminus of yet another Λ, and the followers may serve as leaders in still others. Note that the relationship is expressed as Λ, not Δ. This is to say

[44] The historical differences between the two are unimportant for our purposes and we can take the terms as synonymous, as in practice most Japanese do.

[45] A few domains had limited exceptions to this rule.

that the classic Japanese social hierarchy is strictly a tree structure with quite weak horizontal links joining those at any given level of it.[46]

The relationships within these hierarchies are personal in nature, not functional. If a leader were to die or become incapacitated the group would usually not be able to re-form around a successor. The various subordinate branches may well reattach themselves to other leaders more or less intact, but their relationship with one another will almost surely be quite different. Over time a social hierarchy will, if it is to survive, repeatedly re-form. But most of the individuals within it will continue to maintain the same leader-follower links through these transformations. If, through the successes of his branch and the favor of his leader, a branch leader is able to advance over time, he will pull his branch along with him.

This, needless to say, is quite different from the bureaucratic hierarchies so familiar to most of us. Some of us may have master-disciple or leader-follower relationships that are important to us in personal or career terms, but it is not common for these to supersede or transcend our organizational links and responsibilities. In general, we can change organizational positions or even move from one organization to another without undue difficulty. It was open to individual Japanese to opt-out of their groups, but the personal, social, and political costs were far too high for most to bear, and the prospects for being accepted into another group were remote.

European forms, Japanese content

Wishing to gain military equality with the Europeans, the Japanese services copied their forms of organization. But they had to be made to fit with Japanese forms of social organization. Officers assumed the role of leader of the social group comprising members of their command, a role symbolized by the practice of calling units after their leaders rather than by their official organizational titles. The enlisted personnel of each regiment were raised from a single locality in so far as possible,

[46] A Japanese group in which horizontal bonds predominate over hierarchical one will not be called a *batsu*, however intimte. Commonly, such groups are designated by names with the combining form *-gumi*.

and officers remained with their regiments throughout their careers, unless they were taken into the general staff.

Officers naturally and instinctively aligned themselves into social hierarchies behind various leaders. These are generally referred to as factions and historians strive to assign them political content. In practice once one digs below the level of the general slogan it is often difficult to distinguish the political programs of the various factions; their glue was not political substance but social links, and they more resembled clans than factions. (The Japanese term for them, *batsu*, also can mean *clan*.) Some men did stay relatively clear of such factions, but unless one was a faction leader or senior member it was very difficult to gain a place at the top.

(All of this seems strange to us, but not utterly foreign. Japanese are made from the same material as we, but their history has selected for and emphasized different aspects of human potentiality. If we allow ourselves to we can sense the attractions of such a social order and recognize how it could be so compelling for so many people. It is not without its discontents, but neither is our own.)

In this context, some of the reasons for the distinctive Japanese approach to general staff structure and education become clear. If the general staffs were to serve their functions, they had to be cohesive social units, with all that implied. To try to compose service leadership from men with intense but widely variant loyalties invited disaster, as Yamagata and his colleagues saw things. The Army General Staff group would be united under Yamagata (and similarly for the Navy General Staff under its service leaders). It was not to be expected that all of its branches would naturally work harmoniously together, but all would answer to him as the supreme leader, and he would ensure that matters went smoothly.

Naturally, this would work best if members were co-opted into the group early, before they had formed strong loyalties to another. Hence the early age of general staff selection and education.[47] It was inevitable

[47] In Japan, one was effectively selected for the general staff and then indoctrinated into it through the staff college. In the U.S., selection came after staff college education and was based on its successful completion. There were cases in which a Japanese who had been selected was unable due to force of

that a general staff officer would be a man apart, for in Japanese society it could work no other way.

Of course the whole Army was bound into a larger group whose leader was (at least symbolically) the emperor. A host of mechanisms were invoked to impress this upon every soldier, from highest to lowest, and it lent a great deal of cohesion to the Army. A precisely similar and parallel order existed in the Navy. The general staffs, by "right of supreme command," each controlled their service's path to the emperor, a jealously-guarded prerogative that assured dominance within their services and greatly facilitated their rise to dominance within Japanese society generally.

This system proved strong – but rather brittle and inflexible in ways that Yamagata and his colleagues probably failed to foresee and certainly failed to provide against. There could be no real successor to a man like Yamagata, no one with the prestige and authority that came with having led a successful societal revolution and created the army. His passing left no one to definitively resolve splits within the Army General Staff.[48] These might erupt in literally murderous confrontations,[49] or be temporarily papered over, but not truly resolved.

Intense as the rivalries might be, however, the various factions could be relied upon to close ranks completely against outside groups. In particular, the rivalry between army and navy far transcended the internal rivalries within either. In addition to the social factors it was fueled by the extent to which the military had come to dominate the entire Japa-

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circumstance to attend the staff college but was nevertheless accepted into the General Staff Corps.

[48] In principle the emperor had the requisite prestige and authority to do so, or course. The Meiji dispensation had been constructed to insulate him from such conflicts, however, and Hirohito was not disposed to break free of the restraints absent a direct and palpable threat to the imperial regime.

[49] On 12 Aug 1935 LTC Saburo Aizawa stalked into the office of MG Tetsuzan Nagata, leader of another faction, and cut him down with his sword. Initially the leaders of the faction to which Aizawa belonged blocked effective prosecution of the assassin. Only after a coup attempt brought political realignments that were temporarily to put his faction into eclipse were the members of Nagata's able to bring Aizawa to trial and see him executed.

nese government; each service strove to gain a greater share of that power.

Explaining Japanese general staff behaviors

This very brief and highly simplified outline of the complex subject of Japanese military general staff culture suffices to clarify the main features both of PME practices and of the roots of Japanese operational deficiencies. As we have already seen, it makes the very early selection of officers for the general staff easy to understand. The neglect of logistics and other support functions reflects not an arbitrary choice but the clan nature of the general staff. It had been constituted before the importance of these functions for modern war had become apparent to Japanese military leaders. There was no place in it for the support functions or the officers who oversaw such functions, leaving them as perpetual outsiders, without spokesmen in the councils of the mighty. Much the same was true for intelligence specialists. Individual general staff officers could and did recognize the costs of such neglect but lacked the power to change the underlying nature of the institution, at least in time to meet the need.

More generally, this explains many of the ways in which the Japanese seemed slower to take up and foster innovations in response to perceived problems. Where there was an established institutional channel for recognition and exploitation of innovative potential – as there was for tactical doctrine, for instance – response could be rapid and decisive. But channels involving links to "outsiders" could not rapidly be established. Thus it was very difficult for the military services to make effective use of the potential offered by Japan's reservoir of civilian scientific and technical talent, to cite one example.

Conclusion: Predicting potential

Is there some practical utility to be found in these historical insights? Do they tell us more about predicting and understanding the operational potential of possible opponents?

The insights that were available from an analysis of PME curricula are striking and suggestive. They would not have allowed prediction of all aspects of Japanese operational performance, but they would have predicted some very important and potentially exploitable ones. This is particularly significant because obtaining data on foreign PME curricula seems like a fairly attainable intelligence collection target.

Such knowledge only goes so far, however, and arguably not far enough. Would one really have felt confident in predicting Japanese weaknesses in support and intelligence functions on the basis of such information? Would it not have seemed too "irrational?"

Fuller knowledge of Japan's military culture and of its culture generally would have filled in the gaps and supported reasonably confident and valid general judgments about important aspects of operational importance. But such knowledge was not available in 1941, nor for a long time afterward. Could we have done better today?

In many ways we could. For most societies today we not only have western academic specialists who study them but also local people who combine mastery of objective modern techniques of social science investigation with innate knowledge of the local culture as it is lived. In many cases these local social-science scholars even publish in English.

Such studies of the culture at large would need to be supplemented with specific studies of military culture. Development of such capabilities would of course require considerable investment of money and manpower, sustained over a period of years. We have not always had sufficient foresight about potential enemies for such development, but often we have.

Here, of course, we must face possible limits of our own military and political culture, not only in readiness to sustain development of such capabilities over long periods but in willingness to foster and profit from the necessary research activities. There are few clear precedents for this.

Appendix A: Philippines

Philippines background

The islands of Southeast Asia and to the north and east of Australia are all the peaks of submerged mountain ranges. Most have coastal plains of varying widths, but their interior cores are mountainous and rugged. This is true of the Philippines. The only Philippine island with any extensive interior plains is Luzon, the northernmost and largest of the chain. Together with its position relatively close to the Asian mainland, this has made Luzon the most populous and prosperous of the islands, and the center of Philippine government and commerce.

The Philippines in a sense had been created by the Spanish, who conquered its 7,100 or so islands (including about 350 with land areas exceeding one square mile) and their divers populations in the 16th century and constituted them as a colony named for Spain's King Philip II. The economic basis for the colony lay in its role as an entrepôt in which silver mined in the New World was exchanged for silks and other precious goods from China.

In 1898 Commodore George Dewey, commanding the Asiatic Squadron of the U.S. Fleet, enlisted the aid of Philippine nationalist rebels in taking the islands from Spain. The United States decided to keep the islands as part of its peace settlement following the Spanish-American War, again principally for their presumed value as an entrepôt for the China trade and as a naval base for the protection of that trade. This led to a conflict with the nationalists, who tried to establish an independent state. After several years of fighting the United States defeated the independence movement and put down a more diffuse and less politically focused insurgency – only to confront the fact that it had almost absent-mindedly acquired a large and distant colonial possession that it really did not know what it wanted to do with.

Having quelled the native movement for independence, the U.S. set out to build the basis for Philippine independence. By the 1920s the in-

ternal administration had been passed almost entirely to elite Filipinos. The Tydings-McDuffie Act of 1934 had the effect of guaranteeing Philippines independence in 1946, following a decade as a self-governing Commonwealth subject to U.S. control of external affairs and defense. [114]

Planning Philippine defense

In the early years of American control the army had built then-modern fortifications to guard the entrance to Manila Bay. A severely understrength Philippine Division was maintained in Luzon. Most of its troops were Filipinos enlisted in the U.S. Army as Philippine Scouts, and a few Filipinos were trained and commissioned as officers. In addition there was a force of American coast artillerymen to serve the defenses and various supporting troops. After 1935 the Commonwealth government initiated development of a national army, although progress was very slow, particularly in developing leaders at higher levels and providing adequate artillery and heavy weapons.

Defense of the Philippines presented intractable problems. The land area of the islands totals 115,000 square miles. While the islands are mountainous, many sites on their 21,500 miles of coastline are practicable of amphibious assault. The main island of Luzon, with a land area of more than 40,000 square miles, needed something on the order of 100,000 well-equipped and well-supported troops for an adequate defense against determined assault. Had such a force been available it would have exacerbated another intractable problem, that of resupply. The 4,800 nmi direct route from Hawaii to Manila lay squarely through the Japanese-held islands of the Central Pacific. A more circuitous route would still be open to interdiction by Japanese forces. Even if Luzon were held, capture by the Japanese of the all-but undefended southern islands would cut it off entirely from resupply and reinforcement.

War plans called for U.S. naval forces to forge their way across the Pacific in a series of bounds, each involving capture and development of a major island base. Could the Philippines hold out for the period this would require in the face of Japanese opposition? While strong-willed optimists continued to insist that a way must be found, sober calculations were not encouraging. The solutions proposed ranged from

greatly strengthening American posture in the Pacific to withdrawing altogether from the Western Pacific. None gained acceptance and in the end the doubts and uncertainties were essentially papered over. [115]

In 1935, following his service as U.S. Army Chief of Staff, General Douglas MacArthur was retained by the Commonwealth government to aid it in building a defense force capable of defending the nation against the Japanese following independence. With the aid of two outstanding planners seconded by the U.S. Army (one of whom was Major Dwight D. Eisenhower) he put together a plan for an army founded on large-scale annual conscription for 5½ months of training service followed by ten years in reserve, aiming at a force of 200,000 men by 1946, rising thereafter to about 300,000. Then as now, the Philippines was a poor country, with a per-capita gross domestic product value of approximately $2,000 in today's terms. [116] Reflecting this, the emphasis was to be on a mass of trained manpower with light armament, very limited motorization, and improvised logistics. [117]

This plan was open to a number of objections, notwithstanding the satisfaction expressed by both Eisenhower and MacArthur. Its execution was undermined by the complex and largely unacknowledged motivations behind it. [118] At a practical level, the most crippling problem by far was the lack of suitable training and leadership cadres. [119]

It had been envisioned for decades that a Japanese attack against Luzon was likely to begin with landings at Lingayen Gulf on the western coast of Central Luzon, followed by an advance down the broad central plain south to Manila. Local defense planning had long called for the defenders to march from their cantonments around Manila north and west to the rugged, jungle-clad Bataan Peninsula lying on the western side of Manila Bay and establish a redoubt from which to await relief and reinforcement. Unless and until the invaders took the peninsula and the coast defense installations at its tip, as well as those on the curtain of islands to the south, their naval forces could not enter Manila Bay.

Between May 1940 and April 1941 a new commander in the Philippines, Major General George Grunert, directed a recasting of defense plans, resulting in the much-discussed but often misunderstood WPO-

3.[50] Grunert's plan was to fill out his meager U.S. Army forces with companies and battalions of Philippine Army troops. The best forces would defend forward and seek to throw invaders back into the sea at the beaches while the remainder moved supplies to the Bataan Peninsula and prepared its defenses. If unsuccessful in defeating the landings the forward forces would conduct a phased retreat down the central plan and wheel to withdraw into the fastness of the peninsula. At the same time Grunert peppered his distant superiors with pleas for reinforcements for his forces, albeit with little effect. [120]

At his own prompting, MacArthur was recalled to active U.S. service in July, 1941 and given command of all army (including land-based air) forces in the area. Seeing the Philippines as a vital strategic asset and the key to blocking Japanese expansion he expressed absolute determination that the country must and could be defended against attack. [121] Grunert, rendered redundant by MacArthur's appointment, returned to the United States.[51]

The Philippine Army, such as it then was, was called to U.S. federal service beginning in July, although few formations actually went into service prior to September and the last did not report until after war had broken out. The Army's 125,000 men were for the most part very ready to do what they could to defend their land, but what they could do was very limited: the army suffered most of the defects of the Chinese armies that the Japanese had been making short work of for the preceding four years. It was short of everything from artillery to shoes, and regiments might have troops who spoke half a dozen or more mutually unintelligible languages. Few of the men had been trained in anything beyond close-order drill and few officers had any experience in maneuver above the company level. There were no anti-aircraft guns of any description. [122][123] Despite these limitations, MacArthur mobilized

[50] Meaning "War Plan Orange 3," the title invites confusion with the national strategic plans developed and issued by the military department staffs in Washington. WPO-3 was in fact a local Philippines theater plan issued in response to the strategic guidance from Washington. Local theater commanders were given broad latitude in implementing such guidance.

[51] Although past normal retirement age, Grunert was retained on active duty throughout the war in charge of forming and training major bodies of troops. He retired as a lieutenant general.

it in self-contained divisions, rather than parceling out its units among U.S. forces, as his predecessor had intended. All indications seem to be that MacArthur saw the Philippine forces as he wished them to be, not as they actually were; certainly he continued to express confidence in them until contradicted decisively by events.

The regular U.S. forces, including the Philippine Scouts, were adequate peacetime professional troops, but they numbered fewer than 25,000 and were lacking in modern equipment, including anti-aircraft weapons. Such ground and air forces as were available were rushed to the Philippines, which soon had the lion's share of the army's exigent forces of heavy bombers. But the help possible was limited by lack of equipment and even more by lack of shipping, to say nothing of demands associated with the security of the U.S. home territory itself. Progress in organizing an effective defense system was halting. This was particularly so of air defenses. [124]

These limitations of his forces notwithstanding, MacArthur insisted on a much more aggressive approach than that envisioned under WPO-3, placing absolute emphasis on forward defense to the exclusion of all other options.

In addition to the army ground and air forces the Philippines was home to the U.S. Asiatic Fleet, actually no more than a mixed squadron, and its small force of patrol aircraft. This was all under a navy commander separate from MacArthur. Relations between the two men were frosty.

The Japanese attack the Philippines

Lying more than 80 degrees of longitude to the west of Pearl Harbor, the forces in the Philippines could potentially have benefited from several hours of warning in the time it took daybreak to reach them. The top-level command was very slow and confused in its response, however, and squandered whatever advantage this might have brought.

As elsewhere, the Philippines defenders suffered from lack of appreciation of the capabilities of Japanese forces. In particular they did not recognize either the quality or range of IJN fighter forces, equipped with the new Mitsubishi A6M "Zero". [125] As a result of intensive efforts to maximize their range capabilities, these forces were able to es-

cort bombers from Formosa (Taiwan) during raids on targets in Southern Luzon, 550 nmi away. Thus the Japanese did not have to commit carrier resources to the Philippines campaign. Although weather at the their bases prevented the Japanese raids from arriving until after noon on the first day of hostilities (8 December, east longitude date), they caught the American forces largely by surprise and did severe damage to U.S. air capabilities. Counts of aircraft destroyed vary (not unusual in this campaign where few records survived) but at least 34 of the 92 modern (P-40E) fighters were lost, along with at least 12 of the 35 heavy B-17 bombers. [126] Early-model radar equipment had been shipped to the main island of Luzon, but most was not in operation and little progress had been made in setting up an effective warning and control system.

With American air forces severely eroded within the first few days of the war, the Japanese were able to conduct landings without undue risk. They had a well-developed amphibious doctrine which had been refined through experience. In general this called for surprise landings at night or daybreak with very little fire preparation, at points where little or no local resistance was anticipated, followed by rapid overland advances by converging columns to reach the objective. Specialized equipment suited to this doctrine had been developed and issued, including very serviceable landing craft. [127]

The initial landings were conducted by small units in remote peripheral areas to seize airfields for use as bases for tactical aircraft. The defenders lacked the resources and strength to defeat the landing forces and several airfields were soon placed in operation.

Lingayen Gulf landings

MacArthur deployed what on paper were strong forces near Lingayen Gulf. Other forces were stationed at less vulnerable points to the south or Manila. The problem was that almost all of these forces were green, ill-led, ill-trained, poorly-equipped Philippine Army reservists. The one 7,500-man active duty “division” of the Philippine Army was in the south while the 700-man 26th Cavalry of Philippine Scouts was near Lingayen Gulf. MacArthur’s two battalions of light tanks were in reserve to the north and south. His strongest formation, the Philippine Division of

Americans and Philippine Scouts, was held in reserve near Manila. The orders to the commanders of the forward forces were that the beaches must be held at all costs and that there must be no retreat.

The test of this came at first light on 22 Dec 1941 when three Japanese infantry regiments, supported by artillery and two battalion-sized tank regiments, came ashore at Lingayen Gulf. Even though the landing was impeded by rough weather, it quickly became apparent that the troops of the three Philippine Army divisions lacked the tactical skills and steadiness to conduct effective attacks, or even to hold reliably on the defense, while the 700 troopers of the regular 26th Cavalry simply were too few to make a real difference despite brilliant and heroic efforts.[52] The best the defenders could manage was a somewhat ragged withdrawal toward the south as the Japanese, despite their handicaps, pressed vigorously ahead.

MacArthur ordered the 192nd Tank Battalion to support the defenders, but did not place it under the command of the North Luzon Force commander, Major General Jonathan Wainwright. This was emblematic of the problems of American armor in the Philippines. Relatively raw units raised just a few months before and given little time to train, they were hampered by lack of organic or attached infantry, poor doctrine, and clumsy command arrangements. [128][129][130] Their light tanks were no more than marginally superior to the better of the Japanese tanks. While they ultimately were to prove a mainstay of the defense, on this occasion the small forces committed were quickly thrown back.

Wainwright sought to mount a counterattack and on 23 December requested commitment of the Philippine Division. MacArthur's headquarters refused the request, however, and the counterattack fizzled since without it Wainwright had no major formations that were capable of maneuver.

[52] While trained to fight mounted skirmish and shock actions when the opportunity arose, American cavalry basically were horse-mobile light infantry.

Retreat to Bataan

On 23 and 24 December, divisional strength Japanese forces landed at various points in Lamon Bay, on the eastern coast to the south of Manila. Here too, defending forces were unable to defeat the Japanese and were forced to fall back before them. These landings were in keeping with Japanese operational doctrine which emphasized multiple attacks on converging lines, and in concert with landings on some southern islands served to further isolate the Luzon defenders from any prospect of relief.

It could no longer be denied that the original plan of throwing the invaders back into the sea was impracticable. Late on 23 December MacArthur reverted to WPO-3, which called for a fighting retreat down the central plain to reach the Bataan Peninsula. The planners had laid out five phase lines across the central plain, numbered D–1 through D–5, each about 10 to 20 miles further to the south than the last, and each affording a variety of good defensive positions. Each was to be held for at least a day. Then after dark the main body of the retreating troops would march south while a covering force, termed a *shell*, would hold behind them. Finally, just before dawn, the shell would withdraw, using motor transport to catch up with the main body. The hope was that the advancing enemy would be forced to break march order and deploy to attack each successive set of defenses, thus slowing his pursuit.

The retreats of the U.S. northern and southern forces were skillfully executed and both groups reached the Bataan Peninsula largely intact. After their initial exposure to combat some of the Philippine Army units proved able to mount effective and tenacious defense of fixed positions, and by deploying and supporting them as well as the situation allowed commanders were able to slow and contain the advance of the Japanese significantly. Thus the attackers never were able to cut off and isolate any of the major U.S. units. The Japanese planners had not foreseen that the defenders would retire to Bataan and the Japanese commander on the scene elected to take Manila, in accordance with his orders, rather than pursue vigorously in the last stages of the retreat, thus giving the defenders a little time to consolidate their positions.

Unfortunately, the supply situation of the U.S. troops was poorer than it might well have been. In keeping with the initial plan of defending at

the beaches, operational supply dumps had been established forward while supply reserves remained in and near Manila. Only when it became clear that forward defense had failed were efforts initiated to move supplies to the Bataan Peninsula. While precise data are lacking, it seems clear that many supplies never made it. In addition, MacArthur elected to honor Philippine government requests to avoid requisitioning of private food stocks. (The Japanese soon proved to be very much less obliging in this regard.) Finally, the situation was made worse by lack of effective measures to stem the flow of refugees onto the peninsula. Food and medicine were both in very tight supply. The diet of the troops was seriously inadequate in both caloric intake and balance from the beginning and the situation grew progressively worse. The tropical climate combined with inadequate diet to lay the troops particularly open to disease and casualties from this cause mounted rapidly.

The Philippines campaign marked the most notable occasion on which American troops have operated under conditions of continued enemy air superiority. The Japanese did not always take good advantage of their air superiority (in part due to a doctrine which strongly emphasized battlefield area interdiction) and the effects of their attacks were ameliorated when the troops were under the cover of dense vegetation. Any movement in the open in daylight was hazardous, however, and many casualties were incurred this way.

The Japanese committed remarkably small forces to the offensive against the Allies in the south – the bulk of their army remained in China and Manchuria. (In large measure this was made necessary by their limited shipping resources.) Thus it was necessary to conduct sequential operations, with the same formations participating in two or more offensives. Convinced of the importance of shock and momentum, the IJA adopted a very tight overall schedule. The conquest of Luzon was to be completed in 50 days. But early in January, after seeing that U.S. resistance seemed weaker than anticipated, the high command pulled a division, major air forces, and some key supporting units out of the Philippines for operations elsewhere.

Defense, starvation, and defeat on Bataan

With Manila secured, the Japanese commander turned his attention to the Bataan force. His intelligence regarding its strength and disposition was poor. He supposed that the defenses were both weaker and further to the rear than in fact they were, and the dense natural cover made it difficult to detect the error prior to actual contact. An attack launched on 9 January with inadequate second-line forces almost immediately ran into difficulty.

American artillery in the Philippines was obsolescent in matériel and tactics and scanty in quantity, but nevertheless inflicted many casualties on the advancing Japanese. U.S. armor and infantry forces exacted a heavy toll as well. The Japanese did make some advances, eventually forcing the defenders back to their more-defensible second line of resistance, but by 13 February the Japanese forces had been rendered ineffective through attrition and withdrew from contact altogether.

The Japanese commander, General Homma, said after the war that the U.S. forces could have advanced to Manila had they wanted to; his depleted forces were powerless to stop them. Many U.S. commanders and troops wanted to go over to the offensive but the high command vetoed it on the grounds that it would further deplete the energy and supplies of their troops to retake ground that the Japanese could push them out of as soon as they reinforced and resupplied their own forces.

Frantic efforts were mounted by both the Army and Navy to resupply the U.S. forces in the Philippines. There was no hope of breaking Japanese control of the seas around the islands, but a few freighters were able to sneak through from Australia to the southern Philippine island of Mindanao. Efforts to ferry the supplies and locally-grown food in small batches to Corregidor and Bataan in small, fast vessels bore little fruit, however, owing to Japanese vigilance. Small quantities of medicines were airlifted from Mindanao in aircraft small enough to use Corregidor's airstrip. Five submarines made it through to Corregidor but could carry very little. The net gain in stocks amounted to no more than 5,000 tons, or less than 20 days of supply. [131]

At the outset of the campaign the troops were put on rations that fell approximately 2,000 kCal/d short of meeting their metabolic needs.

Over the nearly 100 days that followed this gap increased in steps to 3,000 kCal/d, resulting in a cumulative deficit of more than 200,000 kCal by the beginning of April, 1942 – corresponding to about 60 lbm of body fat. Since this would have been more than twice the body fat reserves of most of the troops at the outset of the campaign, their bodies would have been forced to scavenge considerable muscle mass to meet their metabolic demands. The effects of this were greatly exacerbated by severe focal nutritional deficiencies in their diet, leading to deficiency diseases such as beriberi. Finally, lack of medicines for prophylaxis and treatment resulted in rampant disease, with malaria being all but universal. Thus by the beginning of April all troops on Bataan were severely debilitated and many were unable to function at all.

The Japanese in the meantime had rebuilt and resupplied their forces. Not recognizing the extremity of the defenders' logistical deficiencies it was decided to assault the peninsula rather than wait the few weeks that it would in fact have taken to complete the work of starvation and disease. After a preparatory bombardment that was exceptionally intense and protracted by Japanese standards (and formidable by any standard) an assault was launched on, ironically, Good Friday, 3 April. Resistance was very markedly lighter than it had been in January and the attackers made rapid progress. The retreating troops suffered severely from air attack.

The American commander on Bataan had specific orders to hold out to the last man and last round. By 9 April, however, it was apparent that the possibility of effective resistance had entirely passed and he decided to disobey his orders and allow his men to surrender rather than see them simply slaughtered. He was never forgiven for this by MacArthur, but in the light of the desperate circumstances his decision may be seen as an act of moral courage, especially as he had no reason to expect the murderous treatment the Japanese would accord to the troops following surrender. [132]

Corregidor and the fall of the Philippines

There remained 11,000 troops on Corregidor as well as another 1,500 in detachments in other island fortresses at the entrance to Manila Bay. About 2,300 civilians were on the islands, chiefly on Corregidor. MacAr-

thur had been ordered to depart for Australia and had left General Jonathan Wainwright in charge, with headquarters in the tunnels beneath Corregidor's rocky surface.

Through the remainder of April the Japanese turned their 56 heavy artillery pieces and 60 medium pieces on the island citadel from the heights of Bataan, two miles away, while continuing bombing attacks. Starting 1 May the fire was intensified in preparation for the assault. As many as 16,000 rounds per day blanketed the narrow, 3½ mile long island, whose outer surface was reduced to a lunar wasteland. High angle fire from the 240 mm howitzers was particularly damaging. The carefully-prepared beach defenses were blasted away and all tactical communications lines irreparably damaged. Essential power and water supply systems were heavily damaged and the island was left with no more than four days supply of water.

Japanese troops began coming ashore just before midnight on 5 May. Despite the devastation of the island it was not the walkover they had anticipated. The attackers became disoriented in the darkness and landed wide of the planned beaches, while sufficient firepower remained ashore to create havoc among the approaching landing craft and drown hundreds of assault troops before they could reach shore. But once the survivors had gained a lodgement the defenders found themselves at a serious disadvantage fighting on a moonscape denuded of cover against an enemy supported with overwhelming firepower provided by the massed artillery less than 5,000 yards away on the heights of Bataan.

After ten hours of intense fighting the Japanese had advanced nearly to the mouth of the tunnel complex and Wainwright, fearing a wholesale slaughter of the more than 11,000 personnel within, surrendered. The Japanese commander, Homma, pressed Wainwright to surrender not simply the Corregidor garrison but all U.S. troops in the Philippines. Although no direct threat to massacre those on Corregidor was issued, that was the clear substance of the refusal to accept their surrender or suspend attacks until all forces in the islands had been surrendered. Wainwright finally yielded, ordering commanders in outlying islands to surrender, while covertly endeavoring to urge them to disperse their men and carry on guerilla operations. Responses varied with commander and circumstances, but many forces that were not hard-pressed

did in fact surrender. Thus organized U.S. resistance ceased throughout the islands over the first few days in May. U.S.-backed Philippine guerilla forces continued harassment of the occupiers throughout the succeeding two years and aided the recapture of the islands in 1944-45.

Unlike the fall of Singapore nearly three months earlier, the surrender of the Philippines brought little criticism or acrimony. The fall of the islands had come to be widely accepted as inevitable and their defense was seen as having been honorable and pursued to the final extremity. The campaign had taken far longer than the 50 days originally allotted by the Japanese and brought disgrace and early retirement to General Homma.[53] It is difficult to support the argument, often advanced, that the delay interfered significantly with other planned operations. All the same, the Japanese might surely have found better uses for the substantial time, matériel, and personnel they lost in conquering Bataan and Corregidor.

[53] After the war, the International Military Tribunal for the Far East (IMTFE) indicted Homma on charges relating to the atrocities committed by his troops against American and Filipino POWs following the fall of Bataan and Corregidor. Following trial before an American military commission in Manila he was convicted and shot, becoming one of the few commanders to be punished by both sides for his failings in the same campaign.

Notes on sources and methods

References have been cited in the text for many specifics. In many cases, however, this has seemed undesirable due to repeated or pervasive reliance on certain sources throughout a section. This section collects the citations of such generally-used sources.

The complete list of sources consulted or reviewed over the course of this project runs to more than 1800 entries. For the sake of manageability I have cited only those which played a truly significant role in the research. Where multiple sources speak to the same effect I have endeavored to cite the one nearest to the primary sources. Those wishing a copy of the complete bibliography should contact the author.

Sources and methods for *Aircraft forces*

Many of the tabular data used throughout contain typographical errors which must be corrected on the basis of checks of internal and cross-source consistency.

Data for Japanese air forces strength and dispositions from [133] and [134] These figures are based on quite incomplete and rather inconsistent official Japanese data; see [135] for details and cautions. For Japanese production, [136] has been used, together with [137], applying quadratic interpolation as necessary for intercalary estimation. Based on analysis of information from various sources it is estimated that approximately 75% of IJA production went to theaters against the U.S. in this period, and approximately 90% of IJN production.

Data for USAAF forces from [138]. When not otherwise specified, includes aircraft based in Alaska as well as Pacific islands. The number of 596 for aircraft at the outset includes 283 aircraft officially classified as *second line* or *miscellaneous*. USAAF deliveries of aircraft to theaters against Japan from [139], with cubic interpolation as necessary for intercalary estimates.

For the USN and USMC, strength figures and aircraft distributions are compiled from data in [140]. Includes aircraft assigned to the Pacific Fleet, Asiatic Fleet, and Marine Air Wing 2. Includes aircraft in overhaul, awaiting overhaul, or short-term storage, and combat-classified aircraft employed in support roles. Excludes lighter-than-air and aircraft officially classified as *obsolete*. After Dec 1941, also excludes aircraft classified as *obsolescent*. Production for the naval service is from [141], with the Pacific share taken to be 60% of the total.

Sources and methods for *Shipping*

Shipping capacities and cargo are measured in a variety of ways, depending on context and purpose. Displacement (Δ) is the weight of the ship at a specified condition of loading, or equivalently of the water displaced by the underwater volume of the ship, expressed in units of long tons or sometimes of metric tons. Gross tonnage (GT), measures a ship's usable under-decks cargo capacity in units of *register tons* of 100 ft^3 each. The DWT of a ship is the weight, in long tons, that it can carry without exceeding its design draft (which may vary with anticipated wind and sea in the region of operation). Measurement tonnage (M/T) is stacked (not stowed) volume of a cargo expressed in units of 40 ft^3. Weights of cargoes also may be expressed in units of short tons.

There is no necessary connection between a ship's gross and deadweight tonnages; ships have been built with a great deal of internal volume relative to weight carrying capacity and with very little, depending on the trade for which they were envisioned. But as a broad generalization, the "normal" dry cargo freighter of this era of, say 10,000 GT would have a DWT of 14,000 tons. Thus where it has been necessary to compare figures stated as GT with others given as DWT, the practice in this analysis has been to use 1.4×GT as an estimate of corresponding DWT. As one example, see [142], where it will be observed that the average ratio for the world's major merchant fleets in 1939 was DWT/GT = 1.37.

The principal sources of data on Japanese dry cargo shipping are [143] and [144]. No such neat compilation is available for U.S. shipping. The War Shipping Administration was interred quite quickly after the war and no official history was prepared – a remarkable omission, consider-

ing how central its functions truly were. It appears that there is no overall analysis or even overall statistical summary of U.S. wartime shipping. As it was not feasible to undertake such an effort within the context of this study, an approximate picture adequate for the present purpose has been pieced together from scattered sources, especially [145], [146], [147], [148], [149], [150], and [151]. For voyage and turnaround times, Japanese data are found in [152], while U.S. data are shown in [153] and [154].

Bases for index of shipping capabilities

Under the Japanese scheme of command, responsibility for the Central and South Pacific lay with the Navy while the Army took the Asian Continent, West, and Southwest Pacific. Thus all Navy or "B" ships have here been counted in Figure 10, but only 40% of Army or "A" ships. Scattered reports of shipping allocations suggest that it would have been unusual for less than 40% of A ships to be allocated to these areas.

As previously noted, the South and Southwest Pacific theaters lay more than twice as far from the U.S. as from Japan. This naturally meant that the voyages took longer, making shipping inherently less productive. While distance is not the sole factor involved in shipping productivity, statistics of actual average turnaround times support the conclusion that on average it took more than twice as many ships to deliver a given flow of cargo over the longer American routes. Thus for the sake of these index calculations, one unit of Japanese shipping tonnage over these routes has been taken as equivalent to two units of American tonnage.

It has been assumed that 80% of all the shipping controlled by the USN was devoted to Pacific theater operations and support in this period. Much of this shipping consisted of vessels modified and configured to permit rapid offload of troops and cargo into landing craft for amphibious assaults – commissioned as assault transports (APA) and assault cargo ships (AKA). While many smaller and more specialized landing ships and craft were employed in the Atlantic and Mediterranean, the APAs and AKAs were for the most part neither suited to nor needed for assaults in these regions and instead spent most of their time in the Pacific.

The Army has reported the distribution of shipping under its control and serving its needs in gratifying detail. [155] However, in this source, shipping capacity is stated in M/T. It is improbable that this is correct as (1) ships are rarely so rated, for practical reasons, (2) the tonnages tally fairly well with DWT as tabulated elsewhere, and (3) if these capacities truly were in M/T the numerical values should be roughly twice as great as those for DWT.

Sources for *Building staff capabilities*

In addition to the sources listed below, much information was gained from a wide variety of biographical studies of Japanese and American commanders.

The history of the staff and in Europe and America is treated in [156]. For a broad summary of U.S. PME development before World War I, Navy as well as Army, see [157].

Table 1 and Table 2, summarizing doctrinal views, are my own interpretations based on consistent elements in actual wartime operations plus a wide variety of doctrinal publications and descriptions of doctrine.

For Japanese Army development see Edward J. Drea, "The Imperial Japanese Army (1868-1945): Origins, Evolution, Legacy," in *War in the Modern World*, edited by Jeremy Black (London: Routledge, 2003); Alvin D. Coox, "The Japanese Army Experience," in *New Dimensions in Military History*, edited by Russell F. Weigley (San Rafael, California: Presidio Press, 1975); and Roger F. Hackett, "The Military: A. Japan," in *Political Modernization in Japan and Turkey*, edited by Robert E. Ward and Dankwart A. Rustow (Princeton: Princeton University Press, 1964).

Information on the Japanese Army's PME is widely scattered throughout sources relating to the army itself. For data on students and their outcomes see [158], which also presents a broad-ranging picture of the officer corps generally.

Valuable treatments of the army and/or its education programs generally, including its general staff, include [159]*, [160], [161]*, [162], [163], [164], and [165].

Particularly relevant treatments of special aspects include [166]*, [167], [168], [169]*, and [170].

(In the above list, entries marked with asterisks also contain much information relevant to the Japanese Navy as well.)

Through the courtesy of Dr. Edward J. Drea I have learned of a new source, [171]. This offers promise of filling in some important gaps, but press of time and the logistical obstacles of exploiting a Japanese-language work have prevented its use in this report.

PME and military doctrine in Japan and America

For the U.S. Army and its World War I experiences see H. P. Ball, *Of Responsible Command,* pages 147-50; Edward M. Coffman, "The Battle Against Red Tape: Business Methods of the War Department General Staff 1917-1918" *Military Affairs*, 26, No. 1 (Spring 1962): 1-10; James J. Cooke, *Pershing and His Generals: Command and Staff in the AEF* (Westport, Connecticut: Praeger Publishers, 1997), pp. 31-43 and *passim*; Timothy K. Nenninger, "'Unsystematic as a Mode of Command': Commanders and the Process of Command in the American Expeditionary Forces, 1917-1918" *Journal of Military History*, 64, No. 3 (Jul 2000): 739-68.

A survey of Army PME generally is provided by [172]. Important studies include [173], [174], [175], [176], [177], and [178].

For the Army Industrial College see [179] and [180]. For the Air Force Tactical School see [181].

The question of the place of the Army's air officers in its PME scheme is subject to various interpretations and suffers from a lack of systematic, synoptic research. I have made my tentative judgments after scanning a number of the entries in Robert P. Fogerty, "Biographical Data on Air Force General Officers, 1917-1952," Two volumes, U.S. Air Force Historical Study No. 91 (Maxwell Air Force Base, Alabama: USAF Historical Division, Air University, 1953). Many memoirs and biographies of senior air officers speak to the issue of estrangement from the rest of the Army and negative feelings about the C&GSS course. See Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940* (Maxwell Air

Force Base, Alabama: Research Studies Institute, USAF Historical Division, Air University, 1955) and James P. Tate, *The Army and its Air Corps,* p. 192.

Naval doctrines and PME programs

An admirable survey of Japanese naval training and education is provided by [182] for the Meiji period (and a bit beyond), during which many of the top leaders of World War II received their PME. The standard study of the Japanese Navy, [183], also provides information on its PME. For other relevant studies see items under Japanese Army, above.

For the NWC see Thomas B. Buell, "Edward C. Kalbfus and the Naval Planner's 'Holy Scripture': *Sound Military Decision*" *Naval War College Review*, 25, No. 5 (May-Jun 1973): 31-41; *Idem*, "Admiral Raymond A. Spruance and the Naval War College: Part I – Preparing for World War II" *Naval War College Review*, 23, No. 7 (Mar 1971): 31-51; *Idem*, "Admiral Raymond A. Spruance and the Naval War College: Part II – From Student to Warrior" *Naval War College Review*, 23, No. 8 (Apr 1971): 29-53; John B. Hattendorf, B. Mitchell Simpson, III and John R. Wadleigh, *Sailors and Scholars: The Centenial History of the Naval War College* (Newport: Naval War College Press, 1984); Gerald John Kennedy, "United States Naval War College, 1919-1941: An Institutional Response to Naval Preparedness" (Ph.D. diss., Minneapolis: University of Minnesota, 1975); Douglas V. Smith, "Preparing for War: Naval Education Between the World Wars" *International Journal of Naval History*, 1, No. 1 (Apr 2002); Michael Vlahos, *Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport, Rhode Island: Naval War College Press, 1980).

Other studies also cast important light, including [184] and [185].

Marines and air forces

For the U.S. Marine Corps see Kenneth J. Clifford, *Progress and Purpose: A Developmental History of the U.S. Marine Corps, 1900-1970* (Washington: History and Museums Division, Headquarters, United States Marine Corps, 1973); Allan R. Millett, *Semper Fideles: The History of the United States Marine Corps* (New York: Macmillan Publishing Co., 1980).

The U.S. Army Air Corps and its doctrinal development is dealt with in Maurer Maurer, *Aviation in the U.S. Army, 1919-1939* (Washington: Office of Air Force History, 1987); James P. Tate, *The Army and its Air Corps: Army Policy Toward Aviation, 1919–1941* (Maxwell Air Force Base, Alabama: Air University Press, 1998).

Sources for *Behind the PME differences*

While [186] is the best-known study of Japanese society to most English-speaking readers, it is handicapped by the circumstances of its writing. The classic study by Chie Nakane [187] offers a clearer and better founded view, whose value for this study is particularly great in that in it the author (born 1926) was examining Japanese society as it was rather than as it is today. Also valuable are [188] and [189]. Reference [190] is helpful in illuminating the historical context.

The process of modernization in Japan and the role of the Meiji elite, including Aritomo Yamagata, are treated in [191], [192], [193], and [194].

For the culture of the Japanese armed forces the sources identified in the preceding section are all valuable. In addition, see [195] and [196].

Sources for *Appendix A: Philippines*

Primary reliance has been on [197], [198], and [199], supplemented by [200].

Acknowledgements

This project was sponsored by Mr. Andrew W. Marshall, Director of Net Assessment for the Department of Defense. Like everyone I am grateful to my sponsor for the opportunity to do this study. In this case, however, my appreciation goes far beyond that, for Mr. Marshall is largely responsible for having cast the whole concept of defense transformation (under various labels) in the first place, and certainly has done a great deal to shape my own conceptions of it over the past three decades. He was by no means a sponsor among many possibilities, for it is difficult to imagine that this project would have come to my mind at all, at least in this form, without his consistent intellectual leadership.

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The major portion of the work of this project has been devoted to assembling and analyzing the great mass of statistical data that, largely unseen, lies beneath the key arguments of this paper regarding force inputs and losses. For this, I owe a great debt to the many unnamed men and women who labored to collect, compile, and publish these data during and after World War II.

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drafts were offered by John Kuehn, Bob Nicholls, William J. Stone, and Alan D. Zimm.

Glossary

AAC	Army Air Corps (U.S.)
AAF	Army Air Forces (U.S.)
ACC	Army command college (Japan) (Non-standard term)
ACTS	Air Corps Tactical School (U.S.)
AIC	Army Industrial College (U.S.)
AWC	Army War College (U.S.)
C&GSS	Command and General Staff School (U.S.)
CINCPACFLT	Commander in Chief, U.S. Pacific Fleet
COMINT	communications intelligence
COMSEC	communications security
Δ	Displacement (of ship)
D/F	direction finding
DWT	Deadweight tonnage (of ship)
GT	Gross tonnage (of ship)
IJA	Imperial Japanese Army
IJN	Imperial Japanese Navy
kCal/d	kilocalories per day (Note: the kilocalorie or "great calorie" of energy is often referred to simply as "calorie" in dietary contexts.)
lbm	pound (of mass)

Kido Butai	First Air (carrier) Fleet of the IJN: its main carrier force
klt	thousands of long tons
M/T	Measurement tonnage (of cargo)
NEI	Netherlands East Indies (Former Dutch imperial possession essentially coterminous with present national territory of Indonesia.)
NWC	Naval War College (U.S.)
PME	professional military education
SNLF	Special Naval Landing Forces (Japan)
SWPAC	Southwest Pacific [Command] (Allied)
USAAF	U.S. Army Air Forces
USMC	U.S. Marine Corps
USSBS	U. S. Strategic Bombing Survey
WPO-3	War Plan Orange, edition No. 3 promulgated May 1941 (of Philippine Department, U.S. Army – not to be confused with sometime national warplan termed War Plan Orange)

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Notes:

USAAF = U.S. Army Air Forces

USSBS = U.S. Strategic Bombing Survey

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