UNITED STATES
STRATEGIC BOMBING SURVEY

SUMMARY REPORT
(Pacific War)

WASHINGTON, D.C.
1 JULY 1945
Foreword

The United States Strategic Bombing Survey was established by the Secretary of War on 3 November 1944, pursuant to a directive from the late President Roosevelt. It was established for the purpose of conducting an impartial and expert study of the effects of our strategic attack on Ger-

many, to be used in connection with the attack on Japan and to establish a basis for evaluating air power as an instrument of military strategy, for planning the future development of the United States armed forces, and for determining future economic policies with respect to the national defense. A summary report and some 300 sup-
porting reports containing the findings of the Survey in Germany have been published. On 10 Aug-
ust 1945, President Truman requested the Survey to conduct a similar study of the effects of all types of air attack in the war against Japan.

The staff of the Survey in Japan, who were all civilians, were:

Franklin Delano Roosevelt, Chairman.
Paul H. Nitze, Henry C. Alexander, Fler Chairman.
Harry L. Bowden.
J. Kenneth Gallaher.
Beach Libbey.
Frank A. McNamaras, Jr.
Paul Smith, Jr.,
Herman E. Hugget.
Dr. Leslie S. Thompson.
Theodore P. Wright, Director.
Walker Wells, Secretary.

The Survey’s complement provided for 500 civilians, 350 officers, and 500 enlisted men. Ninety percent of the military support of the organization for the Japanese study was drawn from the Army, and 10 percent from the Navy. Both the Army and the Navy gave the Survey all possible assistance in the form of men, supplies, transport, and information. The Survey operated from headquarters in Tokyo, with subheadquarters in Nagoya, Osaka, Hiroshima, and Nagasaki, and with mobile teams operating in other parts of Japan, the islands of the Pacific, and the Atlantic theater.

The Survey accorded the principal surviving Japanese leaders and interrogated by Army and Navy officers, Government officials, industrialists, political leaders, and many hundreds of their sub-
ordinates throughout Japan. It was thus possible to reconstruct much of wartime Japanese military planning and execution, engagement by engage-
ment and campaign by campaign, and to secure reasonably accurate data on Japan’s economy and war production, plant by plant, and industry by industry. In addition, studies were made of Japan’s overall strategic plans and the back-
ground of her entry into the war, the internal discus-
sions and negotiations leading to her acceptance of unconditional surrender, the course of events and morale among the civilian population, the effectiveness of the Japanese civilian defense organization and the effects of the atomic bomb. Separate reports will be issued covering each phase of the study.

In this Survey Report the civilian officials and directors of the Survey have not undertaken to write a history of the Pacific war, nor to appre-
ciate credit for victory among the various com-
ponent Allied forces. They have undertaken, as civilians, to present an analysis of the factual ma-
terial gathered by the Survey and their general appraisal issued as to the future.
UNITED STATES STRATEGIC BOMBING SURVEY
SUMMARY REPORT

The attack on Pearl Harbor was designed as a surprise, the means of minor tank fleet, and the power of aircraft to sink surface vessels. It was executed with the loss of 88 Japanese planes. Two days later, the Japanese landed the British battleship, Prince of Wales, and the battle cruiser, Repulse, without air cover of any Japanese and sent them to the bottom with the loss of 4 Japanese Navy mediums. Allied air power in the Philippines, Malaya, and the Dutch East Indies was virtually eliminated, partly on the ground, in a matter of days. These losses were, in turn, Allied air power had been eliminated, were held open to occupation in a matter of weeks, at a cost of less than 15,000 Japanese soldiers killed, and with the loss from all sources in the entire campaign of 58,000 Japanese planes.

As these achievements indicate, the Japanese started the war aware of the fact that major offensive effort could be undertaken without local control of the air. They also appreciated the vulnerability to air strike of such objectives, both on land and at sea. The Japanese failed, however, to appreciate the full scope and complexity of the requirements for controlling control of the air. The Japanese air production program at the start of the war was inadequate, as the Japanese subsequently discovered, not only in relation to the United States, but seen in relation to the capabilities of their own economy. Their planning and execution of the attack on Pearl Harbor, for instance, were in complete accordance with the requirements that subsequently developed. Japan's war plan did not contemplate, nor was its capability such that it could have contemplated, interference with the essential resources of the United States.

On December 7, 1941, the United States and its Allies precipitously sank the Pacific, particularly in land and carrier-based air power. The Allied air groups initially in the Pacific were not only few in number but, in large measure, technically inferior to those of the Japanese. The Japanese strength had been underestimated. Ninety 8-8ths and 22 B-17s in the Philippines could not be expected to check Japanese push northward. These of our seven aircraft carriers were in the Atlantic and our training in the Gulf of Mexico.

In their air power, the Japanese, the full scope of the basic requirements for air power. Our program for training, production, amphibious, intelligence, and intelligence were limited, not so much by lack of concept as by the time required for their development and establishment.

From the original Japanese advance was stopped, how we achieved air superiority, at first locally, but subsequently more and more generally, and over areas within the one-time Japanese dominated area, culminating finally in air supremacy over the Japanese home islands themselves, and how that superiority was exploited, is the story of air power in the Pacific and the subject matter of this Summary Report. The role of air power cannot be considered separately, however, from the role of ground and naval forces our from the broad plans and strategy under which the war was conducted.

JAPAN'S ORIGINAL STRATEGIC PLAN

Japan's governmental structure provided no effective civilian control of her Army and Navy. In the peace between the IPs invasion of Manchuria and the 1931 attack upon Pearl Harbor, the military clique of Japan wanted a progressively tighter control over the foreign and domestic affairs of the nation. These clique included groups within both the Army and Navy, but because of the repeated military successes of the Japanese Army in Manchuria and China and the prestige so acquired, and because of the more ambitious and aggressive moves of the Japanese Army leaders, the political position of the Army was strengthened to that of the Navy. The first decision to enter the war was to advance into the Philippines, the Dutch East Indies, Malaya, Burma and to the southeast way, however, meet with the full concurrence and active consent of all important Japanese Army and Navy leaders and of almost all her important civilian leaders.
This decision to which the Japanese were, in effect, committed by mid-October 1941, was based upon the following conclusions:

1. The threat of Russia on the Manchurian flank had been neutralized by the decisive victory of Germany in Europe which might eventually lead to the collapse of the Soviet Union.

2. Great Britain was in such an irrevocably defensive position that, even if it survived, her active war-making potential would be spent in a desperate effort to protect her home islands.

3. The forces which the United States and her Allies could immediately deploy in the Pacific, particularly in the theater, were insufficient to prevent the fully trained and mobilized forces of Japan from occupying within three or four months the entire area enclosed within a perimeter consisting of Burma, Sumatra, Java, northern New Guinea, the Bismarck Archipelago, the Gilbert and Marshall Islands, Wake, and from there north to the Kuriles.

4. China, with the Burma Road severed, would be isolated and forced to negotiate.

5. The United States, committed to seeing Great Britain and weakened by the attack on Pearl Harbor, would be unable to mobilize sufficient strength to go on the offensive for at least 2 years. During this time, the perimeter could be fortified and the required forward air fields and bases established. So strengthened, this perimeter would be backed by a multi-carrier striking force based on Midway.

6. With the double defense of the expansile perimeter was underwritten American determination to contain the war, the Japanese would probably extend their bases, oil, rubber and antic state forces. Malay, Burma, the Philippines and the Dutch East Indies, and ship those materials to Japan for processing to sustain and strengthen her industrial and military machine.

7. The relations of the United States as a democracy would make it impossible for her to undertake an offensive action in the face of the forces which would be imposed on her by financially resurgent Japanese arms, navies and armies, and the elimination of the Allies. The United States in consequence would compromise and allow Japan to secure substantial portion of her initial territorial gains.

Certain facilities and naval groups were familiar with the United States, its industrial and technological potential, and probable fighting determination when armed. They expressed doubts about a strategy which promised no conclusion to the war other than negotiation, and which then might drag out interminably with consequent loss of momentum. The Navy, however, was greatly concerned about the declining oil supply after the United States and the British economic embargo of July 1941. Such evidence was very realistic and went along with the more dynamic opinion.

None of the responsible Japanese leaders believed that within any reasonable period of time Japan could invade the United States and dominate the White House. Admiral Yamamoto, exposed beyond that Japan would do so was in fact never made. These leaders furthermore felt that Japan's limited shipping would be stretched to the uttermost in providing logistic support for the plans adopted and would be wholly inadequate for any more ambitious program, when the initial operations went unexpectedly well.

EXECUTION OF THE JAPANESE PLAN

In accordance with the above plan, the Japanese Army was given primary responsibility for conquering Malaya, Borneo and Burma and, because of the limited range of its planes, for establishing initial air support in southern Korea only about 400 miles inland. The Japanese Navy was assigned primary responsibility, in addition to the attack on Pearl Harbor, for initially launching operations in the Philippines, Borneo, Celebes, Java, northern New Guinea, the Bismarck Archipelago and out to the Gilbert Islands and Wake. The Army was to assume control in the Philippines as soon as the landing force was established on land. On December 1941 the Japan-}

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<tr>
<th>Unit</th>
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<tr>
<td><strong>ARMY</strong></td>
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<tr>
<td>Third Flying Division</td>
<td>940</td>
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<tr>
<td>Fifth Flying Division</td>
<td>570</td>
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<td>Ninth Flying Division</td>
<td>493</td>
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<td>Fourth Flying Division</td>
<td>850</td>
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<td>Second Flying Division</td>
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<td>Fifth Flying Division</td>
<td>548</td>
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<tr>
<td>First Flying Division</td>
<td>673</td>
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<td>Total Army</td>
<td>3,875</td>
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The majority of these planes were of obsolete type.

These forces were quickly overwhelmed. Fifty percent of the planes were destroyed on the ground. Only three lightly damaged aircraft escaped from the Philippines. These were sent to Formosa. The whole Japanese effort to control the South China Sea failed.

Following the initial success at Pearl Harbor, Malaya and in the Philippines, Wake and Guam were occupied in December, and Hawaii in January. The Japanese gained air superiority in Burma and the Philippines and, with the help of ships, and, with the help of ships, Japanese forces attacked the defense in depth, and the Dutch forces were overwhelmed.
and deploy the United States major staging areas more advanced than Pearl Harbor.

By striking and neutralizing her line of advance, Japan was committed to an expensive and energy-sapping supply problem, she delayed the fulfillment of the perimeter originally decided upon, jeopardized her economic program for exploiting the resources of the area already captured, and had herself open to early counter-attack in the advanced and, as yet, weak position.

THE UNITED STATES PLAN BEFORE PEARL HARBOR

Prior to Pearl Harbor it had been decided that, in the event of war, Germany would have to be eliminated first, and that our initial role in the Pacific would be in large measure defensive. But Japan's effective capabilities were underestimated; it was thought possible to hold the Midway barrier, successfully engage the Japanese fleet in the Central Pacific, and lay the foundations for eventual advance against Japan itself. The United States plan held little substance in reality. With the forces that were available to achieve plan of defense was possible. The loss of relatively unimportant battleships at Pearl Harbor did not substantially reduce the actual combat capabilities of a Navy at that time as opposed to the Japanese Navy with its superiority in aircraft carriers and battle line force. To have implemented an adequate plan in December 1941 would have required both intelligence regarding Japanese intentions and capabilities, an accurate understanding of the predominant and indispensable role of air strength and full public support for the necessary appropriations, all before the actual outbreak of war.

As it developed, all that we could do prior to May 1942, apart from the extension of our isolated forces in the Philippines and specific carrier and land-based air raids, was to build up our strength in Australia and the islands lying between Pearl Harbor and Australia, while bringing the facilities of our training and production programs.

TURNING THE TIDE

United States preparations were still inadequate when it became evident that the Japanese intended to advance south from the Bismark Archipelago, and thus threaten our communications with Australia. It was decided nevertheless to attempt to hold Midway and a line north of Bismarck and south of the Fiji Islands. Exceptional intelligence gave us some information that a group of transports, protected by the Japanese carrier Shoko and by a covering force including two or three cruisers, was on its way to occupy Midway in May 1942. This information enabled us to concentrate at the appropriate point two of our four carriers then available in the Pacific (one had come to the Pacific from the Atlantic, but two were returning from the Dutch East Indies to the Hawaiian Islands, and to sink the Shoko by torpedo-plane and dive-bomber attack. In the ensuing air engagement with the covering force, we damaged one of the Japanese carriers in that force, but lost the Enterprise. The Japanese force had two carriers left to see us, but their air groups had been badly depleted. The transports turned back and returned to Midway, and, for the first time, the Japanese advance had been checked. The battle in the Battle of the Coral Sea was entirely naval air action.

Similar intelligence provided advance information as to the Japanese move toward Midway in June. In this case, the transports were supported by an advance striking force, including the most powerful surface force yet assembled in the east and four of Japan's remaining eight operational carriers. An additional Japanese carrier was in a supporting force farther to the north. Again only weaker forces were available to the United States; three carriers, the Enterprise, Task Force 17, and Hornet, the only one available for combat action in the Pacific at that time, were rushed to the attack. Our plans located the Japanese fleet and ship them to the enemy carriers, and so damaged the fourth that she subsequently did not arrive to a position to receive additional gunfire from the Japanese carriers indicating that they were sunk by carrier-based dive bombers. Two of the four Japanese carriers were scored by Japanese dive-bombers. Some of the Japanese carrier-based planes damaged our carriers and sank a transport. It appears that he went dead in the water and was sunk by a Japanese submarine. Except for the sinking of the enemy submarine, the outcome of this engagement was entirely air action.
Immediately after Midway, the Japanese had a certain fit for action, shortly to be joined by a fifty but of three-only 1/50 was large. In addition, they had 6 carriers under repair or construction. The United States had 8 large carriers operational, 3 in the Pacific and 5 carriers, 15 escort carriers, either being readied for operation or under construction. The Japanese Navy, therefore, was held by its weakness in the air, and could not support forces only at night or under cover of island-based air units until air strength was rebuilt. A balance of naval air power in the Pacific, and as a consequence a balance of naval power as a whole, was then achieved at Midway.

The sense of imminent conflict shifted back to the immediate south of Rabaul, the war surrounding them, and the war over them. The Japanese had determined to renew their offensive against Port Moresby, if necessary by the overland raids from the northern shores of New Guinea, and were constructing airfields in the Bismarkas. The United States-Fleet Chiefs of Staff ordered the two principal attack groups directed toward southern New Guinea from Port Moresby, the other up the chain of the Solomon Islands beginning with Guadalcanal, both with the dual objective of capturing Rabaul. General MacArthur and Admiral Gurney considered the forces available to them inadequate, but, in view of the importance of maintaining the long communications with Australia, they were ordered to go ahead with what they had. A test of the Japanese perimeter thereby developed earlier than the Japanese had expected.

While the Southwest Pacific command was building airfields in northern Australia, Port Moresby and Milne Bay, the Japanese landed on 19 July 1943, at Huna on the north coast of New Guinea opposite Port Moresby and infiltrated over the Owen Stanley Ranges. Their initial communications were cut at Aitape, their advance columns stalled and their attack halted and pushed back by ground forces. It was supplied by air. The Japanese initially that they were unable to reinforce the airfield in Port Moresby, the Japanese had planned to move the airfield to Guadalcanal.

On 7 August 1943, a massive landing was made on Guadalcanal. Three United States marine garrisons initiated air support and the Marines who had landed started a Myrtle Field (later named Henderson Field) which was under construction by the Japanese. Investigation of the senior Japanese commanders involved in the Guadalcanal campaign indicated that they originally emphasized the strength of their attack and rested in only one reinforcement that of the 30,000 men on land, from the Funai. After this battle was virtually lost, they sent in 8 more of which again were not quite sufficient. Finally, they attempted to scale it in whole divisions. Thirty thousand troops were landed by that time, it was too late. Local control of the air provided by planes based on Henderson Field made it possible, but barely possible, to defend our invading supply ships in the daylight, and made it impossible for the Japanese to land, except at night and then under heavy and continual enemy air attack. The efforts of the Japanese to rear reinforcements at night and to move through their shores installations, resulted in a series of night naval surface engagements which caused heavy losses in both sides. Our air strength was totally inadequate. In the air was reduced by enemy naval brotherhood to only 1 operational airstrip. The Japanese constructed a chain of airfields between Guadalcanal and Rabaul, and attempted to nail our ships and installations. In the air we, however, suffered increasingly heavy losses, not mainly in numbers, but also in proportion to United States losses. The Japanese were by a vivid picture of the indecisive position in which it was impossible to achieve air control placed them. General MacArthur had estimated that only 20 percent of the supplies landed from Rabaul in Guadalcanal over reached them. As a result, the 50,000 troops they eventually landed on Guadalcanal lacked heavy equipment, adequate ammunition and even enough food, and were subjected to continuous harassment from the air. Approximately 10,000 were killed, 12,000 starved to death, and the remaining 20,000 were evacuated in February 1943, in a greatly weakened condition.

By the end of 1943, the good weather of the Japanese attempt to drive us out of Guadalcanal had been thwarted and Allied operations continued to be thrust back. Allied supplies had been flown in by night and day, and the axis had not been able to supply its troops. The Japanese, however, had suffered a crucial strategic defeat. Their advance had been stopped, their strategic plan totally upset, many of their best pilots lost, and Allied forces firmly established in
positions in the Solomon and New Guinea, which threatened the safety of their vital oil reserves. In opposing this threat, the Japanese committed a large part of their forces and air strength to the defense of these positions. The United States, on the other hand, was able to concentrate its forces in the area of the Solomons and New Guinea, where they were able to inflict heavy losses on the Japanese forces.

The United States had the advantage of being able to reinforce its forces in the area of the Solomons and New Guinea, while the Japanese were unable to do so due to the limited range of their air power. By concentrating their forces in this area, the United States was able to achieve a decisive victory over the Japanese forces.

The Japanese forces were unable to sustain the prolonged air war in the Solomons and New Guinea, and were forced to retreat. The United States was able to reinforce its forces in the area, and was able to achieve a decisive victory over the Japanese forces.

The United States was able to secure the Solomons and New Guinea, and was able to prevent the Japanese from achieving their strategic objectives. The United States was able to secure the Solomons and New Guinea, and was able to prevent the Japanese from achieving their strategic objectives. The United States was able to secure the Solomons and New Guinea, and was able to prevent the Japanese from achieving their strategic objectives.

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THE ADVANCE ACROSS THE PACIFIC

Since the situation when the United States began its widespread offensive. While major preparations were still in progress, and the heavy attrition of the Bismarcks and eastern New Guinea campaign was showing up Japanese air groups and depleting her shipping and supplies, the first land advance in the advance across the Pacific was undertaken. These began uneventfully with the assault against Aitau, on the northern flank of the Japanese defense perimeter in May 1943. On the southern flanks, the offensive continued with an advance to Manus in June, to Salamaua, Lae, and Finschhafen on New Guinea in September, and Bougainville in November 1943. In the Central Pacific it began with the assault on the Gilbert Islands in November 1943.

Thereafter, the amphibious advance toward Japan continued over the ocean. One was up the north coast of New Guinea to the Philippines, the other across the Central Pacific through the Marshall to the Marianas and Palau and then subsequently on to Iwo Jima and Okinawa. Basically, the advances were for the purpose of protecting United States power in the Pacific and Japan's supply lines from the south and west within striking range of the Japanese home islands. Objectives were set for one or more of four purposes:
- To provide air bases so that United States control of the air; the forward air bases could then provide forward United States control of the air; the forward air bases could then assist to support the invasion force. The invasion force was to be the first to secure land bases for the staging of groups in succeeding advances; and, in the case of the Marianas, to provide bases for long-range air attacks on the Japanese home islands.
- In the New Guinea area it was intended to be possible to achieve objectives for air assembly where the enemy was weak, and to some extent objectives for ground evaluation and more advance to those with land-based air, and in certain instances, to supply the invasion forces by air. Marianas, New Guinea and other island bases on New Guinea, which eventually had come to be important, were earmarked for this mission.

For the long-range amphibious advance against the Japanese islands, a typical pattern developed. Japanese bases facing the United States objective were covered by a combination of air power. Such bases as were within reach, were hammered by shore-based air. Carrier-based air could still find its targets, and thus it was troop movements or any amphibious force moving up, fast carriers supporting the assault, and the objective struck swiftly by large-scale air. With close air support, the amphibious force was protected against the assault, and the objective struck swiftly by large-scale air power to the invasion force. The objective was secured under air support and from the rear, which were not withdrawn until air fields others could be prepared and activated.

The amphibious assault along the two principal lines of advance toward Java were well timed and mutually supporting, even though concentration on the line might have been more rapid. The invasion force at Bataan, primarily by land-based air from the Bismarck and New Guinea, faced the Japanese to the decision not to support their invasion in the Gilberts, were they to do so.

The Central Pacific advance into the Gilbert and Marshall Islands in late 1943 and early 1944, and the threat of a fast carrier task force striking against Truk, which commenced in February 1944, cleared the Japanese threat from the Bismarck and assisted the move into the Admiralties in March 1944 and the key up the coast of New Guinea to Bismarck in April 1944, which was followed by a further advance to Wewak and Finschhafen in May 1944. When the Japanese attempted reinforcement of northern New Guinea, the Central Pacific advance into the Philippines in June 1944, forced the abandonment of the operation. The Japanese committed their carriers in the defense of the Marianas and lost in the Battle of the Philippine Sea practically all their carrier-based air groups effectively taken out of combat, as well as the carrier itself. Accordingly, the Japanese were pushed out of the Marianas. Landings on Morotai were undertaken with these in the Palau.
still believe that Forceless supported this operation. The landing at Leyte Gulf in the Philippines was
not what the Japanese expected. Short of a defense of the Japanese home islands, the United States was
able to use all its available forces to check the United States advance in a decisive engagement.

For several days after the landing at Leyte, the
Japanese had no idea that the United States had landed a
seventh force. They did not know that the United States
had any available forces to use in the Pacific. In the meantime, however, it was essential to defend the
island and to maintain China. We could not afford to make additional forces available. Our contribution to the China-Burma-India theater was almost entirely air and logistic support. The geography of the theater
was such that forward transportation was virtually impossible beyond the Indian Ocean. As a
consequence, the air in the China-Burma-India theater was relied upon, not only for protection
against aerial attack, but also for transport of the needs and supplies for all forces and provides
much of the few power assets in ground operations.

Full superiority near Japanese air forces was
gradually established. British ground forces at
Burma which had been reinforced by an attacking
Japanese force were supplied by Allied air. The
Japanese force was in turn isolated by air
attacks and destroyed. The troops that liberated
Burma were moved, supplied, and supported by
air. Japanese logistics in Burma and China were
disrupted. China was kept in the war.

Over 1,400,000 tons of supplies and equipment and
1,266,000 troops were transported by air. The
air movement over the "tango" between India and
China attained a peak rate of 75,000 tons in 3
months.

In the fall of 1943 it was decided to attack Japa-
ese industrial targets in Burmah and Kyushu
with B-29s flying from advanced bases in China.
When this decision was reached, India, Burma
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er, it was essential to defend India and to maintain
China. We could not afford to make additional forces
available. Our contribution to the China-
Burma-India theater was almost entirely air and
logistic support. The geography of the theater
was such that forward transportation was virtu-
ally impossible beyond the Indian Ocean. As a
consequence, the air in the China-Burma-India theater was relied upon, not only for protection
against aerial attack, but also for transport of the needs and supplies for all forces and provides
much of the few power assets in ground operations.

Full superiority near Japanese air forces was
gradually established. British ground forces at
Burma which had been reinforced by an attacking
Japanese force were supplied by Allied air. The
Japanese force was in turn isolated by air
attacks and destroyed. The troops that liberated
Burma were moved, supplied, and supported by
air. Japanese logistics in Burma and China were
disrupted. China was kept in the war.

Over 1,400,000 tons of supplies and equipment and
1,266,000 troops were transported by air. The
air movement over the "tango" between India and
China attained a peak rate of 75,000 tons in 3
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In the fall of 1943 it was decided to attack Japa-
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tactical and antishipping operations of the Fourteenth Air Force in China. The memory train-
ing and combat experiences with B-29s provided by this operation might have been scored through
attacks to “Water Zone” targets, from bases more easily supplied. In November 1944, long-range
bomber attacks from Guam, Saipan and Tinian were initiated. The B-29s based in China were
transferred to these bases in April 1945.
By March 1945, prior to heavy direct air attack
on the Japanese home islands, the Japanese air
forces had been reduced to Kamikaze forces, her
aircraft were destitute, some parts of her ground
forces involved, and the strength of her navy
soon will begin. What happened to each of these
segments of Japan’s vanishing air potential is
analyzed in the following sections.

**Elimination of Japanese Conventional Air Power**

Japanese production of aircraft of all types rose
from an average of 405 planes per month during
the first 3 months of the war to a peak of 5,876
planes per month in September 1944. The rise was
particularly great during 1943, after the Japanese
had learned the lessons of the 1942 campaign.
Aggregate production during the war was 50,000
planes.

Japanese air and navy planes losses from all
causes, both combat and noncombat, rose from an
average of three 800 planes per month in the
early months of the war to over 8,000 per month in
the latter months of 1944. Aggregate losses dur-
ing the course of the war were of the order of
magnitude of 30,000 planes, of which something
less than 40 percent were combat losses, and
another 60 percent were training, factory, and
other noncombat losses.

The Japanese were thus able to increase the
numerical strength of their air forces in peace, in
almost every month of the war. Numerical strength
increased from 93,903 tactical planes at the out-
break of the war to 9,000 initial planes, plus
4,466 Kamikaze planes, at the time of surrender.

Aggregate flying personnel increased from
approximately 12,000 at the outbreak of the war to
over 100,000 at the time of surrender.

United States aircraft production and pilot
training exceeded the Japanese despite by wide
margins, but only a portion of this strength could
be deployed in the Pacific. United States first line
strength in the Pacific west of Pearl Harbor in-
creased from some 900 planes in 1941 to 11,000
planes in August 1945. It was not until late 1943
that we attained numerical superiority over the
Japanese forces in the field. First in 1942, how-
ever, the relatively few United States air units
in the Pacific were able to deliver greater damage
than they received on the numerically superior Japa-
nese.

Aggregate United States plane losses dur-
ning the course of the Pacific war, not including
training losses in the United States, were ap-
proximately 27,000 planes. Offsives losses 7,000
were on combat missions; the remainder were training,
 ferrying and other noncombat losses. Of the sum-
tal losses over 80 percent were to antiaircraft fire.

As previously stated, Japanese planes at the out-
break of the war were well trained. The average
Army pilot had some 400 hours before entering
combat and Navy pilots 600 hours. These ex-
perienced pilots were largely expended during the
latter campaigns of the opening year and a half of
the war. The Japanese paid for this training, by
sustaining an ever greater number of losses and
replacements, and by undermining their training
program by growing shortages of weapons material.
Aggregate personnel losses of the United States
forces were about 200,000 carriers.

At the time of the initial Japanese attack, Japa-
nese fighter planes, although heavily built, were
more reliable and lasted in fire power than the United
States fighters, had certain flight char-
acteristics superior to those of United States fighter
planes then available in the Pacific. This Japanese
improved the quality of their planes during the
war, greatly increased the power of their aircraft
engines, ultimately exceeded United States fighters
in fire power and had displace aircraft to the
design and experimental stage at the end of the
war. They lacked, however, the widespread indus-
trial and industrial skill to match the United
States in quantity production of reliable planes
with increased range, performance and durability.

After the initial campaign, the United States al-
ways enjoyed superiority in the over-all perform-
ance of its planes.

By American standards, the Japanese never
fully appreciated the importance of adequate maintenance, logistics support, communications and control, and airfields and bases adequately prepared to handle large numbers of planes. As a result, they were unable to concentrate any large proportion of their air strength at any one time or place. Neither did they appear to have the ability to create large formations in the air with any degree of efficiency.

Local air control and its tactical exploitation the Japanese understood and achieved in their early offensives.

But along with all other military powers prior to the war, the Japanese had failed to fully appreciate the strategic evolution brought about by the increased capabilities of air power. The ability to control general and controlling control of the air was not recognized as a requirement in their basic war strategy, as was the planned destruction of the United States Fleet. Had this basic requirement been well understood it is difficult to conceive that they would have undertaken a war of limited objectives in the first place. Once started on a strategic plan which did not provide the means to assure controlling air control, there was no way in which they could revise their strategy to achieve the growing preponderance in the air of a basically stronger opponent who came to understand this requirement and whose war was being fought accordingly.

CONVERSION OF JAPANESE AIR FORCES TO KAMIKAZE FORCES

By the summer of 1944, it had become evident to the Japanese air command that there was no way in which they could equal the United States air arms at any point. Their efforts were inadequate, while the results which they achieved were negligible. The one and only point which they still possessed was the willingness of their pilots to meet certain death. Under these circumstances, they developed the Kamikaze technique. A pilot who was prepared to fly his plane directly into a ship would require but little skill to hit his target, provided he got through the intercepting screen of enemy fighters and anti-aircraft fire. If the pilot of the Japanese plane attached himself to a certain point, it would be impossible to prevent a certain proportion from getting through. Even though losses would be 100 percent of the planes and pilots therein committed, results, instead of being negligible, might be sufficient to cause severe damage beyond that which we would be willing to endure.

From October, 1944, to the end of the Okinawa campaign, the Japanese flew 2,930 Kamikaze missions, of which 435, or 14.7 percent were effective in scoring hits or causing severe damage. Wholesale of all types were damaged, including 31 aircraft carriers, 10 battleships, and 14 light and escort carriers. However, no ship larger than an escort carrier was sunk. Approximately 45 ships were sunk, the bulk of which were destroyers. The Japanese were misled by their own initial claims of heavy ships sunk, and ignored the advice of their technicians that a kamikaze attack had been required to sink large ships. To the United States the loss actually sustained was minor, and caused great concern. Two thousand B-29 sorties were directed from this point on Japanese cities and industrial to striking Kamikaze air fields in Kyushu. Had the Japanese been able to maintain an attack of greater power and concentration they might have been able to cause us to withdraw or to revise our strategic plans.

In the fall of 1944, the Japanese lost more than 2,000 planes in the home islands available for Kamikaze attack, and of the 3,000 that had already been specially fitted for suicide attack to effect our planned invasion.

DISTURBANCE OF THE JAPANESE FLEET

As stated earlier in this report Japan started the war with 35 carriers. Six were sunk during the engagements of 1942. The Japanese during the course of the war constructed or converted from other types of ships a total of 17 additional carriers including 9 escort carriers: of the remaining ones one was made on a Fuso-class battle-ship hull and two, carriers only in part, were the result of converting the other service of battleships and installing larger engines and launching devices. Due to the loss of these six carrier ships in 1944-45 and the time required to task new ones, the Japanese did not commit their carriers again until 1946. In the engagements of that year the Japanese lost 7 carriers without themselves scoring appreciable results. Seven more were lost in late winter in submarine or air attack. All Japanese carriers sunk were lost either to our carrier-based aircraft or to submarines with the exception of one which was finished off by war
first week after it had been mortally damaged by carrier planes.

The Japanese had two fast-cruiser equivalents, each of 10,000 tons, armed with 16-inch guns and completely compartmented, which were more powerful than any United States battleship. One was sunk in the Sibuyan Sea, the other south of Kyushu, both by carrier torpedo planes.

Japan began the war with 157 warships aggregating approximately 1,277,000 tons. An additional 220 combat ships totaling 1,383,000 tons were constructed during the war. Five hundred and forty-two ships of all types and sizes totaling 1,786,000 tons were sunk. Approximately 1,210,000 tons of Japanese warships in the carrier, battleship, cruiser and destroyer categories were the ship, cruiser and destroyer category sunk in the aggregate tonnage sunk. Of this total roughly 418,000 tons were sunk by海军 and 其它的 aircraft, 275,000 tons by submarines, 188,000 tons by surface vessels, 55,000 tons by Army aircraft, and 44,000 tons by various agents. Only 10,000 tons in these categories remained afloat at the end of the war. The tonnage sunk by surface ships was principally in night actions. A shortage of Japanese destroyers after 1943 and inadequate Japanese anti-submarine measures contributed to the success of United States submersible operations against the Japanese fleet.

After the liberation of the Philippines and the capture of Okinawa, the Hungshan oil lands in Japan were completely cut off; fuel oil stocks had been substantially reduced and the few remaining Japanese warships, being without fuel, were demobilized or were covered with camouflage and used only as convoy escort platforms. Except for its thousand-kilometer range aircraft and surface vessels, the class was adapted for anti-aircraft and night attack; the Japanese Navy had ceased to exist.

DESTROYER ACRE OF THE JAPANESE MERCHANT FLEET

Japan’s merchant shipping fleet, not only a key link in the logistical support of her armed forces in the field, but also a vital link in her economic structure, was the sole element of the basic structure of the Navy that was vulnerable to direct attack throughout any portion of the war. Japan’s first threat with some 6,400,000 tons of merchant shipping of over 300,000 gross tons. During the war an additional 4,200,000 tons were inserted, captured or requisitioned. Sufficient information was secured by the Survey in Japan counting this 20,000,000 tons to take into ship by ship, (a) the names and tonnages, (b) the date, location, and agent of sinking or damage, and (c) the present condition and location of each ship as acquired. The course from which evidence was obtained was in some respects confusing. Where possible these conflicts have been resolved. The Joint Army and Navy Assessment Committee has tentatively arrived at similar results and is continuing its efforts further to refine the evidence. The Survey believes that the figures included in the following breakdown will not differ significantly from the final evaluation of the Joint Army and Navy Assessment Committee.

Eight million five hundred thousand tons of this shipping were sunk or mortally damaged as to be out of action at the end of the war. Fifty-four and seven-tenths percent of this total was attributable to submarines, 38 percent to carrier attack, 10 percent to Navy land-based planes and 10 percent to Marine land-based planes. 63 percent was sunk (largely by B-29s), less than 1 percent to surface gunfire, and the balance of 4 percent to mines and torpedoes.

Due to their ability to penetrate deep into enemy-controlled waters, submarines encountered for approximately 60 percent of sinkings up until the final months of the war. During 1944, carrier task force made deep sweeps which accounted for large numbers of ships. After April, 1945, when Japanese shipping was restricted to the Ryukus and Nan newa area and to shallow shallow island waters, mines dropped by B-29s in Japanese harbors took a toll of all ships sunk or damaged. In initiating area of combat from ship borne reconnaissance, ships based on the North Pacific saw large numbers of large mines, even smaller than 500 tons gross, not included in the tabulation prepared by the Survey.

In the Survey’s opinion these air raids which had anti-shipping attacks as their prime mission and employed the required specialized techniques, equipment and training achieved against ships the best results for the effort expended.

The Japanese originally allocated three-fifths of their shipping fleet to the logistic support of their military forces in the field. They expected that
After their original advance had been completed, they would be able to return increasing numbers of ships to the movement of raw materials for their basic economy. After the beginning of the Okinawa campaign, however, they were kept under such constant and unexpected military pressure that the contemplated return after that date was never possible.

Up to the end of 1944, ship sinkings exceeded new acquisitions by a small margin. Therefore, the aggregate tonnage sank increased far more rapidly than could be matched by the expansion of the Japanese shipbuilding program. The size of the available fleet thus declined continuously and at the end of the war amounted to little more than 10 percent of its original tonnage. The Japanese belatedly attempted to build up a convoy system, to reduce freight movements to rail lines, and to absorb excess demand of supply, but these measures acted only as palliation and not as cure. For instance, conversing and re-resting decreased the freight record per ship by a factor amounting to 40 percent in the closing months of the war. In 1944 twelve homes became particularly heavy and were therefore the first concern of the Japanese shipping authorities.

The basic economic consequences of ship sinking will be discussed in a later section. From the standpoint of the Japanese armed forces in the field it will be noted that 27 percent of enemy supplies shipped from Japan were sunk in 1944, 30 percent in 1945, and 33 percent in 1946. A shortage of first necessity was a continuing limitation to the mobility of the Japanese fleet and contributed to its defeat in the two naval battles of the Philippine Sea. Inadequate logistic support, due in large part to lack of shipping, was one of the principal handicaps of the Japanese air forces. Attacks by submarine, long-range search and attack planes, mines, and carrier and land-based bombers were capable of causing and complicated the Japanese defense. Long-range search and attack planes found targets for submarines; converting which suffered severe protection against submarines increased the vulnerability to air attack; ships driven into congested harbors in face of submarine attacks were easily surprising and crippled the Japanese defense. Long-range search and attack planes found targets for submarines; converting which suffered severe protection against submarines increased the vulnerability to air attack; ships driven into congested harbors in face of submarine attacks were easily surprising and crippled the Japanese defense. Long-range search and attack planes found targets for submarines; converting which suffered severe protection against submarines increased the vulnerability to air attack; ships driven into congested harbors in face of submarine attacks were easily surprising and crippled the Japanese defense.
weight of fire on the immediate invasion beaches was generally such that the Japanese retired a short distance inland, but once we advanced beyond the beaches, it became necessary to destroy the remaining Japanese in costly close-range fighting. It was demonstrated, however, that Japanese resistance was effectively weakened and our casualties were lower when the appropriate weapons were employed with sufficient weight and accuracy to both suppress and soften up operations and subsequent close support.

A Japanese estimate indicates that in the northwestern sector, approximately 27 percent of their combat deaths resulted from aerial bombing and 39 percent from small-arms fire, 12 percent from artillery, and the remaining 12 percent from other causes.

In these places where it was essential to eliminate Japanese ground resistance in close-range fighting, great precision had to be developed in air-support operations in order to be certain not to hit our own troops, and to secure kills on the small targets which the retreating Japanese positions presented. This required highly specialized training, and the closest coordination between the ground and air forces through an intensive system of ground and air observers and mutual control by ground-control radio communication. In the Pacific, this system was continuously improved by the Navy and Marines in connection with succeeding amphibious operations against strongly defended positions and reached a high degree of effectiveness. In the Philippine campaign, the Army air forces employed comparable techniques, and General Yamashita has testified to his feeling of complete helplessness when confronted with this aspect of the operation.

In the Southwest Pacific, it often proved possible to effect landings at lightly held positions and then bypass large bodies of enemy ground forces. In the Central Pacific, many of the islands the Japanese expected us to attack were bypassed, and the garrisons left to either fall and die. Survey examinations of the bypassed islands in the Pacific and interrogations of the Japanese survivors confirm the unbelievable situation. Their planes and ground installations were destroyed by air attack. Cut off from any supplies or reinforcement, except occasionally by submarine, their fate was certain. On certain of the islands, Japanese actually ate Japanese. In summary, however, that our air attacks on these bypassed positions were often conducted longer and in greater weight than was reasonably required or practical.

THE JAPANESE ECONOMY PRIOR TO SUSTAINED DIRECT AIR ATTACK

The orientation of the Japanese economy toward war began in 1940, and continued with increasing emphasis during the Manchurian and Chinese campaigns. By 1941, total production had risen by more than 40 percent; heavy industrial production by almost 50 percent; and 17 percent of Japan's total output was being devoted to direct war purposes and expansion of her munition industries, as against 2.6 percent at that time in the United States. Construction of industrial facilities in these years amounted— for the Japanese conditions— to gigantic proportions. Her aircraft, ammunition, machine tools, automobiles, and tank production were erected from almost nothing during this period.

The industrial expansion was based and dependent on the availability of raw materials, raw and crude. It was devoted to the increase of raw material output in the home islands. In more respects, major results were advanced. Coal production in Japan rose from 20,000,000 tons in 1941 to 85,000,000 tons in 1944.Domestic iron output reached considerable figures. Nevertheless, no country could have been farther from self-sufficiency, with respect to raw materials, than Japan.

The development of basic material sources on the continent of Asia constituted almost the central issue of Japan's economic policy during this period.

Although progress in Manchuria and China helped significantly to alleviate Japan's raw material shortages in cobalt, iron ore, and steel, insufficiency of new materials continued to be the most important limiting factor on Japanese industrial output. Nonferrous production of oil and of bauxite sources situated within Japan's "Inner Zone." Output of aluminum ingots had risen from 19 tons in 1935 to 35,740 in 1942, 10 percent of which was produced from bauxite imported from the Dutch East Indies. Plans to develop a synthetic oil industry failed to yield significant results and Japn was almost wholly dependent on oil imports from the United States or the Dutch East Indies, and to a lesser extent on imports estab-

lished for rubber, from countries such as.
diesel, nickel, cobalt and tungsten, and for non-ferrous metals such as tin, lead and mercury.

Focusing more on economic exploitation of the oil and bauxite resources of the southern area, stock piling of these vital materials was a necessity. By the end of 1943, bauxite stocks of 150,000 tons, consisting of a 7-month's supply, and 43,000,000 barrels of oil and oil products were stored in Japan.

Considering the economic performance of the decade, one cannot but be impressed by the tenacity of the effort and the magnitude of the effort. Nevertheless, Japan remained with an economy having approximately 90 percent of the potential of the United States economy. It was desperately vulnerable to attack on its shipping. Having a comparatively small, newly developed industry, it had to work without much concern of under-staffed physical plant capacity. Having had little experience with main production, the country had no opportunity to build up a large force of industrially and mechanistically trained personnel. This meant shortage of skills, ingenuity and ability to impose later on, when the country was under the stresses and strains of hopeless warfare.

This economic potential could support a short war or a war of limited duration. The accumulated stocks of manufacured oil, grains and ships could be thrown into action and produce a damaging effect on our industrial assets. When this initial blow failed to result in peace, Japan, without significant help from Germany, was destroyed. Its economy could not support a protracted campaign against an enemy even half as strong as the United States.

In addition, the success of the initial Japanese military operations delayed total economic mobilization until after the defeat of late 1945. Consequently, the economic resources of the country were not fully mobilized as they were in the United States. Japan was forced to divert its industrial capacity to meet the demands of war. This resulted in a decline in the production of manufactured goods, which in turn affected the economy of the United States.

The economy of Japan was severely affected by the war, and the country was forced to allocate its resources to meet the demands of the military. This led to a decline in the production of manufactured goods, which in turn affected the economy of the United States. Japan was unable to meet the demands of the war, and the country was forced to allocate its resources to meet the demands of the military. This led to a decline in the production of manufactured goods, which in turn affected the economy of the United States.
figure, but would soon have been reduced. The decline in Japan's steel production can be attributed to a depression on shipping and the destruction of the shipping. Had this industry not been mortally wounded by shipping attack and had its destruction by bombing been called for, the effectiveness of the film, strategic bombing units directed against the steel industry might indicate that destruction of the principal plants by bombing or paralysis of the industry by disruption of railroad transportation would have been possible, but only at a later date.

The steel shortage constituted an over-all limitation on the war potential of the Japanese economy. Japanese planners were, however, able to secure a substantial increase in the production of those military products which the experience of the war had demonstrated to be of outstanding importance. Aircraft production in all types, including training planes, was stepped up from 700 planes per month in the summer of 1943 to 2,972 planes in September 1944. Aircraft engine production was not only increased correspondingly in numbers, but a switch was made from 4-cylinder to 12-cylinder engines and from production of turbosupercharged to liquid-cooled engines. Aircraft and submarine and anti-aircraft production was expanded to full scale. The most important consumer of steel was the shipbuilding industry. The increasing critical nature of Japan's shipping situation meant that she had to expand her naval and merchant shipbuilding program to a point where 80 percent of all steel consumed was being used in that industry alone. Construction of merchant ships increased from approximately 208,000 tons in 1941, to 1,400,000 in 1942, and to 2,900,000 tons of wooden ships in 1944. During 1943, shipbuilding delivered 123,000 tons of 60,000-ton and small carriers totaling 69,000 tons. In 1944, 80,000 tons of 114,000-ton displacement and 141,000 tons of escort vessels were delivered. The increase in the number of priority items involved in the making of steel for the shipyards was a result of the shifting of steel to the aircraft industry. The amount of steel required for military production was increased by further shifting of allocations of scarce materials from items of lesser priority. In addition to steel, other basic elements of the economy were involved. Oil, although not as important as steel in the broad impact on the remainder of the economy, was of critical importance to Japan's military machine and to her merchant marine. Oil imports from the Middle East declined rapidly from 1941 levels, and by late 1944, they were only 5,000 tons in the third quarter of 1944, and 3,000 tons in the fourth.

The steel shortage had a serious effect on the shipbuilding program. By July 1944, it began to appear that the Japanese shipping industry might be unable to maintain their merchant marine. The steel shortage was a result of the high priority given to military production. The increased production of steel was not sufficient to meet the needs of the shipbuilding industry.

The AIR ATTACK AGAINST THE JAPANESE HOME ISLANDS

The United States strategy of Japanese war potential by an invasion of the Japanese home islands. The invasion of the Mariana Islands was initiated in November 1944, with the aim of neutralizing the Japanese war potential. In June 1945, the principal theater of the invasion was the Mariana Islands.
test in which it would wreak every capability and would to resist our amphibious forces at the time of landings. This led, originally, to a resumption of the general bombardment of the Japanese fleet and the invasion of Manchuria. It was then, on the dispositions of the invasion forces that the Japanese military leaders and the commanders of the fleet were finally determined to resist by all means. The possibilities of the invasion forces were considered to be the most that could be expected to resist the action of the Japanese fleet in the vicinity of the Kurile islands in November 1943, and the dispositions of the Soviet fleet in the Kurile islands were to be the main target of the invasion forces.
Economic Effects of Air Attack Against the Japanese Homeland

The physical devastation resulting from the air attack on Japan is apparent. The cities of Nagoya, Osaka, and Kobe were destroyed. The attack was so devastating that enemy cities were smaller and more vulnerable. Not only were the Japanese defenses overwhelmed, but Japan's will to continue the war had been broken. The attack was more widespread than expected, and the damage was greater than anticipated. The attack was so devastating that enemy cities were smaller and more vulnerable. The Japanese defenses were overwhelmed, and the will to continue the war had been broken.
completely the residential and smaller commercial and industrial structure in the affected areas and a significant number of important plants, but a portion of the already substantially contracted office buildings and factories in these areas and the underground utilities survived. By 1941 the Japanese had almost eliminated home industry in their war economy. They still relied, however, on plants employing less than 250 workers for subcontracted parts and equipment. Many of these smaller plants were concentrated in Tokyo and accounted for 39 percent of the total industrial output of the city. Such plants suffered severe damage in urban incendiary attacks. 

Some hundred and seventy thousand barrels of oil and oil products, 323,000 tons of foodstuffs and 3 billion square yards of textiles were destroyed by air attacks. Ninety-seven percent of Japan's stocks of guns, shells, explosives, and other military supplies were thoroughly penetrated in dispersed or underground storage depots, and were not vulnerable to air attack.

Physical damage to plant installations by either vice or precision attacks, plus decrease due to dispersal forced by the threat of further physical damage, reduced physical productive capacity by roughly the following percentages of preattack plant capacity: all aluminum, 80 percent; aircraft engine plants, 72 percent; airframe plants, 67 percent; electronics and communication equipment plants, 59 percent; army ordnance plants, 55 percent; naval ordnance plants, 50 percent; merchant and naval shipyards, 43 percent; light metals, 37 percent; iron steel, 18 percent; rubber, 10 percent.

The economic consequences of the physical destruction wrought by air attack are clearly interrelated with the concurrent effects of the interdiction of imports, the cumulative effects of under-maintenance of plants, and the declining health, vigor and determination of the Japanese people.

Let us first consider the level of Japanese industrial activity in July 1943, the last full month before surrender. Electric power and coal consumption were both about 10 percent of the peak recorded in 1941. Production efficiency had, however, declined and the overall industrial output was approximately 20 percent of the 1941 peak. Output worked considerably as between industries, kit, steel, rubber and by area. Output of air frames was 65 percent of the 1941 peak; aircraft engines, 87 percent; shipbuilding, 65 percent; army ordnance, 60 percent; and naval ordnance, 64 percent. Oil refining had declined to less than 20 percent of the 1941 peak. Although white coal production had declined to about 37 percent of the 1941 peak, explosives production was about 40 percent of the 1941 figure.

In such an environment, the anomalous feature of the decline appears to have been different. Electric power consumption fell, but because more power was not available, but because demand had declined. Coal supply was primarily limited by the deficit in low-level shipping from Hokkaido and Kyushu, and the inability of the rail network completely to fill the gap. Despite a decline in demand, shortages of coal were universal throughout the economy. Aluminum production was limited primarily by the continuing effects of the dispersal program brought on by the initial bombing, and aggravated by the subsequent destruction of munition plants prior to completion of dispersal. Had the level of production been any higher, however, aluminum stocks would have been exhausted and aluminum would have become the controlling bottleneck. In any event, not enough aircraft engines were being produced to apply the airframe. Aircraft engine production was plagued by shortages of special steels, but in July 1943, plant damage and delays in completing the underground and dispersed plants started in the spring of the year temporarily prevented the full use of the small stocks of such steels available at the time. Output of radar and radio equipment was limited by plant capacity, the small factories supplying parts having been destroyed in the Tokyo city raids and many of the larger plants either destroyed or forced to disperse. Shipbuilding and heavy ordnance production was limited by the availability of steel. Oil refineries, aluminum plants and steel plants were basically limited by lack of foreign raw materials. Explosive plants were still using up inventories of nitric acid but would shortly have been able to shift their output to the current availability of tanner.

The Japanese labor force had declined in efficiency due to exhaustion and disease, the destruction of homes, and the difficulty of local transportation. Production...
Much of Japan's coastal and inter-island traffic had already been forced to her transpacific railroads. The principal rail routes of Japan are located on Kyushu and Honshu. The coal traffic, formerly water borne, was moving by railroads employing the Kawanami tunnels and the Hakata-Osamisaki rail ferry. The railroads on Honshu include five main lines and three lines totaling bridges of considerable vulnerability. Japan is largely a mountainous country lacking navigable rivers, trucks or the gasoline to make use of them. A successful attack on the Hakata rail ferry, the Kawanami tunnels and 19 bridges and other vulnerable structures of this sort could have allowed the ferries to be blocked. It would have virtually eliminated further coal movement, would have isolated the remainder of the rail system through lack of coal, and would have completed the strangulation of Japan's economy. This strangulation would have more effectively and efficiently frustrated the economic structure of the country than individually destroying Japan's cities and factories. It would have reduced Japan to a series of isolated communities, incapable of any sustained industrial production, incapable of making food from the agricultural areas to the cities, and incapable of rapid large-scale movements of troops and munitions.

The survey believes that such an attack, if it were well planned in advance, might have been initiated by airdraided attacks on shipping and on the Hakata-Osamisaki ferry in August 1944, would have been continued by a second major effort in December 1944, and could have been further continued by initiating the rail attack as early as April 1945. The survey has estimated that such actions would have offset the original intentions of the rail system would have been 660,000 tons of cargo, carrying 8,000 tons of high explosives, 6,000 tons of oil, and carrying high explosives. Monthly tonnage equal to one and one-half times that required to offset the original intentions should have been offset, in view of the Japanese lack of preparations and personnel in offsetting repairs, to maintain the railroads by destroying each bridge and other facilities at the Japanese were able to repair. The use of A-bomb guided bombs, which could have been made available at that time, would have greatly increased accuracy against targets of this type and reduced the requirement to approximately one-third of those given above. An inte...
The health and morale of the Japanese civilian population under assault.

Total civilian casualties in Japan, as a result of 8 months of air attack, including those from the atomic bombing, were approximately 800,000. Of them, approximately 650,000 were fatalities. These casualties probably exceeded Japan's civilian casualties which the Japanese estimated at having totaled approximately 750,000 during the entire war. The principal areas of civilian death or injury were: Okinawa, approximately 150,000; and the initial attack on Tokyo on 5 March 1945. Casualties in many extremely restricted attacks were comparatively low. Yokohama, a city of 600,000 population, was 45 percent destroyed by a single attack lasting less than an hour. The fact that the attack was less than an hour was less than 5,000.

The Japanese had conducted extensive fire-bombing by torching down all houses using selected areas as natural barriers. The total number of buildings burned down in this program, as reported by the Japanese, amounted to 55,000 as against 232,000 burned by the US attacks themselves. These buildings did not effectively stop the spread of conflagration but were dropped on both sides of the barrier. They fell, however, constitute an effective measure for the civilian population.

The Japanese instituted a civilian defense organization prior to the war. It was not until the summer of 1944, however, that effective steps were taken to reduce the vulnerability of Japan's civilian population to air attack. By that time, the shortage of steel, copper, and other construction materials was such that adequate air-raid shelters could no longer be built.

The obligation of preventing fire with some kind of fire extinguisher compounded the problem. The family was given the instruction in each house, and a little dirt. In addition, materials were dug into the sides of hills where the topography permitted.

Japanese planning and the manner for carrying out the plans were such that a single air attack would have been effective in eliminating casualties. School children and other nonessential workers were evacuated to the country. Those who remained were organized in orderly lines and provided with essential assistance.

The air raid warning system was generally efficient. The weight of the individual attacks, however, far heavier than the Japanese had anticipated or were able to cope with. In the major air attacks, the civilian defense organizations were simply overwhelmed.

The growing food shortage was the principal factor affecting the health and vigor of the Japanese people. Prior to Pearl Harbor the average per capita calorie intake of the Japanese people was about 3,200 calories as against 2,200 in the United States. The average of 3,200 calories in Japan is only 9 percent of that of the United States to support a population over half as large.

The Japanese had attempted to obtain from the United States more and more fertilizer, but the American government refused to accept a dollar for its use because it became inordinately expensive. The atomic bomb produced by the United States was the result of long and hard work. By the middle of 1945 it was about 1,000 calories per day.
explains. Coal miners and heavy industrial workers received higher-than-average wages, the remaining workers less. The average diet suffered even more drastically from reductions in fats, vitamins and minerals required for balance and adversely affected rates of recovery and mortality from disease and birth injuries. Undernourishment produced a major increase in the incidence of beriberi and tuberculosis. It also had an important effect on the efficiency and record of the people, and contributed to discemtion among workers.

Survey interrogation of a scientifically designed cross-section sample of the Japanese civilian population revealed a high degree of uniformity as between city and rural sections of the population and between various economic and social strata to their psychological reaction to the war. A relatively high percentage deemed Japan's greatest enemies to have been in the material realm, either lack of resources, productivity plant or modern weapons, and that greatest strength to have been in the Tung-tzu spirit of the Japanese people, their willingness to make every personal sacrifice, including that of 5% blood, for the Emperor or Japan.

The Japanese people reacted to news of the attack against the United States and its Allies with mingled feelings of fear, incertitude and hope. To a people reared by 10 years of war in China, it was clear that this was a major war and not an "incident." The early Japanese military successes, particularly the capture of Singapore and the southern regions, were followed by a wave of optimism and high confidence. Subsequent defeat was mistakenly withheld from the people or disguised as strategic withdrawals. Prior to the establishment of unconditional surrender, Japan was rallied high in spite of subsisting work, poor nutrition and depressed prices. In June of 1944 approximately two percent of the population believed that Japan faced the probability of defeat. The fall of Saigon could not be kept from the Japanese people. Even though the psychological effect of this disaster was far greater on the Japanese leaders and intellectuals than on the mass of the population, all indications of Japanese morale began thereafter to decline. By December 1944 all attacks from the Marianas against the invader's land had begun, defeat in the Philippines had been suffered, and the food situation had deteriorated; 20 percent of the people believed Japan could not achieve victory. By March 1945, when the initial incendiary attacks began and the food ration was reduced, this percentage had risen to 99 percent. In June it was 62 percent, and by February of 1945, 89 percent. Of those who had come to the belief that the nation's efforts would not be sufficient to achieve victory, other than the atomic bomb attacks, and one-third in military defense. Sixty-four percent of the population stated that they had heard a priest or a preacher in church say that they felt personally unable to go on with the war. Of those less than one-third attributed the cause to military defense, one-quarter attributed the cause to shortages of food and civilian supplies, the largest part to air attacks.

A striking aspect of the air attacks was the manner in which it impacted on morals demoralized Japan. Roughly one-quarter of all people in cities died or were evacuated, and three-fourths were subjected to the fear of massacres, including that of 5% blood, for the Emperor or Japan.
The effects of the atomic bombs

On 6 August and 9 August 1945, the first two atomic bombs to be used for military purposes were dropped on Hiroshima and Nagasaki, respectively. Over a thousand people were killed, fifty square miles or over ninety percent of the built-up areas of the two cities were destroyed. The first and crucial question about the atomic bomb that was unanswered precisely and conclusively; atomic energy had been mastered for military purposes and the world-shattering ends of its possibilities had been demonstrated. A detailed examination of the physical, economic, and moral effects of the atomic bomb occupied the attention of a major portion of the Army's staff in Japan, in order to arrive at a more precise definition of the present capabilities and limitations of this radically new weapon of destruction.

Eyewitness accounts of the explosion all describe similar pictures. The bombs exploded with a tremendous flash of blue-white light, like a giant explosion. The flash was of short duration and accompanied by intense glare and heat. It was followed by a tremendous pressure wave and the humming sound of the explosion. The sound is not clearly recorded by those who survived near the center of the explosion, although it was clearly heard by others as much as fifteen miles away. A huge smoke-cloud shot rapidly into the sky and the scene on the ground was obscured first by a black haze and then by a purple-brown cloud of dust and smoke.

Such eyewitness accounts account for the sequence of events. At the time of the explosion, energy was given off in the form of light, heat, radiation, and pressure. The complete band of radiation, from X-rays through ultraviolet and light rays to the radiant heat of infra-red rays, travelled with the speed of light. The shock waves created by the enormous pressures built up almost instantly at the point of explosion but moved out more slowly, that is at about the speed of sound.

The superheated gas surrounding the original fireball expanded outward and upward at a slower rate.

The light and radiant heat rays accompanying the flash travelled in a straight line and any exposed object, even a single bed of a room, shielded objects lying behind it. The duration of the flash was only a fraction of a second, but it was sufficiently intense to cause third degree burns to exposed human skin up to a distance of a mile. Clothing ignited, though it could be quickly blown out, telephone poles charred, thatched roofs caught fire. Black or other dark-colored surfaces of combustible material absorbed the heat and immediately charred or burst into flames; white or light-colored surfaces reflected a substantial portion of the rays and were not burned. The heavy black city tiles which are an almost universal feature of the roofs of Japanese houses burned at distances up to a mile. Tests of samples of this tile by the National Bureau of Standards in Washington indicate that temperature in excess of 1800°C must have been generated in the surface of the tile to produce such an effect. The surface of granite blocks exposed to the flash and spalled at distances up to about a mile. In the immediate area of ground zero (the point on the ground immediately below the explosion), the heat charred turf beyond recognition.

Penetrating rays such as gamma-rays exposed X-ray film stored in the basement of a concrete hospital almost a mile from ground zero. Symptoms of their effect on humans being close to the center of the explosion, who were exposed to these effects, were generally delayed for two or three days. The bone marrow and the organs of blood formation were affected. The white corpuscles went down and the heart's process of replacing blood cells in lower. Post-operative surgery was followed shortly thereafter.

The majority of radiation cases who were at greater distance did not show severe symptoms until 1 to 4 weeks after the explosion. The first symptoms were loss of appetite, insomnia, and general discomfort. Within 5 to 40 hours, fever became evident in many cases, going as high as 106° to 108° F, which in fatal cases continued until death. If the fever subsided, the patient usually
showed a rapid disappearance of other symptoms and soon acquired the feeling of good health. Other symptoms were those of white blood corpuscles, loss of hair, and decrease in appetite.

Though rays of this nature have great power of penetration, interesting structure life and precise them. As the weight of the interesting material increases the percentage of the rays penetrating goes down. It appears that a few feet of concrete or a measured greater thickness of earth furnished sufficient protection to increase, even those close to ground zero, to prevent serious after effects from radiation.

The blast wave which followed the flash was of sufficient force to pass in the earth of surrounding concrete structures and its force completely all less sturdy structures. Due to the height of the explosion, the peak pressure of the wave at ground zero was no higher than that produced by an explosion of a high-explosive bomb, and decreased at greater distances from ground zero. Reflection and shielding by intervening hills and structures produced some variation in the pattern. The blast wave, however, was of far greater extent and duration than that of a high-explosive bomb and most reinforced concrete structures suffered structural damage or collapse up to 700 feet at Hiroshima and 2000 feet at Nagasaki. Brick buildings were flattened up to 750 feet at Hiroshima and 2000 feet at Nagasaki. Typical Japanese houses of frame construction suffered total collapse up to approximately 100 feet at Hiroshima and 2000 feet at Nagasaki. Beyond these distances structures received lesser serious damage to roofs, walls, partitions, and the like. Glass windows were blown out at distances up to 3 miles. The blast wave, being of longer duration than that raised by high explosive detonation, was accompanied by very little debris. Window frames, doors, and partitions which would have been shaken during a high-explosive bomb were hurled at high velocity through those buildings which did not collapse. Machine tools and some other production equipment in industrial plants were damaged by the blast wave, but were not damaged by collapsing buildings or moving general storm.

The above description outlines all the catastrophic destructive actions by the atomic-bomb explosion at Hiroshima and Nagasaki. There were no other types of action. Nothing was vaporized or disintegrated, vegetation is growing again immediately under the center of the explosion; there are no indications that radioactivity continued after the explosion to a sufficient degree to harm human beings.

Let us consider, however, the effects of those variant types of destructive action on the cities of Hiroshima and Nagasaki and their inhabitants.

Hiroshima is built on a broad river delta; it is flat and little above sea level. The total city area is 30 square miles but only 7 square miles at the center were densely built up. The principal industries, which had been greatly expanded during the war, were located on the periphery of the city. The population of the city had been reduced from approximately 200,000 to 80,000 as a result of a civilian defense evacuation program. The explosion caught them by surprise. An alert had been canceled but in view of the small number of planes the all-clear had been given. Consequently, the population had not taken shelter. The bomb exploded a little southwest of the center of the building area. Everyone who was in the open and was exposed to the initial flash suffered serious burns when not protected by shielding. Over 4 square miles in the center of the city were fit only to the ground with the exception of some still remaining concrete buildings, most of which were internally gutted and many of which suffered structural damage. Most of the people in the flooded area were created swept down by the collapsing buildings or flying debris. Shortly thereafter, numerous fires started, a few from the direct heat of the flash, but most from overturned chemical storage tanks or other secondary causes. These fires grew in size, merging into a general conflagration fanned by a wind which blew into the center of the city by the rising heat. The civilian-defense organization was overwhelmed by the magnitude of the destruction, and the spread of fire was halted only by the air rushing toward the center of the conflagration than by efforts of the fire-fighting organization.

Approximately 80,000 to 70,000 people were killed, and 25,000 were injured. Of approximately 90,000 buildings in the city, 8,000 were rendered unserviceable and all the remainder received at least light superficial damage. The underground utilities of the city were undamaged except when they passed bridges over the rivers cutting through the city. All of the usual factors in the
center of the city were destroyed. However, the big plants on the outskirts of the city were almost completely undamaged and 94 percent of their workers survived. These factories accounted for 74 percent of the industrial production of the city.

It is estimated that they could have resumed substantially normal production within 30 days of the bombing, had the war continued. The factories running through the city were repaired for the reception of production credits on 8 August, 6 days after the attack.

Nagasaki was a highly congested city built around the harbor and up into the eastern and western valleys of the surrounding hills. Some of these hills coming down close to the head of the bay divide the city roughly into two sections. The hilly area was 4.4 square miles of which 75 percent was food or housing area.

The city of Nagasaki was heavily damaged by the bombing. The docks and the factories that produced the nation's vital war materials were severely damaged. The docks were completely destroyed and the factories were partially damaged.

The city was in a state of chaos and therefore the few personnel that were left were not able to function properly. The current situation was a major concern for the city, as it was facing a severe economic crisis. The factories that were damaged were not able to function properly.

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would have been required to appreciate the dangers and necessities of evacuation. This estimate presupposed bombing under conditions similar to those existing when the atomic bombs were dropped and bombing accuracy equal to the average attained by the Twentieth Air Force during the last 3 months of the war.

At night, in the exposure of the populace to the bombs was feared, uncontrolled terror, strengthened by the fear borne of the destruction and suffering experienced and experienced by the survivors. Prior to the dropping of the atomic bombs, the people of the two cities had few misgivings about the war than those in other cities, and their morale held up after it better than might have been expected. Twenty-nine percent of the survivors interviewed indicated that after the atomic bomb was dropped they were convinced that victory for Japan was impossible. Twenty-four percent stated that because of the bombs they felt personally unable to carry on with the war. Some 40 percent testified to various degrees of degradation. A greater number (54 percent) expressed themselves as being impressed with the power and scientific skill which underlay the discovery and production of the atomic bomb than expressed anger at its use (20 percent).

In many instances, the reaction was one of resignation.

The effect of the atomic bomb on the confidence of the Japanese civilian population outside the two cities was even greater. This was in part due to the effect of distance, lack of understanding of the nature of atomic energy, and the impact of other demoralizing experiences. The role of the atomic bomb in the surrender must be considered along with all other factors which bear upon that question with Japan.

JAPAN'S STRUGGLE TO END THE WAR

Although this constitutional structure was such that in practice the Emperor merely approved the decisions of his advisors, a consensus among the military that the Emperor's advice and his confrontation with the cabinet on this point were relevant. Thus, a decision on the question of national policy could be delayed. These factors, each of which had a different point of view, included the group around the Emperor of whom Emperor Hirohito and the Emperor of the Fuyi State, was the most important, the preponderance consolidating the decision of a body of senior officials, and the substructure of the army and navy under the cabinet ministers, who, together with the two chief of staff, had direct access to the Emperor. The cabinet could deliberate (and only so long as it was possible) on alter the view of the Army and Navy officers, who, until the end, were strongly influenced by the fanaticism of their officers and many of the younger Navy officers. The ruling oligarchy considered the opinions of the Japanese people as only one among the many factors to be taken into consideration in determining national policy and no one so controlling.

The first definitive step in the political coalition which began the war occurred following the surrender of Japan. On July 14, 1945, the cabinet headed by General Tojo fell. This significant step was the cause of Japan's wartime policies was not merely the result of an immediate crisis. Even at that date, elements opposing continuation of the war had found covert means of applying pressure against the fanatic proponents of Japan's militaristic clique. The original decision who had ordered the attack on Pearl Harbor, as one goes along, or perhaps the first step in the plan of the conflict recognized as even in the spring of 1942 that Japan was nearing ultimate defeat. By that time, United States determination to fight and her ability to mount overpowering and complete surrender of the European Second Front, had already been demonstrated by many of those who had access to all the facts. The political problem of those who saw the situation was to expedite among other leaders in retreat or to the government, a statement of the United States. But the Japanese government in favor of which would bring the war to an end.

Dear Admiral Nagumo,

I am the Assistant Chief of Staff of the Navy General Staff and was present at 20 September 1939 and February 1941, of the war's battles stopped up to that time. Based on an analysis of air, naval and merchant ship losses, Japan's inability to import essential materials for production, and the possibility of air attacks on the home islands, Nogumo concluded that Japan could not win and should make a comprehensive peace. His study and a similar one made by Shikoku of the Chief Planning Board documented the forces of the Japans, and through them of Marquis Kido, that all was not well with Tojo's preservation of the
was. With the loss of Saipan, it was possible to build up sufficient pressure to force Japan's surrender.

The government of General Tojo, who was chosen by the war cabinet to head the surrender cabinet, did not have the strength to withstand the pressure and was a disappointment to the more authoritative peace makers. As a result, the Japanese government was given the choice of a Supreme War Council, an interim cabinet which supplied the necessary strength and which the problem of surrender was eventually resolved.

The occupation and strengthening of the peace party was increased by the mounting Japanese military defeat, and by Japan's willingness to make itself a part of the growing weight of air attacks on the home islands. On 26 July 1945, less than a week after United States landings on Okinawa, Korea was annexed and the war was over. On 29 July 1945, the Japanese signed the Instrument of Surrender, officially bringing the war to an end.

On 29 July 1945, the Supreme War Council began active discussions of ways and means to end the war, and talks were initiated with the Russians seeking their intervention as a means of further negotiations. The talks with the Japanese ambassador in Moscow and with the Soviet ambassador in Tokyo did not make progress. On 26 June the Emperor, on his own initiative, called the war council to a conference and said it was necessary to have a plan to close the war as soon as possible. The Emperor and the Supreme War Council agreed that a plan to end the war was necessary and that a plan to end the war had been prepared.

The Emperor and the Supreme War Council, in its deliberations on the Japanese Declaration, agreed on the advisability of ending the war. With the loss of Saipan, the Japanese government was given the choice of a Supreme War Council, an interim cabinet which supplied the necessary strength and which the problem of surrender was eventually resolved.

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CONCLUSION

The foregoing pages tell of the results achieved by air power in each of its several roles in the war in the Pacific, including the effects of the atomic bomb. The Survey has already reported on the month during which air power in the European war. It is only in the degree to which it became effective. The word "effective" in this study has been defined or described in the Pacific; he describes the results of the existence of atomic bomb on the role of air power; and to state the Survey's recommendations. First, however, it is necessary to point out one of the unique features of the Pacific war which must be kept in mind while considering them to be learned from it.

Uniqueness of Pacific War

The Pacific war was unique in many respects. It was not the European war, and great nations should be used in assuming that what was against these circumstances would be similarly effective at other times and under different circumstances. Japan's initial war strategy called for a war of limited objectives. Its capabilities did not permit an attack on our basic supporting strength. She was, however, a fanatically determined enemy, well prepared initially, and the fighting quality of her soldiers, sailors, and airmen should not be underestimated.

Japan's geographical situation determined that the Pacific war should be at least as a war for control of the sea and to have control of the sea, for control of the air over it. As a result, attacks against isolated ships and amphibious operations for protection of island positions, on which forward bases could be located were close to the heart of the strategy. Carrier task forces, carrier ships to provide logistic support, and submarines therefore assumed roles of primary importance.

Japan's industrial potential was approximately equal to that of the United States. Even though her research and technical design work was not exactly duplicated, her ability to develop reliable operating equipment in the new field was fine. Her subway and communications equipment was weak. She could not build sufficient ships or aircraft. She lacked construction equipment to build adequate airfields. She was never hampered by a lack of oil. Her soldiers it was sustained. She could not economically afford to build adequate shelters for her population. She could not both dispense her food and have repair damaged planes. She chose disposed rather than repair, but she had insufficient men even to dispense effectively.

Strategy

Not only the uniqueness of the Pacific war but also new developments in weapons and tactics made it impossible to meet that suggested to the future derived from the Pacific war will apply with equal force to other situations. The Survey believes, however, that the following elements on the role of air power should be given through consideration by those working out the solutions to new problems arising under differing conditions.

1. Control of the air was essential to the success of every major military operation. Control of the air allowed us to move the man as far as that control extended, even within range of many land-based aircraft. Control of the air permitted amphibious landings at any point where that control could be assured. Control of the air permitted close air support to ground forces, the effectiveness of which was decisive when fully employed. Control of the air over bases of communications permitted effective interdiction of them to the enemy and prevented them from invasion. Control of the air over the Japanese home islands permitted the destruction by long-range bombing of both her industries and cities as we choose to attack. The first objective of all commanders in the Pacific war, whether ground, sea, or air, whether American, Allied, or Japanese, was to acquire control of the air.

2. Control of the air was only achieved, and becomes the coordinated application of all that is necessary for the nation. Air power consisted not merely of the planes and pilots that engaged the enemy, but of the resources of strength that supports, reinforced, and exploited control of the air. It was conditioned by ground, sea, and air forces, both ground-based and carrier-based, and their supporting services, backed up by the full effect of all phases of the forces front that enabled us to exercise control of the air, at first locally and then more generally, submitting to
virtual freedom of the air over the Japanese home islands themselves.

3. The limitations of air control deserve special mention. It was more completely possible to deny the air to the enemy. It was considered that we had control of the air when the enemy could not operate in it without prohibitive loss in relation to results achieved, while our own planes could operate in it at will and with unavoidable loss. The Japanese increased their ratio of results to losses by adopting Kamikaze tactics. This was a measure of desperation, but the results obtained were considerable and, had they been much greater, might have enabled us to withdraw or to modify our strategic plans. The principle involved is that the degree to which definitive air control must be increased or enemy losses kept beyond the range of our raid planes or guided missiles from such land or sea as we propose to use.

4. Given air control, there were also limitations as to the specific results which could be achieved in exploiting such control by aircraft carrying conventional high-explosive bombs. Bombs, large area groundemplacements and other proposed defenses could not in many cases be reduced, and it was necessary to eliminate remaining ground forces in costly close-range fighting even though these forces were isolated and completely cut off from supplies and reinforcements.

Weather and darkness limited exploitation of air control, but as the war progressed technical and tactical advances were made which progressively reduced these limitations.

Combat ratios of fighters and time on patrol at maximum radius, although great by previously accepted standards, required that airfields or carriers be available within 800 nautical miles or less of the point of conflict for optimum fighter control. The effective radius of our longest range bombers was limited to 1,200 miles and bases still closer to Japan were considered essential for emergency landing and fighter support.

The importance of reducing these limitations of control of the air and its exploitation by the application of research and development work is now obvious.

5. The experience of the Pacific war supports the findings of the Army in Europe that heavy, concentrated and accurate attack against carefully selected targets is required to produce decisive re-

...cells when attacking an enemy's sustaining re-
sources. It further supports the findings in Ger-
many that no nation can long survive the free
exploitation of air weapons over its homeland.

For the future it is important fully to grasp the
fact that many plans relying on control of the
sky over one's land can be so disastrous to one's
country as its occupation by physical forces.

Midnight

Midnight essentially suggests that in some re-
spects air power might have been differently or
better employed.

Prior to the European war, we underestimated
the predominant role that air power would play
and allocated to it too small a share of our
existing resources thus available to the Army
and Navy. At the outset of the Pacific war, air
deficiency was particularly great in medium-
land-based fighters and in carriers. Over 1,000
planes in the Philippines, at least equal in per-
fomance to the best then available to the Japa-
nese, including types effective against shipping,
well armed, equipped and supplied, and dis-
posed on some 50 airfields, would have seri-
ously impaired the original Japanese advance if kno-
...edge of their existence had not entirely dissolved
the Japanese force making the attempt. The loss of
relatively unprotected battleships at Pearl Har-
bor had little effect on the Navy's combat capa-
cibilities at that time, while the addition of a few
carriers would have enormously increased its
capabilities. Larger naval appropriations to the
armed forces, beginning at the time of Japanese
occupation of Manchuria when the threat to peace
in the Far East became evident, might have made
war unnecessary and would have saved for long
many times over in reduced casualties and ex-
penditures had war still been conceivable.

Upon entering the war, we were deficient not
only in numbers, but in quality of many of our
aircraft types. We were forced therefore into
hasty and costly modification and technical de-
velopment programs to raise the performance of
our aircraft to acceptable standards. These pro-
gress could have been conducted more efficiently
and economically during peacetime years.

In the actual conduct of the war we were more
quickly grasped the strategic resolution brought
about by the capabilities of air power than did the
Japanese. By the end of 1943 we had achieved...
through combat and the augmentation of our forces, each were cut separately over the Japanese in all elements of air power that eventual victory was assured.

In exploiting this superiority greater accuracy of effort was possible. Illustration of this was the accurate air attack by only one, the net result of the President's most decisive action, if possible to fill the gap. Each of its members held in the effect of the power of the enemy, which was achieved possibly by precision. It proved impossible to agree on an overall commander for the Pacific as a whole. Our military and economic strength, however, made it possible to plan and execute a dual line of advance across the Pacific and to mount on air attack of sufficient weight to induce unconditional surrender concurrently with the preparation for the full scale invasion.

The effect of the atomic bombs on the Japanese home islands. The effectiveness of our air attack in refocusing on proposed defenses and in striking remaining ships was overestimated. Failure in the occupation of the Marshall Islands could have been more effectively used in coordination with submarines for search, non-front attacks and mining to neutralize the destruction of Japanese shipping, or in destroying oil and metal plants in the northern areas, then in striking the Japanese \"inner area\" from China bases.

In the final assault on the Japanese home islands we were handicapped by a lack of proper economic intelligence. General economy of effort could not be achieved and much anti-aircraft effort avoided, by controlling and neutralizing the effectiveness of the Japanese economy already taking place as a result of prior attacks on shipping. This could have been done by an earlier concentration of the main striking power, concentration of carrier plane attacks in the last months of the war on Japan's remaining merchant shipping rather than on her already isolated warships, and a coordinated B-29 and escort air attack on Japan's essential railhead system beginning in April 1945.

We underestimated the ability of our air attack on Japan's home islands, because it was with produced limited strategic results.
number of enemy planes or guided missiles may be able to avoid all our defenses and so attack any objectives within range.

The threat of immediate retaliation with a striking force of our own should deter any aggressor from striking.

If we are to be unanxious about our defenses, we must reduce nationally our vulnerability to such attack. The economies of both the Pacific and European war emphasize the extent to which civilian and other forms of passive defense can reduce a country's vulnerability to air attack. Civilian defense and fortification can be reduced by presently known techniques, to one-tenth or less of the current level which would be suffered were these techniques not employed. This does not involve mor- ing everything underground, but does involve a progressive evacuation, dispersal, warning, air raid shelter, and potential emergency assistance program, the foundations for which must only be laid in peacetime. The advantage of the effects of the sudden attack is unknown. Hence, national defenses can also work not satisfactorily even in peacetime.

As the army's military field the impact of atomic weapons and guided missiles on strategy and tactics can only be developed by military specialists. It is the country's opinion, however, that further study by such specialists will support the conclusion that a combination of air power and military forces, if fully developed, can be retained to the deterrent of effective and on a national basis much beyond the range of protective fighter, and that several types of all-weather and nuclear-armed planes must be developed to do so. It is further assumed here that any of these arms are to be deployed in sufficient numbers to ensure the destruction of the country's industrial, economic, and military capacity and that the forces of the United States are not only to be isolated but also to be held in peacetime.

The recent increases in our defense expenditures, in the production of our new weapons, and in the training and readiness of our forces will enable us to continue this development.

Recommendations

Our first and foremost recommendation is that we continue our efforts to increase our defense expenditures, not only in the immediate future but to the fullest extent our resources will permit. The continued development of our defense forces is essential to our national security and to our economic welfare.

In conclusion, it is our opinion that the United States must continue to develop its defense forces, not only in the immediate future but to the fullest extent our resources will permit. The continued development of our defense forces is essential to our national security and to our economic welfare.
In the future, national security will depend on a high degree of operational efficiency in the collection and processing of intelligence. To meet this requirement, a comprehensive system of operational intelligence must be organized.

The system must include a network of intelligence centers that are capable of collecting, analyzing, and disseminating intelligence information. These centers must be staffed by trained personnel who are able to interpret and assess the significance of intelligence data. The system must also include a mechanism for the exchange of information between the centers to ensure that all relevant intelligence is available to all levels of the organization.

The success of the system will depend on the ability of the intelligence centers to rapidly and accurately assess the significance of intelligence data. The centers must be able to identify trends and patterns that may indicate the intent of an adversary, and they must be able to develop accurate assessments of the capabilities of an adversary.

In conclusion, the development of a comprehensive system of operational intelligence is critical to the success of any organization. The system must be able to collect, analyze, and disseminate intelligence information in a timely and accurate manner. The success of the system will depend on the ability of the centers to quickly and accurately assess the significance of intelligence data.
strength as a force for peace—The Survey's report on the European war stated that the goal seems to be the liberation of the Western powers and the reassertion of the United Nations. The United States was founded on principles of freedom, democracy, and international law, and it has stood firm against aggression and brutality, and has never been defeated in battle. Strength based on these principles is no threat to world peace. Prevention of war will not be furthered by neglect of strength or lack of foresight or a hesitancy on our part. Those who contemplate evil and aggression find encouragement in such neglect. Either fail to lead or fail to lead with conviction. The Japanese would never have attacked Pearl Harbor had they not correctly assessed the weakness of our defenses in the Pacific and had they not incorrectly assumed the fighting determination of the United States when attacked.

Suggestions for assuring the military strength and security of the United States are by no means included as a recommendation for a race to arms with other nations; nor do they reflect a lack of confidence in the present international relationships founded upon mutual respect and good will which will themselves be a guarantee against future war. The development of an intelligent and coordinated approach to American security is essential and should take place within the framework of the security organization of the United Nations.

The United States as a member of the United Nations has contributed not to its own extent in defense of law as embodied in the purposes and principles of the United Nations Charter. An assurance of future progress we must be prepared to set in due course and to devote our resources in that regard to assure that other nations live up to their own commitments.

The United States must have the will and the strength to be a force for peace.