STRATEGY RESEARCH PROJECT

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AN ARMY AIR CORPS TEST OF STRATEGIC AIR POWER: OPERATION MATTERHORN AND THE B-29 SUPERFORTRESS

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ABSTRACT

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The Army Air Corps played a pivotal role in bringing Nazi Germany to her knees through strategic bombing. General H. Arnold believed that strategic bombing alone could bring about strategic victory, saving lives of ground forces. General Arnold viewed the newly fielded B-29 "Superfortress," with its exponential increase in bombing capability, and the Pacific theater as an acceptable "proving ground" to test his theory. This paper examines the thesis that strategic bombing at various centers of gravity was contributory but not singularly responsible for war termination. Strategic bombing was one of many components of the total Allied war machine that defeated Imperial Japan.

TABLE OF CONTENTS

ABSTRACT iii

PREFACE vii

LIST OF ILLUSTRATIONS ix

LIST OF TABLES xi

AN ARMY AIR CORPS TEST OF STRATEGIC AIR POWER: OPERATION MATTERHORN AND THE B-29 SUPERFORTRESS 1

STRATEGY ANALYSIS 3

NATIONAL INTERESTS AND POLICY OBJECTIVES TO BE SERVED BY OPERATION MATTERHORN 4

TAILORING NATIONAL STRATEGY TO MEET POLITICAL OBJECTIVES 4

STRENGTH OF THE HOME FRONT 5

STRATEGY OF THE DAY: DIFFERENCES, LIKENESS BETWEEN PAST AND PRESENT 6

AIR CAMPAIGN EXECUTION 6

MATERIAL AND LOGISTICS SUPPORT OF CAMPAIGN EXECUTION 7

AIR CAMPAIGN EVALUATION 10

PRINCIPLES OF WAR HONORED 11

PRINCIPLES OF WAR NOT FULLY HONORED 12

SUMMARY AND STRATEGIC/DOCTRINAL IMPLICATIONS 15

CONCLUSION 16

ENDNOTES 19

BIBLIOGRAPHY 25

PREFACE

This is an evaluation of how Operation MATTERHORN, the aerial bombing campaign from China against Imperial Japan during the period 1944 - 1945, was effective in advancing the timetable for successful war termination in the Pacific theater under terms favorable to the Allies. Additionally, Operation MATTERHORN provided the operational environment to test many theories of strategic bombing as a means of waging total war in order to cause enemy capitulation without the need for a ground invasion.

This research provides an overview as to political and military factors that led up to bombs actually being dropped on Japanese home island targets. Key factors were the political need to keep China in the war and the Army Air Force's desire to prove an American style of strategic bombing before war's end.

Supporting analysis of the overall strategy of the operation will be through the use of *Crowl's Questions.* This method of strategy analysis discusses the interrelationships of the factors, to include political and military strategy, behind this air campaign strategy.

Close attention is given to operational factors such as execution, Japanese efforts to thwart the bombing campaign, American technological and industrial superiority, and the overall command, control and leadership attributes of Operation MATTERHORN. And, an evaluation is made seeking to ascertain the reasons why this campaign was largely successful through the prism of Clausewitz's *Principles of War.* The salient technological and logistical factors that hindered and/or contributed to overall campaign success are cited and analyzed.

Finally, this research will examine why the air campaign was adopted and why it was, or was not successful. It will address the strategic implications of the campaign by showing how well Operation MATTERHORN contributed to the overarching political and military objectives of the war in the Pacific.

LIST OF ILLUSTRATIONS

FIGURE 1 – MAP OF B-29 OPERATIONAL AREA 9

LIST OF TABLES

TABLE 1 - ESTIMATES OF FACTORY SPACE DESTROYED 11

TABLE 2 - B-29 COMBAT MILESTONES 14

AN ARMY AIR CORPS TEST OF STRATEGIC AIR POWER: OPERATION MATTERHORN AND THE B-29 SUPERFORTRESS

This is an evaluation of how Operation MATTERHORN, the aerial bombing campaign from China against Imperial Japan during the period 1944 - 1945, was effective in advancing the timetable for successful war termination in the Pacific theater under terms favorable to the Allies. Additionally, Operation MATTERHORN provided the operational environment to test many theories of strategic bombing as a means of waging total war in order to cause enemy capitulation without the need for a ground invasion.

Jointly, President Roosevelt and Prime Minister Winston Churchill devised the basic Allied strategy of World War II. The focus of main effort would center on defeating the Axis forces in Europe first, while conducting a holding action against the Imperial Japanese forces in the Pacific and the Far East. Once Germany was defeated Imperial Japan would then become the main effort. Though the United States desired to focus upon Japan first due to her sneak attack on the Pearl Harbor naval base President Roosevelt knew that for the Allied coalition to succeed the European war would have to be won first.[1] America would delay and consolidate in the Pacific[2], while building up her industrial might at home. Through the ability to read Japanese secret codes and communications, which resulted in the victory at Midway and Coral Sea, the Allies held the means of ultimate victory until Germany could be defeated.[3]

Three Allied war conferences, the Casablanca Conference in January 1943, the Cairo Conference in August 1943 and the Sextant Conference held in Cairo in late November through early December 1943, provided the venue for strategic planning, analysis and execution.[4] The genesis of Operation MATTERHORN can be viewed as a continuous thread throughout the aforementioned strategy conferences. But the key conferences, Cairo and Sextant, between Roosevelt and Churchill, laid the foundation for focusing the war effort on Japan once Germany was defeated. Just prior to the Cairo Conference, President Roosevelt advised Prime Minister Churchill that the US had a project under development that would strike a heavy blow against Japan.[5] Roosevelt's intelligence services had indicated that Japanese military-naval and shipping strength was heavily dependent on steel, therefore any effort to disrupt or halt production would have an immediate effect on the Japanese naval war effort. Over half the coke processing sites for steel production could be reached and destroyed by long-range bombers operating from the Chengtu area of eastern China.[6] President Roosevelt indicated that the effort would be self-supporting by air from bases to be built near Calcutta without disturbing current airlift commitments to India and the Far East, which were of concern to Britain.[7] At the Cairo conference, the Allied leaders settled on a broad strategy for engaging Japan. The plan's major tenet was to continue the two mutally supporting advances across the Pacific: General Douglas McArthur's thrust from the southwest and Admiral Chester Nimitz's sweep through the central Pacific.[8] The leaders had also discussed, but did not finalize an "Air Plan for the Defeat of Japan." A modified version of this plan was tacitly adopted at Cairo, and was included as part of the Allies' "Overall Plan for the Defeat of Japan."

The Air Plan would later be code named "Matterhorn" for the famous Alpine peak whose ascent was a great challenge to mountain climbers of the 19th and 20th centuries.[9] Henry "Hap" Arnold, General of the Army, would find the task of bombing Japan from China no less challenging.[10]

President Roosevelt realized the need to include China in these discussions in order to maintain Chinese support of the war effort, which had been battered greatly during six years of Japanese occupation. Roosevelt was also desirous on making good on Allied and American promises of war support that by late 1943 had fallen through for a number of reasons.[11] He was also very concerned about flagging morale of both the Chinese people and the remaining national leadership. Washington also saw Chinese inclusion as a way to infuse American influence into China.[12]

At the Cairo strategy conference President Chiang Kai-shek of China articulated clear and succinct demands of the Allies in terms of what kinds of military contribution he wanted as the minimum price for Chinese war participation. Chiang had to get Roosevelt and the Allies to make the contributions to China sufficiently conspicuous so as to serve as a fitting conclusion to Chiang's visit to the Cairo conference. Chiang was under great pressure to save face by his attendance at the Cairo conference, which was not highly regarded by members of his inner circle. Roosevelt promised increased war materials, and by default Operation MATTERHORN itself, which served to make his attendance worthwhile.[13]

Based on the broad goals of the Allied leaders, the Air War Plans Division of the Air Staff devised an outline for MATTERHORN using the new B-29 "Superfortress" bomber, which was just beginning to roll off assembly lines, flying from China. Thought to be ineffective overall, the plan went forward mainly for political reasons.[14] Members of the Air Staff, such as General George Kenny, wanted to forget China and use Australia to attack enemy petroleum facilities in the East Indies. But to hit the Japanese home islands at the earliest possible time, China would have to be used. This met more of a political goal than a military goal. Up to this time the bulk of the American involvement in China was through the 14th Air Force under General Claire Chennault and his famed "Flying Tigers." Roosevelt envisioned an ultimate American force of between 200-300 planes thoughout India and China, culminating in advanced bases within striking range of the Japanese home islands.[15]

Though the China bomber-basing plan was thought to be ineffective, other members of the Air Staff, such as Generals Arnold and Curtis LeMay, envisioned the Plan as a possible venue to finally test evolving theories of strategic bombing using the B-29. They also sought to refine and expand on the lessons learned from coordinating and executing joint British-American bombing techniques in the Combined Bomber Offensive (CBO) in Europe.[16] Their experiences and observations from their European bombing campaigns would be refined into totally American way of conducting strategic bombing.[17]

Prevailing doctrine at the time MATTERHORN was being formulated relied heavily on the CBO model. But there were many issues that the Americans had to confront regarding targeting that the British had long since resolved. The savage fire raids of WW II were the final repudiation of a prediction by American military writers George Fielding Elliot and R. Ernest Dupuy who wrote in the 1930s. Their book, <u>If War Comes</u>, condemned indiscriminate bombing. But several countries had already conducted

such actions – Spain in its civil war, Russia in Finland and Japan in its invasion of China. Both the American government and the American people, expressing feelings of longstanding, found these actions unacceptable. President Roosevelt registered objections when Russia bombed Helsinki and other Finnish cities.[18] The Army Air Corps' position in early 1944, as expressed by General Arnold, was that "the Air Corps is committed to a strategy of high altitude, precision bombing of military objectives" and "use of incendiaries against cities is contrary to our national policy of attacking only military objectives."[19] The massive and deadly fire raids at Dresden notwithstanding, General Arnold's statements reflected the concept evolved at the Air Corps Tactical School, a school through which most of the Air Corps' World War II leaders had passed during the twenties and thirties.

In 1926 the Air Corps Tactical School made a drastic change. Earlier field manuals made greater reference to the conventional thinking that the Air Corps was to support the Army's ground forces and to attack the ground forces of the enemy.[20] In its 1926 manual titled Employment of Combined Air Forces the Tactical School, influenced by the thinking of Giulio Douhet and General Billy Mitchell, endorsed the idea of an independent air arm. The objective, after gaining command of the skies, would be to bomb the enemy's population and economic centers, vice attacking to defeat ground troops. Such an attack was far preferable to a war of slow attrition. By the mid-thirties, the school had moved away from this concept and embraced another new concept – aircraft would bomb only the enemy nation's vital centers and centers of gravity such as factories, power resoruces, transportations infrasturcture and raw materials produciton and refinement.[21] The resultant destruction would undermine the civilian economy and war production capability, thus creating a national war effort collapse.

The war in Europe provided the basis for heavy bombing of industrial targets in and around civilian areas. Soon after German raids on London, the British began reprisal raids on German cities. The British policy of "area-bombing" was designed to hit industrial areas though they were in and around population centers. The resultant heavy civilian casualties were accepted at first reluctantly, then as a part of the effort to destroy the military target and breakdown German morale.[22] American strategic bombing planners now had the raw materials with which to shape the American brand of that would be tested and refined on Japanese targets.

STRATEGY ANALYSIS

The following section examines Allied strategy for Operation MATTERHORN using Crowl's Questions as a framework. Crowl's Questions are the work of Philip A. Crowl, former World War II naval officer, author, doctor, and professor of history, at the Naval War College.

During a lecture at the US Air Force Academy in October 1977, Dr. Crowl proposed an outline of several questions history suggests that strategists must examine before they commence a war, or before they undertake a wartime campaign, or before they end a war in which they have already engaged. The goal of these questions is to define and examine a strategic problem from multiple angles. The questions that Dr. Crowl proposes, of which there are six, aid civilian and military leaders in the execution of their responsibilities over national decisionmaking.

NATIONAL INTERESTS AND POLICY OBJECTIVES TO BE SERVED BY OPERATION MATTERHORN

Crowl's first question suggests that when the possibility of war presents itself, political and military leaders should consider the ramifications thoroughly. A basic question to be asked is: "What specific policy objectives will be served by going to war, what specific national interest require these objectives be pursued, and are these objectives and interests worth the price that war more often than not demands?" For America, war with Japan and the Axis Powers was a matter of long-term global survival. Japan initiated hostilities throughout Asia in order to secure resources and create an east Asia-Pacific hegemony. The European war held the prospect of the demise of democratic nations, specifically Britain, resulting in an American isolated against a Europe controlled by the Nazi Reich.[23]

Operation MATTERHORN was an extension of the pacific war's goal of defeating Japan. Specifically, the operation sought to address the following issues:

1) Keep China in the war and restoring flagging morale.

2) Maintain American influence and allied integrity through support of Chiang Kai-shek with military and financial aid, and offensive operations from China in order to draw forces back to the home islands from China.

3) Meet President Roosevelt's desire to begin home-island bombing prior to seizure of the Marianas Islands.[24]

TAILORING NATIONAL STRATEGY TO MEET POLITICAL OBJECTIVES

Crowl's second question centers on determining the proper methods of fighting the war once it starts. Allied and American strategy sought to so weaken the Japanese capability and will to fight as to cause capitulation or permit occupation against disorganized resistance and failing this, to make an invasion feasible at minimum cost.[25] The key goal was to avoid a costly invasion of the Japanese home islands. Air power advocates worked to show that air power could obviate the need for an invasion. Plans were ongoing concurrently just in case an invasion was required.[26] Military strategies in Europe were used to the maximum extent in war planning and execution against Japan. The airmen at the SEXTANT discussions deliberately inserted the term "occupation" as distinct from "invasion."[27] By using China as an offensive base of operations, military strategy was tailored to meet political objectives.

In the summer of 1943, President Roosevelt was anxious to use bombers against Japan to spur China's war effort.[28] Additionally, with Japanese forces consolidating gains in China there was a significant desire to assist the war-weary nation. British failure in Burma had also damaged the Allied cause in China, and the deteriorating tactical situation was embarrassing to the Chunking government. A more vigorous China-Burma-India (CBI) policy, both by the Western powers and by China, seemed imperative if the latter country was to be kept in the war.[29] China was important not only as a staging base for future attacks against Japan, but also for post war unity. Use of China created a strategy that called for an intensification of operations currently projected in China and Burma, but its chief concern was to carry the war to Japan.[30]

According to proposed war schedules, no Pacific islands would be in Allied hands in 1944 to support the range of the B-29s against Japanese targets on Honshu. However, Chinese bases offered practical operating ranges with the requisite capacity and dispersion. Army Air Force (AAF) planners believed that "the initiation of the bomber offensive, and even measures in preparation thereof, [would] tremendously stimulate Chinese morale and unify the Chinese people under the leadership of Chiang Kai-shek.[31] In spite of all the opposition and criticism, Operation MATTERHORN was approved at the SEXTANT Conference.

The Limits of Military Power

Crowl's third and most difficult question focuses on military limitations and resources. Are the forces tasked, provisioned and capable of fulfilling the assigned mission? American military officers have a professional attitude best expressed as "can do." Yet there are many things armed forces, no matter how powerful, cannot do. If physical force is the means to exert a nation's will on the enemy, Crowl also asks the question how much and of what type will bring the desired effect. By mid-1943 American industry was turning out war material in amounts able to support nearly the entire allied war effort. Early 1944 saw new and more deadly bombers and bombs, particularly incendiary types, being produced.[32] Japanese combat power throughout the Pacific was rapidly declining due to ever increasing Allied ground, air and naval victories. Japan also suffered from grave and irreplaceable combat losses, particularly in pilots, and long lines of supply, which were being severed by American submarines. America, on the other hand, had no practical limits on her military power as she retook control of the Pacific.[33]

Alternatives Strategies, Alternatives to War

Crowl's fourth question focuses on "alternatives" and the contingency plans of the strategist. Of the four elements that make up the climate of war, according to Clausewitz, one is "uncertainty" and the other "chance." The wise strategist will have prepared contingency plans that account for the "fog of war" in all its manifestations. Flexibility is key as well as the ability to adapt quickly to changed circumstances. This ability allows the strategist to turn chance or even misfortune to his own advantage.

Based on the goals of the Axis powers, the Allies had no alternative to war other than defeat. Political considerations drove the China bomber-basing proposal as a more preferable option than to wait until air bases in the Marianas were ready. A secondary course of action was the use of Australian bases to strike at enemy petroleum facilities in the East Indies, in order to deprive the enemy of raw materials.[34]

STRENGTH OF THE HOME FRONT

Crowl's fifth question relates to the strength of the home front in terms of the action contemplated. The first attacks on Kyushu by the 20th Bomber Command on 15 June 1944 were a major boost to US morale. This was the second strike on Japanese home islands since the General Jimmy Doolittle raid in early 1942. The attacks garnered front-page headlines, along with information on the "New Superfortress, B-29." Washington wanted each subsequent strike to be bigger, based on the success of the first strike.[35] Public opinion and support was never an issue, particularly against Japan. Every military action was seen

as a "pay-back" for the sneak attack at Pearl Harbor. Nearly every aspect of military action was deemed morally acceptable, even as ever-larger amounts of incendiary bombs rained down and gutted Japanese cities. [36]

STRATEGY OF THE DAY: DIFFERENCES, LIKENESS BETWEEN PAST AND PRESENT

Crowl's final question attempts to get strategists to consider the day, the past and even the future. Concern over past success and failures can develop into neurotic fixations, blinding the strategist to changing circumstances requiring new and different responses. Alternatively, are we still fighting the last war? For the US, based on the long hiatus and degraded nature of the military from World War I, military strategists were free to pursue new avenues of strategy and tactics. Though much was learned and transferred from experiences in Europe, American planners did not merely repeat the European model.[37] American industry continued to produce both revolutionary and evolutionary weapons, while Japanese efforts focused on production improvements. The result was technological gaps in favor of America and by extension the Allies. Finally, the origins of Operation MATTERHORN can be traced to air power doctrine developed in the mid-1920s using principles developed by Douhet and General Billy Mitchell. The Air Staff, and General LeMay in particular, was anxious to validate his theories before war's end.[38] The main difference between the European model of strategic bombing in Europe and the American model in the Pacific was the level of intensity which was soon to be far greater then any seen thus far in the war.[39]

AIR CAMPAIGN EXECUTION

Under prevailing doctrine early in WW II, air units were assigned to a theater commander under broad directives from the Joint Chiefs of Staff (JCS). Theater commanders enjoyed broad control of theater forces, both air and ground, delegating to air force commanders the means by which air power would be applied.[40] While this arrangement worked for tactical air power, for strategic air operations special and unique problems arose. It was only as General Arnold's planners began to consider future deployments of the B-29s to the Pacific as well as in China, Burma and India (CBI) Theater that the idea of an independent strategic air force appeared in staff discussions.[41] After approval of MATTERHORN, the JCS found it necessary to provide mechanisms whereby it might exercise directive oversight of B-29 units in the CBI Theater and later in the Pacific.[42] The idea of creating a "Headquarters, Strategic Air Force" was opposed by the Navy who had been attempting to block MATTERHORN outright, fearing a shift of resources from naval strategic goals. President Roosevelt made the final decision that control of the very long-range (VLR) forces, of which the B-29 was a component, would be retained under JCS control and oversight.[43]

An entirely new command, the 20th Air Force (AF), was created to manage this campaign. The 20th AF was independent of theater commanders, but area commanders would provide logistical and base defense support.[44] The 20th AF was activated in Washington D.C. on 4 April 1944 operating under the JCS, with General Arnold, the Commanding General of the AAF as both the single commander and

the executive agent to implement JCS directives for employment. So unique was this command that it was only assigned one type of aircraft, the B-29.[45]

The issues of command and control of the B-29s pointed up to the difficulty of coordinating B-29 operations in the CBI under the existing command structures, not to mention the regional allied military personalities involved. The Twentieth's chain of command jumped some important brass in the various theaters where personalities counted heavily. The JCS had built a fine record of commanding through general directives, leaving the theater commanders to work the details. The Twentieth AF would depart from that practice in the crucial details of target selection and mission directives, full control would remain in Washington. General Arnold used the argument for the establishment of this command and control structure that the mission and characteristics of the B-29 required the 20th AF to report to him rather then to a theater commander.[46] In the final analysis, everything about the 20th was special. With fifteen air forces already in place, it should have become the sixteenth air force, but General Arnold went to the next round number and called it the *Twentieth*. There was the European theater, the Pacific theater, the Mediterranean theater, and the 20th Air Force.[47]

MATERIAL AND LOGISTICS SUPPORT OF CAMPAIGN EXECUTION

The B-29 bomber was a technological marvel at this point in the war. Development and testing were accomplished at the unheard of cost of three billion dollars. By comparison, the development of the atomic bomb, the "Manhattan Project," cost two billion dollars. The high cost reflects advanced engineering designs and innovations built in the aircraft in a relatively short timeframe.[48] The B-29 was designed to fly at speeds of up to 375 miles per hour (MPH) over 3,250 miles at 25,000 feet with a 20,000-lb bomb load. Navigation and bombing were handled through then state of the art radar and Long Range Navigation (LORAN) avionics.[49] This aircraft had more defensive firepower than any other bomber in the world, being armed with a total of twelve .50 caliber heavy machine guns and one 20-mm cannon. All weapons were controlled through remote fire control stations with specially designed automatic computer gun sights that corrected for range, altitude, and temperature and aircraft speed. Four Wright R-3550 Cyclone 18 cylinder radial supercharged engines powered the aircraft, each developing 2200 horsepower (HP) at takeoff. The most serious aircraft problems were encountered in the engines, which continually overheated and caught fire often with fatal results. The basic cause was a faulty engine design. Though many "fixes" would be added to try and arrest the problem, the B-29 suffered numerous engine fires and went into combat with many faulty engines. [50]

During testing in September 1942 the B-29 project suffered a major setback in the loss of a B-29 carrying the chief test pilot for Boeing and several other key Boeing aeronautical engineers. While in flight another recurring engine fire broke out that ultimately burned through a wing spar causing a catastrophic failure just minutes from an emergency descent back to Boeing field. The burning aircraft crashed into downtown Seattle killing test pilot Eddie Allen and the ten-member flight test crew. The loss of Eddie Allen was considered a test program disaster of unparalleled proportions to the B-29 project due to his intimate knowledge of the aircraft. It could be likened to the Apollo I fire in January 1967, which

nearly derailed the American lunar landing program or the *Challenger* disaster in 1986.[51] General Arnold had fully committed himself to the B-29; having ordered over 1600 of the bombers even before flight-testing began." General Arnold was not content to just let time go by until a solution materialized. He devised a "B-29 Special Project" group that was led by General Kenneth B. Wolfe, one of the AAF's most experienced procurement and engineering officers. General Arnold gave Wolfe "carte blanche" to find solutions and get the B-29 combat ready by the end of 1943. One significant deficiency that contributed to engine fire problems was traced back to in-flight supercharger overheating. This was determined to be the cause of the disaster that took the life of Eddie Allen. An initial lack of bombers in sufficient quantity impeded pilot training significantly. Many pilots and crews gained the majority of their operational experience in the bomber ferrying their planes into the CBI Theater.[52]

Logistics played a key role in the conduct of MATTERHORN. The 20th Bomber Command had an operational distance of over 11,000 miles from the US. The primary means of supply was from the U S to India by ship, with a trip from Los Angeles to India taking over two weeks. From the East Coast, it was well over one month. High priority items such as aircraft engines were flown direct from the States, much akin to the Pony Express. This system got so good that it could deliver parts from the U.S. in 70 hours, an air distance of over 11,000 miles. All fuel, bombs and spare parts had to be flown through China. Weather played a significant factor in overall air operations and meeting re-supply delivery schedules. From Bombay, India, to the main "Hump" staging point, there was an additional 1,500 miles.

The primary purpose of the "Hump" airlift was to keep China in the war with enough capability to allow China to be used as a future base for attacks on the Japanese home islands. From small beginnings in 1942, the "Hump" airlift moved 300 tons/month; by July 1945, the level had peaked at 70,000 tons/month. Aviation fuel was the "long pole" in the MATTERHORN tent. It took seven round trips of eleven hours each to ferry enough fuel for *one mission* against Japan.[53] A number of B-29s were stripped of armaments and fitted with extra fuel tanks in order to carry fuel and cargo for stockpiles in China. It took on average seven gallons of fuel consumed in aerial transport to deliver one gallon of fuel to air bases in China, depending on weather and headwinds. Airfields for bomber and fighter units were hand-built by over 300,000 Chinese. The main tools used were hand-held implements, hand-drawn carts and rollers and other manual means, primarily in the Chentgu region of China. (Figure 1)

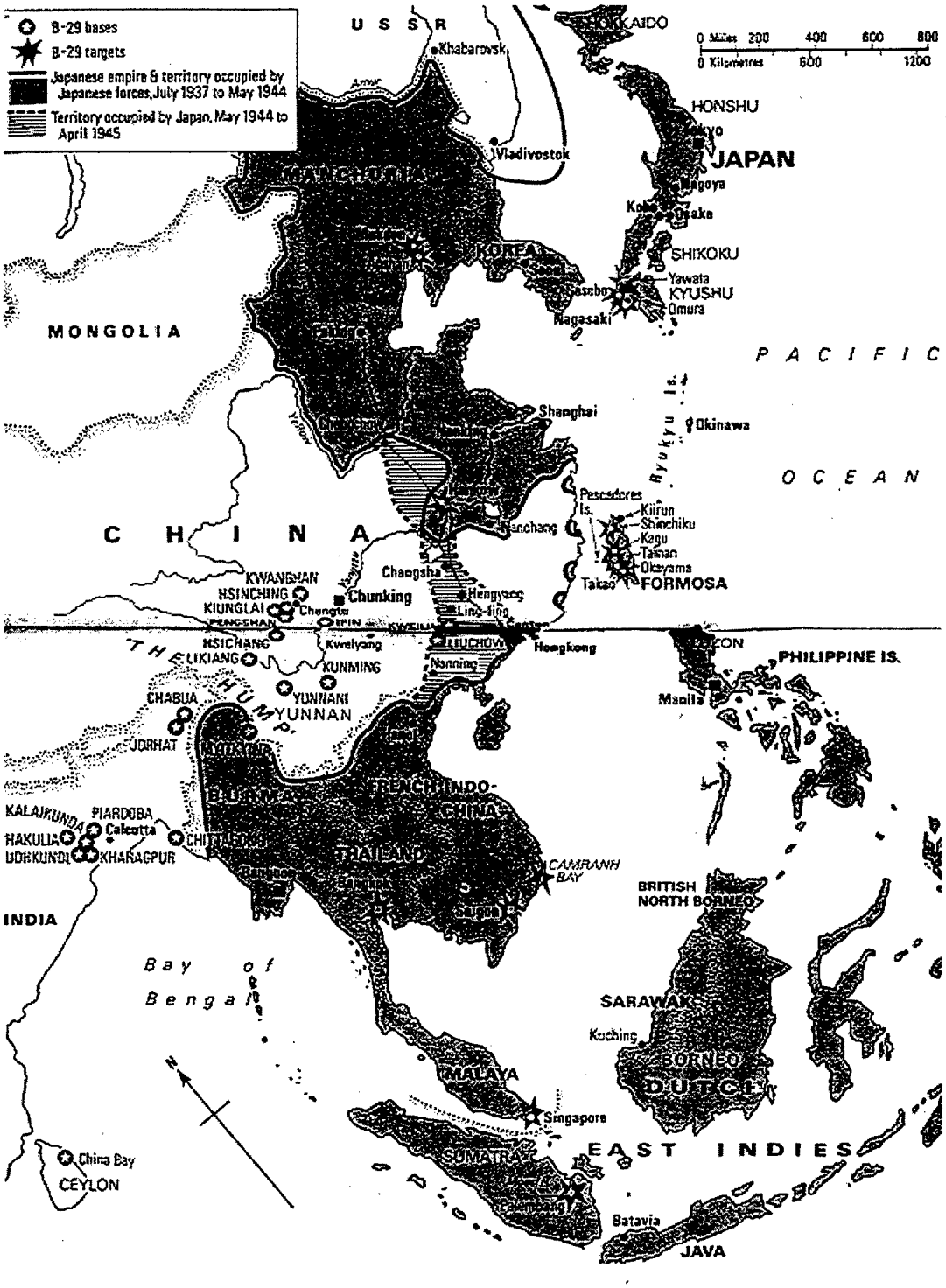

FIGURE 1 – MAP OF B-29 OPERATIONAL AREA[54]

The basic premise of MATTERHORN was that it would be "self-supporting." This is in keeping with the AAF concept of the bomber command as a self-contained unit.[55] Three factors continually placed stress on the logistical efforts in the CBI. The first was the inordinate distances from the US to the CBI theater. The second factor was the low priority accorded to the CBI in the allotment of shipping. And finally, the insistence of early commitment of the B29s, which left little time to readjust existing transportation, schedules. Though the logistics plan for MATTERHORN was a long document, its essence was compressed into one cogent sentence spoken by General Arnold: "Remember too, that every single goddam thing that we send to China has to be flown in."[56]

The Committee of Operations Analysts (COA) had submitted a report to General Arnold called the "Economic Objectives in the Far East." The report gave the six most strategic targets in Japan, in no particular order of priority: merchant shipping, steel production, urban industrial areas, aircraft plants, anti-friction bearings and electronics. Arnold's operational planners knew that the majority of the Japanese steel production was on Kyushu, the westernmost home island of Japan. The COA focused also on overall war production as a key center of gravity, citing the fact that many small houses in Japan were not just residences, but workshops contributing to the production of war material. The report advocated attacks against urban areas, having an effect of overwhelming the relief and repair facilities of the country as a whole.[57]

By mid-June 1944, sufficient logistics, airfield infrastructure and training were in place that missions against southern Kyushu could commence. The first B-29 attacks hit strategic large iron and steel works at Yawata on Kyushu. Based on an initial attack force of 40 aircraft sortied on 15 June, planners in Washington wanted a 100 plane attack within days of the first, with up to four additional "follow-on" attacks being planned to keep the pressure on. These plans and requirements were not based on the realities of life on the ground with all the attendant problems of maintenance and logistics.

Due to the inability of the 20th Bomber Command's commander, Major General Kenneth B. Wolfe to meet expectations for increased sortie rates he was replaced by General Curtis LeMay. LeMay was a veteran of the European theater where intensive bombing had gone on for over three years. He had watched and learned from the British, perfecting American bombing techniques. LeMay arrived in the CBI theater on 29 August 1944, ready to use what he had learned and experimented with in Europe against the Imperial Japanese.[58] The hard life of Operation MATTERHORN was about six months old, when operations shifted to newly opened airfields recently captured in the Marianas. 20th Bomber Command dropped over 11,477 tons of bombs over 3,058 sorties within 49 missions.

AIR CAMPAIGN EVALUATION

The following discussion will evaluate Operation MATTERHORN's success or failure using the framework of Clausewitz's *Principles of War.*

PRINCIPLES OF WAR HONORED

Objective. This principle speaks to directing military operations toward a defined objective that contributes to strategic, operational or tactical goals. Operation MATTERHORN met the objectives of Washington and air power advocates striving to destroy the war making capability of Japan at the earliest possible time.[59] Army War Production Document-42 (AWPD) listed iron and steel as a prime target system in the air offensive against Japan. Six coking plants, three in the southern island of Kyushu, two near Mukden in Manchuria, and one in Korea produced 73% of the Japanese coke. The destruction of these six plants would deprive Japan of 66% of her steel production.[60] The destruction of not only these plants, which were nearly impossible to replace,[61] but the destruction of the population and their environment caused the cessation of every other form of manufactured war materials. In essence, the operation defined and advocated a wholly new target system – Japanese war industries embedded in her cities. The destruction of her war industries and the disruption of the workforce would have an immediate and lasting impact on the ability of Japan to maintain war production, field forces and distribute war materials.[62] The political objective of maintaining Chinese participation in the war was also met through basing, grants of war materials and billions of dollars in US payments for airfield construction and maintenance.[63]

Industry	Pre-attack Plant Area in 1000s of sq. ft.	Industrial bldgs. Destroyed or badly damaged
Aircraft	140,000	37%
Ordnance	110,000	15%
Shipbuilding and repair	45,000	15%
Oil (including storage)	150,000	5%
Electrical equipment	40,000	28%
Machinery & finished metal prod.	110,000	33%
Metals (ferrous and non-ferrous)	150,000	14%
Chemicals	130,000	9%
Rubber	30,000	17%
Textiles	50,000	24%
Mil. And Gen. Storage area	200,000	12%
All others	445,000	20%

TABLE 1 - ESTIMATES OF FACTORY SPACE DESTROYED[64]

Offense. This principle seeks to have military forces act rather than react. Military forces dictate the time, place, scope and intensity of operations, with the goal of fully seizing and exploiting the initiative. The campaign was offensive in nature in that this was a new attack avenue from China, an area thought secure to Japan, and it brought Allied power to bear on a previously untouched part of Japan.[65] Other

raids/attacks made on Manchuria, as well as attacks on enemy petroleum facilities at Palembang, Netherlands East Indies, kept the pressure on Japan's resource and logistical lifelines. B-29s also attacked Hanchow in support of Chinese efforts to stem enemy offensives in late 1944, as well as bombing Formosa in support of MacArthur's Leyte operations.[66] Even though the scope of operations was not of the level experienced in Europe, the Japanese were unable to stop or deter the attacks. Therefore, the cumulative effect became greater with each raid.[67] The initiative was maintained throughout MATTERHORN, followed by subsequent operations from the Marianas.

Economy of Force. Using incendiary bombs, MATTERHORN operators were able to get the biggest destructive effect for each planeload of bombs. A report titled "A-2 Incendiary Report" provided a comprehensive evaluation of what was required to attack Japanese cites with incendiary bombs, and the probable results.[68] The report highlighted the lightly built and flammable nature of Japanese city construction. Therefore, to destroy the cities and disrupt the people would result in an immediate and lasting impact on the ability of Japan to maintain their war production and distribution to field forces.[69]

Maneuver. The principle of maneuver places the enemy in a position of disadvantage through flexible application of combat power. Use of China provided another direction from which to attack Japan before seizure of bases supporting B-29 operations. Attacks on the home islands would draw resources from throughout Japan's operating areas to counter attacks at home. Japan had to reorient fighter support to cover western Japan, which took assets away from other areas, particularly China.[70]

Surprise. The operation met the tenet of striking the enemy at a time or place or in a manner for which he is unprepared.[71] Japan never conceived of the US conducting attacks from China. Therefore, the first attacks in 1944 produced a profound psychological effect on the Japanese leadership and populace.[72] The massive fire raids on Tokyo brought the war home to a nation that heretofore had exported it.[73] Japan never fully developed and fielded fighter aircraft capable of destroying either the high-altitude bombers, or a sufficient air defense system that might have thwarted bombing attacks.[74]

Unity of Command. Unit of command was guaranteed through creation of the 20th AF.[75] The 20th Air Force was largely free of intra-theater conflicts since the chain of command was direct through the JCS. In that the headquarters was so far removed from its combat units and from the harsh realities of the theater, extensive and protracted correspondence by radio, tele-type conference and courier was required for each separate mission. Only because all operational authority was vested in the JCS did this principle come close to being applied.[76] Theater commanders were looking for any means by which to gain operational control of the B-29s. Had that been granted, the power of the bomber would have been expended nibbling away at the fringes of Japanese operational and strategic power, almost acting as a naval auxiliary against shipping.[77]

PRINCIPLES OF WAR NOT FULLY HONORED

Security. Japanese intelligence was very good. As early as 1943, Japan was receiving intelligence that the US was building a very long-range (VLR) bomber. Confirmation came from various sources, even

from the *New York* Times, which published reports quoting General Arnold to the effect that the Army's most powerful weapon was in production.[78] However, the US tried to fly B-29s into the CBI Theater via Europe. The Japanese knew the order of battle and the units within hours of their arrival with information provided by collaborators.[79] By ascertaining the range of the B-29, they surmised that southern Japan was the likely target area. Japanese intelligence also kept a running total on the buildup of US forces in the CBI.[80] Initial efforts at interdicting American raids were aggressive and costly. As the tactics, numbers and operational procedures of the bomber force improved and increased, Japanese aerial and ground fires were overcome and negated.

Simplicity. Due to the logistical factors and the newness of the B-29, Operation MATTERHORN was anything but simple. Combined Staff planners had concluded in mid-1943 that the plan was unfeasible from a logistical viewpoint. Nevertheless, the plan went forth for both military and political reasons.[81] MATTERHORN was maintained at great cost of both manpower and materiel, and at a cost to theater commanders who lost transport tonnage throughout the CBI due to the massive requirements of the operation.[82]

Mass. The early MATTERHORN force involved over 110 planes consisting of seven planes per squadron, four squadrons per group, four groups per wing. As more bombers arrived in theater General LeMay increased the number per formation in order to put more bombs on target.[83] However, the increase was a long process and fraught with difficulties. Planes and crews flew two sorties a month due to the difficult logistical situation.[84] With bomb groups performing five missions per month at 50% strength, 168 group-months would suffice to destroy the designated targets, with a total time required of about 12 months.[85] The payload of the B-29 was a major factor in getting more bombs on target per plane, as well as advances in radar bombing and unit tactics.[86] But in the final analysis, the harsh logistical realities of the CBI theater, the long logistical pipeline from the US to the CBI, and the relatively low numbers of B-29s in theater would lead one to believe that in comparison to the huge numbers of bombers used in the European theater, the principle of mass was never fully attained. Initial results were so feeble in light of the pressure from General Arnold to fly exact numbers of sorties, that it cost a general officer his job due to his inability to reach those numbers.[87] The use of B-29 performance criteria from Washington was no match for real world difficulties.[88] The requirement from Washington to fly 100 sortie missions was rarely attained due to the aforementioned reasons.[89] Only in the final stages of the campaign did sufficient logistical support and numbers of aircraft increase to such levels that by early 1945 1,000 plane raids became the norm. (Table 2)

First Combat Mission: June 5, 1944, against rail yards at Bangkok, Thailand. The mission originated in India.
First Combat Mission against Japan: June 15, 1944, against the Imperial Iron and Steel Works at Yawata. The mission originated in China.
Longest Single-Stage Combat Mission: August 10, 1944, from China Bay, Ceylon to Palembang, Sumatra (3900 miles).
First Combat Mission Flown from the Marianas: October 28, 1944, against submarine pens at Dublon Island.
First Combat Mission Flown Against Japan from the Marianas: November 24, 1944, against Tokyo.
Last Combat Mission Not Originating in the Marianas: March 25, 1945, against various targets on the Malay Peninsula. Mission originated in India.
Single Combat Mission Resulting in the Greatest Damage to Target: March 9/10, 1945 (night mission) incendiary attack on Tokyo resulting in 267,000 buildings destroyed.
Largest Number of B-29s Launched on a Single Day: August 1, 1945 - out of 836 B-29s launched, 784 reached their targets.
Last Combat Missions of World War II: August 14, 1945, a total of 741 B-29s were launched against targets throughout Japan.

TABLE 2 - B-29 COMBAT MILESTONES[90]

SUMMARY AND STRATEGIC/DOCTRINAL IMPLICATIONS

Operation MATTERHORN was successful in that it met the following stated and/or implied goals:

1) Keep China in the war as a viable and contributing nation. This allowed President Roosevelt to make good on Allied promises through money, war materials and a significant Allied operation, and keeping American influence in the forefront in China;[91]

2) Provide a venue for American air power strategist to test and refine theories and concepts pertaining to strategic bombing as a means of war termination without an invasion.[92] General Arnold's staff, thoroughly imbued with AAF doctrine of strategic bombardment, saw in the B-29 a weapon with which the Japanese homeland could be hit. In the autumn of 1943, no base areas within striking distance of the Inner Empire were available, save China.[93] The 20th Bomber Command historian reflected the widely held view that the command was "a great testing laboratory.";[94]

3) Keep military pressure on Japan during the Allied advance toward the home islands. No time was lost striking Japan wherever possible while efforts were ongoing to secure B-29 bases within range of all Japan.[95]

The operation should be viewed as a hard won success due to the enormous amounts of logistics required to sustain operations. Factors such as the vast distances flown to transport fuel, parts and replacement aircraft, the crude bases and operational infrastructure and the oppressive operational climate from Washington all acted to put a drag on the operation in the early and intermediate stages. An evaluation board reviewing the record of MATTERHORN in autumn of 1944 tried to balance the yet inconsiderable combat effort against the levy on Hump tonnage, which might have been employed in operations of more immediate utility. The board's tentative judgment was most cautiously phrased: "There is no question but that strategic bombing pays big dividends and perhaps diversion of such [logistical] effort to the 20th Bomber Command is more than justified in the big picture, all of which cannot be seen from this theater."[96]

Operation MATTERHORN's influence on current air doctrine can be seen through several operational contexts. The innovative approach to the formation of the 20th Bomber Command was founded on the concept of an organization operating as a self-contained, independent command of great striking power, mobility and flexibility, more akin to an overseas air force than a conventional bomber command. In addition, it was to operate in an "austere" theater.[97] In order to sustain its striking power aircraft maintenance procedures were streamlined, allowing local commanders full control of all echelons of maintenance. The result was better management of maintenance resources. This concept would remain a part of the future separate service Air Force organization.

Operation MATTERHORN was conceived politically and militarily as a means to an end. Politically, the operations held out the promise of great returns in the present and the future. Militarily the campaign provided a ready-made "laboratory" to test air power theories. The MATTERHORN plan reflected the predominant interest in strategic bombing that existed in AAF headquarters. Essentially, it was an effort to introduce into the war against Japan the objectives and techniques of the Combined

Bomber Offensive in Europe, to so batter the industrial fabric of an enemy nation by long-range bombardment that armed resistance would be enfeebled. Nevertheless, the circumstances under which the new campaign would be conducted contrasted sharply with those in Europe.[98]

Political and military leaders were to become disillusioned and weary at the constant demands the operation required. The increasing calls for more men and resources placed strains on America's heavily taxed war industries. Moreover, the toll placed on operatives in the field to "make things happen" in order for both the political and military to declare success was incalculable.[99] Operation MATTERHORN could be considered a great undertaking that proved it could be done, and hoped that it would never be repeated.[100]

The Allies endeavored to attack a major center of gravity of the military war machine of Japan, her war industries.[101] Destroying the industrial base resident within and amongst the civilian populace resulted in the weakening of Japanese military power throughout the Pacific. Strategic conventional bombing in Japan failed to deliver the singular "knockout blow" as hoped for by air power strategists. At best, it provided added advantage to the sum total of land and naval strategy to bring about the fall of Imperial Japan.[102]

However, a view from the enemy's perspective is also insightful in viewing the effect of B-29 operations in the Pacific. Many Japanese leaders gave credit to the B-29 citing their attacks on mainland interior regions and industrial cities as the single greatest factor in their decision to surrender. Some Japanese went so far to say that the B-29 reduced their military production by as much as 50 percent.[103] Additionally, Operation MATTERHORN markedly influenced the ability of Japan to service her fighting units due to reduced war production created by burned out cities in which the populace not only lived but also worked[104]. And while a heavy psychological blow was dealt to the Japanese populace who had been told that the war was being won, the operation provided a morale boost to America, already long weary of war on two fronts.

CONCLUSION

Operation MATTERHORN facilitated the defeat of Japan without a ground invasion. Although the B-29 attacks were considered by many as preludes to an invasion of the home islands, there was always the underlying hope that Japan would surrender before that became necessary.

With its first role that of strategic bombardment, the 20th Air Force faced severe handicaps. Control from Washington proved to be "clumsy", although it did protect the B-29s from wasteful diversion to tactical operations. The logistical problems in using B-29s from the China bases meant that their potential could never be fully realized, and the weather conditions severely hampered early operations from the Marianas.

Reviewing the operation in light of the Principles of War, the two most evident principles were maneuver and offensive. Maneuver was attained through the application of military force from an unexpected direction, which caught Japan off guard. The result was the reallocation of scarce resources to defend the home islands at the expense of defending territory already seized. The two-pronged Allied

juggernaut towards the home island presented Japan with increasingly few options and hastened her withdrawal from China and the central Pacific region.

The principle of the offensive is seen through the desire to maintain pressure on Japan through any avenue possible. American strategy calling for a determined march northward via naval forces could have been allowed to run its course, probably to ultimate victory. Nevertheless, political and military strategists looked to keep the pressure on and conclude the war as rapidly as possible. By utilizing the offensive power and striking distance of the B-29 America carried the war to Japan while still prosecuting the island seizing campaign. Japan was never allowed a moment's respite, thanks to the capabilities of the B-29.

In applying *Crowl's* Questions to Operation MATTERHORN, the first question is the most applicable. That is the question of whether or not a particular war, or military campaign or other action serves the national interest. What specific national interests and policy objectives are to be served by the proposed military action? The prosecution of Operation MATTERHORN fulfilled both political and military objectives, in spite of the "pain" inflicted upon a heavily task saturated civil-military operation. Operation MATTEHORN met many stated and implied goals of the Allies. It was a major component of a total effort that defeated Imperial Japan. Lessons learned regarding command and control, the utility of an independent air arm for offensive strategic bombing and the feasibility of operations in austere wartime environments can be fast-forwarded to today. Operation MATTERHORN met it goals for its time in history and served as a springboard for changes relevant to modern times.

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