Dozens of B-29 wing structures fill the vast Boeing plant in Wichita, Kan.

Boeing and the Air Force struggled to build B-29s and train their crews in time for the planned offensive against Japan.

The B-29's Battle of Kansas

By Walter J. Boyne

Few American battles during World War II had as many top level people "helping" as did the Battle of Kansas in the winter of 1944. There, on wind- and snow-whipped plains, civil and US Army Air Forces teams struggled in deplorable weather to build and modify Boeing B-29s, while crews trained to take the airplane into combat.

Their eventual success is a tribute to motivation, skill, and hard work under appalling conditions.

This battle was of visceral interest to world leaders in the US, UK, and China—not to mention Japan.

President Roosevelt was concerned that China, hard-pressed by the Japanese since 1937, might drop out of the war. At the Cairo Conference in November 1943, he pledged his word to Generalissimo Chiang Kai-shek that B-29s based in China would bomb Japan by the spring of 1944.

In England, Prime Minister Winston Churchill worried that the enormous diversion of resources to the B-29 would affect the war in Europe. His fears were real, for at $3 billion, the B-29 was the war's most expensive

B-29 wings are mounted in the factory. The Superfortress was a complex, sophisticated aircraft that required a huge, well-trained workforce.

program. It was also the most vital, for only the Superfortress could deliver the atom bombs created by the war's second most costly program, the $2 billion Manhattan Project.

Weight Vs. Cost

The B-29 was needed to keep China in the war until Japan was brought to its knees.

Unfortunately, the hoped-for B-29 flood was dammed up by myriad technical problems and the Herculean effort needed to build plants and modification centers while simultaneously training the crews.

The most challenging element—developing correct doctrine and tactics—came hard, much later, at a great cost in airplanes, lives, and careers.

The B-29 was an immensely complex aircraft, the most sophisticated, advanced bomber of World War II. Each of its major features might have taken five years to test under ordinary circumstances. Without question, the most demanding of all was development of its Wright R-3350 engine. Everything had to be rushed into being concurrently to fulfill Roosevelt's promise.

The Boeing Airplane Co. had kept up with new technology and routinely met its customer needs before and during World War II. Unfortunately, the Curtiss-Wright Corp., which began operations as Wright Aeronautical in 1919, bumbled toward senility during the same period. Buffeted by the Great Depression, Curtiss-Wright's management avoided risk and placed a greater focus on the bottom line than it did on customer requirements.

The significant differences in the way each company conducted its business accounts for both the great successes and the many failures of the B-29.

When challenged by the Army Air Corps on Feb. 5, 1940, to build a "Hemisphere Defense Weapon" Boeing pulled out all the stops to respond with its Model 345. This ultimately became the B-29, incorporating a very streamlined fuselage, a revolutionary high aspect ratio wing with huge Fowler flaps, and a tricycle landing gear. Other refinements included cabin pressurization, a sophisticated central fire-control system, and a flight engineer's station to ease the pilots' load.

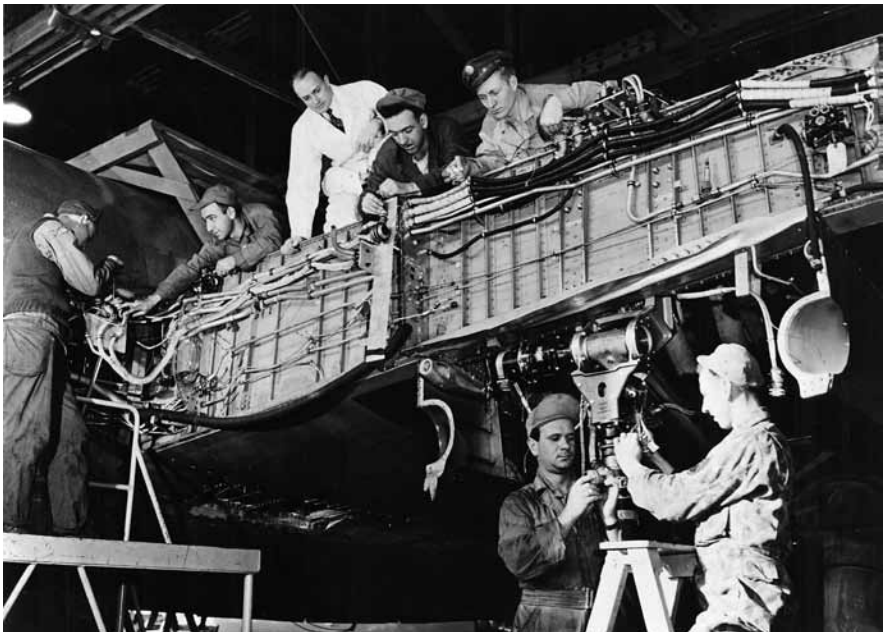
More concerned with weight than cost, Boeing created the ultimate World War II bomber. The Air Corps ordered more than 1,500 of them before the first one flew.

Only one engine was considered suitable for this new aircraft: the 2,200 hp Wright R-3350.

The Wright was a big 18-cylinder, twin-row radial that ran for the first time in 1937. Despite the power plant's promise, Curtiss-Wright put the design on the back burner, electing to spend resources on mass production of its bread-and-butter engines, the R-1820 and R-2600.

The R-3350 was thus denied the extensive test and development programs necessary to discover and cure its many problems. These included inadequate cooling, insufficient lubrication to upper cylinders, failure-prone reduction-gear design, poor carburetion, and an inefficient mixture distribution. All of these conditions resulted in excessive heat and sometimes fire, which fed upon the engine's extensive use of magnesium.

The R-3350 got its real "test and development" in combat, where engine



Electrical mechanics-in-training work on the miles of wiring in a B-29's wing spar. Because of new and revolutionary materials and features incorporated, the workers faced a steep learning curve.

A fully assembled B-29. By mid-April 1944, 150 Superfortresses were finally combat ready.

problems brought down more B-29s than the Japanese.

FDR's pledge to Chiang Kai-shek presented Gen. Henry H. "Hap" Arnold, USAAF commander, with a seemingly unsolvable problem.

By the time of the Cairo Conference, fewer than 100 B-29s had been produced, and of these only about 15 percent were flyable. They were grounded by everything from engine fires to equipment failures to change orders. Fewer than 70 pilots were checked out in the aircraft, and there were few trained aircrews.

Arnold believed Operation Matterhorn—the strategic bombing of Japan from India and China—would require at least 175 B-29s, with trained crews, appropriate maintenance and logistics, airfields located within range of Japan, and full support from theater commanders.

Boeing had a strong presence in Wichita, Kan., having acquired the Stearman Aircraft Corp. in 1934. There it produced almost 10,000 of its famous biplane trainers by 1945. Many were built in what was retrospectively known as Plant I after Plant II was built to produce B-29s. Although it took 18 months to complete after its June 1941 ground breaking, Plant II was in partial operation by June 1942.

Building a new plant was formidable, but staffing it with sufficient adequately trained workers was far more difficult.

Many of the employees from the local population had never before actually touched an airplane, much less one as demanding as the B-29. A mammoth recruiting, training, and job placement task eventually created a skilled workforce able to reduce the man-hours required to manufacture a B-29 from more than 150,000 to 20,000.

Less obvious, but equally challenging, were the problems faced by the thousands of subcontractors that also had to expand and train their workforces across the country.

Arnold's Rage

Companies that used to supply simple reels of wire and conventional plug-in connections now had to manufacture the complex wiring bundles required by the B-29. Cannon plug connections, sophisticated enough themselves, needed upgrading to withstand the challenges of mating a pressurized compartment to a nonpressurized area. Similar problems were found in most of the other components.

Configuration control was not the science it is today. The revolutionary new airplane required thousands of changes over time, from new sets of wires to new types of Plexiglas. In the rush to complete the aircraft, changes were made on the spot on the production lines as the deficiencies were discovered.

But applying the corrections on future aircraft made at other plants was difficult. B-29s were produced by Boeing at Renton, Wash., and in Wichita; by Bell in Marietta, Ga.; and by Martin in Omaha, Neb.

Col. Leonard Harman proposed forming a B-29 Special Project Office to coordinate everything from production through flight training. His idea was approved and his boss, Brig. Gen. Kenneth B. Wolfe, took charge of the program. It became standard practice to fly newly manufactured B-29s directly to a modification center where the aircraft could be brought up to full combat readiness.

These modification centers were vastly overtaxed, with such limited hangar space that repairs took place in the open, without regard to the weather.

In early 1944, Arnold was already suffering from the heart problems that ultimately took his life. Despite this, he was determined to see FDR's promise of bombers in China fulfilled and visited Wichita on Jan. 11, 1944.

Arnold walked down the assembly line and selected the 175th fuselage to bear his name, stating he wanted it delivered before March 1, 1944.

All of the personnel involved in producing the B-29 worked hard to achieve Arnold's demand. Unfortunately their efforts were hampered by the innate complexity of the aircraft, continuing engine problems, and the slow delivery of key parts. The workers were facing a very steep learning curve. None of this mattered to Arnold when during a March 9, 1944, return to Kansas he found no B-29s available for combat operations.

Furious, Arnold plunged into the problem, assigning Brig. Gen. Bennett E. Meyers as special project co-coordinator. The B-29 was to have priority over all USAAF programs. Meyers selected Col. Clarence S. Irvine as his deputy.

With Arnold's rage as their clout, Meyers and Irvine imposed order on the chaotic program. Boeing sent 600 workers, and USAAF units were tapped for their top maintenance personnel. Anyone subcontracting parts for USAAF received directions to apply all their efforts to the B-29 program.

Most of the workforce had been battling the long Kansas winter for months, working outside with temperatures hovering between two below zero to 20 degrees Fahrenheit. Even as spring approached in March, the weather continued to hamper the work effort with large snowfalls. Often the cold was so severe workers could work no longer than 20 minutes at a stretch before going to warm up at one of the small gasoline heaters studding the flight line.

Arnold's key deputies applied pressure on everyone to produce more and quickly. As they did, they began to regularize vast numbers of changes. These ranged from physically strengthening

the internal structures of the aircraft with steel plates and new skin panels to resoldering thousands of electrical connections and replacing entire rudders.

One perplexing problem was the variation in empty weight from one B-29 to another. Eventually it was found that allowable commercial tolerances in equipment and raw materials created a "lap error" sometimes as large as several hundred pounds.

On the flight line, the R-3350-23 engines continued to overheat on takeoff. It was found that reducing the size of the cowl flaps slightly allowed more airflow without increasing drag. All of the aircraft were destined to receive a later model R-3350-3A engine which had some—but not all—of the cooling problems solved.

Flying techniques were also improved. One important new method was to delay the climb after takeoff. Maintaining level flight just after liftoff allowed a few more knots of airspeed, reducing the incidences of overheating and engine fires.

The shortage of B-29s reduced the scope of Arnold's original plans for Operation Matterhorn. Ultimately, the US decided to build five bases in India to support the effort, plus four advanced bases in China to put the southern part of Japan in range.

Among Japan's blazing victories in the spring of 1942 was the conquest of Burma and severance of the famous Burma Road, the only land route from India to China.

As a result, the bases in China had to be supplied by air. With insufficient conventional transports available, the B-29s themselves were used to carry fuel from India over the "Hump" of the Himalayas to forward bases. It was a dangerous task for the Superfortress, still untried and in short supply.

In a management master stroke, Arnold reserved command of the newly created Twentieth Air Force for himself. It became a small-scale prototype of the future United States Air Force. Brig. Gen. Haywood S. Hansell Jr. became his chief of staff and, effectively, the commander. Under him, Wolfe had charge of XX Bomber Command.

The new command was established with two combat wings, each of four groups. The implacable transport problems soon reduced this to a single wing of four groups. It was the start of the slow transformation of FDR's pledge from a war-winning China-based strategy to a show of force.

Arnold had selected the right leaders to carry out his forced-draft plan and by April 15, 1944, 150 aircraft were combat ready.

Low-level Firebombing

Roosevelt realized his exact promise had not been fulfilled, but it was close enough. By May 8, 130 B-29s had made the 11,500-mile journey from the United States to India and China, arriving in immediate need of maintenance and repair.

The B-29s, ready or not, were about to go to war.

Unfortunately, the logistics and maintenance concepts of Operation Matterhorn had fatal flaws. There were not enough transports available to carry the fuel and bomb loads, so the valuable new B-29s took their place. Writing after the war, Gen. Curtis E. LeMay noted it was necessary to make seven trips in a B-29 to stockpile fuel for a combat mission from its forward base. On the eighth mission, the B-29 flew over the Hump carrying bombs.

Brig. Gen. LaVerne G. Saunders led the first raid from China on June 5, 1944, with 98 B-29s attacking Bangkok, Thailand. The mission was a fiasco, with less than two dozen bombs hitting the target railroad yard. Fourteen Superforts aborted en route, 42 diverted to alternate airfields, and five crashed on landing.

Things would improve, but only moderately.

Ten days later, 68 B-29s took off for the first attack on the Japanese homeland since the Doolittle raid. Only a few aircraft found their target, the steel mills of Yawata, located in southern Kyushu. Losses included a crash on takeoff, one shot down by flak, and six others in accidents.

Reconnaissance photos showed only one bomb landed near—but not on—the target.

Arnold replaced Wolfe with Saunders temporarily, assigning LeMay to take command Aug. 30. LeMay introduced new training standards, but was unable to do achieve significantly better results. However, he did experiment with the firebombing techniques he would use later against Japan.

LeMay soon realized that the difficulties Wolfe had encountered made operations from China too difficult to sustain. The combination of inexperience, continued problems with the R-3350 engines, and adherence to the concept of precision bombing rendered the magnificent efforts of the previous two years moot. Japan was still at the limits of the B-29's range, and its targets were of a far different nature than those in Germany. The weather, particularly the jet streams, made operations over the enemy homeland from the attackers' range unprofitable.

Even the Japanese concluded the B-29s were a net loss to the Americans, costing great sums of money without being able to deliver significant damage.

Despite the enormous effort, the Japanese assessment was correct. China-based B-29s dropped about 11,000 tons of bombs on Japan but without the necessary accuracy.

Other battles, far more costly in time, materiel, and casualties than the Battle of Kansas, changed things. The capture of the Marianas put Japan within reasonable range for the B-29s, and limitless supplies could be provided by ship. There XXI Bomber Command under Hansell began operations against Japan with far more optimism. Hansell persisted in the doctrine of high-altitude precision bombing despite inadequate results.

In January 1945, Arnold relieved Hansell, appointing LeMay in his place.

High-altitude precision bombing techniques continued for a short while, until LeMay introduced a series of low-level firebomb attacks lethal to Japan.

It was quite a turnaround. Initial operations from China indicated that the B-29 was a potential failure, but under LeMay's leadership, the B-29 came to symbolize airpower. It offered, at an ever-decreasing cost in aircraft and personnel, the option of victory over Japan.

Ultimately, two nuclear weapons provided that victory, one that might have been long delayed without Hap Arnold's furious management of the B-29 development program.

Sadly, as the result of a final "Battle of Kansas" the magnificent contributions of Boeing's Wichita plant will end in 2013, an unexpected victim of defense budget cuts. ■

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