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WORLD WAR II WAR PRODUCTION—

WHY WERE THE B-17 AND B-24 PRODUCED IN

PARALLEL?

A Research Paper

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by

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Disclaimer

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the US government or the Department of Defense.

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Abstract

The United States war production capacity played a significant role in the Allied victory in World War II. The aircraft industry in particular rallied to mass produce thousands of aircraft to support the war efforts in both theaters. Mass production led to the dilemma of sacrificing quantity for quality. This research focuses on one aspect of this issue—in particular the mass production of B-17s and B-24s and why they were produced in parallel.

The methodology followed in conducting this research included the use of historical books and published document collections. In addition, historical records, such as field surveys conducted during the war years and official Army Air Forces correspondence, were used.

The research includes an explanation of the aircraft industry as well as facts and information on the production of the B-17 and B-24 aircraft. Reliability and maintainability problems associated with the two bombers are discussed, including those which led to accidents and aircraft failures. The findings presented are based on combat effectiveness as well as economic and political issues.

Chapter 1

Background

> *The superiority if the United States in munitions and ships must be…so overwhelming that the Axis nations can never hope to catch up with I… to attain this overwhelming superiority, the United States must build planes and tanks and guns and ships to the utmost of our national capacity. We have the ability and capacity to produce arms not only for our own armed forces, but also for the armies, navies and air forces fighting on our side. This production of ours… must be raised far above its present levels, even though it will mean the dislocation of the lives and occupations of millions of our own people. We must raise our sight all along the production line. Let no man say it cannot be done.*
>
> —President Roosevelt

In the late 1930's the United States faced the possibility of being forced into a war which was being fought by the great powers in Europe. At the time, the American aircraft industry faced the problem of producing mass quantities of aircraft suitable for our country to use. The industry rose to the challenge and rallied to mass produce thousands of aircraft. Between mid-1940 and V-J Day, the United States spent $45 billion on military aircraft.[1] This sum was only for the cost of planes and engines and did not include ordnance, government-financed factory expansions, marketing, equipment, housing for workers and other necessary expenses. In support of the strategic bombing mission, American industry mass produced 12,761 B-17s[2] and 18,481 B-24s.[3]

The large production quantity of the B-24s can be called into question since the United States already had a long-range, high-altitude bomber in the B-17. However, in

the latter part of 1938, the Army Air Corps (AAC) pushed for the production of another bomber, the B-24. Some might argue that the reason for the production of the B-24 was that the AAC requested a plane with better range and better performance than the B-17, but this research shows that the B-24 did not outperform the B-17, as proven by historical documentation which included results of accident causes and correspondence from senior AAF officials comparing the two aircraft. Another argument might be that B-24s were produced because the B-17 contractors could not mass-produce a sufficient number of B-17s in support of the strategic bombing campaign in Europe. Yet another argument is the cost benefit factor of producing a competitor to the B-17, thus maintaining lower costs for both of the planes. A political argument for producing the B-24 could be the fact that having multiple contractors produce thousands of aircraft in different locations spread the job and employment benefits across the United States. This research will show that the reason for producing the B-24 was actually a combination of all these factors.

The Inter-war Years

The 1920's brought numerous changes for the American aircraft industry. Aircraft designs changed drastically since the early World War I models, and manufacturers were trying to cope with constant design changes. Military sales also dropped and the airlines became an important customer for the nation's aircraft manufacturers. Airline sales contributed significantly to maintaining a high gross for the aircraft manufacturers and hence foster a healthy industry. "Airline purchases of big multi-engine transports also stimulated production of a character closely akin to, if not precisely the same as, those encountered in the production of military aircraft."[4]

During the decade between 1928 and 1938, certain critical factors fostered the growth of the aircraft industry. The first one, the Air Mail Act of 1925, opened the door for private contract mail carriers to replace the government-operated carrier system that had been in existence since 1918. This law was designed as a virtual subsidiary to stimulate the development of airlines, and by 1927, contract carriers handled all air mail. A second factor fostering growth in the business was the passage of the Air Commerce Act in 1926. This Act made available federal aid for aerial navigation in the form of radio stations, emergency landing fields, and beacons under Department of Commerce sponsorship, thus allowing air carriers to spend more capital on aircraft development. Yet another factor was the massive increase in airline passenger traffic. Between 1928 and 1934, passenger volume increased from less than 50,000 to almost 500,000 annually.[5] Both the improvement of the safety record and lower fares contributed to this increase in passenger volume. Again, this contributed to allowing the aircraft industry to develop more planes.

During the interwar years, Congress passed several pieces of legislation that established the mechanism for mobilizing industry in case of war and reorganized the procurement process. The National Defense Act of 1920 outlined the responsibilities of the Office of the Secretary of War and charged the Assistant Secretary of War with the supervision of the procurement of all military supplies and other business associated with industrial mobilization essential for wartime.[6] The Act also directed that all chiefs of branches of the Army report directly to the Assistant Secretary of War regarding all matters of procurement. "The Assistant Secretary of War now had under his control something that had been lacking in the Army for 150 years—a more unified procurement

apparatus and a directive to plan for future industrial mobilization."[7] The Statute that shaped the way for the procurement of aircraft was the Air Corps Act of 1926. The Act provided for competition among designs and encouraged aircraft development. It also permitted the Secretary of War to buy experimental aircraft at his discretion and without competition and to award to the lowest responsible bidder in a competition. The Act also established policy for different types of contracts, including making cost-plus percentage of cost contracts illegal. It encouraged the use of cost-plus incentive type contracts in order to accommodated design changes. This Act, along with numerous other procurement organization and administration changes during the 1930s, paved the way for industrial mobilization in support of World War II.

Aircraft Industry on the Eve of World War II

The American aircraft industry on the eve of World War II consisted of four distinct groups. The first was the airframe manufacturers, which designed new aircraft and produced them. Airframe manufacturers would sometimes fabricate nearly all of the items within their own manufacturing organization and sometimes simply assembled the components and subassemblies made by their subcontractors. The second group was the engine manufacturers. During World War I engine manufacturing had been carried out by the auto industry, but at the eve of World War II there were seven or eight manufacturers who specialized in aircraft engines.[8] Of these, two, Wright Aeronautical Corporation and Pratt & Whitney Aircraft Division of the United Aircraft Corporation dominated the field in numbers produced, with 72% of the business in 1934.[9] Subcontractors were the third group in the industry. They provided major components and subassemblies. During

peacetime very few major contractors did business with subcontractors because they preferred to build everything themselves rather than dealing with subcontractors. However when the war began, major contractors were forced to rely on subcontractors due to the high volume of work. The last group in the aircraft industry consisted of vendors and suppliers. This group provided ready made, off-the-shelf items. Some vendors specialized in a particular item of the aircraft, such as Sperry Corporation which specialized in instruments and controls.

There were several factors that affected the aircraft industry on the eve of the war. Marketing in particular had both a positive and negative effect. By 1938, most of the planes being built were sold to civilian airlines. Aircraft manufacturers were forced to expand their facilities and to invest in new tooling within a short period of time. When the war began, some large facilities were available to support mass production. However, since the military market was low prior to the war, very few aircraft manufacturers specialized in military planes. Complexity and military emphasis on high performance drove up average unit costs. This forced the aircraft manufacturers that wanted to compete for the military market to operate with larger capital structure, thus tying up funds that could be used for other purposes. Government-imposed maximum profit rates of 10% also dissuaded some aircraft manufacturers from doing business with the military.

Another factor affecting the industry on the eve of the war was the lack of production-mindedness in the aircraft industry. Unlike the automotive industry which was used to mass producing, the aircraft industry's emphasis was on design engineering versus production engineering. Production engineering consisted of producing automobiles of a proven design and a given demand, whereas the aircraft industry's design engineering

focused on new concepts and initial production in limited quantities. Although this problem faced the American aircraft industry at the beginning of the war, the demand for military aircraft forced the industry to develop mass production techniques.

Research and Development

During the prewar years the AAC realized that building higher performance aircraft required more time and effort dedicated to research and development. However, the expansion program launched in 1939 placed the first emphasis on acquiring large quantities of planes which would offset the potential enemies' time advantage.[10] This led to large-scale production of current models rather than waiting for far superior models that might be produced later. President Roosevelt warned the Department of War that no contracts would be negotiated for developmental aircraft or aircraft engines without consulting the expansion committee first.[11] Gen Arnold responded by placing first priority on the production of current models and by assuring to the Chief of Staff that "every effort was being made to standardize equipment, increase production, expedite deliveries, and defer present research and development."[12] This action did not completely stop current developmental work, but it did delay several programs such as the Curtiss XP-46 and the Republic XP-47. However, several factors led to a change in the philosophy of putting "quantity over quality."

By the end of 1940 a more balanced program between production and development was sought and the National Defense Research Committee (NDRC) was formed. The NDRC was tasked to oversee and support scientific research related to warfare, except those related to flight. A year later the NDRC became part of the newly created Office of

Scientific Research and Development (OSRD). Although the NDRC was not tasked to look at aeronautical research, it did review projects that contributed to the aircraft overall performance such as communication equipment and armament.

Another factor that affected American research and development was the British proposal in June of 1940 for exchange of scientific data. Secret information on communications, radar, underwater detection, fire control, turrets, superchargers, rockets, explosives, and chemical weapons led to increased interest on new weapons and further research. This exchange also led to the passage of the Lend-Lease Act. The Act allowed for the United States to send war materials to the allies as early as March 1941.

On a mid-1941 visit to Great Britain, General H.H. Arnold assured the British that the United States would not lag behind the great air powers of the world in the quality of its equipment. Thus in May 1941, the Materiel Division urged manufacturers to push for full exploitation of research and development. Once the United States entered into war, the renewed need for production resurfaced. The dilemma of the search for the "more and better" weapons was overshadowed by the "quantity versus quality" issue.[13]

Notes

[1] Jacob Vander Meulen, *The Politics of Aircraft* (University Press of Kansas, 1991), 182.

[2] H.P. Willmott, *B-17 Flying Fortress* (Prentice-Hall, Inc., 1983), 63.

[3] Allan G. Blue, *The B-24 Liberator* (Charles Sciber's Sons, undated), 192.

[4] Irving Briton Holley, jr, *Buying Aircraft: Material Procurement for the Army Air Forces* (U.S. Government Printing Office, 1962), 12.

[5] ibid., 14.

[6] Alan L. Gropman, *Mobilizing U.S. Industry in World War II* (Institute for National Defense Studies, 1996), 9.

[7] ibid.,10.

[8] Holley, 6.

Notes

[9] ibid., 7.

[10] W. F. Craven and J. L. Cate, *The Army Air Forces in World War II, Vol IV Men and Planes* (The University of Chicago Press, 1955), 228.

[11] ibid., 229.

[12] ibid., 229.

[13] ibid., 230.

Chapter 2

American Bomber Production

> *I want to tell you from the Russian point of view, what the President and the United States have done to win the war. The most important things in this war are machines. The United States has proven that it can turn out from 8,000 to 10,000 airplanes a month. Russia can only turn out, at most, 3,000 airplanes a month. The United States, therefore, is a country of machines. Without the use of those machines, through Lend-Lease, we would lose this war.*
>
> —Joseph Stalin

The origins of the American bomber force can be traced to the concept of strategic bombing. Early aviation advocates such as Hugh Trenchard in Britain, Guilio Douhet in Italy, and William "Billy" Mitchell in the United States, defended the concept of defeating the enemy by destroying its means of waging war. American aviators at the Air Corps Tactical School took this concept and developed the doctrine of strategic bombing. The doctrine essentially stressed that the most efficient way to defeat an enemy was to destroy, by means of bombardment from the air, his war-making capacity. The bombardment would be done by large masses of bomber aircraft flying in formation, at high altitude, in daylight, and equipped with precision bombing sights.[1] Although isolated geographically, in 1931 the United States recognized the advantage of having a long range aircraft that could protect its borders and territories and ordered the AAC to undertake the role.

Despite budgetary limitations, intensive research was conducted in collaboration with interested aircraft manufacturers toward the development of large bombardment airplanes. Preliminary investigations were underway late in 1933 for an ultra long range multi-engine monoplane bomber. Boeing and Martin submitted preliminary designs and engineering data, and the AAC negotiated contracts in the following year for additional technical information, test, wind tunnel models, and mock-ups.[2]

The B-17 Flying Fortress

In 1934 the Air Corps wanted a heavy bomber with the speed comparable to the latest foreign pursuit aircraft and with strong fire power to fight off concentrated enemy attacks. They were specifically looking for a plane that could carry a bomb load of many tons, fly above 24,000 feet, and have the range that would allow it to span the continent in a single flight at a speed approaching 250 miles per hour. Their requirement also called for a plane that would also be capable of carrying its striking power out to sea and be able to intercept and destroy any enemy attempting to invade American shores.[3] Although the design competition proposal distributed had not specified two engines (it read "multi-engine"), all but one manufacturer assumed that only a highly superior twin-engine model of standard design was desired. The Boeing Company engineers noticed the loophole in the proposal and developed an entirely new bomber, a four-engine superbomber. The proposal requested for the design and construction of the developmental model in twelve months. For Boeing it was a gamble because in addition to being purely a speculative effort, there would be no compensation for the cost of research and development if the design did not win.

The XB-17 (Boeing Model 299) was introduced in September 1934. It had many problems, since no such bomber had been produced in the United States. Four engine bombers such as the Russian Sikorsky had been produced in small quantities; however, these had also been slow, clumsy and relatively underpowered. Numerous improvements in the design were included in the XB-17. To reduce air resistance, bombs were to be carried internally. Other improvements included housing the pilot and crew members inside the fuselage in heated soundproofed quarters; installing additional machine guns to fire from enclosures in the fuselage; adding new Hamilton constant-speed propellers which would improve the versatility of the operation; developing tabs for the rudder and elevators to assure easier trim control; and eliminating all protruding surfaces as far as possible in order to provide an aerodynamical clean aircraft.[4]

In August of 1935 the XB-17 successfully flew its maiden flight from Seattle to Wright Field in Dayton for evaluation. The fight covered 2100 miles at an average speed of 232 per hour. Its performance, coupled with the size, weight, and armament of the four-engine design, impressed the AAC bombardment pilots. During later performance tests, the XB-17 crashed following a takeoff made with the controls inadvertently locked. However, the potential of the design was so great that the Air Corps issued a contract for 13 aircraft and one static test model. The planes were to be built using Government-furnished Wright engines. The contract type was fixed priced for a total amount of $3,823,808. The unit price for each of the thirteen airplanes was $246,030 and the unit price of the static test model was $171,225.[5] The AAC gave the aircraft a military designation of B-17.

The service test model's landing gear (fully retractable along with the tail wheel) was equipped with air brakes, a first for any Army bomber. The four Wright 850 horsepower engines allowed it to reach a speed of 256 miles per hour at 14,000 feet,, a service ceiling of 30,600 feet, carried a normal bomb load of 2500 pounds for 2260 miles at operating speed, and posted a maximum endurance of 10.4 hours in the air.[6] It was also capable of carrying a maximum bomb load of 500 pounds for 1700 miles at a cruising speed of 228 miles per hour.

At the time that the XB-17 was being performance tested, others bombers in testing were experiencing numerous maintenance problems. Convinced that the superior performing B-17 had opened the way for establishing a strong offensive power, the AAC started arguing for the experimental development and construction of larger and more powerful types of aircraft. Arguments were made for the exclusive development of the four-engine models to perform all long range missions. The War Department, however, was still not convinced that a requirement existed for a bomber with a range exceeding 3500 miles.

Between 1936-1940, a total of 134 B-17 models A, B, C, and D were developed in Boeing's plant in Seattle.[7] Although designed primarily as a defensive aircraft, it still laid the foundations for high altitude combat bombing by employing turbo-supercharged engines. This was the standard B-17 model available at the start of the war.[8]

Foreign Competition

In 1938 the AAC conducted a study on specific reasons why the performance of some foreign models exceeded those of the Air Corps. Comparison was made between the B-

17, the latest German four-engine Junkers 89, and the Russian four-engine TB-6. Military intelligence reported that these foreign models had superior altitude and speed performance. These advantages were achieved by sacrificing crew comfort and eliminating gun protuberances to increase speed.[9] Foreign models used special engines producing more than normal rated power and high octane fuels, and these also contributed to better performance. However, the B-17 turbo-charger engine boosted its operational altitude to 20,000 feet, 6000 feet better than the German and Russian bombers. This was not enough to convince the Chief of the Air Corps, who believed that the American bombers under development fell short of the performance figures of foreign aircraft. He believed that crew comfort and convenience, although important for increased efficiency, should be sacrificed in order to increase aircraft performance. As a result of the AAC study, the Materiel Division became interested in the development of a bomber to serve as companion to the B-17 and capable of exceeding the performance of experimental foreign aircraft in the same class.

B-24 Liberator

During the latter part of 1938, the AAC, aware of the growing possibility of a war in Europe, asked Consolidated Aircraft Corporation (CAC), of San Diego, CA, to consider becoming a second source for B-17 production. CAC was one of the leading companies producing long-range flying boats for the U.S. Navy. CAC personnel visited the Boeing plant in Seattle to study the proposal, but they rejected the idea "on the basis that the B-17 design was incomplete and, in any case, would be hard to adapt to CAC building methods."[10] The company also recommended that a new and better airplane, both from a

tactical and production perspective, be produced.[11] In January 1939 the Air Corps again approached CAC but this time they were asked to produce a four-engine bomber with a speed in excess of 300 miles per hour, a ceiling of 35,000 feet, minimum cruising speed of 220 miles per hour, and an operating range of 3000 miles.[12] In March 1939, CAC presented preliminary designs and engineering data for the XB-24, and by the end of the month the company received a contract for the prototype of the new model to be produced in nine months. The XB 24 made its first successful flight on 29 December 1939.

The B-24 differed greatly from the B-17. Its 110 foot wing was a radical departure in airfoil types at the time. Other differences included hydraulically operated wing flaps, bomb bay doors, and power brakes. It was the first American heavy bomber to operate with a retractable landing gear, and unlike the B-17, its tail assembly had two vertical fins and rudders. Its service ceiling was estimated to be 31,500 feet and it could carry a maximum bomb load of 8960 pounds.[13] The engines were four Pratt & Whitney-1830 engines which made the gross weight of the airplane close to 41,00 pounds.

After the first prototype contract was issued, the Army immediately negotiated a contract for 7 additional planes to be delivered starting in May 1940 and 3 per month thereafter until completion. The French also became interested in the plane and negotiated a contract with CAC for the procurement of 139 B-24 type airplanes. The contract was signed in June 1940. This was the first real production contract signed in support of the war since all previous contracts were for quantities too small in numbers to be considered production levels.[14] When the Germans occupied France, the British took over the French contract, and the airplane was known as the LB-30. Thus, when the United States entered

the war in December 1941, two long-range, high altitude bombers, the B-17 and B-24, were being mass produced.

Notes

[1] Harold Winton, *A Black Hole in the Wild Blue Yonder: The Need for a Comprehensive Theory of Airpower* (Air Command and Staff College War Theory Coursebook, 1996), 13.

[2] USAF Historical Study No. 6. *Development of the Heavy Bomber 1918-1944* (USAF Historical Division, Air University, 1951), 74.

[3] ibid.,74.

[4] ibid., 75.

[5] Air Material Command. *Boeing Aircraft Company, Seattle, Washington, B-17 Construction and Production Analysis* (LA AAF Procurement Field Office: Industrial Planning Branch, 1946), 11.

[6] USAF Historical Study No. 6, 76.

[7] Willmott, 63.

[8] USAF Historical Study No., 78.

[9] ibid., 78.

[10] Blue, 11-12.

[11] Air Materiel Command. *Consolidated Aircraft Company, San Diego, Construction and Production Analysis* (LA AAF Procurement Field Office. Industrial Planning Branch, 1945), 1.

[12] USAF Historical Study No. 6, 80.

[13] ibid.

[14] Air Materiel Command. *Consolidated Aircraft Company, San Diego,* 13.

Chapter 3

Who Built the B-17 and B-24

> *I have just sent a directive to the appropriate departments and agencies … ordering that immediate steps be taken:*
>
> *To increase our production rate of airplanes so rapidly that we shall produce 60,000 planes, 10,000 more that the goal set a year and a half ago. This includes 45,000 combat planes—bombers, dive bombers, pursuit planes. The rate of increase will continue so that next year, 1943, we shall produce 125,00 airplanes.*
>
> *Only this all-out scale production will hasten the ultimate all-out victory. Speed will count. Lost ground can always be regained—lost time, never. Speed will save our lives; speed will save this nation which is in peril; speed will save our freedom and civilization—and slowness has never been an American characteristic.*
>
> —President Roosevelt

In May of 1940, foreseeing American involvement in the war in Europe, President Roosevelt called for the production of 50,000 planes. In response to this authorization, four months later, the Materiel Division awarded contracts to Boeing for 512 B-17E's and to Consolidated for 408 B-24's. This was the opening of the Air Corps heavy bomber production.[1]

Increased production caused some immediate concerns—one being whether there were sufficient facilities to support mass production. Since at the time the industry's maximum existing capacity was 15,000 planes a year[2], current facilities would have to be expanded. Major airframe manufacturers immediately began to increase their floor space.

The Government, recognizing this was a major undertaking, provided 89 percent of the $3,840,000,000 invested in aircraft plants between 1940 and 1945.[3] Plant expansions brought the problem of lack of warehousing facilities. Contractors had to lease warehousing facilities in nearby areas to resolve the space problems.

Introduction of More Contractors

The production of heavy bombers in the quantities needed was too large for Boeing and Consolidated to handle alone, so the Air Corps decided to form a pool of manufacturers to produce these. The Boeing, Vega, and Douglas consortium was formed in order to produce B-17s. Douglas Aircraft Company and Vega Aircraft Company (an associate of Lockheed which was consolidated into Lockheed in 1943) agreed to produce B-17's under license from Boeing. In the process, Boeing agreed to enlarge its B-17 plant in Seattle and to build a new one in Wichita. Douglas contracted for a new plant in Long Beach and Vega expanded its facility in Burbank. The Douglas and Vega plants initially encountered many problems associated with setting up complex assembly lines. However, by the end of B-17 production, Douglas produced 3,000 (23.5%) and Vega produced 2,750 (21.6%).[4]

The AAC selected Douglas and Ford to join Consolidated in producing B-24's. At a new large plant to be built in Willow Run, Michigan, Ford would produce a "knock-out" version of the B-24.[5] The plant became a model for mass production as document by a 1946 Air Materiel Command Field Survey Report, "Willow Run's mass-production of B-24 Liberators was without precedent. There was no pattern of large-scale production in the aircraft industry to follow, and Ford staked everything on his belief that mass-

production techniques developed in many years of automobile manufacture could be applied equally well to an airplane, a washing machine—or anything."[6]

Concerned about the possibility of enemy attacks to production plants on the coast, the War Department decided that new defense plants were to be built at least 200 miles from the borders. Thus, Consolidated built a new plant in Fort Worth and Douglas built one in Tulsa for B-24 production. A fifth B-24 production line was opened with North American Aviation's plant in Dallas in 1942.

Opening plants for B-17s and B-24s production around the country, not only spread the amount of work among different Congressional districts, but it also opened competition among contractors. In the late 1930's, Congress decided not to recognize design rights. This allowed the Government to take the design from one contractor, even if the contractor had financed its own research and development, and give it to another contractor to produce. Although done so other contractors could support mass production in time of war, it was a political tool of which the Government could take advantage. This, combined with the introduction of the B-24, kept Boeing's costs for the B-17 low. Such was the case that in 1939, the Air Material Division reported to Gen Arnold "this means of bringing in an additional source of supply for heavy bomber [B-24] will react as an advantage in negotiation with the manufacturer of the B-17 model airplane. It is to be noted that the prices quoted by Boeing Aircraft Company in quantity production are in excess of production prices quoted by Consolidated."[7] Boeing soon found that it was not possible for them to "to produce the aircraft without a loss."[8]

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Notes

[1] USAF Historical Study No. 6, 81.

[2] Craven and Cate, 308.

[3] ibid., 317.

[4] Willmott, 63

[5] Crave and Cate, 312.

[6] Air Materiel Command, *Ford Motor Company, Willow Run Bomber Plant, Ypsilanti, Michigan Construction and Production Analysis* (Industrial Planning Division, 1946), viii.

[7] Jacob Vander Meulen, *The Politics of Aircraft: Building an American Military Industry* (University Press of Kansas, 1991), 213.

[8] ibid. Quote came from Mr. P.G. Johnson, Boeing President, in a letter to Gen Arnold, dated 28 Mar 1940.

Chapter 4

B-17 or B-24?—Which was the Better Plane?

> *Efforts to increase the ability of the B-24 to protect itself against enemy fighters through an increase in its defensive fire power have seriously reduced the performance of this aircraft. This has now reached a point where a basically new tactical employment must be considered or, if the airplane is to be used conventionally in this theater, immediate remedial action must be taken through extensive local modifications and substantial changes in design must be accomplished now even though this may necessitate a reduction in production.*
>
> —Maj Gen James Doolittle, *letter to Lt Gen Spaatz, dated 14 Feb 44*

Perhaps those who flew the B-17 and B-24 bombers could describe the differences between the two planes and explain the performance advantages that the B-24 was supposed to have over the B-17. However, B-24 performance problems, coupled by the fact that B-17 production was to taper off prior to B-24 production, prompted the Army Air Force (AAF) to investigate the combat effectiveness of the plane in comparison to the B-17.

A comparative analysis conducted in the spring of 1944 by the AAF Operations and Requirements Division concluded that "it would be desirable to increase B-17 production and decrease that of the B-24, because the former airplane is a much more effective combat weapon."[1] The study discussed that the plan for reducing the production of the B-17 was presumably based on the B-24's previous superior range, speed and load capacity and greater ease of production. The study went on to recommend that current production

plans be reconsidered. This recommendation was based on statistical comparisons made, of which most are summarized as follows[2]:

1. Statistical data compiled on the utilization of both planes showed that the B-17 was easier to maintain and therefore more available for combat.
2. Statistical data on time from aircraft acceptance to delivery in theater showed that the B-17's spend only half as much time in modification centers thus are available at the theaters in a shorter time.
3. Use of B-17 combat sorties, versus B-24, resulted in a 40% savings in personnel and material.
4. The average man-hours expended in producing and modifying one B-24 were greater than for a B-17.
5. Statistical comparisons done on loss rate per sortie showed that the B-17 had a 35% longer combat life than the B-24.

Another study was conducted in the fall of 1944 by the AAF Unit Training Division. This study analyzed the Third Quarters accidents of both planes. In the final report, Colonel Walker, Chief of the Unit Training Division, states the following:

> The extensive use of the B-24 is inconsistent with the blunt fact that it is the most extravagant killer of any airplane in the AAF. Since Pearl Harbor through September 1944, B-24 accidents in the U.S. have resulted in 2,188 fatalities. In the first 9 months of 1944, B-24's did only 6% of total flying in the U.S. but accounted for 26% of all fatalities. They flew 5% less than B-17's but had 105% more fatalities and 85% more wrecks.
>
> Had the B-24 had as good accident rate as the B-17 during the period 7 December 1941 through September 1944, there would have been a saving of 230 aircraft wrecked, 904 lives, and approximately $60,000,000."[3]

With the results and recommendations of the reports stated, why is it that B-24 production continued at a rate higher than that of the B-17? Between Nov 1944 to Jun 1944 an additional 3,153 B-24's [4] were produced. During this same time period less than 1000 B-17's were produced and an additional order for 600 planes for Vega to produce was canceled.[5]

Although some in the AAF were not too enthused about the B-24's performance, the Royal Air Force (RAF) preferred it to the B-17. Unconvinced of the value of daylight

precision bombing with a four-engine aircraft, the RAF was sold on the "safer" night area bombing. They also believed that "the B-17 would make a satisfactory night bomber but pointed out that its firepower was wholly inadequate for protection during daylight missions, and that its bomb capacity was too light to warrant the raduis of action of which it was capable."[6] However, they considered the B-24 a superior night bomber because of its greater bomb load and larger fuselage which made possible the installation of increased defensive armament. The RAF also believed that the B-24 was useful for coastal patrol for locating and destroying enemy submarines and the German Focke-Wulf patrol bombers.[7] Even though it had less defensive fire and high altitude speed than the B-17, the British felt that the B-24 was still superior to the German bomber. Thus, they preferred the B-24 and even named her "The Liberator."[8]

Was the British preference of the B-24 over the B-17 enough to convinced American Air Commanders in the European theater? Apparently not. In a letter dated 14 Feb 1944, Maj Gen Doolittle, 8th Air Force Commander, requested to Lt Gen Spaatz, U.S. Strategic Forces in Europe Commander, that B-24's be modified and redesigned in order to correct performance problems that the plane had been experiencing.[9] He stated that the problems were a result of the efforts taken to increase the ability of the B-24 to protect itself by increasing its armament. He also explained that it was difficult to motivate his crews because the pilots flying the B-24's knew that the plane was not performing as well as the B-17. One can assume that Maj Gen Doolittle, highly regarded by his men, was concerned about his flying units and that he would had wanted only the best for his crews. Lt Gen Spaatz forwarded Maj Gen Doolittle's letter to Gen Arnold with a cover letter that stated:

> I can not sponsor any extensive modification or redesign program in the B-24 airplane which would prejudice the now scheduled deliveries to this theater. I consider that I do not have an unlimited time to do this job, and I must, in the best way possible, do it with the tools you furnish me. The German Air Force must be liquidated if OVERLORD is to be successful, and I can not liquidate it with airplanes resting in modification center either in the United States or in the United Kingdom.[10]

Gen Arnold agreed with Gen Spaatz. Operation OVERLORD was just four months away and this was a crucial time to establish air superiority over the Luftwaffe. Although they all knew about the B-24 performance problems, they needed the planes to support their strategic bombing theory.

Notes

[1] Brig Gen Mervin Gross, USA, AAF Requirements Division. Letter to Materiel Division, 23 May 1944.

[2] Maj Gen H.A. Craig, USA, AAF Assistant Chief of Staff, Operations, Commitments and Requirements. Letter to Chief of the Air Staff, dated 22 May 1944.

[3] Col R.R. Walker, USA, AAF Chief Unit Training Division, Assistant Chief of Staff, Training. Letter to AC/AS, Training, dated 13 Nov 1944.

[4] Blue, 192.

[5] Lockheed Aircraft Corporation Production and Construction Analysis, 9.

[6] USAF Historical Report No. 6, 107.

[7] ibid.

[8] Blue, 25.

[9] Maj Gen J.H. Doolittle, USA, Commander 8th Air Force. Letter to Lt Gen Spaatz, dated 14 Feb 1944.

[10] Lt Gen Carl Spaatz, USA, Commander U. S. Strategic Forces in Europe. Letter to Gen Arnold, dated 18 Feb 1944.

Chapter 5

Summary and Conclusions

Briefly, the situation is this: The B-17 is a fine, heavy bomber which has been lavishly built up by the Press with the result, we believe, that not only the public but the personnel in the Army Air Forces think of it as an airplane far superior to any other heavy bomber. At the same time, our industry is just beginning to put out large numbers of B-24's. Even in its condition today, without the (lower) turret, which may be available in quantity by the first of the year, the B-24 has shown up in proving ground tests as a very fine heavy bomber with a greater range that the B-17.

Brereton has used this same B-24 with German and Italian opposition and has had a remarkable degree of success in air combat. Likewise, Butler's small B-24 unit has been highly successful against the Japs in the Aleutians. It is unfortunate at this time that neither of those theaters has had the publicity enjoyed by the B-17 in the United Kingdom. The net result is a false public impression that the B-17 is a fighting airplane far superior to any other heavy bomber in the world, because of the briefness of B-24 combat experiences and lack of publicity for its successes in battle.

We find ourselves faced with what may be a real and acute problem in psychology and in leadership.

—Gen H. H. Arnold

This research paper looked at the United States war production capacity leading to and during World War II, in particular the bomber aircraft industry. The paper researched the question of why were the B-17 and B-24 built in parallel. It is an interesting argument since the United States already had a long-range, high-altitude bomber in the B-17 and still

pursued the production of another bomber, the B-24. The findings in this research conclude that the decision to build the two planes in parallel was based on several factors.

Combat Effectiveness

The argument that there was a requirement for an aircraft with better range and better performance than the B-17 is valid. Foreign comparable models were believed to be faster and had better overall performance than the B-17. Therefore, foreseeing American involvement in a European conflict, the AAC pursued the development of an aircraft that would complement the B-17. The B-24 aircraft should have performed better than its counterpart; however, findings showed that several modifications made to the plane for increasing its firepower against enemy fighters made the plane unstable and less combat ready. Even American well known aviators, such as Gen Doolittle, expressed their concerns over the B-24 performance.

"Quality versus Quantity"

This issue was debated constantly during the war years. Although not intended to be a war of attrition, the strategic bombing strategy used against Germany cost a lot of aircrew lives. Enemy flak and enemy fighters downed numerous bombers. Mass production of bombers was the answer to this kind of warfare. This left little time to work the quality issues, as Gen Spaatz pointed out to Gen Arnold in the letter discussed in Chapter 4 of this research.

Economic

Economic factors are always present when it comes to production decisions. The introduction of the B-24 affected the costs of the B-17. Competition drove prices down and the B-17's cost per unit went from $231,385 to $125,120.[1] The author recognizes that this decrease was also due to other factors such as learning curves in the assembly. However, the fee paid to Boeing was also lowered as it went from 6% to 3.99%.[2] So there was economical advantage when opening the door to competition.

Political

Although controversial, politics plays a big part in today's defense acquisitions and 58 years ago it was not different. First was the statement by President Roosevelt in 1940 setting a goal of producing 50,000 per year. Congress saw this as an opportunity for bringing new jobs to their districts. Conveniently, the Department of War requested that new plants built had to be at least 200 miles from the borders. This opened the door for the opening of several plants across the United States.

Another political factor was the Government's decision to retain design rights on new developments. Unlike today, the Government incentives defense contractors to commercialize their designs and products in order to stimulate the economy. Taking the B-17 design rights from Boeing and giving them to Vega and Douglas, a competitor to Boeing, was a political move. The same can be said of the B-24 design which was given to Ford , Douglas, and North American. Although Douglas was initially reluctant to participate, it found that it had to since it had been selected by the Government.[3] Thus, political factors are heavily weighed when making defense acquisition decisions.

In conclusion, war production played a significant role in the Allied victory during World War II. As the Nation rallied to mass produce bomber aircraft in support of the war, certain political and economical decisions were made in the best interest of the Government. These decisions, along with the need for better bomber, were the reasons for parallel production of the B-17 and B-24—even though strictly military considerations would have dictated otherwise.

Notes

[1] Air Material Command, Boeing Aircraft Company Survey, 9.
[2] ibid.
[3] Craven and Cate, 312.

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