

NORTH AMERICAN:

By Ralph B. Oakley

Part 2 — World War II — 1937 - 1945

The first installment of the history of NAA appeared in the 1974 summer issue of the *Journal*. It told the story of the founding of the company in 1928, and its reorganization in 1934, changing it from a holding company into an operating company. In 1934 Dutch Kindelberger became president, and the sale of the BT-9 to the Army Air Corps provided the impetus to move the plant from Dundalk, Maryland to Inglewood, California.

NAA MOVES TO CALIFORNIA

The move to California took place in the fall of 1935. The company occupied temporary quarters until the new factory was ready in January, 1936.

About a hundred employees made the move, some at company expense and some paying their own way. Many were still with the company in the early 1970's.

The new factory was located on the northwest corner of Imperial Highway and Aviation Boulevard, on what is now the Los Angeles International Airport. The site now is the home of the B-1 Division.

The new factory was well-suited for the production of modern military aircraft. About 300 feet square, it had an open area two stories high, and a mezzanine along one side of the production of detail parts.

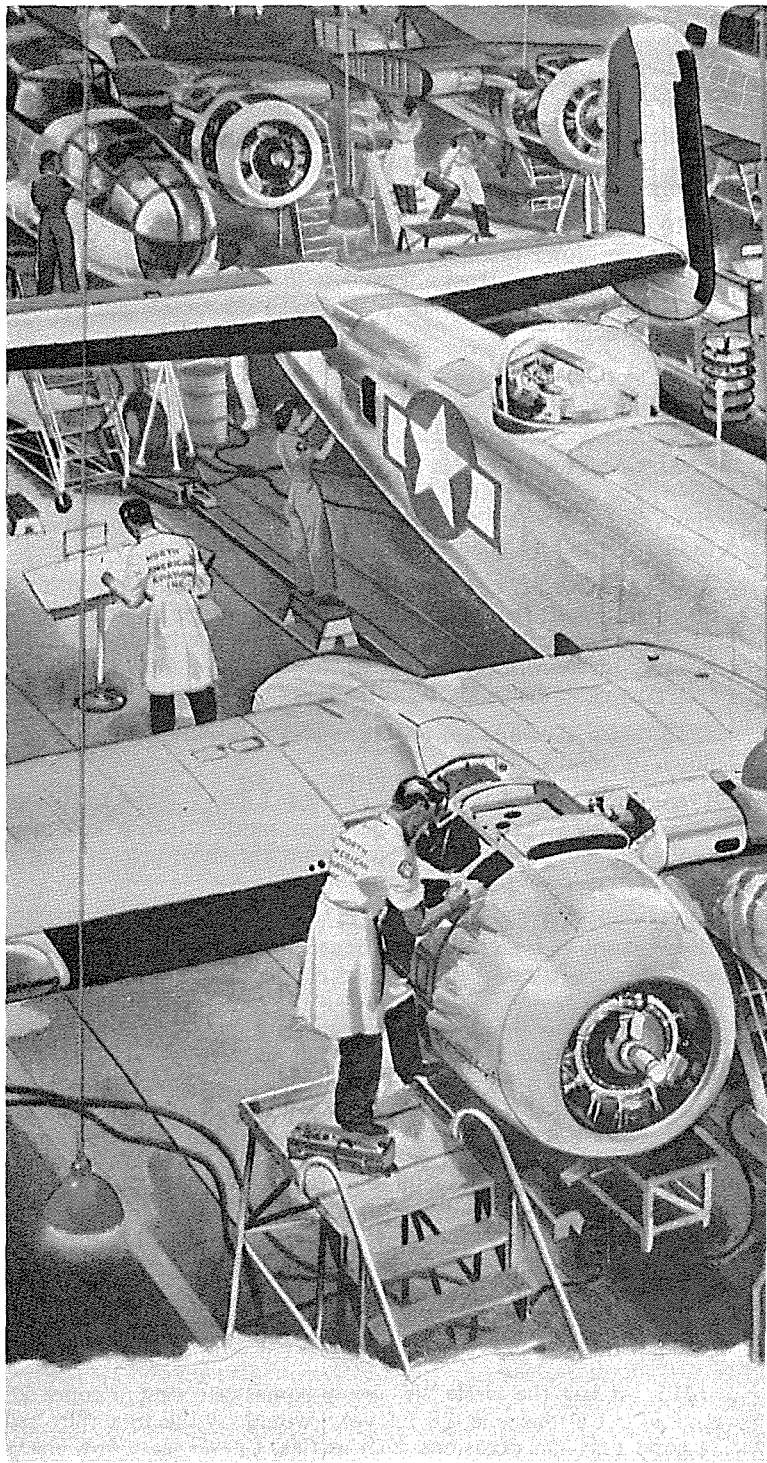
Production got underway in early 1936. The first production BT-9 was test flown by Paul Balfour on April 15. Before the year was out, all 42 BT-9 and 40 BT-9A trainers were completed and delivered to the Air Corps.

The new type trainer was a great success. Its rugged construction and outstanding flight qualities were widely recognized. During the next two years, 273 basic trainers, in 12 different models, were sold to the Army Air Corps, to the Navy, and to six different foreign countries.

The success of the basic trainer led to the design and construction of the NA-26, a more advanced trainer, one with a larger engine and retractable landing gear. The NA-26 demonstrator was also well-received, which led to an order for 177 BC-1 aircraft from the Army Air Corps. This was the first of a nine-year production run of the airplane which eventually became the T-6. More military personnel have trained on the NAA T-6 series aircraft than on any other of the the world's great airplanes.

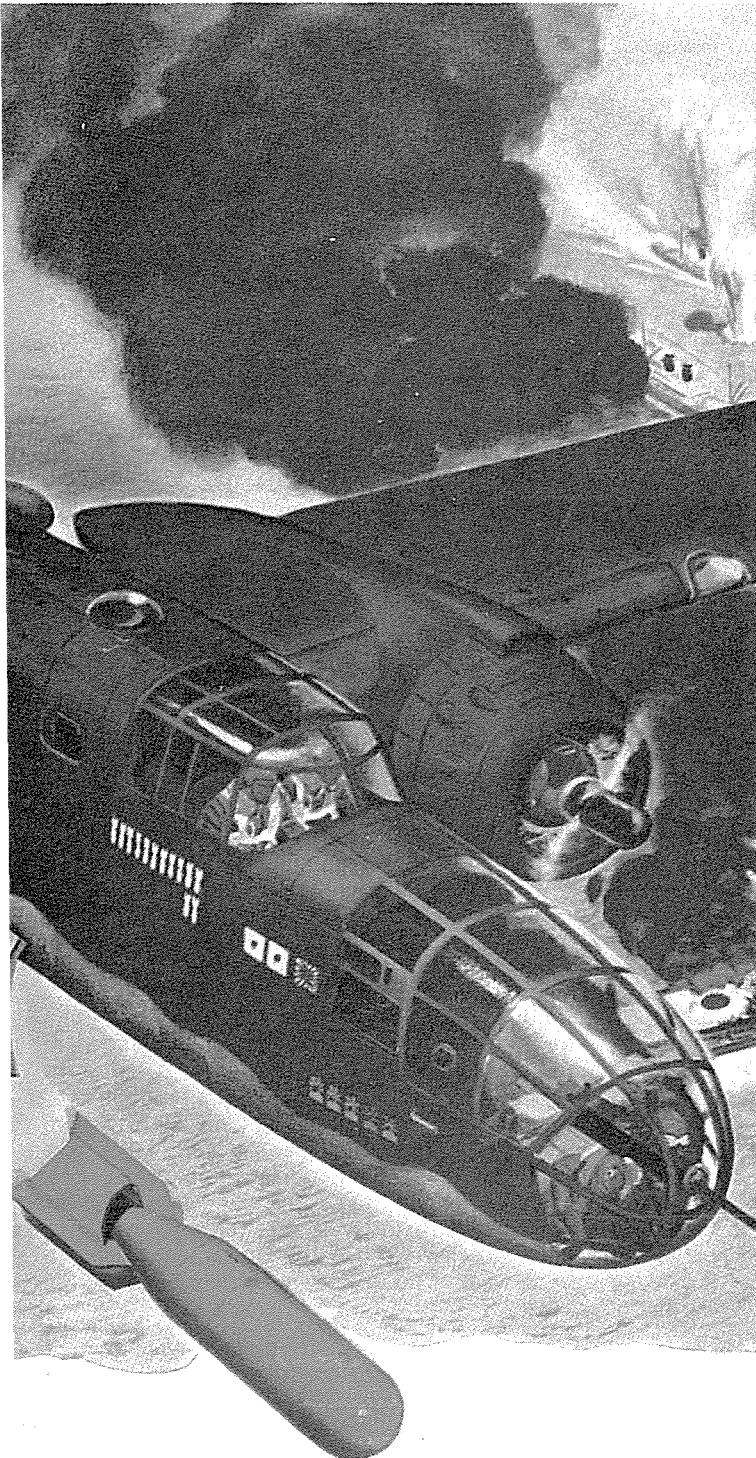
NAA was also busy on other models. In 1936, NAA received an order for 164 O-47 observation airplanes. This model was originally designed in 1935, when the company was still in Dundalk.

The company's first venture into the field of twin-engined bomber aircraft was initiated in January 1936, when the NA-21 was released for design and construction. The airplane was entered in the 1936 Army bomber competition. The NA-21 did not win the competition, the Air Corps purchased the single model, gave it the designation XB-21, and used it for many years at Wright Field as a flying laboratory.



GOES TO WAR!

A WWII advertisement of North American Aviation B-25 appeared in aviation publications including *Flying*.



Toward the end of 1937, work was begun on another twin-engine bomber, the NA-40 — another non-winner in the latest Air Corp competition.

One other design was initiated in this period. It was the NA-35, a two-place light trainer. However, construction of this model was delayed until 1939.

During the first two years of operations in California, the company began work on 624 airplanes, 294 of which were completed by the end of 1937. Employment at the time reached 1990.

FIRST WAR EFFORT

North American's initial contribution to the war effort began February 8, 1938, when the British Purchasing Commission awarded the company a contract to build 200 advanced trainers, subsequently designated the Harvard.

This was a big order. Through 1937, the company had completed only 294 aircraft. Here was a single order for 200 airplanes, the first of many big orders.

During 1938 and the following seven years, NAA built 43,208 airplanes.

The significance of NAA's accomplishments during the war may best be noted by comparing the performance of the other aircraft companies with that of North American. A report issued in 1953 by a committee headed by Jimmy Doolittle noted that during the six-year period ending in 1945, the United States produced 303,218 aircraft. NAA produced 40,768 units — 13% of the U.S. total. Douglas and Convair produced 30,000 units each, and Curtiss-Wright almost 25,500 units. Boeing, Lockheed, Grumman, Republic, and Bell, each produced between 13,400 and 18,000 units. The other 47 companies produced 93,499 units, for an average of fewer than 2000 each.¹

At the beginning of 1938, NAA employed 1990 persons. During 1938, 1108 employees were added, for a new total of 3098.²

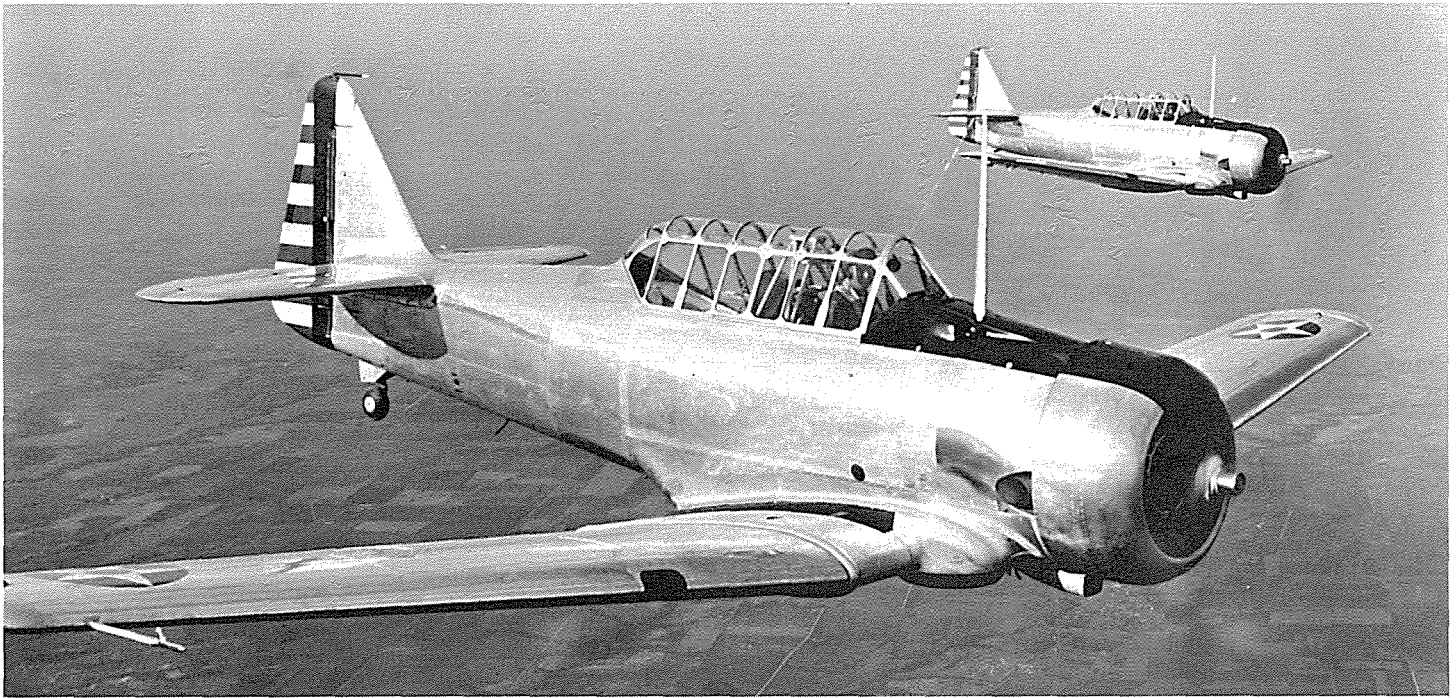
At that time NAA consisted of two divisions, the manufacturing organization located in Inglewood, and Eastern Air Lines, with headquarters in New York.

The Board of Directors consisted of nine members, four of whom were full-time officers. Ernie Breech was chairman of the Board. Dutch Kindelberger was president. There were three vice presidents: Lee Atwood, Eddie Rickenbacker, and Paul Brattain. L. R. Beardslee was secretary and Joe Mehl, treasurer.

At the beginning of 1938, NAA had orders for 399 airplanes, valued at \$9.3 million.

During 1938 work was begun on seven different new contracts. In addition to the order for the Harvard trainers, six other contracts called for 54 airplanes. The largest of these contracts was for 16 trainers for the Navy. Shortly after the first order for 200 Harvards, the British increased the order to 400 airplanes.

The importance of this first real step toward mass production is readily apparent.



During 1938, 400 airplanes were delivered; the next year 793. Production increased each year through 1944, when 14,862 airplanes were produced. During the eight years ending in 1945, NAA produced 16,680 trainers, 15,501 fighters, 10,786 bombers, and 241 other types.

On April 22, 1938, NAA sold Eastern Air Lines. Eddie Rickenbacker, who had been serving as a vice president of NAA and general manager of NAA's Eastern Airlines division, headed a group of individuals who raised \$3.5 million to buy the airline from the company.

North American originally purchased the airline for \$2.5 million in July, 1929. It was operated as a subsidiary until the end of December, 1934, when it became a division of the company.

NAA had a rather tumultuous first 10 years. The company had six presidents in the first six years, had a number of designs which were not eminently successful, was reorganized in 1934, and finally obtained new leadership, headed by Dutch Kindelberger.

WAR IN EUROPE BEGINS

On September 1, 1939, Germany invaded Poland, and the war in Europe was underway.

By that date, NAA had completed the first order of 200 Harvard trainers, and was busy on the second order of 200.

Earlier in 1939, the French government had ordered 230 fixed-gear trainers, most of which eventually were delivered to the British. In line with the custom of naming American-procured training planes for American universities, the British chose the name Yale for the French-ordered basic trainers, to compliment the Harvards procured from NAA earlier.

A few days after the war in Europe started, the U.S. Army Air Corps placed its initial order with NAA for 184 B-25 bombers, as well as an order for a single experimental bomber — the XB-28. At about this same time, NAA began production of the first AT-6, and the first of the BT-14 trainers. Before the year was over, the British ordered 600 additional Harvards.

At the the end of 1939, the backlog of orders exceeded \$50 million, almost five times greater than the backlog at the end of 1938. Employment was up to 4639. The Inglewood plant had expanded from its initial 160,000 square feet in early 1936 to 418,000 at the beginning of 1939. An additional 236,000 square feet of plant facilities were then under construction.

ROOSEVELT'S 50,000 AIRPLANES

The initial success of Germany in the fall and winter of 1939 and into the spring of 1940 was attributed to a great degree to Germany's use of aircraft.

What the allies needed was more aircraft. To the surprise of both the U.S. military men and members of the aircraft industry, on May 16, 1940, President Roosevelt called for the production of 50,000 aircraft a year. That was more airplanes than had been built since the first Wright flight of 1903.

There were many problems associated with the large scale increase in production of airplanes.

Five years after the war was over, Dutch Kindelberger described some of the problems this way:

To build airplanes you need three things. You need facilities, you need materials, and you need manpower. This seems fairly obvious, and even childishly simple. But let me remind you that the story of World War II aircraft production was largely a story of our battle to get these three things together so that airplanes could fly forth in the black clouds that everybody wanted. First we fought the battle of facilities. The brick and mortar part of the battle wasn't too difficult, but machine tools were a different story. I don't know of a single new aircraft plant that was not handicapped to some extent by inability to get all the necessary machinery as fast as it was needed. Next we fought the battle of materials, and that was a tough battle until we got a coordinated material allocation system that forced the services to cut their coats to fit their cloth. You can imagine how frustrating it was to have the President calling for 125,000 airplanes, and the services backing this up with sky-high schedules, at a time when had to fight for every pound of material under a system which gave practically all military programs the same priority as aircraft. Finally, and right up to the end of the war, we fought the battle of manpower, and that was perhaps the worst of all the battles. It got so bad that we told the Government flatly to decide whether it wanted more men or more airplanes from the aircraft plants.

September 1944, more than 11,000 military leaves were granted by the company at the three plants in Inglewood, Dallas, and Kansas City. Approved military leaves were granted only to employees who had been with the company one year or more, and who subsequently were certified by their commanding officers as

(Opposite page) AT-6, the most popular trainer used during WWII.

(Right) NAA Inglewood Plant, as it appeared shortly before US entry into WWII. The view looks to the northwest. In the center is present Los Angeles International Airport. This facility now the home of B-1 and LA Aircraft Divisions of Rockwell International.



actually being in the service. Thousands of additional employees who had been with the company less than a year were inducted through the Selective Service System. Many others left the company of their own accord to join the Army, Air Corps, and Navy.

There were other labor problems. Absenteeism became a national issue in 1942. Another even more serious problem was employee turnover. To combat these problems a well-organized plan to provide greater benefits to employees was initiated. The plan included increased personal services, shift adjustments, and later a plan to eliminate Saturday work. During the latter part of the war, employees generally worked 45 hours per week, nine hours per day, five days a week.

Some of the personal services made available to employees included assistance with personal problems, home calls by welfare nurses on ill employees; handling bailable traffic citation in order to avoid the necessity of the employee's appearance in court; free notary public service; assistance in problems involving child care; transportation such as the formation of car pools; assistance in securing housing; full industrial hospital facilities; a company-operated store selling tools and other necessities at cost; a parcel checking service; distribution of income tax forms; check-cashing service; cafeterias and portable lunch wagons; the company weekly newspaper and bi-monthly magazine; and in-plant service concerning the issuance of rationing documents for tires and gasoline. An extensive recreation program embracing dozens of indoor and outdoor sports was provided.⁽⁵⁾

NA-26 of BC-1 basic trainer. Design and development began October, 1936. It was similar to BT-9 except had larger engine, a P&W R-1340. Also had retractable landing gear and armament. Was a forerunner of BC-1, Harvard, and AT-6 series. This specific airplane sold to Canada, 1940.



DALLAS OPERATIONS

Although it was not known what the mix of the increased production would be, it was obvious that the increase called for by President Roosevelt would involve one or more, and probably all three of the types of aircraft then produced by NAA. The Inglewood plant was being increased in size to exceed one million square feet of floor area. It was apparent, for a number of reasons, that there was a practical limit as to the size of a single plant, and that a second plant should be opened in another part of the country.

A site adjacent to Hensley Field, an Army Reserve Base near Dallas, was chosen as the possible site for the second plant. Consolidated Aircraft Corporation also desired the site for a new plant, but NAA was given the go-ahead.

The new facility, to be used to build trainers, was announced on August 17, 1940. The construction was to be financed by the Defense Plant Corporation (DPC), a government agency created for such purposes.

Ground breaking ceremonies were held September 28, but the general contract for the construction was not signed until November 13, because of delays attributed to the new DPC arrangement. The first concrete was poured late in November, and the first steel erected on December 2. Late in January, NAA personnel began moving into the plant, and the first manufacturing operations were started on March 8.

The plant was a little more than a million square feet in size. It was windowless and completely air conditioned, and designed to produce one specific model aircraft, the AT-6. Before the war was over, other types of planes were built at the Dallas plant, principally the P-51 Mustang fighter and the B-24 bomber.

Because the Dallas plant and the organization to operate it was patterned after the existing plant and operations in Inglewood, it was not difficult to select the members of top management and the supervisory personnel to be sent to Dallas. Generally, the department head in Inglewood, or his assistant, was chosen to move to Dallas to head a similar department. In nearly every case, the assistant received a promotion, either as head of the Inglewood department, or the new department in Dallas.

By the time the plant was dedicated in March, 1941, about 75 employees from Inglewood were supervising the Dallas operation. The other employees, about 95% of the total, more often than not were native Texans who had no previous experience in aircraft work.

The first training school for Dallas workers was established on November 4, 1940. The first two-week class consisted of 35 men, and subsequently 100 workers were trained every two weeks. Those who proved reasonably adept were graduated and placed on the payroll, where the second phase of their training began under the supervision of the former Inglewood personnel.

The first general manager of the Dallas plant was Alex Burton. Alex joined NAA as a test pilot and engineer in 1937, after three years in the Air Corps, where he served as both a pilot and engineer. In 1938 he went to England, where he supervised the assembly and test of the British Harvard trainers.

In February 1941 Jim Rivers was named manager of the Dallas plant and Alex Burton was sent to Washington as Eastern Representative for the company. Alex replaced Lee Taylor, who returned to Inglewood as executive staff assistant.

Jim Rivers was replaced by Harold Schwedes sometime later and in 1944 Bob McCullough was named plant manager. Bob remained head of the Dallas operation until the war was over, when he resigned to form Texas Engineering and Manufacturing Corporation (Temco). Temco obtained a lease on the government-owned former NAA Dallas plant. At the time, Bob McCullough's action was considered by many to be inopportune, as the country didn't appear to need another new aircraft organization. The war was over, and NAA and the other giants were in the process of cutting their operations to about five percent of their war-time peak.

Bob McCullough built Temco into a successful organization, which later merged with the Ling and Vought organizations, to form the Ling-Temco-Vought Corporation, now generally known as LTV.

KANSAS CITY OPERATIONS

About the time manufacturing operations got underway at Dallas, the company announced plans for construction of a third factory, this one to be built in Kansas, to assemble B-25 bombers.

The announcement was made December 7, 1940. A year later, at the time of the attack on Pearl Harbor, the plant was essentially complete. The first three airplanes were delivered to the Air Corps on December 23, 1941.

The Kansas plant was part of a program instituted by William Knudsen, former General Motors executive who became director general of the U.S. Office of Production Management. The Knudsen plan called for the auto industry to manufacture detail and sub-assembly parts and the existing aircraft manufacturers to manage the new plants, where final assembly operations were to take place.

The plan for NAA called the General Motors Fisher Body Division to build a B-25 sub-assemblies. Martin operated a new plant in Omaha for the assembly of B-26 bombers. Douglas operated a plant in Tulsa for the A-20, and Consolidated, later known as Convair, operated a plant in Fort Worth for B-24 bomber production.

The establishment and operation of the Kansas plant was similar to the Dallas plan, except that the government built the Kansas plant, and NAA operated it for the government.

H. V. Schwalenberg was the first general manager of the Kansas plant.

In 1943, Harold Raynor was named manager of the Kansas plant, where he remained until after the war. Raynor joined Fokker aircraft in Hasbrouck Heights, N.J. in 1930. He remained with Fokker through the organization's metamorphosis into Atlantic Aircraft, General Aviation, and subsequently North American Aviation. Raynor later served with the Missile Division, now the Space Division. He retired at the end of 1966.



ERNIE BREECH RESIGNS AS NAA BOARD CHAIRMAN

In June 1942, Henry M. Hogan, a vice president of General Motors was elected chairman of the Board of North American Aviation.

Hogan replaced Ernie Breech, who had been chairman since 1933, when General Motors acquired a substantial interest in NAA. Earlier, in February, 1942, Breech was elected president of Bendix Aviation. As an executive of General Motors, Breech had served on the Bendix Board since December 1937.

The expanded operations of Bendix, in which GM also had a substantial interest, made it advisable to put Ernie Breech, a strong financial man in charge of the Bendix organization. The switch of jobs, made it unwise for Breech to serve both Bendix as president, and NAA as Board chairman. Breech continued to serve as a member of the NAA Board until 1947, shortly after being executive vice president of Ford Motor Co.

Breech's principal contribution to NAA occurred in 1934, when he brought the Kindelberger-Atwood team into the company. His second most important contribution probably was the establishment of a sound financial system, which was so important to a company growing as fast as NAA did in the period just prior to and during World War II.

Hogan remained as Board Chairman until 1948, when GM sold their 29 percent interest in NAA.

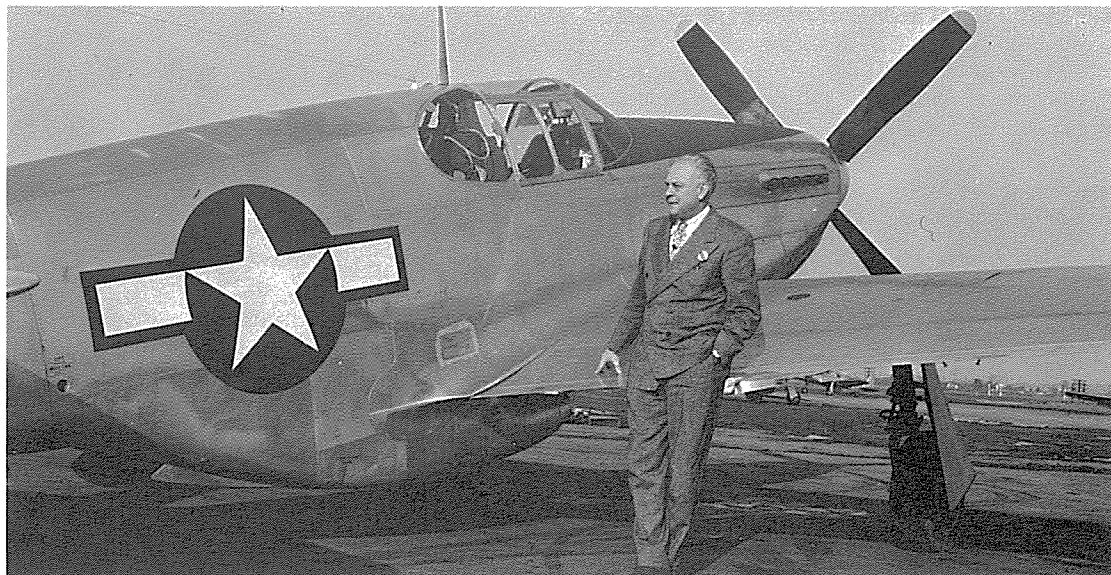
NAA TRAINERS

Production of the NAA series of trainers began in 1936 and continued right up to the end of World War II. The first model was the BT-9, and the last the Air Force AT-6F and the Navy SNJ-6. During this period the company produced 16,974 trainers in its plants at Inglewood and Dallas. Here are the production figures for each year: (6)

1936	82	1942	3,676
1937	212	1943	4,024
1938	323	1944	3,298
1939	655	1945	1,237
1940	1,194		
1941	2,273		
			16,974

The first known instance of the Air Force and Navy procuring a single type aircraft occurred in 1940, when the Air Force ordered 1330 type AT-6A's and the Navy 150 SNJ-3's, identical aircraft

(Right) Dutch Kindleberger leans against trailing edge of early P-51 Mustang.



(Left) NAA Dallas, Texas plant at Hensley Field for the manufacture of the AT-6.

except for external markings. This standardization continued throughout the war, and was extended to the air services of practically every nation taking part in the war on the Allied side or friendly to the Allied cause.⁽⁷⁾

Trainer production got underway in earnest shortly after President Roosevelt's 50,000 airplane message to Congress in May 1940. Air Corps officers indicated that when funds became available large scale orders would be placed with the company for additional trainers. On the strength of information received from the Air Corps, on June 28, 1940 the company issued a General Order NA-77, to begin the manufacture of the first of these planes. The first formal contract was executed on August 13, and called for 637 AT-6A and SNJ-3 aircraft. Thanks to the initiative shown by the company in proceeding without a contract, the first airplane was delivered to the government on September 27. The entire order of 637 airplanes was completed in August 1941, just one year after the contract was signed. This airplane was the first delivered to the government under the new National Defense program.

The first contract for the manufacture of airplanes at the Dallas plant was an order for 1,480 AT-6A and SNJ-3 trainers. It was released as NA-78 on October 1, 1940. In August 1941, approximately four months after the initial deliveries were made at the Dallas plant, the last advanced combat trainer produced by Inglewood under domestic contracts was delivered to the Army Air Corps. Thereafter, all trainers for the U.S. government were built at Dallas.

During this time the Inglewood plant continued its work on the Harvard trainer for the British. The 1,000th Harvard airplane was produced in March of 1941. This was an all-time record for a single model. Although identified as a single model, they were not 1,000 identical airplanes. Actually, there were 2,500 drawing changes made after the first Harvard was produced, and the 1,000 aircraft actually consisted of 25 different models, each differing from the others in some detail in construction.

The last airplane to be built under the second French contract for 230 airplanes was completed in August of 1940. German troops entered Paris on June 14 and on June 17 France sued for peace. The undelivered portion of this contract was taken over by the British government, and the airplanes subsequently delivered to Canada.⁽⁸⁾

Hundreds of these trainers were still in use in 1974. Between 1949 and 1952 NAA rebuilt 1802 trainers which originally were

manufactured during the war. They were given model designation T-6G and both new customer and company serial numbers. The work was performed first at the NAA plant at Downey, then in Columbus, some in Long Beach, and finally at the company plant in Fresno.

B-25 BOMBER

In 1939 the Air Corps issued a request for proposals for a new medium weight bomber. This airplane was to be procured under a new type of competition. The production contract was to be based on the specifications prepared by each company in accordance with the general requirements set forth by the government. Prior to this time it had taken as long as five years to produce a new model airplane. This included the time to issue the request for proposals for prototype articles, prepare proposals, evaluate the proposals, and build and flight test the prototypes. Subsequently, a similar proposal cycle was required for the production contract.

NAA had participated in an earlier bomber competition in 1938, one which required the construction and test of a prototype. NAA's entry was the NA-40, which made its maiden flight on February 10, 1939 with Paul Balfour at the controls. The NA-40 passed its Air Corps flight tests successfully at Wright Field, but the airplane was destroyed by fire after a crash, subsequently determined to have been pilot error.

Some persons believe the B-25 was the production version of the NA-40, but this was not the case. The two airplanes were not alike. The NA-40 was a three-place, tandem-seated aircraft. The B-25 was a five-place airplane, somewhat larger than the NA-40. The pilot and copilot of the B-25 sat side-by-side.

In the 1939 bomber competition, the company submitted 83 different model specifications, giving the Air Corps 83 opportunities to select just about whatever it thought best. In the summer of 1939, contracts for production quantities for two different bombers were awarded. One went to NAA for the B-25. The other to Martin for the B-26.

The initial B-25 contract called for 184 airplanes. NAA officially began work on the contract on September 5, 1939 under company model NA-62. Vance Breese made the first B-25 flight on August 19, 1940. The first 25 airplanes became the B-25, the next 40 were B-25A's and the last 119 were B-25B's.



NAA built 9816 B-25 series airplanes in the Inglewood and Kansas City plants. Production by year was as follows:

1941	171	1944	3677
1942	1555	1945	1460
1943	2953		

B-25's were deployed on every war front. They were based in England and later on the continent; North Africa and later in Italy; in the China-Burma-India theater; in Australia and other areas of the Southwest Pacific, and in the islands of the South Pacific. B-25's also were supplied to Britain, the Netherlands, China, and Russia.

Perhaps the most interesting and effective use of the B-25 took place in New Guinea and adjacent islands in the war against Japan.

Much has been written about the innovative Air Force Colonel Pappy Gunn, his Fifth Air Force modifications, and use of the B-25 as a strafing. Credit also must be given to General George Kenney, who gave Pappy free rein to develop new ideas on how to make more effective use of the rugged B-25. General Kenney, too, must be given credit for convincing General Douglas MacArthur that aircraft could be a most effective weapon against Japan.

One must not forget Jack Fox, the hard-working NAA Field Service Representative who, except for two brief trips to the factory, spent 44 months with the Fifth Air Force, from the early days of

the war in Australia to the final days in the Philippines and Japan.⁽⁹⁾

This issue of the AAHS *Journal* contains an article on the 3rd Bomb Group and the work of Pappy Gunn in creating the eight-gun low-level B-25 strafers. This fascinating story will not be repeated here.

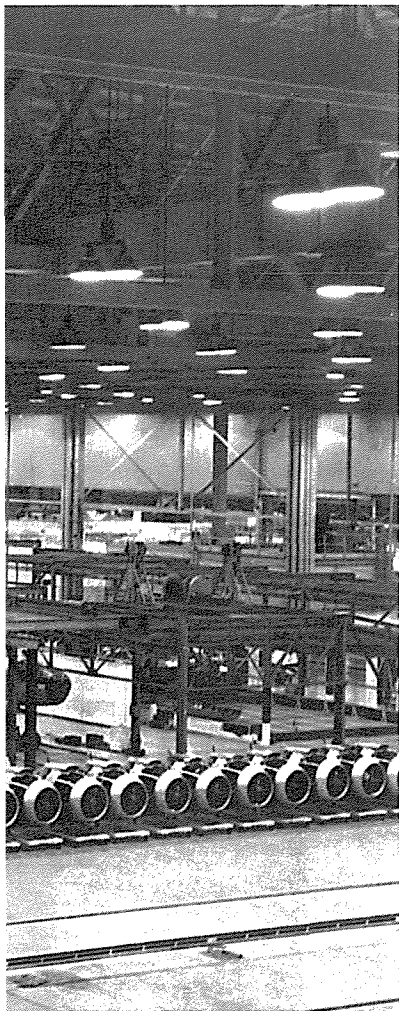
During the early days of the World War II there was considerable talk about freezing the design of all aircraft, in order to achieve maximum production. This talk was fostered principally by the auto manufacturers, who in many ways were the experts on mass production.

The freeze policy was never implemented. Instead, it was decided that every airplane was to be the best that could be produced at the time it was completed. As a result, the aircraft industry was directed to produce a tremendous volume of aircraft and at the same time incorporating changes which combat experience and independent research showed would produce more effective aircraft.

NAA produced eight basic models of the B-25 at the plants in Inglewood and Kansas City.

Robert Lovett, Assistant Secretary of War, in 1943 had this to say:

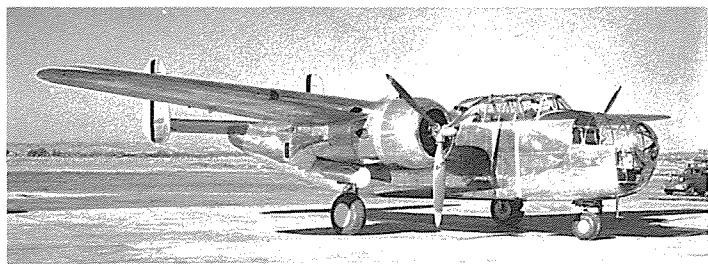
There are few more dramatic examples of the advantages of constant improvement of current models than the modifications and design changes in the B-25 medium bomber. It is serving in every theater of war completely around the world. A superb medium bomber, the Fifth Air Force in the Southwest Pacific, working with North American Aviation, Inc., has



(Above) B-25C, No. 41-12823, the 590th of the 9816 B-25 series bombers built at Inglewood and Kansas City.

(Opposite page) Interior of NAA Kansas City, Kansas plant where 6408 B-25's were built, including 2209 D models and 4318 B-25J's.

(Lower left) NA-40, NAA's entrant in the 1939 Air Corps bomber competition. Although NAA did not win the competition, it proved to be stepping stone for later B-25.



converted it into a devastating attack bomber with tremendous firepower forward and a specialized technique in medium altitude bombing of shipping.

DOOLITTLE TOKYO RAID

The single most dramatic event of the early days of World War II was the bombing of Tokyo by a squadron of 16 B-25 airplanes under the leadership of Lt. Col. Jimmy Doolittle.

The raid occurred April 18, 1942, a little more than four months after the Japanese bombed Pearl Harbor. The bombing of Tokyo was the first good news of the war for the American people, for the war thus far had been a series of victories for Japan.

The story of the Tokyo raid is so well known, it will not be repeated here.⁽⁹⁾

Employees were very enthusiastic about the "big" B-25 twin-engine bomber when construction got under way in 1939. This

was big, compared to the trainers which the company had built for so long.

There was considerably more interest and pride by engineers and other employees in the B-25 than in the new P-51 fighter which closely followed the B-25 into production.

Employees were comparing the two airplanes with each other, and in the minds of employees, the B-25 was the more important airplane, principally because of its size.

They failed to compare the P-51 with other fighters. It was later generally conceded that the P-51 was the best in its field by a recognizable margin.

The importance of the P-51 Mustang was not recognized during the early days of production.

P-51 MUSTANG

The war in Europe got underway in September 1939.

In the late fall of 1939 the British Purchasing Commission (BPC), suggested that NAA consider producing the Curtiss P-40. The suggestion was not given much serious consideration at the time — as Dutch Kindelberger and Lee Atwood thought NAA could build its own designs better than those of other companies. In a like manner, it was thought other companies could build their designs better than NAA could. This policy held for a long period, and it was not until the middle of the war that NAA undertook the production of another company's airplane.

In January 1940, the British again asked NAA to submit a proposal to build the P-40.

At the time the P-40 was about the best American fighter then in production, so it was only natural that Lee Atwood, who had



(Left) Three early Mustangs, part of an order of 500 A-36 airplanes, which were P-51's equipped with dive brakes and used as low level bombers. This model was developed when Air Corps ran out of funds allocated for fighters, early in 1942. Earlier Air Corps had purchased 150 Mustangs for the British, and designated them P-51's to distinguish them from the Mustangs procured directly by the British.

(Opposite page) To build B-24's in Dallas an additional million square feet was added to original plant.

been vice president and chief engineer, had given considerable thought about the design concept of the P-40, and how it might be improved.

The first and most apparent change would be to place the radiators back of the wing, with ducts which would discharge the heated air under pressure, in a manner of the yet-to-be-developed ram-jet engine. This principle had been studied by the National Advisory Committee for Aeronautics in the United States and in England as the "Meridith" effect. Applying this principle to a fighter, in theory, would reduce the cooling drag to zero.

In response to the British request of January 1940, it was decided to offer a new fighter, one which would be better, and which could be built in a reasonably short time.

Discussions were held in New York at various times during January, February, and March. Toward the end of March or the first week in April, Sir Henry Self, head of the BPC, requested a definite proposal for 320 airplanes to be designed and built by NAA. Because NAA had never designed a big-league fighter, Sir Henry asked Lee Atwood to obtain, if possible, copies of the Curtiss P-40 wind-tunnel data and flight test reports. Sir Henry said this would give the British more confidence in NAA's ability to move forward rapidly.

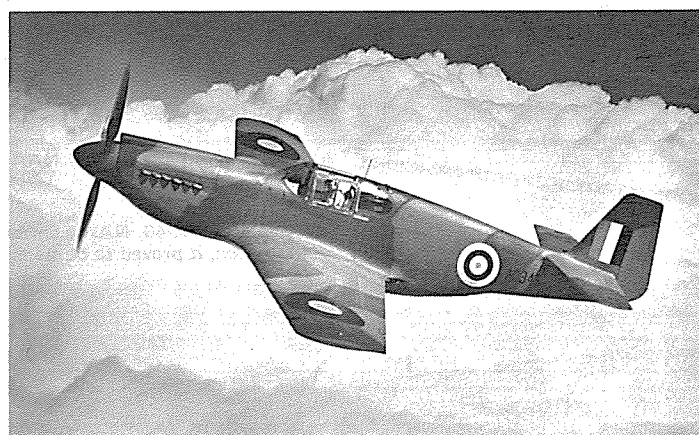
Lee Atwood took the train to Buffalo, where he discussed the matter with Burdette Wright, general manager of the Curtiss plant. An agreement was reached which called for Curtiss to furnish copies of the Data to NAA for \$56,000.

Atwood returned to New York, and submitted a draft of a letter contract to the BPC for the production of 320 NA-73 airplanes. The cost was not to exceed \$40,000 per aircraft, excluding the engine, armaments and some other items. There were no drawings or specifications available at this time. The only documents were several free-hand sketches made during the discussions to demonstrate the concept the company had in mind.

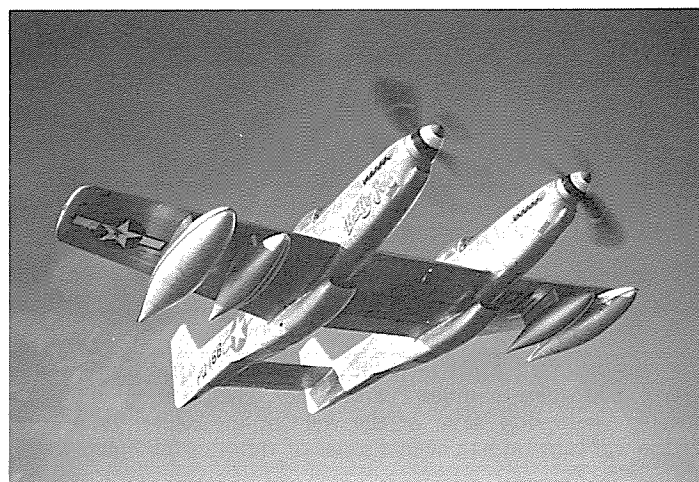
The contract was signed April 10, 1940. Less than seven months later, on October 26, the first Mustang made its maiden flight, with Paul Balfour at the controls.⁽¹⁰⁾

Lee Atwood recently had this to say:

The original concept did not include the laminar flow wing, which was eventually incorporated. This wing design came



Pictured here is Mustang 1, Number 1 procured by British.



P-82 Twin Mustang "Betty Joe" flown by Lt. Col. Jack Carter non-stop from Honolulu to New York, February 1946. It was originally planned to use Twin Mustangs as fighter escorts for B-29's in war against Japan, but war ended before they could be of such use.



from the aerodynamics department of the North American Aviation engineering group headed by L.L. Waite, and the concept was originated by Edward Horkey, one of the aerodynamic specialists. His work was based on very recent developments of the National Advisory Committee for Aeronautics, which later became NASA — National Aeronautics and Space Administration.

The engineering department was then headed by Raymond Rice, who had recently succeeded me as Chief Engineer, and Edgar Schmued was Assistant Chief Engineer and chief of the preliminary design group. The drawings were prepared under his general supervision and that of Raymone Rice and other senior personnel in the engineering department.⁽¹¹⁾

As in the Case of the B-25 there were many changes in the development of the Mustang. The most significant change was the substitution of the Packard-built Rolls-Royce Merlin engine for the Allison engine used in the P-51 and the P-51A models. No one realized at the time just how significant this change would be. The course of the greatest war in history was altered by the mating of the Merlin to the Mustang.⁽¹²⁾

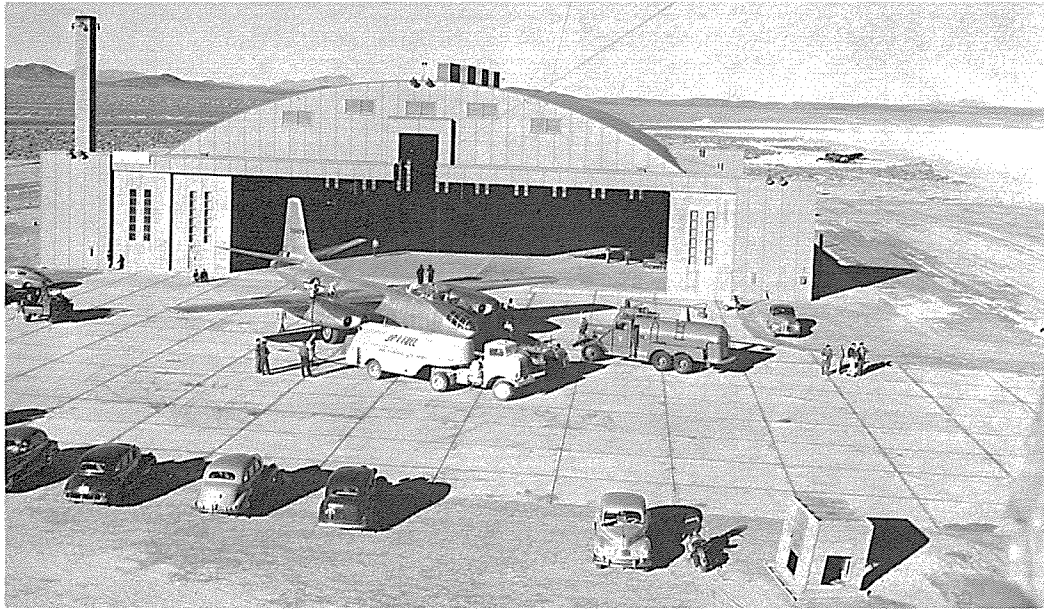
The use of the high performance Merlin engine gave the Mustang performance far in excess of any other fighter then in service. More than 220,000 engineering hours were used to make the change, which involved 1500 new or revised drawings.

The Mustang was initially scheduled for production with the Allison engine, which at the time was allocated for use in P-38 and P-40 fighters. In exchange for a shift in allocations, the Air Force requested that two of the early aircraft be delivered to Wright Field so the airplane could be flight tested and evaluated for possible use by the U.S. forces. Consequently, a contract was negotiated which called for the fourth and 10th Mustangs to be designated XP-51 models. During 1941, the company produced and delivered 132 Mustangs, two for the U.S. Army and 130 for the British.

The two XP-51's didn't generate much enthusiasm at Wright Field, probably due to some extent to the use of the Allison engine. General George Kenney told the writer during a conference in Brisbane, that "you had to wear hip boots to wade through the oil to get to the airplanes," which were parked in the hangar at Wright Field.

On Sept. 24, 1940 the British ordered 300 additional Mustangs. Then on July 7, 1941 the USAAF ordered 150 P-51's, which were furnished to the British under the Defense Air Program.

As the Mustang proved itself in the war, the USAAF became interested, but by the time they made up their minds to make a purchase, they found the funds for fighters temporarily depleted. The ingenious Dutch Kindelberger found a solution to the Air



(Left) First XB-45, No. 45-59479 at North Base, Edwards AFB. This design initiated September, 1944, and was first four-jet bomber to enter military service.

Force problem. The company would add bomb racks and dive brakes and call the airplane an attack-bomber. Sure enough, the Air Force had funds for attack airplanes. And thus was born the A-36. The Air Force bought 500 A-36 models on April 16, 1942. Funds were available during the next fiscal year for more fighters, and the Air Force lost no time in ordering 310 P-51A's.

The Mustang was a fine low-level fighter. An official Air Force report said "Below 22,000 feet, the P-51 ... has the best all-around fighting qualities of any fighter." The top speed of the P-51 equipped with the Allison engine was reached at 15,500 feet, when it was able to fly at 386 mph.

In the fall of 1941, Major Tommy Hitchcock, the well-known sportsman and polo player, was military attache in London. He is credited with suggesting that the British Rolls-Royce engine be installed in the Mustang, which he described as one of the best "if not the best" fighter airframe developed to that date, in order to give the airplane the high-altitude capability which then was so badly needed.

The military personnel appeared to be dragging their feet. They seemed to regard the Mustang as a "foreign" airplane, designed to British specifications for British used.

The military personnel appeared to be dragging their feet. They seemed to regard the Mustang as a "foreign" airplane, designed to British specifications for British use.

General Hap Arnold was reported to have overruled the Air Material Command's recommendation on aircraft procurement. Earlier, he had toured the NAA plant and looked at the production line and had talked to General Carl Spaatz, who then was organizing the Eighth Air Force. Spaatz had told Arnold what he wanted was the Mustang with the Merlin engine. Arnold reportedly told Spaatz, "If that's what you really want, you'll get it." Arnold later testified before the House of Representative's Armed Services Committee, that he was never sorry for making the decision.

The new Mustang with the Merlin engine was designated the P-51B. It proved a spectacular success, and gave the Mustang the high-altitude capability that put it in a class by itself.

The new P-51B made its first appearance of the war in December, 1943. The high-altitude capabilities of the new Mustang provided a new bomber-escort. The range of escort fighters jumped from a radius of 320 miles to 650 miles. A few months later, the airplane was equipped with two 108-gallon wing tanks, and the range increased to more than 800 miles. The later P-51H model had a range of 2000 miles.

Hermann Goering, in an interview with General Spaatz after the war, said that he knew Germany would lose the war when he first saw the Mustang fighters over Berlin. Goering at the time said, "The reason for the failure of the Luftwaffe against the Allied Air Forces was the success of the American Air Forces in putting out a long-range escort fighter airplane which enabled the bombers to penetrate deep into Reich territory and still have a constant and strong fighter cover. Without this escort the air offensive would never have succeeded."¹³

The Merlin engine was designed by Rolls-Royce, but the model for the Mustang was built in the United States by Packard Motor Car Co. The initial order called for 9000 engines, 3000 for the U.S. and 6000 for Britain. Almost 2000 P-51B's equipped with Merlin engines were built by NAA during 1943 and 1944. All of the subsequent Mustangs, almost 12,000, were so equipped.

No other U.S. contractors built NAA designs, although a number of foreign companies were awarded the right to manufacture NAA-designed aircraft.

In spite of Dutch Kindelberger's belief that each company could build its own designs better than those of any other company, NAA did build a few models designed by other companies.

Because of the great need for heavy bombers, the Air Force asked NAA to build B-24 bombers at Dallas. The work was performed in a new facility, Plant B, located adjacent to the original Dallas factory. On January 31, 1942, NAA contracted to build 1400 B-24 airplanes, under company charge number NA-95. During 1943, 61 B-24G airplanes were completed, and in 1944, 369 "G's" as well as 536 B-24J models were completed and delivered by the Dallas plant. Only 966 of the 1400 ordered were actually built, due to changing war requirements.

The need for a new type cargo plane resulted in an Air Force contract to build the Fairchild C-82 Packet. This was a twin boom, tail-loading twin-engine cargo airplane, designed to carry artillery, tanks, and trucks. Only three airplanes were completed when the war ended.

On January 18, 1945, NAA received an order to build 1000 Lockheed P-80 jet fighters at the Kansas plant. None were completed by war's end.

Earlier, in the fall of 1944, NAA began work leading to the production of B-29 tail assemblies. Again, changing military requirements caused the effort to be cancelled before the first was completed.

A number of new designs initiated during the later part of the war were considered so worthy that the Air Force ordered that production be continued after the war.

P-82 TWIN MUSTANG

A bold new concept, based on the successful P-51, was released for design and construction on January 7, 1944.

This was the P-82 Twin Mustang, designed to provide even longer range than the latest Mustang then in production. The Twin Mustang consisted of two fuselages, each containing a pilot and an engine. It was expected to be used as an escort for the B-29's to be used in the Pacific against Japan.

Between 1945 and 1949, 272 P-82's were built.

To prove the long range effectiveness, in February 1946, P-82 "Betty Joe" flown by Lt. Col. Jack Carter, made a non-stop flight from Honolulu to New York a distance of 5,051 miles in 14 hours and 33 minutes.

XFJ-1 - NAA'S FIRST JET AIRCRAFT

In 1944, NAA began work on the company's first jet aircraft.

The first to be released was the XB-45, but the first NAA jet to fly was the XFJ-1. The first flight occurred on September 11, 1946 with Wally Lien at the controls.

Although NAA was one of the Air Force's⁽¹⁴⁾ best sources of supply, the AF was not interested in an NAA jet fighter. It was deeply committed to the production of the Lockheed P-80.

NAA turned to the Navy, and succeeded in selling the new jet fighter design. On December 12, 1944, work was initiated on the design of the XFJ-1, the Navy's first carrier-based operational jet fighter. The first order was for three aircraft, and before the war was over, the Navy ordered 30 FJ-1 production versions. The three XFJ-1 aircraft were accepted by the Navy in 1947, and the 30 production airplanes the following year. Production continued into 1958. Altogether, 1148 FJ Fury series aircraft were built at Inglewood and later at the Columbus plant. The FJ-2, -3 and -4 models were basically similar to later models of the F-86 Air Force jet fighters.

B-45 BOMBER

The first NAA jet airplane built for the Air Force was the XB-45 Tornado, the first jet bomber ordered into production by the Air Force. The initial order was for three aircraft, and was released as the NA-130 on September 13, 1944. Altogether, 143 B-45 series aircraft were built.

F-86 SABRE JET

In spite of the Air Force's avowed interest in only one jet fighter, the Lockheed P-80, company personnel thought the AF just might like to look at the specifications for the NAA XFJ-1 airplane. A copy of the specification was furnished engineering personnel at Wright-Patterson AFB, and a few days later they asked for a round-house figure on how much it would cost to build three test models for the Air Force.

As a result, on May 23, 1945, the Air Force ordered three of the new NAA jet fighters, which came to be known as the F-86 Sabrejet.

Before the design had progressed very far, NAA obtained performance data on the German swept-wing fighters. The figures were so impressive, NAA proposed swept wings be incorporated in the three XP-86's then in the design stage.

The Air Force accepted the proposed change. The swept-wing F-86 turned out to be the greatest fighter used during the Korean war. It had a kill ratio of 14 to 1 over the MIG-15, Russia's best fighter at the time.

The last model to be release prior to the defeat of Japan was the XSN2J-1, a two-place scout trainer for the Navy. The order was for two aircraft, and was released on August 2, as NAA model NA-142. The two aircraft were delivered in 1947. The XSN2j-1 was the stepping stone to the later NAA T-28 AF trainer.

WAR'S END

Germany surrendered on May 7, 1945, and about three and a half months later, on August 14, fighting ceased in the Pacific. In a note to employees dated August 20, Dutch Kindelberger had this to say:

You all know by now that victory over Japan has brought cancellations and drastic reductions in military contracts held by all plants producing material for the war effort.

I have been advised by the Army Air Force as to the extent of these cancellations, as they affect North American Aviation.

First of all, the great productive capacity of the three North American Aviation plants no longer is required. The Army Air Forces has cancelled all work hitherto performed by us at Kansas City and Dallas. Those plants will be returned to the government as soon as inventories and closing out operation can be completed.

The Army Air Force has cancelled more than 75 percent of the production previously called for in Inglewood. As a result, nearly 25 percent of the P-51H contract, together with some experimental work, remains in force at this plant.

In terms of jobs, this means that approximately 50 percent of all employees, excluding all technical engineering personnel, *who are not affected*, will be laid off within the next few days.

With few exceptions, the entire personnel of the Texas and Kansas plants will be laid off this week. Those exceptions include personnel transferred from Inglewood since the expansion of our operations in 1940, and personnel necessary for inventory and closing out work.

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7. *Ibid. Brief History: p. 20.*
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9. A good short report on the Tokyo raid appears in the book, *World War II in the Air - The Pacific*, edited by Major James F. Sunderman, USAF; Bramhall House, New York, 1962.
10. Atwood, J. L. *Origin of the P-51 Mustang Fighter Airplane*, memorandum dated August 8, 1973.
11. *Ibid.*
12. The story of the Merlin engine and the P-51B was well told by Ed Rees in "The Mustang - A Great War Horse," published in the October 1962 issue of *Airpower Historian*.
13. *Ibid.*
14. Although known as the Air Force throughout WWII, the USAF was in reality the USAAF (U.S. Army Air Force) until September 18, 1947, when the three military services were given equal status under the Unification Act, as part of the Department of Defense. Prior to June 20, 1941, the USAAF was officially the U.S. Army Air Corps, which was established as such on July 2, 1926.