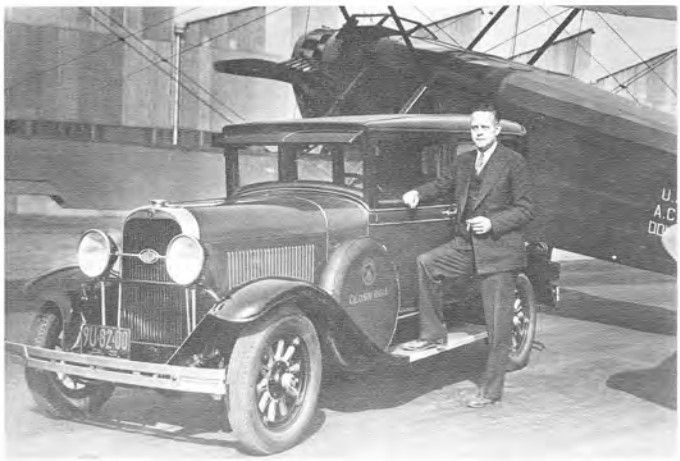


North American's rise to prominence among the aircraft manufacturers of the world evolved in large measure around James H. "Dutch" Kindelberger, shown at left when he was Chief Engineer of the Douglas Aircraft Co. On these pages are shown some of the highlights of NAA and its antecedents. Above, the Fokker F-10A and Super Universals, sparkling with burnished cowlings, represented the most advanced technology in the late 1930's. Below, North American's XB-21 lost out to the Douglas Company in twin-engined bomber competition because of the lower cost of the B-18, but built its reputation and finances on the BT-9, two of which are shown with the "Dragon."

It was with the P-51, T-6 and B-25 that North American made its name as manufacturer of the greatest number of military airplanes during WWII. Shown below are some of the output of the Dallas plant's P-51 production. The AT-6/Harvard line was also produced there, and B-25's were made at Kansas City, in addition to the production of the Los Angeles plants. (Photos from James J. Sloan Collection).

North American Aviation, Inc. began as a holding company, later turned totally to manufacturing, absorbing other firms along the way. This four-part series by Ralph B. Oakley will trace the company's history from its antecedent Fokker/General Aviation/Berliner-Joyce organizations to the present day Rockwell International.

NORTH AMERICAN

By RALPH B. OAKLEY

PART 1: THE BEGINNINGS – 1928-1937

In the opinion of many the two most significant events in the history of aviation were the Wright Brothers' flight of 1903 and Charles Lindbergh's solo flight from New York to Paris in May 1927. Lindbergh's feat sparked great public interest in aeronautics, and many people who were then cool to aviation enthusiasts soon became enthusiasts themselves.

During the year following Lindbergh's flight, many new companies were formed to build and operate airplanes. Because there was plenty of money available for aviation purposes, financing at that time was easy. One of the many men who saw the possibilities of growth and profit in the aviation business was Clement W. Keys, who began organizing an aviation holding company based to some degree on the pattern developed in the automobile industry.

As a result of Keys' effort, North American Aviation, Inc., was formed. The date was December 6, 1928. The charter set forth the corporation's plans: to acquire and hold stocks and securities in other corporations; manufacture all kinds of aircraft; operate, directly or as an agent, air navigation facilities; carry airmail for the United States and foreign governments; and help finance or develop new companies. Six million shares of stock were authorized; the first issue, consisting of two million shares, was sold for $25 million.[1]

Because North American's business was buying and selling securities in other aeronautical organizations, the company had few employees. The business was managed by the Executive Committee selected by the Board of Directors. During the formative years, membership of the Executive Committee ranged between seven and nine; the number on the board varied from five to sixty.

Clement Keys was the first chairman of the board, serving from December 6, 1928 to December 29, 1931. Born in Canada, Keys at one time had been a reporter for the *Wall Street Journal*, and was responsible for the 1929 merger of the Curtiss and Wright organizations, serving as first president of the resultant Curtiss-Wright Corporation.[2]

NAA's initial investments in aviation stocks were almost $4-1/2 million. The largest, $3,136,000, was the purchase of stock in the Curtiss Aeroplane & Motor Co. About the same time, $534,000 was invested in stock of the Curtiss-Wright Flying Service. The first "annual" report issued by North American covered the

A production B-25C in flight check even before the serial number has been added. (Courtesy of Norman L. Avery)

The XB-45 shown here was the second of three ordered, 45-59480, and was photographed in flight over the desert near Edwards AFB with the first XF-86, 45-59597. (North American photo, from James J. Sloan Collection).

period from its founding on December 6, 1928 to the end of the year, and during this abbreviated period, the company earned a profit of $8,858. The report showed income from interest on call loans of $48,452, profit of $4,888 from the sale of stock in other companies, and interest on bank deposits of $593.

Expenses for the period consisted of interest on securities, ($8,070), legal fees and expenses ($20,178), costs of listing on the New York Curb Market ($1,100), printing and signing of stock certificates ($12,587), and reserve for taxes of $798. It is interesting to note that no salaries or wages were paid.

The 25 directors of the company in the first year included a number who were already well known in the aviation industry, among them Howard Coffin, Donald Douglas, Herbert Fleischacker, Paul Henderson, Thomas Hitchcock, Clement Keys, Townsend Lundington, William B. Mayo, Frank Phillips, Charles Reed, Herbert Bayard Swope, Harold E. Talbot, Jr., and William Vanderbilt.

During the first 26 days a preliminary payment of $100,000 had been made in purchase of the stock of Sperry Gyroscope Co., Inc. and shortly after the first of the year 1929, NAA completed the purchase of Sperry for $4 million. Its first annual report stated: "The Sperry Company has been and is a leader in the manufacture of many patented instruments and devices used by the navies and merchant marines of the world and in aviation, among which are included the gyro compass; the gyrostabilizer; gun-fire control equipment, including antiaircraft guns; searchlights, both military and commercial; airway and airport beacons; floodlights; and bomb-sighting equipment for aircraft . . . The business of the Company is international, as patents owned by it or its subsidiaries in the United States, Canada, Great Britain, and Japan are in many cases recognized as basic.

Significantly, during the first few days of the company's founding, the word "international" appeared in the annual report. Forty-five years later, after several reorganizations and mergers, North American Aviation, Inc., became Rockwell International Corporation. If he were alive today, Clement Keys could marvel at the growth of the company he founded in 1928.

In February 1931, NAA issued its 1930 Annual Report, which contained information about some of the other companies that it had bought outright and those in which substantial investments had been made. Following are excerpts from both 1929 and 1930:

EASTERN AIR TRANSPORT: (1929 annual report) "On July 8, 1929, your Company acquired the entire capital stock of New York & Altantic Seaboard Air Express, Inc., which . . . owns the entire capital stocks of Pitcairn Aviation, Inc., and four small subsidiary companies. The name of Pitcairn Aviation, Inc., has recently been changed to Eastern Air Transport, Inc., and this Company has contracts with the United States Government for carrying airmail from Newark to Miami."

FORD INSTRUMENT COMPANY: (1929) "On February 15, 1930, your Company acquired the entire capital stock of the Ford Instrument Co., Inc. This Company was founded fifteen years ago by Mr. Hannibal C. Ford, formerly chief engineer of the Sperry Gyroscope Co. Inc., for the purpose of the development and manufacture of fire-control apparatus for the U.S. Navy. It has specialized and has become a leader in the design of rangekeepers, computing mechanisms, directorscopes, and other intricate mechanisms for both main battery, broadside, and antiaircraft fire control, representing the heart of the modern naval fire control system."

BERLINER-JOYCE: (1930 annual report) "In June 1930, your Company acquired 44,082 shares of Class A stock and 100,000 shares of common stock of the B/J Aircraft Corporation and is now acquiring the remaining outstanding stock, namely, 37,918 shares of Class A stock, through the exchange of 18,959 shares of your Company's stock. The B/J Aircraft Corporation is built around a group of trained and experienced aviation engineers and is engaged in development work for the Army and Navy, as a result of which it has recently received a substantial airplane order from the Army."

CURTISS-WRIGHT CORPORATION: (1930) By the end of 1930, NAA owned 504,451 shares of Curtiss-Wright common stock and 83,432 shares of Class A stock. The 1930 annual report stated the Curtiss-Wright Corporation was the largest aviation manufacturing unit in America and also operated flying fields and airports. It had heavy operating losses in 1930 and at the close of the year announced it had set up reserves to cover all possible contingent adjustments of assets. The report went on to state that Curtiss-Wright's position in the trade was maintained throughout the depression: by units, it had 23 percent (622 airplanes) of all commercial sales in the trade; the company's commercial inventory had been reduced by 500 airplanes during the year but was "then at a satisfactory level," and its military airplane sales were 38 percent of the total output.

"In engines, the Company sold 27 percent of the airplane engines of all classes, both military and commercial. Its position in this trade has greatly improved, especially in the engines of 500-700 horsepower, a rapidly growing class."

TRANSCONTINENTAL AIR TRANSPORT: At the end of 1930, NAA owned 103,400 shares of common stock of Transcontinental Air Transport, Inc. (The 1930 annual report): "This company, together with Western Air Express, Inc., recently formed a new operating company called Transcontinental & Western Air, Inc., which has taken over the operation of the transcontinental passenger line, and this, together with the contract recently received by it to carry airmail between New York and Los Angeles, makes the new company the central transcontinental system of the country, serving Philadelphia, Harrisburg, Indianapolis, Columbus, St. Louis, Kansas City, and many other of the principal cities throughout the Eastern Seaboard and the Middle West."

DOUGLAS AIRCRAFT CO: NAA owned 72,579 shares of Douglas Aircraft common stock. (1930 report): "This Company has completed the largest business in its history, the preliminary figures for the year ended November 30, 1930 showing sales of $4,088,594.00 as against $2,546,025.00 for 1929. At the end of the year, it had substantial orders on its books for delivery throughout the current year. The Company's preliminary figures for 1930 show a profit of $689,849.00, as against $403,364.00 for 1929. The Company has a substantial cash position and continues to maintain its place in the industry as one of the outstanding profitable manufacturers in this country. The management of the Company is pursuing a conservative dividend policy, paying $1.00 per annum. Profits for 1930 are estimated to be in excess of $2.00 per share."

UNITED AIRCRAFT: NAA owned 21,076 shares of common stock in United Aircraft and Transport Corporation at the end of 1930. "This is one of the outstanding units in the aviation industry. Its manufactured output and its transport system are among the largest in the country. It owns valuable properties, including Pratt & Whitney Aircraft Company, Boeing Airplane Company, National Air Transport, Inc., and Boeing Air Transport, Inc. The latter two constitute the northern transcontinental route for the transportation of passengers and mail."

INTERCONTINENT AVIATION, INC.: Intercontinent Aviation was a little-known company in the 1930's. It had been organized to enter the aviation field in foreign countries, and 52 percent of its stock was owned by NAA at the end of 1930. Its 1930 annual report showed three major investments in foreign fields as follows:

"*Cuba*. Intercontinent Aviation, Inc., owns substantially all

of the stock of Cia Nacional Cubana de Aviacion Curtiss, S.A. of Cuba, and this Company has recently signed a contract with the Cuban Government for the transportation of mail and passengers from Havana to Santiago.

"*China*. Intercontinent Aviation, Inc., owns all of the stock of China Airways Federal, Inc., U.S.A. This Company, in 1929, began the operation of a mail and passenger line from Shanghai to Hankow. In July 1930, a new company was formed for the operation of this line and various extensions, the new company being owned 55 percent by the Chinese National Government and 45 percent by China Airways Federal, Inc., U.S.A. In spite of bad economic conditions in China, traffic has grown steadily on this line. The enterprise, however, is still in the pioneering stage.

"*Peru*. Intercontinent Aviation, Inc., owns 55 percent of the stock of the Cia de Aviacion Faucett, S.A. of Peru, which is engaged in carrying passengers, mail, and express on a route of 1,100 miles in Peru. The Company's reports show improving business, and its operations resulted in a small profit in 1930."

OTHER INTEREST: At the end of 1930, NAA owned stock in a number of other companies including:

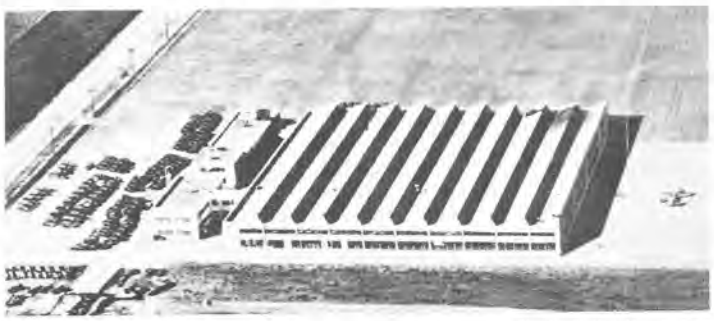
500 shares of common stock – Airport Development and Construction Co.
16,499-3/4 shares common stock – Aviation Corporation
1,100 shares common stock – Aviation Securities Corp.
7,780 shares common stock – Bendix Aviation Corp.
5,500 shares preferred stock – Curtiss-Reid Aircraft Co.
23,900 American shares – Fairey Aviation Co., Ltd.
6,100 shares common stock – Irving Air Chute Co., Inc.
1,000 shares common stock – St. Louis Aviation Corp.

The total market value of these shares, with the stock in other companies previously mentioned and the miscellaneous securities owned by the company, amounted to $4,075,585 at the end of 1930. Six weeks later, the annual report listed the value of these stocks as $5,850,528. Unfortunately, due to the depression, *NAA had paid more than $15.4 million for them*.

The final note in the 1930 report read as follows: "The executive work of your Company, involving continuous contact with all of the aforementioned properties, has assumed such proportions that it is necessary to increase the official organization, which has remained almost without change since incorporation. For that reason, Thomas A. Morgan, President of Sperry Gyroscope Company, Inc., has also been elected President of your Company, and C.M. Keys has been elected Chairman of the Board of Directors, retaining his position as Chief Executive Officer of the Company. The Board has also created the position of Vice Chairman of the Board of Directors, and J. Cheever Cowdin has been elected to fill this office, thereby becoming Assistant Chief Executive Officer. Captain Thomas B. Doe, President of Eastern Air Transport, Inc., has also been elected First Vice President of your Company."

NAA did exceptionally well during the first two years and 26 days of its existence, but in the next four years other problems arose. Some were management problems; but the biggest of all were those that occurred after the airmail contracts were cancelled in February 1934. The Airmail Act of 1934 resulted in reorganization of the company from a holding corporation to an "operating" company. This change in methods of operation, plus new management prepared the company for a new role when the war clouds began to form over Europe within the next four years.

Some of the company's problems, however, were the result of the depression. During the three years ending in 1933, the company suffered losses of more than $1 million. In 1931, profit dropped to a modest $301,000 from almost $2 million in 1930. In 1932, the loss amounted to $243,000 and, in 1933, $1.1 million.



Anthony H.G. Fokker obtained a contract for the "rebuilding" of 110 DeH-4 airplanes for the Air Service to essentially new DeH-4M2's and took over the former Witteman-Lewis factory at Teterboro, New Jersey. This was where the Barling Bomber, the XNBL-1, was built. As shown at top, circa 1926, the first of the Air Corps' C-2 airplanes was in final assembly. (Photo – James J. Sloan Collection)

The B/J aircraft plant (B/J on water tower) was built in 1929 a mile south of Baltimore's Logan Field, near Dundalk, Maryland. The building nearest foreground was a 6,000 square foot wind tunnel, one of two in the United States then owned by an aircraft manufacturer. (Rockwell Int'l)

The General Aviation plant at Baltimore was the former Curtiss-Caproni plant (from WWI). Located adjacent to Logan Field, it was taken over by GAMC in 1931 and had access to both Logan Field and the nearby Patapsco River, used in testing seaplanes and amphibians. (Rockwell)

The first of North American's plants in California was built on what is now the Los Angeles International Airport and occupied in early 1936. In the lower photo, the buildings are still in use as the L.A. Aircraft Division of Rockwell's North American Aircraft Group. (Rockwell Int'l)

In January 1931, Clement Keys resigned as chairman, to be succeeded by H.E. Halbot, Jr. A month later, Tom Morgan succeeded Keys as chairman of the Executive Committee, and, before the year was out, Keys resigned as a member of the committee. In October of the next year, Talbot resigned, and George Armsby became chairman. The turning point in the company's fortune came in April 1933, when Ernest Breech succeeded Armsby as chairman of the board. Breech came to the organization through General Motors and Transcontinental and Western Air, but it is first necessary to fill in the background on other companies which were part of the North American complex.

ANTECEDENT COMPANIES

Berliner-Joyce was one of two principal antecedent companies that supplied the talent which was the foundation for the newly reorganized NAA as a successful manufacturer of military aircraft. The other was Fokker.

Berliner Aircraft Co., of Alexandria, Virginia, was organized in 1926 by Henry Berliner, who had gained some fame as the pilot of the Berliner helicopter, which made a successful flight at College Park, Maryland in June 1922. The helicopter was designed by Henry's father, Emil. In February 1929, the company was reorganized as the Berliner-Joyce Aircraft Corp., with headquarters in Dundalk, Maryland. In an advertisement in the April 1929 issue of *Aero Digest*, Berliner-Joyce Aircraft listed Henry Berliner as vice president in charge of production. Temple N. Joyce was vice president in charge of sales.

The advertisment stated, "Temple Joyce is internationally known as a test pilot for the Army during the war, testing practically every type of plane constructed by the Allied and Central Powers. Later, he was Washington representative of the Curtiss Company, and then sales manager for Chance Vought."[3]

Others listed in the advertisment as part of the Berliner-Joyce team were Frank S. Hubbard (MIT), chief engineer, formerly head of the technical department at Curtiss; William H. Miller (University of Missouri and MIT), chief of research, designer of the wind tunnels at MIT and later in charge of the research laboratories at Curtiss; William Wait, Jr., chief of design, formerly a design engineer of the Curtiss Schneider Cup and Pulitzer Trophy racers; Earl P. Osborn (Rensselaer Polytechnic Institute), in charge of structures section at Curtiss. The president of Berliner-Joyce was W.W. Moss, former vice president and controller of Curtiss.

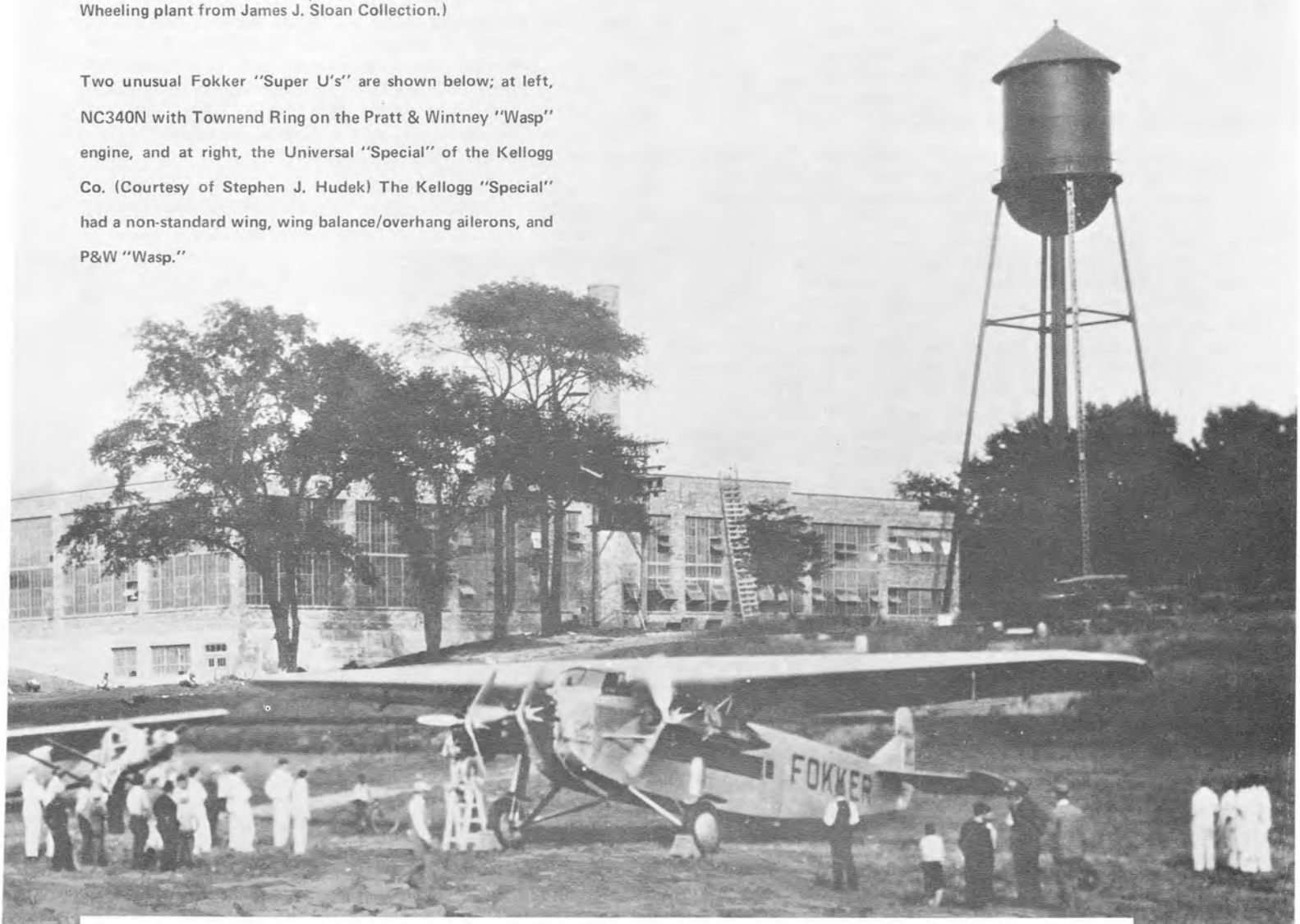
When NAA first secured an interest in Berliner-Joyce, *Time* Magazine reported it was a worthy "orphan" company, rich in engineering talent and sales ability, but poor in cash. (Even earlier, in 1930, Douglas Aircraft Co. had conducted negotiations for the acquisition of Berliner-Joyce.)

The Berliner-Joyce plant was built in 1929 on a 5-1/2-acre site at Dundalk, Maryland, near Logan Field, Baltimore's municipal airport. The plant included a wind tunnel, one of the few then owned by an aircraft manufacturer, but less than 200 workers were employed at the end of 1929.

The first airplane built by Berliner-Joyce was a commercial two-place cabin monoplane, but after the stock market crash in October the project was abandoned. The first Berliner-Joyce military airplane was the XP-16, a two-place, gull-winged fighter powered by a Curtiss Conqueror 625-horsepower water-cooled engine designed and built in early 1929 for the Army Air Corps' design competition. The experimental fighter was a success and resulted in an order for 25 P-16 aircraft, later to become redesigned PB-1.[4] About the same time, the company built one XOJ-1 observations airplane for the Navy. Subsequently, it built 27 OJ-2 airplanes and one XOJ-3. The company later produced three carrier-based fighters for the Navy: an XFJ-1 single-place fighter, an XF2J-1 two-place and XF3J-1 single-place fighter.[5]

The Fokker factory at Wheeling, W. Va. went into operation on the Super Universal with extensive equipment. At left is the final assembly of wing spars, the capstrips for which had been milled on machines which produced varying thicknesses along the span. (This and background photograph of the Wheeling plant from James J. Sloan Collection.)

Two unusual Fokker "Super U's" are shown below; at left, NC340N with Townend Ring on the Pratt & Wintney "Wasp" engine, and at right, the Universal "Special" of the Kellogg Co. (Courtesy of Stephen J. Hudek) The Kellogg "Special" had a non-standard wing, wing balance/overhang ailerons, and P&W "Wasp."



In June 1930, NAA established a new wholly owned subsidiary, the B/J Aircraft Corporation, which acquired the assests of the Berliner-Joyce Aircraft Coporation. The Berliner-Joyce Aircraft Corp. was dissolved in 1933 and the B/J Aircraft Corp. was operated as a subsidiary of NAA until 1933, when it was merged into the General Aviation Manufacturing Corp.

FOKKER

Anthony Fokker came to the United States in the early 1920's after gaining fame as a successful designer of military aircraft for Germany during World War I. He opened a plant in Hasbrouck Heights, New Jersey in 1924 under the name Atlantic Aircraft Corporation. In December 1927, the name was changed to Fokker Aircraft Manufacturing Corporation.[7]

Early production of Fokker aircraft consisted of four types, principally the Universal and Super Universal, both single-engine cabin monoplanes, and the F series trimotor transports. The major design feature of the F series was the wood cantilever wings, built initially in the Fokker plant in Holland. Fokker aircraft made a number of historic flights in the 1920's. The first airplane to fly non-stop across the United States was a Fokker, the U.S. Army's T-2 transport, flown by Lieutenants Oakley Kelly and John Macready in 1923. Commander Byrd made the first flight over the North Pole in May 1926, and another flight across the Atlantic in 1927 in the AMERICA. Kingsford-Smith flew 7,300 miles across the Pacific in 1928 in the SOUTHERN CROSS. Amelia Earhart flew across the Atlantic in the FRIENDSHIP in June 1928. Almost 275 Fokker commercial and military aircraft were built in the United States between 1926 and 1932.

Before establishing its manufacturing plane (1924), Fokker created a sales organization in the United States (1921). The organization was called the Netherlands Aircraft Manufacturing Co, of America with R. B. C. Noorduyn in charge of these American Fokker activities. Noorduyn, a Dutchman, had worked for Sopwith in England before WWI, and during the war with Armstrong-Whitworth and the British Aerial Transport Co. He remained with Fokker until 1929, then served for a while with Bellanca and Pitcairn, and subsequently formed Noorduyn Aircraft, Ltd., in Montreal, Canada.[8]

FOKKER AIRCRAFT BUILT IN THE UNITED STATES[9]

Model	Number	Deliveries
Commercial		
Universal	44	May 1926 - Apr. 1931
Super Universal	80	Nov. 1927 - Jan. 1931
F-10 Trimotor	7	May 1928 - Dec. 1928
F-10A Trimotor	58	Jan. 1929 - Oct. 1929
F-11 Amphibian	1	Jun. 1929
F-11A Amphibian	4	Dec. 1929 - Jun. 1920
F-14 Mailplane	12	Oct. 1929 - Feb. 1930
F-14A Transport	1	?
F-32 Transport	6	Apr. 1930 - ?
Total	211	
Military		
TA-1 Marine Corps Trimotor	3	Oct. 1927 - Jan. 1928
TA-2 Marine Corps Trimotor	3	May 1928 - Jul. 1928
C-2 U.S. Army Trimotor	3	Feb. 1927 - Apr. 1927
C-2A U.S. Army Trimotor	8	Jun. 1928 - Jan. 1929
C-7A U.S. Army Trimotor	6	Mar. 1930 - Jul. 1930
C-5 U.S. Army Trimotor	1	Apr. 1929
Y1C-14 U.S. Army Cargo Plane	19	Dec. 1930 - Sept. 1931
Y1C-15 U.S. Army Ambulance	2	Apr. 1931 - Mar. 1932
FLB U.S. Coast Guard Flying Boat	5	Fall 1931 - Spring 1932
Y0-27 U.S. Army Observation Plane	12	Summer 1931 - Spring 1932
Total	62	
Grand Total	273	

GENERAL MOTORS

In May, 1929, General Motors acquired 400,000 shares of stock, a 40-percent interest, in the Fokker Aircraft Corp. of America. Tony Fokker retained a 20-percent interest and became technical director of the company.

The Board of Directors of Fokker was expanded to include C.F. Kettering, Fred J. Fisher, and C.E. Wilson, all of whom were vice presidents of General Motors. W.T. Whalen, another GM vice president, was named general manager. Eddie Rickenbacker, of the GM Cadillac Division, later became Fokker vice president for sales.

The venture was, for GM, not as successful as it had envisioned, primarily because of the stock market crash of 1929. A year later, in June 1930, the Fokker name was again changed, to General Aviation Corporation. Concurrent with the change of names, GAC was reorganized as a holding company only, and the Fokker manufacturing rights and facilities and other assets were transferred to a new subsidiary corporation named General Aviation Manufacturing Corporation (GAMC). GAMC continued to produce aircraft under the "Fokker" trademark.

The biggest blow of all to Fokker, both the man and the aircraft, was the crash of a T&WA Fokker trimotor in Kansas on May 31,

1931, in which Knute Rockne was killed. The 35 Fokker 1929 models then in use as airliners were immediately grounded by the Department of Commerce. Within two weeks, the grounding order was lifted – the suspect wings were not considered weak after all. The only design change was the addition of counterweights to the ailerons.

Anthony Fokker and GM parted company on July 10, 1931. The rights to use of the Fokker name reverted to Tony Fokker, who retained his salary of $50,000 per year for the remainder of his five-year contract with General Aviation and Herbert Thaden succeeded him as chief engineer of GAMC. The design and construction of the Thaden T-4, a small, all-metal cabin monoplane was undertaken at this time, but the project was abandoned for the GA-43, a single engine, 10-passenger transport monoplane, actually a redesigned Pilgrim 150. The GA-43 was the design of Virginius Clark, who then replaced Thaden as chief engineer in September 1932.[10] This project was also dropped, in 1933, after the Department of Commerce ruled that single-engine aircraft would no longer be permitted for airline use.

An interesting 1932 project was the design of the GA-38, initiated as a low-wing trimotor that the company hoped to sell to Transcontinental and Western Air. This project went the way of many others; T&WA instead ordered the twin-engine Douglas transport.

The year 1933 was also a bad one. In June, NAA merged B/J Aircraft into General Aviation Manufacturing Corporation. Before the merger, 300 people were employed by B/J and about 1,000 at GAMC. Employment was soon down to 600, and had dropped to 200 by May 1934, when operations were consolidated at the Berliner-Joyce plant at Dundalk, Md. William H. Miller became chief engineer, replacing Virginius Clark.[11]

1934 brought the Air Mail Emergency and the CAA ruling about multi-engined transports.[12] It was also the bottoming out of the Depression years and the low ebb of North American Aviation fortunes, but several developments were to come that would revitalize the company; its change to a manufacturing concern, the introduction of Ernest R. Breech and others into the management, and some new technology.

The person most responsible for shaping the future of NAA was Ernest R. Breech. He was born in 1897 in Lebannon, Missouri, in the heart of the Ozark Mountains. After two years of study at Drury College, Springfield Missouri, he left school in April 1917 and went to Chicago, where he hoped to join the Army and attend ROTC at Ft. Sheridan. Before he could arrange that, he got a job in the bookkeeping department of Fairbanks, Morse and Co. His salary was $15 a week. Six years later, he joined the Yellow Cab Manufacturing Co. and while there he arranged a job for his old friend at Lebannon High School, R.A. (Andy) Lambeth, who later became senior vice president and treasurer of North American Aviation.

Yellow Cab merged with the General Motors Truck Division in 1925 and Breech went to Pontiac, Michigan as controller of the new Yellow Truck and Coach Manufacturing Co. Within four years he moved to New York to become general assistant treasurer of General Motors. Thirteen months later, he was named to the Board of Directors of Transcontinental and Western Air, Inc., replacing GM vice president C.E. Wilson. He was only 33 years old.

Breech was a very active member of the T&WA Board of Directors. His training and experience in cost accounting and financing paid off. Breech is credited with turning the company around, from one consistently in the red to one showing black figures the first year after he joined the board. Among the changes initiated by Breech was securing a new president, Richard W. Robbins of Pittsburgh. Robbins replaced H.M. Hanshue, who had previously been president of Western Air Express and was eager to return to California.[13]

On Christmas Day 1932, Eddie Rickenbacker and his wife visited the Breech home in Larchmont, New York. During the visit, Rickenbacker suggested that General Aviation and North American be merged. The friendship between the two men had begun during Rickenbacker's days with Cadillac. In July 1929, he had become vice president of sales for Fokker and moved to New York. He stayed with the Fokker company until the end of March 1932, when the Fokker operations were moved to Baltimore. In April, Rickenbacker joined American Airlines as vice president, remaining with the airline until its headquarters were moved to Chicago in February 1933.

Looking for something of special interest in the East, and hoping to resign when American Airlines moved their headquarters to Chicago, Rickenbacker had his eye on Eastern Air Transport, one of the subsidiaries of NAA. Ernie Breech became greatly interested in Rickenbacker's idea of a merger of General Aviation and NAA. At the time Breech had considerable interest in the performance of General Aviation Corporation, GM's new name for the old Fokker company, and he discussed the proposed plan with the top executives of General Motors, TWA, DuPont, and several of the leading financial institutions.[14]

Left, the major personalities of North American Aviation, Lee Atwood, Dutch Kindelberger, and Stan Smithson, pore over drawings at the old General Aviation plant on May 30, 1935. Above, the first prototype of the NA-16 series. From this, which became the basic BT-9 design, came the T-6/Harvard/Texan line which would ultimately be built near the 17,000 mark. (Rockwell Int'l, courtesy of Author)

One of the main points agreed upon during the negotiations was to sell NAA's interests in Sperry and Ford Instrument.[15] In this and similar plans there were generally two primary considerations. One was the value of the company at the time, based on the assets, liabilities and the goodwill. Of more importance was the potential for earning money in the immediate and the distant future.

For 1932, NAA reported a loss of $234,573. The income for the Sperry Gyroscope subsidary was less than that in 1931; the operations of Ford Instrument were greatly curtailed, which resulted in a substantial loss for 1932. Eastern Air Transport also

showed a small loss for the year, and Berliner-Joyce's loss was substantially less than that of the previous year, although there was some production going on for the Army and the Navy. George Armsby, board chairman, and Tom Morgan, president, reported the company and its subsidiaries had made drastic reductions in all classes of expense during 1932 and was continuing to effect economies wherever possible.

In addition to the wholly owned subsidiaries previously mentioned, NAA still held a large share of one stock of Intercontinent Aviation, which owned Aviation Exploration, Inc., and China Airways. Substantial blocks of stock were also held in Curtiss-Wright, Transcontinental Air Transport, and Douglas, and although NAA lost money in 1932, prospects for the future appeared good. Perhaps the merger of General Aviation and NAA as suggested by Eddie Rickenbacker would make sense.

Alfred P. Sloan and the other top executives of General Motors asked the sixty-four dollar question, of each other and of the merger architect: "Who is going to run this new and greatly enlarged North American Aviaton?" As Mel Hickerson related:

> "Ernest R. Breech was ready for that question. Busy as he had been since the day after Christmas, he had given enough thought to the ultimate North American organization to say 'What about me?' and to say it in such a way and with such a smile of confidence that only one answer was possible. There were no other candidates for the top job, though Ernie's good friend and long-time sponsor, Albert Bradley [GM vice president-finance], was quite surprised to realize that his protege was willing to leave the financial department of well-established General Motors and get into the operating end of a newborn company in a new industry."[16]

The largest stockholder in NAA at the time was United Aircraft. Col. A.E. Deeds was a primary stockholder of National Cash Register, and, through United, owned 330,000 shares of NAA stock. Deeds opposed the merger of NAA and General Aviation but eventually lost the battle. The United Aircraft shares of NAA were purchased by General Motors.[17]

The "merger" of NAA and General Aviation was actually the acquisition of General Aviation Manufacturing Corp. by NAA, accomplished on April 28, 1933, when the 2,000 shares of stock in GAMC were secured from General Aviation in exchange for 1,485,922 shares of NAA stock.[18] The transaction resulted in GAMC's becoming a wholly owned subsidary of NAA and gave General Motors a 29-percent interest in NAA. General Motors held the NAA stock until June 1948, when it, plus their stock in Bendix and Greyhound, were sold to the public in order to raise funds for additional capital expansion.

Again, quoting Hickson:

> "What followed was essentially formality. On May 1, 1933, Ernest R. Breech was elected chairman of the Board, chairman of the executive committee, and president of North American Aviation, Inc. The three presidents – of Eastern Air Transport, Transcontinental and Western Air, and Western Air Express, all of which North American now controlled – moved with their staffs into adjoining offices in the General Motors building and reported to Breech. His salary was $22,500 per year. Here indeed, he believed, was his 'great opportunity' and he had to make good with it. The Top Brass of General Motors had their eyes on him more intently than ever and his name and confident contenance had been publicized throughout the United States and overseas."[19]

As part of the reorganization of NAA in April 1933, NAA established the Sperry Corporation. All of the capital stock of Sperry Gyroscope Corp., Ford Instrument, Curtiss-Wright, and stock in several other companies that the company owned was transferred to the new Sperry company in exchange for stock in that corporation. This stock was then distributed to NAA stockholders as a dividend.[20] Thus NAA divested itself of its interests in these companies to concentrate attention on its remaining interests. At the same time NAA owned 25 percent of Douglas, and in April 1934 sold all of its Douglas holdings. The company suffered another deficit in 1933 – a loss of $1,104,451. Conditions were to get worse before they got better.

CANCELLATION OF AIRMAIL CONTRACTS

In February 1934, the Roosevelt Administration cancelled all airmail contracts. The decision to cancel was based on the charge that the contracts resulted from collusion between Hoover's

Top left, the General Aviation GA-43. Five were built in 1933 but none were sold. The 0-47 prototype, X-2079, was the first design by Kindelberger and associates while NAA was still at Dundalk, Maryland. Above, the personnel of General Aviation's engineering staff in 1932. L. to r., Houston and Todd at rear (under props); rear row – Sigafoose, Tooley, Kingston, Buckley, Midboe, Behrnt, Ellis and Van Rosenberg. Long row – Young, Nowry, Weaver, McMullen, Berman, Haberland, Raydon, Thwing, Rich, Schmued, Thaden, Hammer, Steckel, Fox, Mundhenk, Webster, Shropshire, Haag, Schuttle, Nagel, Raynor. Front row – Sadler, Stone, Graham, Comstock, Falk, Bossert, Peyney, Hutchinson, Paul, Bonk, Smitch, Tousignan, Koenig, Johnson, Young.

Postmaster General Brown and the airline operators. Many years later, Ernie Breech was reported to have said, "I've examined, read, and studied the history of the award of the airmail contracts by Postmaster Brown and [still believe] they were awarded under competitive bidding."[21]

In *Climb to Greatness*, John Rae had this to say about the background leading to the contact cancellations:

> "The background to this occurrence was exhaustively, if not impartially, investigated at the time and has been gone over several times since, so that the facts are readily available. The essential part of the story is simple enough. President Hoover's Postmaster General, Walter F. Brown, foreseeing a great expansion of air transport, wanted to use his authority over air mail routes and contracts to establish a nationwide network of soundly organized and financed airlines. He particularly wanted to keep out what he regarded as the shoestring operators, the little companies that were springing up with secondhand equipment bought on credit, and seeking mail contracts by cutting their bids to figures that Brown considered unrealistic, with the probable result that the contract could not be fulfilled. To achieve his objective Brown used to the full his legal power to award air mail contacts to the lowest *responsible* bidder, and to avoid wasteful competition among these he held periodic conferences with the established airline operators at which mail routes were allocated.
>
> These conferences were the foundation for the subsequent charge of collusion between the Post Office and the big operators to keep the small fry out. Actually the airline executives had little choice but to go along with the Postmaster General; without a mail contract no airline could live . . . A hostile investigating committee later went over every detail of his activities and was unable to find that he had exceeded his legal authority or that there had been any taint of corruption in what he had done. He genuinely wanted to build a sound and substantial air transport network, but the chose an unfortunate way to go about it."[22]

The Army Air Corps was ordered to carry all airmail – on a 10-day notice. The results were disastrous: 10 pilots were killed in a few months. They simply were not prepared to fly in the bad winter weather of early 1934. The three NAA-controlled airlines – Transcontinental and Western Air, Western Air Express, and Eastern Air Transport – were reorganized in order to bid on the resumption of contract airmail operations. Each won a contract, and today, TWA, Western and Eastern Air Lines are among the leading airlines in the United States.

NAA BECOMES AN OPERATING COMPANY

In order to conform with the requirements of the new Airmail Act of 1934, NAA sold its interest in TWA and WAE. Because of a technicality in the airmail law, Eastern became one of the two divisions of the new NAA, with Rickenbacker as general manager. At the time, Eastern operated a route 3,358 miles long and had fewer than 500 employees. Eastern remained an NAA division until 1938, when the airline was sold to a group of investors headed by Eddie Rickenbacker.[23]

Airmail contractors were prohibited, after December 31, 1934, from holding interest in any other aviation enterprise except landing fields and appurtenances thereto; conversely, other aviation enterprises were prohibited from holding any interest in airmail contracts. Contractors were prohibited from employing any person in a managerial capacity who had entered into any unlawful combination to prevent airmail bidding and each bidder for a contract was required to furnish the postmaster general a list of all stockholders owning more than five percent of the bidder's capital stock, financial statement, and, if a corporation, the original amount paid to the corporation for its stock.[24]

NAA complied with this provision of the act by reorganizing –

Eastern Airlines became a division of the company, just as had the manufacturing element of the company. All other interests that conflicted with the law were sold by NAA by the end of 1934.

"DUTCH" KINDELBERGER

Ernest Breech was in California on a visit, principally to discuss with Douglas personnel the new Douglas commercial transports. While there, he talked to the Douglas Chief Engineer, James H. Kindelberger, about the future of the aviation business and about NAA in particular. The result of those talks was the Kindelberger, Lee Atwood, and Stan Smithson – all Douglas employees – joined NAA and moved to Baltimore.[25]

James Howard (Dutch) Kindelberger was born on May 8, 1895, in Wheeling, West Virginia. Wheeling was then, and is today, a steel mill town located on the Ohio river about 40 miles southwest of Pittsburgh, on the spike of West Virginia that separates Ohio from Pennsylvania. In 1911, at the age of 15, Dutch quit high school to become an apprentice engineer with the National Tube Co. in Wheeling. Two years later, he beacme a junior draftsman for the U.S. Army Corps of Engineers. While with the Corps of Engineers, he studied after work in order to obtain a high-school diploma and to prepare for college entrance examinations. He passed the exams and, in 1916, enrolled in Carnegie Institute of technology, Pittsburgh.

Soon after the United States entered the war with Germany, Dutch left school and joined the Army as a second lieutenant. Although something of an engineer in civilian life, Dutch found himself digging ditches for the fortifications being contructed in Norfolk, Virginia. To better use his training and experience, Dutch obtained a transfer to the Aviation Section of the Signal Corps, attended ground school at Ohio State University and soloed in a Curtiss Jenny in Dallas. He eventually became an instructor and spent the rest of the war at Park Field, Memphis, Tennessee.

Kindelberger obtained a job as a draftsman with the Glenn L. Martin Co. in Cleveland; the following year, he was appointed chief draftsman and assistant chief engineer.

Four men, each of whom later became a giant in his own right, were then working together in the Cleveland plant: Glenn L. Martin (president), Donald Douglas (chief engineer), Larry Bell (factory manager), and Dutch Kindelberger.[26]

Donald Douglas left for California in March 1920 to form a partnership with David R. Davis and built the Liberty-engined "Cloudster," which they hoped to use for the first nonstop transcontinental flight. During the attempt, a timing gear caused the flight to be terminated at El Paso, Texas. Before a second attempt could be made, Lieutenants Oakley Kelly and John McReady crossed the continent in the Fokker T-2.

Davis lost interest in the plan, and Douglas obtained new financing which led to the establishment of Douglas Aircraft Co. The new company soon received an order from the Navy for 40 torpedo planes, and an order from the Army for the World Cruisers. At the end of 1924, Douglas employed 112 workers.[27]

Although Kindelberger had been invited to join Douglas several years eariler, when a number of other executives left Martin for Douglas on the West Coast, Dutch stayed with Martin until August 1925. When he finally took a job with Douglas, he became chief engineer, and in 1928, he was elected vice president of engineering. Kindelberger remained with Douglas for almost nine years. During that time, he directed the design of an impressive number of successful Douglas airplanes, including the world's most successful airliner, the DC-3.

Kindelberger's coming to NAA as president and general manager of General Aviation Manufacturing Corp., was July 13, 1934. Many years later, C.J. (Red) Hanson, at the time a member of the engineering staff, remarked that Dutch's arrival did not appear very earthshaking. "Well, here is another president" was the tone of the employees at the time. But Dutch was not just another president. He remained president 14 years and chairman of the board for the next 14 years until his death in 1962. Under his leadership, North American quickly became one of the leaders of the aircraft industry.

Stan Smithson later headed production operations, becoming vice president of manufacturing in 1942. Lee Atwood was named chief engineeer two weeks after joining the company, and when Dutch was named chairman of the board in 1948, Atwood became president. The two made a great team. Dutch was outgoing, had many ideas, and possessed a broad understanding of the larger issues. Lee, on the other hand, was shy, a quiet and deep thinker. Both had great knowledge of aircraft, aircraft structures, operations, and how to get things done. Dutch was the adventurer, Lee the cautious engineer. The two men complemented each other and were much more effective together than either would have been alone.

When Kindelberger, Atwood, and Smithson reached the NAA-owned General Aviation plant in Dundalk, Maryland, about 200 people were employed, net worth was down to $11,625, and operations were conducted in two factories: the Curtiss-Caproni plant and the Berliner-Joyce plant, about five miles apart. The Curtiss-Caproni plant was closed in May and operations were consolidated in the newer Berliner-Joyce facility.

Efforts to sell the GA-38 transport were unsuccessful; airlines, even those with a direct or prior relationship with NAA, chose the Douglas DC-2 or DC-3 transports. The Berliner-Joyce work for the Navy – the FJ carrier-based, experimental fighters and the XOJ-3 observation airplane – was almost completed. There appeared little prospect for new business. In a further organizational change Kindelberger was named president and general manager of North American Aviation, succeeding Breech, who continued as chairman of the Board of Directors.

FIRST OF A NEW BREED

Kindelberger saw little in GA's current designs or recent production upon which to build a future. For some time, even before joining GAMC and NAA, he had been thinking of a new type of observation plane. During the preceding 10 years, the Air Corps had ordered more than 40 types of observation planes, all two-place aircraft, mostly biplanes with fabric-covered wings and fuselages. Many had been built by Douglas under the engineering supervision of Kindelberger. He was now thinking of a three-place observation plane – a mid-wing craft manufactured of aluminum, with stressed-skin cantilever wings, constructed somewhat like the Douglas airliners then going into service. He outlined his ideas to Ernie Breech and the Board of Directors, and although the military had no immediate plans to procure more observation airplanes, the board authorized the company to spend up to $125,000 on the new model.

The principal feature of the new plane was that it facilitated observation – it was designed for the observer. In the past, most observation planes had been adaptations of contemporary airplanes. In the new aircraft, the pilot sat in the front seat, the gunner and radio operator in the rear seat, and the observer between the two, all three enclosed in a large glass canopy, which eventually became unknown as the greenhouse. The observer's seat could be lowered so that his head was below the wing, in a potbellied section of the fuselage. Windows on either side of the fuselage permitted a good view downward. The lower section also housed camera equipment.

The GA-15, completed in July 1935, was demonstrated to the Army Air Corps at Wright Field. In January 1936, the Army purchased the single demonstrator, designating it the XO-47.[28] In August 164 of the model were ordered (company model NA-25) – 71 for the Air Corps and 93 for the National Guard. 74 more

were ordered (identified as 0-47B, company model NA-51) in 1939, both A and B models incorporating the Wright R-1820 engine.[29]

Kindelberger also had an idea for another airplane – a new type of trainer. He envisioned a rugged airplane, with a cantilever wing mounted below the steel-tube fuselage. Removable fabric covered side panels were to be mounted on the fuselage to facilitate construction and maintenance of the aircraft. A single-strut oleo gear would be used in each landing gear leg.

The Air Corps had announced a design competition to be held at Wright Field in April 1935. Kindelberger requested $36,000 to build the airplane he had in mind, as the company's entry in the competition. Breech thought the time was a little short in which to design and build a new airplane, but $36,000 seemed a reasonable amount of money and might be worth the gamble. Kindelberger was sincere and his plans were sound, so the money was allocated for company mondel NA-16. It was early 1935 and the competition was less than three months away.

The men of NAA were highly skilled, with many years of experience, some dating back to the Fokker days in Europe. The men worked hard, often returning at night to work on their own time despite the NRA rule limiting workers to 40 hours per week. Dutch later learned of the "overtime," but the men claimed they were not working, "just for fun."

The prototype NA-16 was completed in the record-breaking time of nine weeks, and was flown to Wright Field on April 22, 1935. It won the competition, and the Air Corps ordered 42 airplanes, designated Air Corps model BT-9. The contract was for $560,000, as company model NA-19.

About the same time, NAA received an order of 161 sets of floats for the Curtiss SOC-1 Scout observation plane identified, for accounting purposes, as company model NA-17. In 1936, another order for floats was received – 48 sets for the SOC-2 airplane. Given model number NA-20, it was completed in California following the move from Dundalk.

NAA MOVES TO CALIFORNIA

The first order for 42 BT-9 airplanes for $560,000 seems small by today's standards but it was a turning point in the company's success. It had been less than a year since Kindelberger and his two colleagues had joined NAA. Two new airplanes had been designed and built, and a production order received that would permit the plant to move to California, and Dutch had gone to California to look at possible sites, "just in case."[30] Dutch, in California about nine years when he worked for Douglas, knew the area well, was aware of the fine flying weather, and knew there were many capable workers in the area and that more would be eager to move to California if they had the opportunity.

This was the chance to move before production got under way. Details were completed, and the Directors of NAA and General Motors both approved. On July 25, 1935, the Los Angeles Chamber of Commerce released the story to the press:

> "North American Aviation, Inc., affiliate of General Motors Corporation, has just leased twenty acres at the southeast corner of the Los Angeles Municipal Airport on which to erect an airplane factory to cost $500,000."

The news release said construction of the 150,000-square-foot facility would get under way about September 1. Plans for the factory were prepared by L.B. Norman, an engineer of Santa Monica, who had designed the Douglas plant and the new Consolidated Aircraft Corp. factory being built at Lindbergh Field. The factory manager for the new plant would be Ed Doak, who also had been with Douglas and who later headed his own aircraft company.

In order for the City of Los Angeles to lease part of the airport to a private corporation for the manufacture of airplanes, Assembly-

At top is the first airplane built by the newly formed Berliner-Joyce Aircraft Co., as a private venture. It underwent a number of modifications but never was sold. (Photo – James J. Sloan Collection)

The forerunner of the OJ-2 series was the basic trainer demonstrator, next. Forty-six of the OJ-2 and OJ-3 series were built. (Rockwell; courtesy of Author, original photo 20.101/99 dated 9-20-34)

Next, the Berliner Joyce XF2J-1, which followed the biplane single-seat XFJ-1 as a two-place carrier-based fighter. It went to the Navy as BuNo 8973. (Rockwell; original photo No. 20.101/73, courtesy of Author)

Bottom, third and last of three carrier-based fighter types designed by B/J, the XF3J-1, a beautiful airplane but expensive to build (then). BuNo 9224. (Rockwell; original photo 20.101/91 dated 3-30-34, Author)

man Ralph L. Welsh sponsored a bill that provided the basic legislative authority for the activity.[31] Lease of the 20 acres from the City of Los Angeles became effective September 24, 1935, and on October 1 construction of the main part of the new factory was begun. Plans were also made to move approximately 100 workers and their families from Dundalk to Inglewood.

In the Fall of 1935 temporary quarters were found for the company in a building originally used by the Moreland Aircraft Company, then by The Northrop Corporation, which still stands at the southwest corner of Douglas Street and Imperial Highway in El Segundo. Occupation of the quarters began in November, and in January 1935 the move into the new factory building was accomplished.

It was a major milestone in the already varied career of North American Aviation. In the next few years it was to become the story of climb to the pinnacle of success, an account to be related in the succeeding parts of this series. The AT-6's which live on into the 1970's had their beginnings in the BT-9 of 1935, to be followed by the B-25, the P-51, the F-100, the F-86, and many other famous aircraft. But the main portion of the story is in the men – as well as their products – who carried the company name on into the Space Age with Apollo and the Landing on the Moon.

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ABOUT THE AUTHOR

Ralph B. Oakley obtained his pilot license in 1931 but did not join the aviation industry until 1938; instead he was a part-time aviation editor for the Tri City Star of Davenport, Iowa. North American Aviation drew him, first in engineering, then in field service, where he had the somewhat dubious, if adventurous, pleasure of becoming manager of NAA's office in Brisbane, Australia in 1942. Since that date he has been in administration of engineering personnel, projects, and public relations for North American, now Rockwell International.

On the avocational side, Ralph was one of the founders of several aviation history groups in Southern California, Chairman of the History Committee of AIAA Los Angeles' section, is currently the Chairman of AIAA's National History Committee, and has served both officially and unofficially as Division Historian of Rockwell's Space Division, Downey plant for several years.