

Saga Of A Square Tail Stearman

by Thomas E. Lowe and Kenneth D. Wilson

To many enthusiasts of the Golden Age of Aviation, the 1920s and 1930s, the ultimate evolution of the civilian biplane was found in the Stearman Model 4 Junior Speedmail, a large open cockpit airplane that was the epitome of speed, grace and styling. It served as a mailplane for numerous airlines as well as a personal business airplane for individuals and large corporations and Lloyd Stearman called it, "The finest airplane I ever built."¹

The Model 4 was built under six different Approved Type Certificates, but there actually were only three slightly different versions with the major differences being the engines. The 4C and 4CM were powered by the 300-hp Wright J-6-9, the 4D and 4DM by the 300-hp Pratt & Whitney *Wasp Junior*, and the 4E and 4EM by the Pratt & Whitney *Wasp* engine of 420 to 450 horsepower.²

A total of 40 Model 4s were built by the Stearman Aircraft Company in Wichita, Kansas, between September 1929 and August 1930, and today only a handful of these historic air-

planes survive. One of the three 4Es operated by Standard Oil Company of California, NC784H, has been restored by the Canadian National Museum and carries the markings, CF-AMB, a Stearman 4E that originally was operated by Canadian Airways, Ltd.

Standard Oil of Louisiana's 4E, NC791H, currently is undergoing restoration by the Antique Airplane Association Airpower Museum at Blakesburg, Iowa.

4CM, NC489W, has been converted to an agricultural sprayer and is owned by Forrest Bennett of Milwaukee, Oregon.

Stearman 4C, NC665K, currently disassembled and awaiting restoration, is owned by Richard Reade of Mid-Continent Aircraft Corporation in Hayti, Missouri.

4E, NC785H, and 4D, NC774H, are both owned by Gene Frank of Caldwell, Idaho, and are being restored by Dolph Overton of Kenly, North Carolina.

NC485W, a 4CM-1, is owned by Specialty Restaurants in Bakersfield, California.

4E, NC779H, 4D, NC796H, and 4D, NC11724, are reported to still be in existence, but their current whereabouts are unknown.

Several other Model 4s may still exist in various conditions as crop dusters in the western states. The only stock Model 4E currently flying, and the subject of this article, is NC663K, owned by Dan Wine of Boulder, Colorado.

The saga of the Stearman 4E *Junior Speedmail* that was to become NC663K began on November 12, 1929, when William Keith Scott, a Los Angeles, California, businessman, placed a verbal order for a Model 4 with Rogers Aircraft, Inc., the local Stearman distributor.³ The basic list price was \$16,000 and with optional equipment, including such items as an additional reserve fuel tank, Ryan retracting landing lights, dual flare tubes



A restored Stearman 4E, NC663K, at the National Stearman Fly-In at Galesburg, Illinois.

Kenneth D. Wilson)

with Wiley parachute flares, radio and wheel pants, the final delivery price rose to \$18,107.50, a substantial sum for 1929.⁴ The 4E was constructed under Job Order 4803 and was the fifth Model 4 built, bearing the serial number 4005 and the CAA registration number NC663K. It was powered with a Pratt & Whitney C-1 Wasp engine of 420 horsepower, serial number 2255, and was promised for completion by December 16, 1929. However, it was not actually delivered until February 20, 1930.⁵

Keith Scott was to own and operate NC663K for the next 12 years, using the Stearman in numerous business and pleasure flights throughout the United States. However, the majority of his flying occurred in California and Nevada where he had business interests. By August 1930, just six months after purchasing the airplane, Keith Scott had flown it for 237 hours and had the Stearman repainted.⁶ Mr. Ancel N. Smith, A&E number 1853, was to serve as the mechanic for the 4E as long as it was owned by Keith Scott, and he would play a major role in its restoration - many years later.

During the years 1930-1939, the 4E amassed another 450 hours of flying time and the logbooks indicate that only periodic maintenance and normal repairs were accomplished. The engine received one top overhaul and two complete overhauls during this time and the only major airframe repairs undertaken was in 1931 when it was repainted for the second time.⁷ An important modification to the airplane that significantly improved its performance occurred in March 1939, when Pacific Aeromotive Corporation, Union Air Terminal, Burbank, California, overhauled the engine and installed a 10:1 supercharger.⁸ Subsequently, in September 1939 the engine was further modified to conform with the CAA Specification No. 58, which changed the engine horsepower rating from 420 horsepower to 450 horsepower.⁹ Pacific Aeromotive had performed maintenance on NC663K throughout the years, including most of the engine overhauls, and earlier in 1939 had re-covered the entire airplane with new fabric. At that time the total time accumulated on the airframe was 820 hours and 963 on the engine.¹⁰

Keith Scott continued to fly Stearman 4E, NC663K, for several more years until he sold the airplane on August 4, 1942, to Malcolm Carberry, who operated Carberry Crop Dusters, Inc., in Brawley, California.¹¹ Since WWII was then in progress, special permission was required for the subsequent flight to Brawley. On December 3, 1942, C.S. McBrien, Chief, General Inspection Branch, issued approval for the flight in the Western Air Defense Zone on behalf of the Commanding General of the IV Fighter Command.¹² The flight from Metropolitan Airport in Van Nuys, California, to Brawley took place on December 10, 1942, and the Stearman sat there for 18 months before flying again.¹³

The next flight entry in the logbooks was not until June 30, 1944, when it was flown from Brawley to Phoenix, Arizona. In all, only five flights were made in NC663K during 1944 by various Carberry pilots.¹⁴ In 1945, 11 flights were conducted by Carberry pilots in the 4E, again mostly between Brawley, Fresno and Phoenix. The last flight entry was on June 14, 1945.¹⁵

The use and activities of NC663K during the years of 1945 to 1950 are rather sketchy as there were no entries in the aircraft's logbooks. The next aircraft logbook entry was on February 2, 1950, when the paperwork reflected the completion of its conversion into an agricultural dusting aircraft.

All the extra items that had contributed to making it one of



A brand new Stearman 4E, NC663K, s/n 4005, parked in the grass alongside the Stearman Service Hangar at the Wichita Municipal Airport. This area is now part of McConnell AFB and the Stearman Service Hangar now houses the McConnell AFB Aero Club. (Stearman Aircraft Co.)



Three of the Standard Oil of California's Stearman 4Es in front of the Stearman Service Hangar on the Wichita Municipal Airport. This building currently houses the USAF Aero Club at McConnell AFB. (Stearman Aircraft Co.)



Lineup of six Stearman Model 4 Junior Speedmails in front of the terminal at United Airport, California. The first three Stearmans belonged to the Standard Oil Co. of California and were used in promoting the sale of Standard Oil products on the West Coast. The last three Stearmans were privately owned. (Stearman Aircraft Co.)

Stearman 4D, NC769H, s/n 4009, was owned and operated by the Pratt & Whitney Aircraft Co. and was used by their salesmen-pilots for travel and demonstrations. (Stearman Aircraft Co.)



Fine finish and details are apparent in this photo of NC663K. Colors are black and yellow. (Kenneth D. Wilson)



Rear view of the Stearman 4E clearly shows the unequal wingspans that were a characteristic of the early civilian Stearman airplanes. (Kenneth D. Wilson)

Stearman 4E, NC663K, parked on the ramp outside the Stearman Service Hangar. Wolf's head insignia on the fuselage was selected by Keith Scott. (Dan Wine Collection)



The 38-foot wingspan and the general size of NC663K show to good effect while in flight at the National Stearman Fly-In at Galesburg, Illinois, in September 1980. (Kenneth D. Wilson)

Dan Wine runs up the P&W SC-1 engine of his Stearman 4E at Galesburg, Illinois, in September 1980. (Kenneth D. Wilson)



the classiest of open cockpit biplanes were removed in lieu of weight savings and utilitarian use. The engine cowling and cylinder baffles and all front cockpit items including the seat, instrument panel, flight controls and baggage compartment, were removed as well as the radio and all accessories. The fuselage was stripped and cleaned with the fuselage tubing members modified between Station 3 and 4 for the installation of a hopper. The 31-inch auto fan wheels, streamlined tires and brakes were replaced with Goodyear airwheels and brakes, and the tailwheel also was replaced. The rudder, horizontal stabilizer and elevators were modified by covering them with 24ST Dural .020 aluminum, but the vertical fin remained original with fabric covering. The four wing panels and the center section were rebuilt with new wood using the original metal fittings and wires and the original manually operated Ryan landing lights were removed from the lower wings and replaced by Grimes ST-250 landing lights.

Final dusting additions included two overhead engine exhaust pipes and an agitator gearbox and propeller installed under the lower left wing. The entire airplane was re-covered with Grade A cotton fabric and the Stearman was relicensed into Restricted Category approved for a 10% overload.¹⁶ The aircraft's total flight time at this point was 954 hours with 1121 hours on the engine.

The converted Stearman 4E was test flown by Thomas R. Fisher on May 11, 1951, and found to be satisfactory with the special-purpose load of 1600 pounds.¹⁷ NC663K then became a hard-working Stearman duster for Carberry Crop Dusters and flew faithfully for many years. In 1952 it had an engine failure caused by a broken intake pipe on the number one cylinder, but with a quick repair it returned to service.¹⁸ The Stearman remained in dusting operations through 1954, accumulating a total flight time of 1453 hours on the airframe and 1204 hours on the engine.¹⁹ It was not flown during 1955 as it once again was disassembled and the wings and center section removed for re-covering. Only the original upper right wing was reinstalled after being re-covered with linen fabric as a used center section and three other wing panels that had previously been re-covered with new fabric were mated to the airplane.²⁰

The original Pratt & Whitney SC-1 *Wasp* engine that had served Keith Scott through his many hours of flight and had powered the 4E throughout its early crop-dusting years finally was separated from its only mount in 1958 when it was removed for overhaul and replaced with a newly overhauled Pratt & Whitney S3H1 engine, serial number 7755. The original engine, serial number 2255, had a total of 1666 hours at the time of its removal.²¹ The entire airplane again was completely rebuilt and re-covered in September 1958²², and Thomas R. Fisher once more served as the test pilot for its relicensing into Restricted Category on March 10, 1959.²³

The Stearman remained in agricultural dusting use with Carberry Dusters at Fresno, California, for several more years, although indications are that it was utilized less and less each year, probably as newer, more efficient dusting airplanes were introduced into the operation. By 1961 only an additional 157 hours had been flown following the recent overhaul.²⁴ An interesting logbook entry was made in 1963 when note was made of the installation of a used Pratt & Whitney R-1340 engine, serial number 8977, replacing engine serial number 5094. But there was no entry whatever in the logbooks to indicate when engine serial number 5094 had been installed.²⁵ NC663K continued in



Emily Wilson and Nancy Lowe, the authors' wives, enjoy a flight in NC663K with Dan Wine over the Illinois countryside. (Kenneth D. Wilson)

service with Carberry Dusters for another year before being retired. The last entry in its logbooks was on October 31, 1964, which showed a total flight time of 2108 hours.²⁶

Stearman 4E, NC663K, sat derelict, engineless and forlorn for many years until Robert Penny, Jr., a well-known California collector and restorer, purchased it along with several other deteriorating Model 4 Stearmans and trucked them to his home in the San Gabriel Valley in Los Angeles County. Out of the various airframes, Bob Penny selected NC663K for restoration. The entire airplane was disassembled and all dusting equipment and modifications removed. The fuselage was completely stripped, with several new pieces of tubing welded into place to replace those that had been corroded by the dusting chemicals. However, the fuselage framework did remain over 90% original, as there were more tubing modifications and non-standard support brackets removed from the fuselage than new tubing installed.²⁷ All new engine and cockpit cowlings were built as original, the instruments overhauled and all original equipment reinstalled except for the flares and streamlined wheel fairings. All the wing panels were rebuilt and re-covered by Vernon Beilby at Vern's Wing Shop in Bakersfield, California, and he also removed all the metal covering from the tail surfaces and returned them to their original fabric covering.²⁸

During the course of restoration, Bob Penny pursued a diligent effort to obtain all the technical and historical information possible on the Stearman Model 4s and NC663K in particular. Through original Stearman Company records still on file with the Boeing Airplane Company in Wichita, Kansas, he determined the serial number of the engine that originally was installed in NC663K and by retracing its history, fortunately was able to locate the engine. In 1970, after being overhauled by Earnie Shults, Pratt & Whitney *Wasp* SC-1, serial number 2255, the engine which faithfully powered Keith Scott and Carberry Dusting pilots through many hours of flight, was again mated to the fuselage of NC663K.²⁹ Bob Penny also contacted Keith Scott in Los Angeles, California, who graciously gave him all the paperwork and photographs that he had saved. Keith Scott also gave Bob Penny the name and address of Ancel N. Smith, his former mechanic who had maintained NC663K from the day it departed the Stearman Company factory until it was sold to

Right side view of NC663K shows the sleek lines of the graceful and powerful design of Lloyd Stearman (Kenneth D. Wilson)



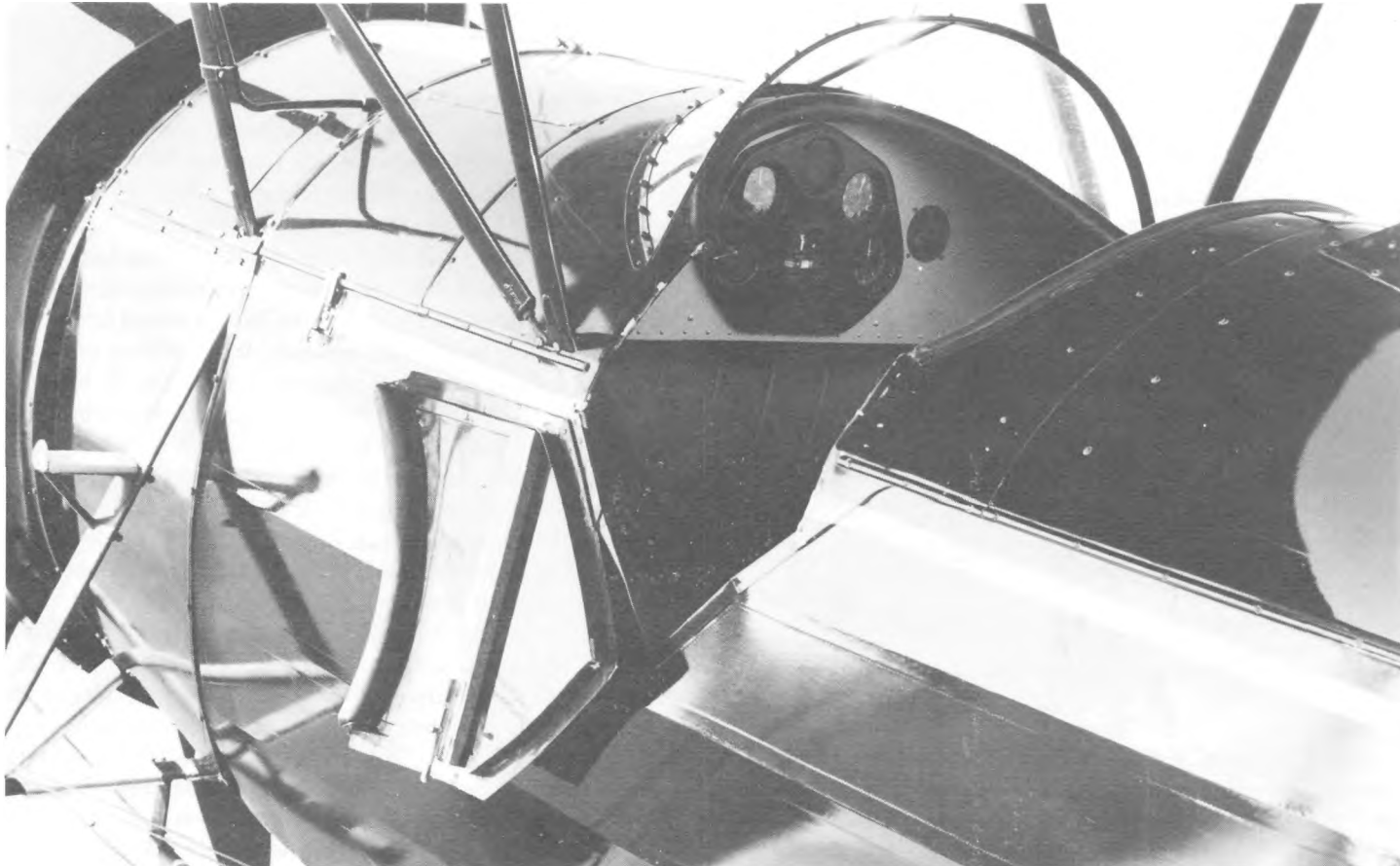
The fine workmanship of the restoration by Bob Penny is evident in this closeup of the forward right fuselage area. (Kenneth D. Wilson)

The large tail surfaces and beautiful black and yellow paint scheme highlight the excellent workmanship in the restoration of NC663K. (Kenneth D. Wilson)

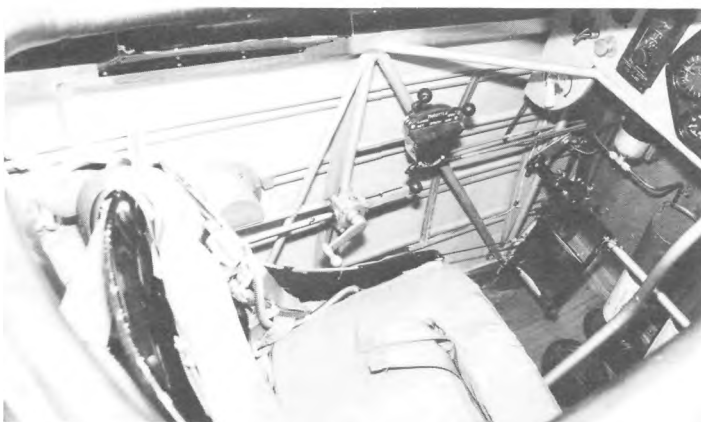


Closeup of engine cowling of Dan Wine's 4E shows the latches that failed and caused the cowling to be damaged while David Dacy was flying the airplane at Dacy Airport in Harvard, Illinois. (Kenneth D. Wilson)





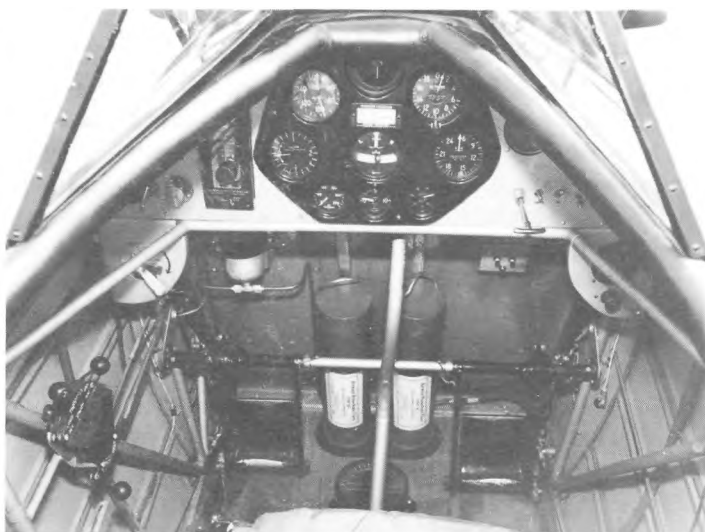
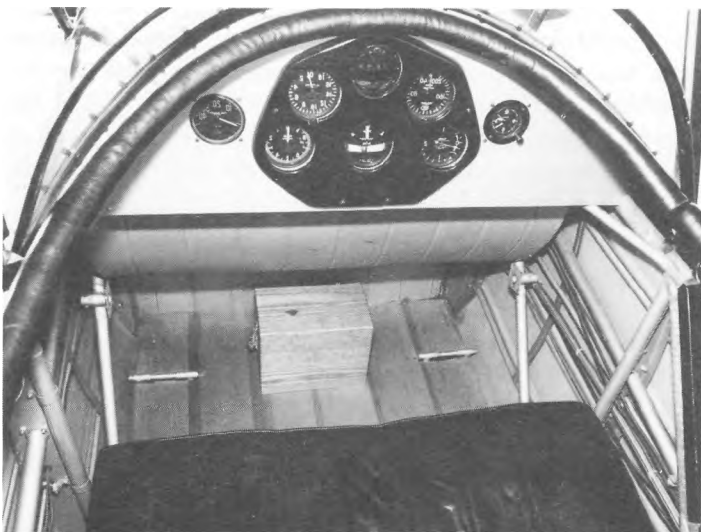
(Kenneth D. Wilson)



Left side of rear cockpit of Dan Wine's Stearman 4E. (Kenneth D. Wilson) Right side of the rear cockpit of NC663K.

(Kenneth D. Wilson)

Front cockpit and instrument panel of the restored Stearman 4E, NC663K, Pilot's cockpit and instrument panel of NC663K. Flare tubes are located on the owned by Dan Wine. (Kenneth D. Wilson) floor between the rudder pedals. (Kenneth D. Wilson)





Stearman 4E, NR783H, s/n 4020, was the number 3 Stearman in the Standard Oil Co. of California fleet. (Kenneth D. Wilson Collection)

Carberry Dusters during WWII. “Smitty” was intimately familiar with the Stearman 4E and was enticed from retirement to direct its restoration. Keith Scott also provided an exact scale model of his Stearman 4E—built in 1938—that was of great assistance to Bob Penny in returning NC663K to its original configuration.³⁰ Of the 40 Model 4 Stearmans built, none was exactly alike, varying in details such as instrumentation, lighting and the location of baggage pits and doors. All components of NC663K were re-covered with Stits Poly-Fiber fabric and refinished in its original black and yellow paint scheme.

After several years undergoing restoration, Stearman 4E, NC663K, once again took to the air in its original configuration at Brackett Airport on January 30, 1971.³¹ Since Bob Penny had never flown as large an airplane as the 4E, he selected G.E. Moxon, an experienced antiquer, to make the inaugural flight which lasted 50 minutes. Among those who witnessed its first flight were Bob Penny, A.N. Smith, Harold Dickey, who was largely responsible for its restoration, and Lloyd Stearman, who commented that the airplane was much larger than he had remembered.³² The second flight of the day carried A.N. Smith as a passenger and on the third flight, Bob Penny experienced the thrill of flying in the Stearman in company with Lloyd Stearman. In total, five flights were made on that day.³³ Bob Penny made his first solo flight in the Stearman on February 10, 1971, and later that month the airplane made its public debut at the EAA fly-in at Flabob Airport where it received the Grand Champion Award.³⁴ In May a nostalgic flight to Carberry Dusters in Fresno was made to exhibit the restored Stearman to its former owner while en route to the Watsonville AAA Fly In where it received the Grand Champion Award. On June 1, 1971, it also received the Grand Champion Award at the Merced AAA Fly In, completing a sweep of the major California antique fly-ins. After that fly-in, NC663K made what was to be its last flight for many years when Ray Stephen, who owns a rare Stearman YPT-9, flew it to Morgan Hill, California, where it was placed on display in the Flying Lady Museum. Total flight time since restoration was only 13 hours.³⁵

Stearman 4E, NC663K, remained at the Flying Lady Museum for the next six years until Bob Penny eventually decided to sell

it. Dan Wine, a United Air Lines captain in Denver, Colorado, had purchased a Navy N3N from Bob Penny several years before and had indicated to him since that time that he would like to have a chance to buy the 4E if it was ever put up for sale. Bob Penny informed Dan in 1977 that he would have his chance, but that there was another individual whom he also felt deserved an opportunity to buy it. Both were to submit a sealed one-time bid for the purchase, and whoever bid the highest would be the new owner of the only flying stock Stearman 4E. Dan Wine pondered for some length of time as to what the value of the 4E would be and how much he could afford to pay for it before submitting his offer. When both bids were received, Dan Wine’s bid proved to be \$100 higher and he owned the longed-for “square tail Stearman.”³⁶ Dan picked up the 4E at the Flying Lady Museum at Morgan Hill, California, on July 9, 1977, and made his first flight in it to Hollister where he made several practice landings before returning to Morgan Hill.

The following day he departed for Colorado via Love-Lock, Nevada, Salt Lake City, Utah, and Rock Springs, Wyoming. The flight manifested several problems which were to plague the airplane and the new owner for several years before finally being cured. Engine roughness and a vibration developed and subsequently the magnetos were checked at Salt Lake City, Utah, but were found to be all right. The flight continued to Rock Springs, Wyoming, where the engine was thoroughly examined and it was determined that there was a short in the ignition harness. Because of the terrain between Rock Springs and Denver, Dan did not want to continue the flight until the ignition was repaired. A mechanic friend flew into Rock Springs from Denver, and he and Dan bypassed the original ignition harness by externally wiring another harness onto the engine. The left brake also became inoperative due to the deterioration of the rubber seals over the years of storage in the museum. The flight was finally completed successfully with the landing at Van-Aire in Brighton, Colorado.

Dan Wine spent the next year rewiring the ignition harness and repairing the brakes as well as acquainting himself with the 4E and in fine tuning the many minor problems with the airplane that surfaced after flying again following six years’ storage in the museum. Dan’s long-awaited anticipation of flying the Stearman to the various major antique fly-ins was whetted and he planned his first long cross-country flight to the EAA Fly-In at Oshkosh, Wisconsin, in the summer of 1978. Those plans were dashed when Dan received a telephone call from his friend and mechanic who had decided to fly the 4E around the pattern as a final check prior to the departure for Oshkosh the next morning. The flight culminated in a disastrous ground loop accident which wiped out the landing gear and damaged the lower right wing—effectively canceling the flight to Oshkosh.

Most of the next year was spent in completing the necessary repairs to make the 4E airworthy again. Since parts for the early civilian model Stearmans are virtually nonexistent, the landing gear had to be rebuilt and the damaged longerons in the fuselage replaced. The wing was repaired and re-covered and eventually on July 11, 1979, it was once again ready for flight.³⁸ Hurried test flights were accomplished, once again in the hopes of attending the EAA Fly-In at Oshkosh as well as the AAA Fly-In at Blakesburg, Iowa, and the National Stearman Fly-In at Galesburg, Illinois. By the time Dan Wine was ready for the flight, NC663K still had amassed only 50 hours of flight time



Stearman 4CA, NS2, s/n 4001, was the first Model 4 Stearman built and was operated by the Aeronautics Branch and Airways Division, U.S. Dept. of Commerce, and flown by G.G. Budwig, Dir. of Air Regulation. (Edgar B. Smith)

Lloyd Carlton Stearman, founder of the Stearman Aircraft Co. and the designer of the Model 4. (Bob Steele)



Stearman 4DM-1, NC774H, s/n 4011, was the "Dispatch Ship" of Western Air Express and was used by Transcontinental Western Air executives for regular travel and emergencies in the operation of their airline. (Stearman Aircraft Co.)

Stearman 4E, NC791H, s/n 4023, was delivered to Standard Oil of Louisiana on August 13, 1930, and currently is being restored by the Antique Airplane Association Airpower Museum in Blakesburg, Iowa. (Charley Scheetz Collection)





Dan Wine and Deed Levy (in the cockpit) pose with Dan's Stearman 4E, NC663K, at the National Stearman Fly-In.

(Kenneth D. Wilson)

STEARMAN JUNIOR SPEEDMAIL 4E

PERFORMANCE

High Speed: 158 miles per hour
Cruising Speed: 128 miles per hour
Landing Speed: 53 miles per hour
Ceiling: 18,000 feet
Climb: 1400 feet per minute
Cruising Range: 650 miles

CONSTRUCTION

Fuselage: Welded steel
Cover: Fabric
Landing Gear Tread: 8 feet
Cargo Space: 43 cubic feet

APPROVED TYPE CERTIFICATE NO. 292

Open land biplane; 2 pass., 1 pilot.
Factory price, \$16,000

DIMENSIONS

Length Overall: 26 feet 4 inches
Height Overall: 9 feet 10 inches
Wingspan: 38 feet

AREAS

Wing Area
including Ailerons: 307 square feet

WEIGHTS

Weight Empty: 2434 pounds
Useful Load: 1502 pounds
Pay Load: 657 pounds
Fuel: 100 gallons
Oil: 10 gallons
Gross Weight: 3936 pounds



Deed Levy, who was the chief experimental test pilot for the Stearman Aircraft Co. for almost its entire corporate existence, poses in the cockpit of Dan Wine's Stearman 4E at the National Stearman Fly-In at Galesburg, Illinois, in September 1980.

(Kenneth D. Wilson)

since Bob Penny's restoration had been completed.³⁹

This trip was to prove to be a severe test of endurance and perseverance for both man and airplane requiring several months' efforts prior to their return home again. En route to Oshkosh a severe engine and propeller vibration developed which would continue to plague the Stearman throughout the summer which first manifested itself by causing a large piece to break entirely off the engine cowling. While at the EAA and AAA Fly-Ins, numerous suggestions were investigated to find the source of the vibration and engine roughness, but no solution was found. NC663K was temporarily hangared at Dacy Airport in Harvard, Illinois, and at Antique Airfield in Blakesburg, Iowa, for several months while Dan commuted back and forth to work in Denver while attempting to solve the problem. Numerous engine compression checks were taken, the engine cowling rebuilt and the propeller overhauled, but nothing cured the vibration. Eventually, in late September 1979, Dan Wine and the 4E returned to Boulder, Colorado.

That winter Dan Wine met Ken Burnham, a retired A&P mechanic who had worked at the Pratt & Whitney engine plant in the late 1920s and early 1930s and who most likely had helped in the original assembly of NC663K's engine. He agreed to work on the engine and found that during restoration incorrect jets had been installed in the carburetor and that the engine had been running very lean, dangerously close to the detonation range, resulting in the severe engine vibration. When correct jets were eventually found and installed, the engine became a smoothly running, efficient powerplant.⁴⁰

During the summer of 1980, Dan Wine and his Stearman 4E, NC663K, attended the National AAA Fly-In again and also became the first "square tail" Stearman to attend the National Stearman Fly-In where the 4E drew considerable attention and greatly impressed everyone with its performance, size and history.

The Stearman Model 4 was the last of the line of the large single-engine, open cockpit biplanes that blossomed during the early 1930s and was the epitome of grace, styling and performance. A biplane with a 38-foot wingspan that cruised at 128 mph, with a maximum speed of 158 mph, much better than many modern light airplanes of today, truly was a superior airplane in its own day and amazing to those today who have been privileged to see it in flight. It is fortunate that at least this one example remains in flying condition so that today's generation may experience the sight and sound of this unique airplane.



Dan Wine poses in the cockpit of his Stearman 4E, NC663K, at the National Stearman Fly-In. Aircraft data plate is mounted on outside of the rear cockpit sheet metal cowling.
(Kenneth D. Wilson)

16. CAA Repair and Alteration Form ACA-337 and NC663K Aircraft logbook, February 18, 1950.
17. *op. cit.*, Aircraft logbook, May 11, 1951.
18. *ibid.*, July 21, 1952.
19. *ibid.*, 1954.
20. CAA Major Repair and Alteration Form ACA-337, August 9, 1955.
21. CAA Major Repair and Alteration Form ACA-337 and logbooks, May 2, 1958.
22. *op. cit.*, logbooks, March 19, 1958.
23. *ibid.*, March 10, 1959.
24. *ibid.*, 1961.
25. CAA Major Repair and Alteration Form ACA-337, February 14, 1963.
26. *op. cit.*, logbooks, October 31, 1964.
27. Bob O'Hara, "Rebirth of a Bull Stearman," *Sport Flying*, Vol. 4/No. 10, December 1970, pp. 36-37.
28. FAA Major Repair and Alteration Form 337, December 15, 1968, and June 1, 1969.
29. *ibid.*, January 15, 1970.
30. *op. cit.*, *Sport Flying*, p. 40.
31. *op. cit.*, logbooks, January 30, 1971.
32. Bob O'Hara, "The Bull Flies," *Sport Flying*, Vol. 5/No. 4, August 1971, p. 38.
33. *op. cit.*, logbooks, January 30, 1971.
34. *ibid.*, February 10, 1971, and February 28, 1971.
35. *ibid.*, May 14, 1971; June 1, 1971; and June 3, 1971.
36. Dan Wine, Boulder, Colorado, personal interview with the authors at Crystal Lake, Illinois, August 5, 1979.
37. *op. cit.*, logbooks, July 9, 10, and 11, 1977.
38. FAA Major Repair and Alteration Form 337, July 11, 1979.
39. *op. cit.*, logbooks, July 20, 1979.
40. Dan Wine, Boulder, Colorado, personal interview with the author via telephone, April 15, 1980.

NOTES AND REFERENCES

1. Peter Westburg, "Stearman 4E," Part One, *Model Builder*, December 1978, p. 37.
2. Mitch Mayborn and Peter Bowers, *Stearman Guidebook*, Dallas: Flying Enterprise Publications, pp. 15-18. ATC-304, -325, -305, -326, -292 and -322.
3. Stearman Aircraft Company Construction Program, November 12, 1929.
4. Stearman Aircraft Company Purchase Invoice Number 2718, February 12, 1930.
5. Boeing Airplane Company Report Number 8820, Serial Numbers, October 30, 1943, Revised October 1, 1962, pp. 13-14.
6. NC663K Aircraft Logbook, August 25, 1930.
7. NC663K Aircraft and engine logbooks, various dates between November 25, 1930, and December 18, 1933.
8. *op. cit.*, logbooks, March 22, 1939.
9. CAA Repair and Alteration Form 18-1, September 19, 1939.
10. *op. cit.*, logbooks, March 22, 1939.
11. CAA Aircraft Bill of Sale, Stearman 4E, NC663K, serial number 4005, August 4, 1942.
12. Flight Authorization form letter to Malcolm Carberry from C.S. McBrien, Chief, General Inspection Branch, December 3, 1942.
13. *op. cit.*, Aircraft logbook, December 10, 1942.
14. *ibid.*, June 30, 1944.
15. *ibid.*, June 14, 1945.

ABOUT THE AUTHORS

This is the first collaboration on an article for the *Journal* by Tom Lowe (left) and Ken Wilson, but each have had other articles published previously. Ken Wilson's article, "The National Stearman Fly-In," appeared in the Spring 1977 issue, and Tom Lowe has had several articles published including "The Flying Aces Air Circus," which received both the Willis L. Nye Award and the Contributor's Award for 1977. They have been cooperating on research into the Stearman Aircraft Co. for several years and plan to co-author a book on the history of the Stearman Co. and all the airplanes produced by it. Ken Wilson is an employee of Alcoa Aluminum Co. in Evansville, Indiana, and Tom Lowe is a pilot for United Air Lines in Chicago, Illinois.

