



THE WINGS OF WALDO DEAN WATERMAN

By ERNEST L. TRUE

The words above, on a bronze plaque attached to a granite marker located at the corner of Albatross and Maple Streets in San Diego, California, pay tribute to the man who is recognized, through records kept by The Early Birds and by current Federal Aeronautics Authority records, as America's senior, licensed Commercial Pilot.

Born June 16, 1894 in San Diego, Waldo had a grandfather who had been the 18th governor of California, a mother who was an accomplished artist and who would become a renowned architect in Southern California, and a father who was managing the San Diego, Cuyamaca & Eastern Railroad at the time of his death in 1903.

During 1894, the Corps of Army Engineers awarded a contract to build the first unit of a jetty at North Island to control the incoming tide from carrying sand into the main channel of the harbor. The work of building this jetty was continued whenever Congress appropriated funds, and was finally completed in 1904. During this construction period the San Diego, Cuyamaca & Eastern Railroad was employed to haul in granite boulders from mountain quarries. During the ten years of work, Waldo often accompanied his father and explored the island while the train was being unloaded.

The maintenance shop of the railroad gave Waldo the opportunity to observe mechanical craftsmanship, developing within him a fascination for this type of work that was to influence his entire life. After his father's death, he spent his available free time at Hunt's Machine Shop where he was taught lathe operation, pattern making, foundry work and automobile mechanics. The Hunt brothers had hand-built several automobiles in their shop for local customers.

By the time he entered San Diego High School in 1908, Waldo had combined the lure of kite flying with his love of mechanical craftsmanship and developed a deep interest in flying. Following the aerial achievements of the Wright brothers and Glenn Curtiss, he soon reached the point where he knew he had to try to fly himself.

In the April 1909 Popular Mechanics magazine there appeared plans for a Chanute-type biplane glider. Purchasing the materials, he built his glider in the wood-working shop of the high school. It was finished in the early summer of 1909, and he sought the best location for gravitational flight--or as Waldo refers to it today, getting airborne successfully "from up there down to there." The steep canyon slope at the dead ends of Albatross and Maple Streets offered the proper characteristics, and it was there that Waldo was able to successfully glide from the top to the bottom on July 1, 1909.

Highly pleased with this flight, he continued making flights with a critical mind toward improving them. His first endeavor was the design and installation of between-the-wings ailerons to aid in overcoming a lateral skidding action. Satisfied with the better control, he devised a catapult system in an effort to obtain longer flights, but this was not successful. The automobile tow-off method was tried and this led to some longer flights along 6th Avenue during the remainder of the summer.

In the Fall of 1909, Dick Ferris began promoting the January 1910 Dominguez Air Meet at Los Angeles ① and listed \$5,000 in prize money for California amateurs. Today Waldo is convinced that part of the promotional plan was to add an extra cipher to all the prize amounts.

Having studied all the available information on both the Wright and Curtiss airplanes, Waldo designed his first powered aircraft with qualities he felt were the best of each. Anxious to have it completed in time for the air meet, he asked a friend, Kenneth Kendall, to join him. Unfortunately, this was not enough help to enable him to have the airplane ready in time for the meet.

Waterman and Kendall, however, attended the air meet and, with their "ENTRANT" pass, were allowed into the infield. It was here that Waldo first met Glenn Curtiss.

After establishing their misfortune in being unable to complete their own airplane, Curtiss was taken with their sincerity and made a place for them in his camp. Here they were allowed to help chief mechanic Henry Klecker assemble a Curtiss Pusher that had just been purchased by Frank Johnson. By the time that the meet drew to a close, the two boys had picked up quite a wealth of experience and were eager to return to San Diego and finish their own airplane.

Before they left, Curtiss asked Waldo many pertinent questions regarding the San Diego area, particularly about any large flat fields and smooth beaches. Waldo, with his first-hand knowledge of North Island, was able to present a detailed report on this area.

Back in San Diego, Waldo and Kenneth resumed their work, and in the February 12, 1910 San Diego Union the following excerpted comments appeared on the front page, with a halftone of the Waterman-Kendall airplane.

"In general lines the partnership machine is much like the Curtiss aeroplane but it embodies several new ideas. One of these is the arrangement by which the three wheels may be folded up under the machine. This is controlled by the same lever that shuts off the engine preparatory to landing. This allows the machine to alight upon its skids, thus reducing the chance of wheel collapse as has been experienced on the Curtiss machine. It further makes unnecessary the starting carriage employed with the Wright machine used for its take-offs and often inconveniently miles away from the landing site of the aeroplane.

"Waterman and Kendall are trying to secure the use of the engine (a 4 cylinder, 25 hp Cameron engine) which Charles F. Walsh had in his unfortunate monoplane."

Circumstances prevented the acquisition of the Cameron engine, and a 2 cylinder Speedwell engine was obtained. Taking the airplane to Coronado Polo Field in March 1910 for testing, it was quickly apparent that the Speedwell would not develop enough power to lift the airplane. Resorting to the automobile tow-off, it became possible to get into the air and make short straight away flights. Waldo did the preliminary piloting as he had the former glider flying experience.

Convinced that their airplane was structurally safe, Waldo instructed Kenneth on the flying procedure and then watched while he was towed aloft. As Kendall was about to land, the airplane got out of his control and came to earth with a crash that demolished the landing gear structure and the rear spar of the lower wing.

Repairs were completed in April 1910 and flying was resumed at the Coronado Polo Field. Taking his place at the controls, Waldo made several flights. On the last of these, he released the tow rope and then saw the rope become entangled in the forward structure. Before anyone had a chance to take any corrective measures, the airplane and Waldo were hauled abruptly back to earth. The Waterman-Kendall airplane was demolished and both of Waldo's ankles were badly fractured.

While Waldo convalesced, the Coronado Beach Company granted Glenn Curtiss permission to use a certain area of land on North Island for a period of three years, without any charge or obligation, for a proposed aviation school. Sage and other brush were cut down so as to level off the 500 foot runway and make an area to erect three buildings for shops and hangars. Curtiss established his aviation school at North Island on February 2, 1911. (2)

As soon as Waldo was able to get back on his feet, he went down to North Island to renew acquaintances with Glenn Curtiss. Soon he was helping with the operation of the flying school. Eager to learn and willing to help, Waldo soon made many friends. Charles C. Witmer was Waldo's special pal, and he gave Waldo an airplane ride around North Island. Waldo was the second passenger that Witmer had ever carried.

In the spring of 1911, Curtiss returned to Hammondsport, New York leaving Waldo in charge of the remaining

equipment at the flying school. A training airplane, affectionately known as "Lizzie", was left and in this plane Waldo acquired more experience flying around the island. Later in the summer the compression fell below flying power, so Waldo removed the engine and hauled it up to the automobile engine repair shop at his home to give it an overhaul. Curtiss at the same time sent a wire asking that the engine be crated up and shipped to Hammondsport, New York at once. Packing it in a heavily built wooden crate, Waldo called Wells Fargo and had the engine shipped. Surely, Waldo has always thought, the shipping charges were far in excess of the actual value of the worn-out engine, but Curtiss never mentioned the matter again.

With his aerial activity halted for the remainder of the summer, Waldo set about to build his second powered airplane. It was a tractor biplane he had previously designed and was powered by Charles Walsh's Cameron engine. It proved to be airworthy, but the engine had overheating problems which prevented any sustained flights. While attempts were being made to overcome this problem, a sudden windstorm struck North Island one night during February 1912. The wind rolled the airplane into a ball of muslin, wires and struts.

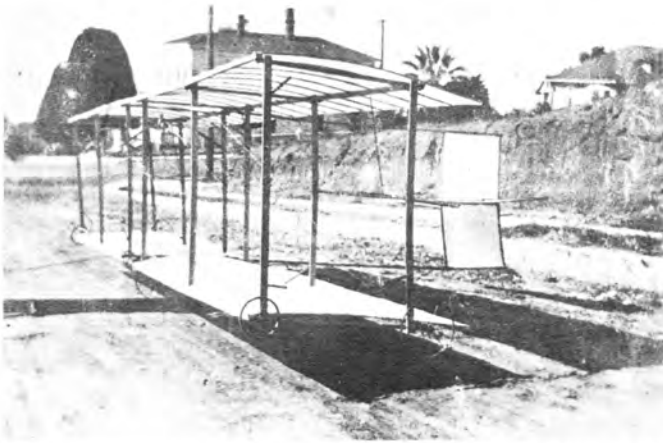
In January 1912, the Air Section of the United States Navy arrived at North Island and Waldo was in the midst of the aerial activity. At this time, the Navy had a Wright Hydro Aeroplane, the B-1, a Curtiss Hydro Aeroplane, the A-1, and a Curtiss Landplane, the A-2. It was the B-1 that was to crash into San Diego Bay and associate Waldo with the destruction of one-third of the United States Navy's airpower.

Ensign Victor D. Herbster and Waldo developed a companionship that led to their taking a flight around North Island in the Wright B-1. This, Waldo felt, was worthy of recording on film and, after landing, he suggested attaching a camera to an outer strut. Then, by means of a string fastened to the shutter release, they could take their photograph as they flew over the water. The camera set-up was accomplished a few days later and they took off. The B-1 climbed quite sluggishly to 600 feet, but they passed off the performance as due to the drag of the camera near the wing tip. Their plan was to go into a gentle dive, bank steeply over the island beach and snap the photograph. This would show the two flyers with the island and water in the background below.

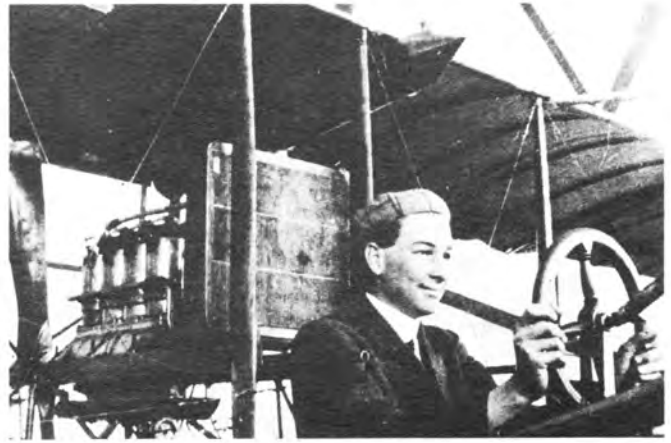
The gentle dive suddenly took on the proportions of an uncontrollable maneuver as water that had previously leaked into the pontoons rushed forward within the pontoons. (There were no bulkheads in the pontoons at that time.) Fighting to prevent a disastrous crash, Herbster was able to bring the nose up enough to hit the water at a 45 degree angle. The pontoons absorbed the force of the impact and caused the airplane to turn over on its back, submerging the two flyers. Entangled in wires and struts, it was only their ability as excellent swimmers that enabled them to stay below the surface until they could free themselves.

Glenn Curtiss, who was in a motor launch nearby, came up to the scene of the crash and after finding that the two men were safely clutching the still-floating pontoons and were unhurt, began taking photographs of the demolished Wright. Curtiss was a great camera fan and wasted no time in taking photographs of William Atwater's Curtiss Hydro "rescuing" the Wright flyers as it flew close by the wreck. The two men were finally picked up by a Naval boat that "chugged" out from shore at some four knots per hour.

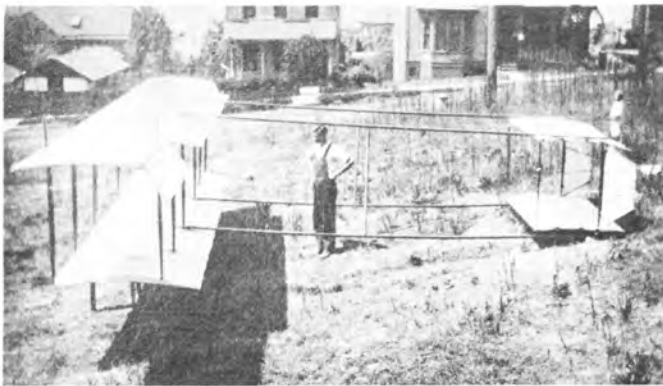
After graduation from San Diego High School in June 1912, Waldo wanted to become an exhibition flyer, but Glenn Curtiss convinced him that this type of pilot was becoming quite plentiful. Instead, Curtiss convinced him that the real need in the aviation industry was for engineers. With the background of having built a glider and two airplanes, and much to his mother's satisfaction, he enrolled in the Mechanical Engineering Department at the University of California, Berkeley campus in Sep-



Waldo Waterman's hang glider in July 1909, modified with wing tip wheels which he applied after several flights in the machine. (Paul R. Matt Aeronautical Collection)



Waldo in the Curtiss Pusher "Lizzie" at North Island, June 1911. Flights in this aircraft were more like ground hops due to the low-powered engine. (Paul Matt)



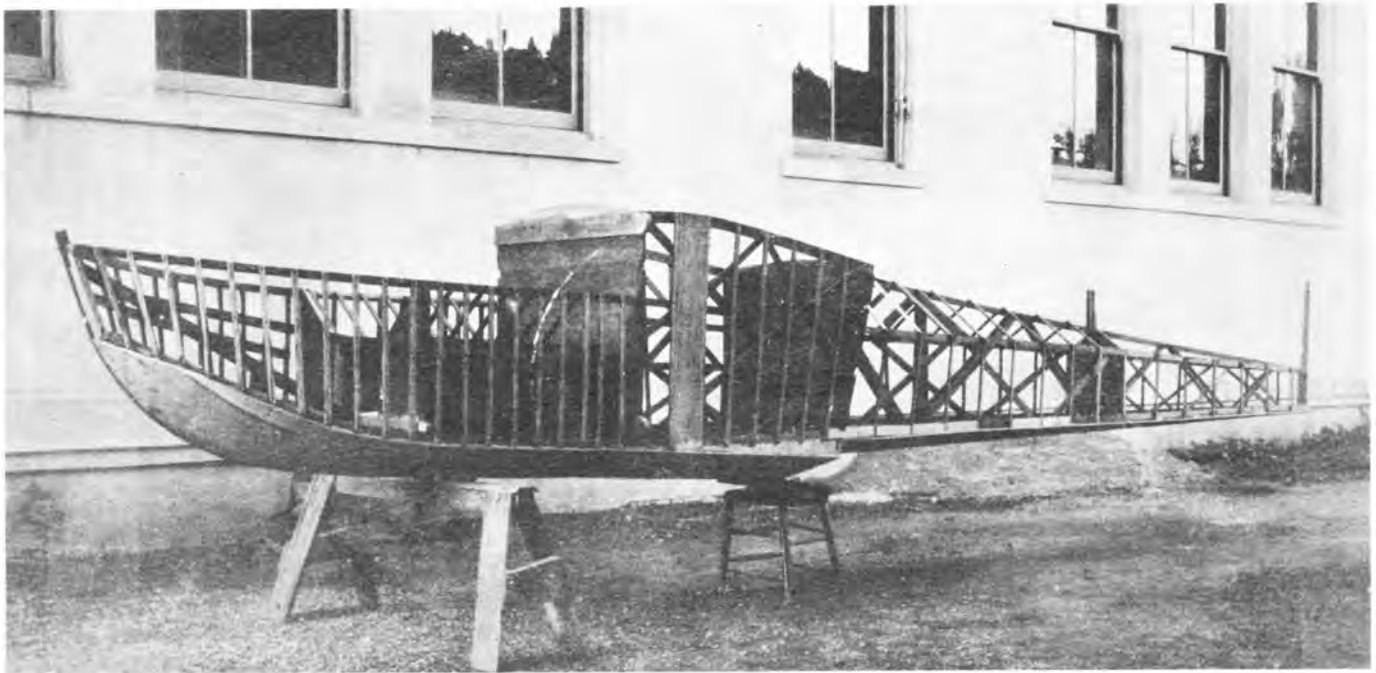
The Waterman "Tractor" of 1911/12 under construction in a vacant lot near his home in San Diego. (Paul Matt)



The "Tractor" at North Island, 1912, with Waldo by the propeller. Engine was 20 hp Cameron. (Paul Matt)



Wreck of the Navy Wright B-1 after crash by Ensign V. D. Herbster and Waldo Waterman in 1912. (U. S. Navy Photo)



The Waterman Flying Boat at its furthest point of construction in 1913. It was created to fly passengers between Oakland and San Francisco during the 1915 Panama Pacific International Exposition. (Paul Matt)

tember of 1912.

During his Freshman year, he designed a flying boat with the commercial possibilities of flying passengers between Oakland and San Francisco during the Panama Pacific International Exposition to be held in San Francisco in 1915. The project and its intention was written about in the University of California newspaper and came to the attention of Mr. Walter Seaborn, City Clerk in Berkeley, California. Seaborn offered Waldo encouragement, financial aid and even the use of a Hall-Scott 80 hp engine. Waldo could hardly believe it all, but Seaborn sounded so sincere there was nothing to do but proceed. Selecting a few fellow-students he knew to be competent, work was commenced on the flying boat.

Summer vacation of 1913 saw most of his help leave for home, but Waldo was determined to stay in Berkeley and continue work. Looking around for a part-time job, he applied at the Hall-Scott engine company and was hired. This led to his acquaintance with Al Hall and Lee Scott, and the Seaborn proposal was brought up. Neither Hall nor Scott had ever heard of Seaborn nor of any plan to furnish an engine. Further investigation

showed that while Seaborn may have been "thoughtfully" sincere, his actual grasp of such a project was one of inexperience. Waldo was unable to secure any other financial aid for the flying boat, so the construction and idea were abandoned, although the hull was nearly completed.

The flying boat was to have been a twin tractor with two propellers driven with a chain and sprocket arrangement from the engine located within the hull. The hull design was well advanced for the day with a V-bottom and the step well aft of the center of gravity.

The remainder of Waldo's college years were spent in varied aviation pursuits. He aided Adolph Sutro, Jr. of San Francisco with the final rigging and completion of his hydro-aeroplane and worked for the Patterson Aeroplane & Supply Company putting a new bottom on Roy Francis' flying boat after its return from a Great Lakes air tour. He also worked for T. C. Macaulay in beefing up Horace Kearney's old Curtiss Pusher so that Macaulay might attempt a loop-the-loop (he never did in this aircraft) and aided in the investigation of Lincoln Beachey's fatal crash.



Early employees stand before the Waterman Aircraft Manufacturing Company building, Santa Monica. (Paul Matt)



LePere LUSAC-11, highly modified by Waldo into a 3-place executive aircraft, became Waterman 3-L-400. (Paul Matt)

After finishing college in June 1916, Waldo became a full time employee with Hall-Scott and was working there when the United States made its declaration of war in April 1917. Leaving at once for North Island, he offered his services to the Aviation Section of the U. S. (Army) Signal Corps but was declared unfit for flying duty because of his accident-weakened ankles.

Colonel Thurmond H. Bane, an old friend, then second in command at North Island, tried to intervene on Waldo's behalf, but met with no luck. Rather than let Waldo's abilities go unused in the war effort, Colonel Bane suggested that Waldo return to the University of California at Berkeley and instruct Army Air Cadets in the general art of aeronautics. On June 15, 1917 Waldo became head of the Department of the Theory of Flight at the U. S. School of Military Aeronautics at Berkeley.

The repetitious lecturing became boredom beyond the bearing of an active man, and after a few months, and 600 students, he began looking for more productive fields in the war effort.

Early in 1918, the United States Aircraft Corporation bought the Christofferson aircraft factory in Redwood City, California and began looking for experienced personnel. Waldo applied for work; was first hired as Purchasing Agent, then Chief Engineer, and worked up to General Manager. This plant was one of the few to fulfill their contract of 100 Curtiss JN-4s within the specified time.

After the Armistice, Waldo was retained by the corporation to liquidate the plant and materials. Through the court order for liquidation, Waldo was able to purchase much of the materials for himself. Finally disposing of the balance, he loaded his own purchases into a boxcar and left for Venice, California.

He leased a part of the Crawford Airplane & Supply Company building, and the Waterman Aircraft Manufacturing Company was established early in 1919. With the JN-4 parts and jigs, a Hisso-powered Jenny was built for millionaire real estate man, L. C. Brand. Similar orders followed, and the company soon moved into larger facilities at the corner of Third and Sunset in Santa Monica, California.

In 1920 Mr. Brand asked Waldo to build him a larger and more powerful aircraft. Factory drawings for the U. S. Army Le Pere (LUSAC-11), were obtained, but the design was extensively changed to meet Mr. Brand's requirements. The passenger cockpit was fashioned into comfortable accommodations for two with luxurious upholstery, carpeting and refreshment lockers. Further refinements and modifications gave justification to changing the name to the Waterman 3-L-400 (3 seater, Liberty 400 hp).

In 1921 movie director Cecil B. DeMille was nearly as active in aviation as he was in the motion picture industry (Mercury Aviation), and he was anxious to have a racing airplane for the Los Angeles International Air Tournament. Powered with a Curtiss OX5 engine, a machine was designed and built for the purpose of being raced in the Curtiss Cup Race. Construction began April 1, 1921 and on June 6, the "Gosling" was ready for flight. Pilot Eldred R. Remelin was chosen to race the airplane, but failed to win due mainly to Emory Rogers, in the Pacific Standard C-1, cutting the pylons just a little closer each time around.

Commercial aviation failed to develop in the manner that aviation enthusiasts expected, or hoped that it would, and about the only progress being made, and that very slowly, was in the military field. Going to Washington, D.C., Waldo conferred with Naval Constructor, Captain Holden C. Richardson. The topic of discussion was the coming Naval competition for torpedo aircraft. Waldo had begun a preliminary design and as a result of this meeting, felt quite certain that he was on the right track. Anxious to get back to California and work on his torpedo airplane design, he boarded the first train west.

This train out of Washington also carried General "Billy" Mitchell and his staff who were en route to McCook Field in Dayton, Ohio. Lt C. C. Moseley, a WW I student of Waldo's and now on the General's staff, encountered Waldo on board and introduced him to General Mitchell. The General and Waldo discussed aviation for many miles and Waldo learned that the Army was going to call for bids on the manufacture of 200 Thomas-Morse



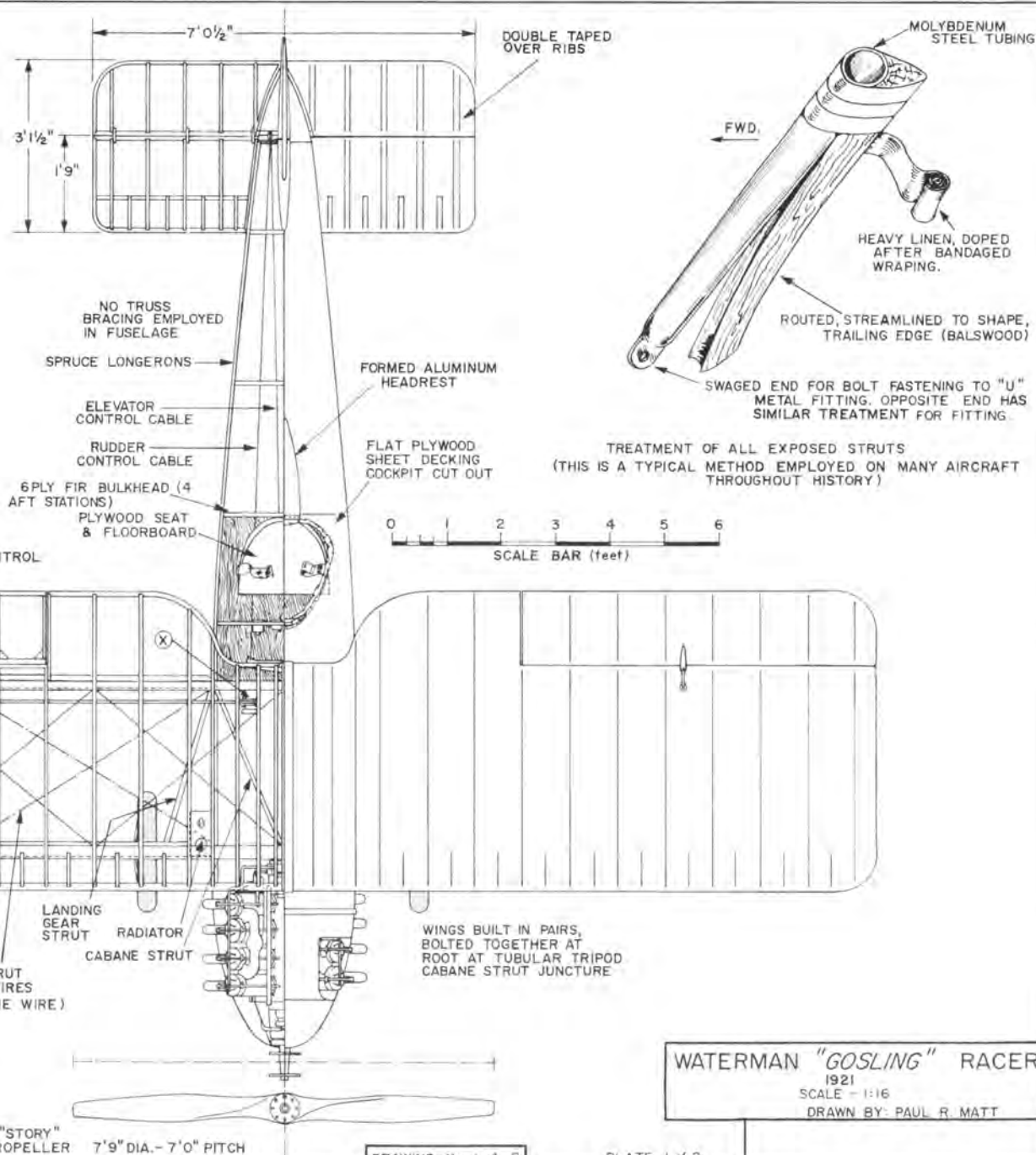
Waldo stands before the "Gosling" racer built for movie-film director Cecil B. DeMille, July 1921. (Paul Matt)

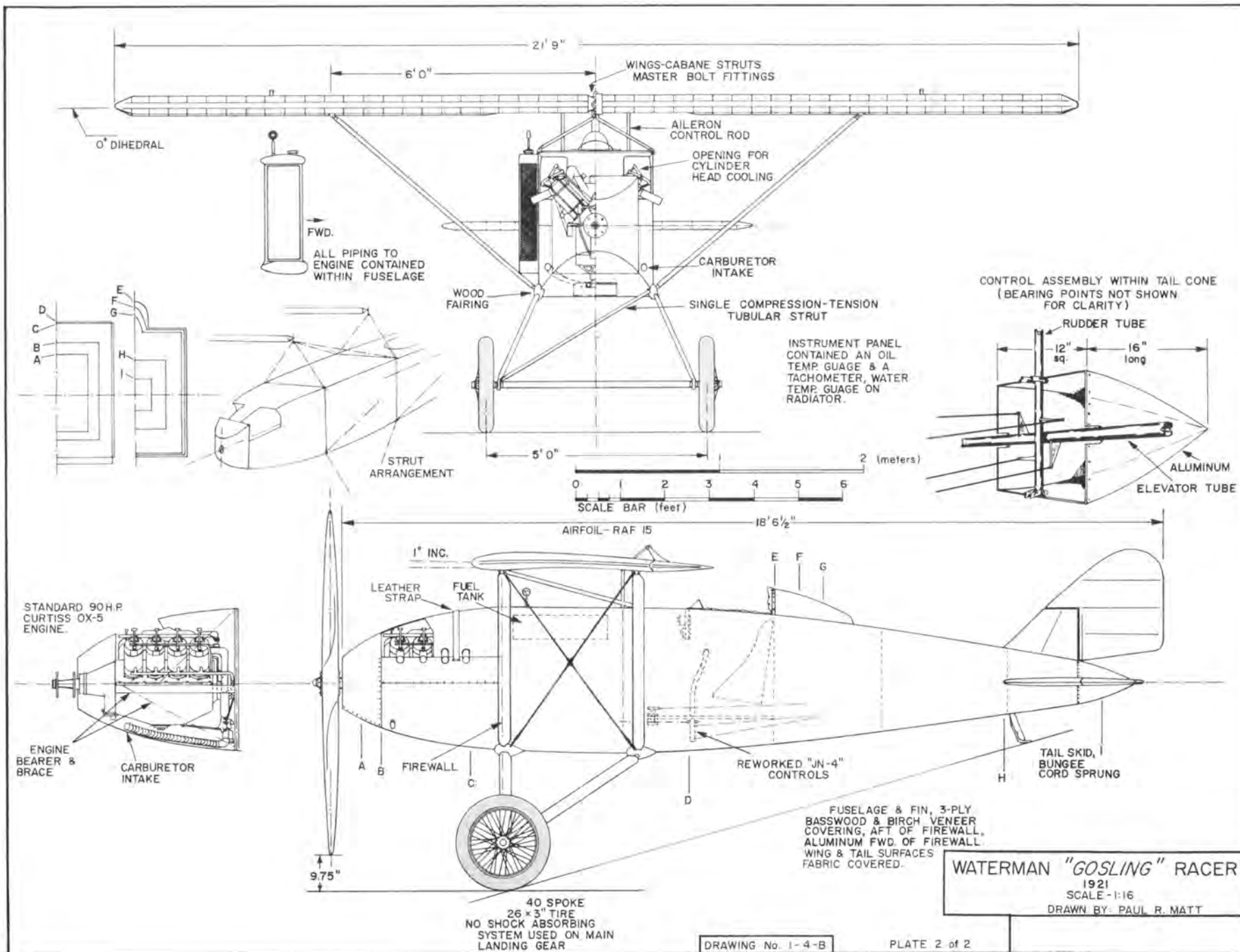
GENERAL SPECIFICATIONS

WEIGHT EMPTY	885 lbs.
USEFUL LOAD	245 "
GROSS WEIGHT	1130 "
FUEL CAPACITY	10 gals.
OIL CAPACITY	3 "
SPEED, MAX.	136 mph
LANDING SPEED	60 "
CRUISING SPEED	110 "
WING AREA	112 sq. ft.
WING LOADING	11.1 lbs./sq. ft.
POWER LOADING	12.5 lbs./H.P.
RANGE AT CRUISING	135 miles

COLORING:

FUSELAGE & ALL STRUTS - GLOSS BLACK
WING & TAIL SURFACES - CRIMSON RED
NO LICENSE OR LETTERING EMPLOYED







Waldo, left, with Waterman modified Boeing C of the Big Bear Lake Airline meeting Los Angeles bus. (Paul Matt)

MB-3 pursuit airplanes. This, according to General Mitchell, would be divided into lots of 50, or possibly 100, so that the work would be spread out among the nation's aviation companies.

This had a far more attractive appeal than the construction of three experimental Navy torpedo airplanes, so Waldo left the train at Dayton, Ohio and spent three days at McCook Field inspecting the prototype MB-3 and calculating the production costs. Then he was off to California again to make many necessary arrangements, production-wise and financial-wise. Satisfied that he was ready to meet the proposed contract specifications, he mailed in his bid to Washington. The Waterman Aircraft Manufacturing Company had submitted the lowest bid on 50 and 100 units, but Boeing had submitted an even lower per unit bid on the entire 200 and was awarded the contract.

Meanwhile, the Navy had let its three torpedo airplane contracts of three airplanes each, including one to Douglas, so the financial backing that Waldo had lined up for the MB-3 project swung over to Douglas. This collapse in business arrangements brought about the closing of the Waterman Aircraft Manufacturing Company in the summer of 1921.

During the remainder of 1921 and into 1922, Waldo developed and patented a frost-dispelling machine, utilizing surplus airplane engines and propellers. Seventeen years later, when Waldo's patents expired, they became quite indispensable in Southern California citrus groves. Chase Story, a manufacturer of propellers, looking for a market, was happy to become an associate with Waldo.

During 1922, Waldo purchased a surplus Jenny and started flying anyone anywhere. This business included passengers, real estate salesmen, aerial photography, movie flying, leaflet throwing, barnstorming and flight instruction.

A flying club in Ontario, California purchased a new Jenny still in the original crate. They asked Waldo to assemble it and give them flying lessons in it. The club prospered and the members became affluent enough to afford an airplane for themselves. A surplus auction in San Diego provided Waldo with the opportunity of buying six Boeing Model C seaplanes for \$150 each. Trucking them back to Ontario, he converted them into landplanes and sold them to the club members for \$500 each.

The Ontario airport was improved, hangar facilities added and Waldo became General Manager of the operation, incorporated as Ontario Aircraft Corp.

During this period, Waldo would buy surplus military aircraft and convert them, or refurbish them, to more civilian-like configurations. One of his favorites was making a two-seater out of a Thomas-Morse Scout. By offsetting the seats, staggered side by side and replacing the rudder bar with stirrups, it became possible to

squeeze two people inside.

As aviation continued to grow in the 1920s, those in the know realized that the government was becoming serious about airmail contracts. With this thought in mind, Waldo left for Washington, D. C. to confer with Assistant Postmaster General Harry S. New. The gist of this meeting was that established airline operators would supposedly be given preference for airmail contracts over certain approved routes.

Back at Ontario, Waldo flew one of the airplanes up to Big Bear Lake in the San Bernardino Mountains. Talking with people in the Big Bear Lake area, he learned that they would be highly receptive to cooperating with him in establishing an airport and receiving sportsmen from the Los Angeles area. The one road into this fabled sports area was a long and tedious mountain drive, but flying in, there was no telling how big this venture might grow.

Several of the Boeing Cs were pooled from the Ontario flying club and converted into four passenger, plus pilot, airplanes. The summer of 1924 found the Big Bear Lake Airline in business, but Waldo was not completely satisfied with the performance of the 180 hp Hiss engines. If the temperature rose excessively at Big Bear Lake, it became tricky to take off at that 7,000 foot elevation with a full load. The 260 hp watercooled Salmson had about the right weight and the right power, so Waldo installed one on a Boeing C. The increase in performance was adequate and it was purely accidental that Waldo found out that this engine could be converted to aircooled. On an air trip to Chino, California, the Salmson blew up and the parts had to be shipped back to Ontario in a basket. During the rebuilding, Waldo became aware of the possibilities and finally ended up with an engine comparable in configuration and weight per hp to the current Wright Whirlwind, and at a considerable monetary savings.

During 1925, the Big Bear Lake Airline became associated with the Motor Transit Company of Los Angeles for the purpose of allowing passengers to purchase tickets at the bus depot, be "bussed" to the Ontario Airport and flown up to Big Bear Lake.

With airmail contracts due to be awarded upon the selection of qualified bidders, Waldo felt the Big Bear Lake Airline flew over some of the most rugged terrain that would be encountered between Los Angeles and Salt Lake City and the newly converted aircooled Salmsons were capable of government acceptable standards of performance.

The Ford dealers of southern California, plus Harry Chandler and his Los Angeles Times, got together and formed Western Air Express. This group intended to use Ford-Stout, Liberty-powered AT-2s. These aircraft were unacceptable to government standards because of the reasonable doubt that they were too underpowered to travel fully loaded over the mountains. This gave Harry Chandler



Another Waterman modified Boeing C with 180 hp Hisso engine at Big Bear Lake, circa 1924-25. (Paul Matt)



Waldo Waterman and his wife, Carol, standing by modified Boeing C with Salmson engine installed. (Paul R. Matt)

the opportunity to insert the new Douglas M-2 as Western's equipment. This left many Ford heads rolling, but it won the airmail contract for Western Air Express from Los Angeles to Salt Lake City.

There are two versions of the bids submitted to the Post Office Department. In one Waldo states: "Ontario Aircraft Corporation submitted a bid of .0731 cents per ounce. Western Air Express submitted a bid of .08 cents per ounce." According to *Aviation* magazine, Volume XIX, number 13, September 28, 1925, page 382: "For the Salt Lake City-Los Angeles route, Western Air Express submitted a bid of 80% of the postage. Ontario Aircraft Corporation submitted a bid of 73.1% of the postage."

The figures are the same, there is a difference in interpretation, but the award went to Western Air Express. From *Aviation* magazine, volume XIX, number 16, October 19, 1925, page 552:

"Salt Lake City - Los Angeles airmail contract awarded to Western Air Express. Ontario Aircraft Corporation, Ontario, California - This bid was not favorably considered because it was decided that the successful bidder was better able to fulfill the contract."

Big Bear Lake Airline's days were numbered by early 1926, new and improved roads were being built into the mountain resort area and people began enjoying the driving independence of their own automobiles. Waldo looked around for a new aviation venture.

The Bach Aircraft Company was preparing to design and build the world's fastest tri-motored transport and needed an economical, yet powerful engine for the nose. The air cooled Salmson seemed like a logical solution and Waldo was called. He sold them an engine and went over to Bach in Santa Monica.

L. Morton Bach had formerly worked for Waldo back in 1919, and now it was Waldo's turn to work for Bach.

He was hired as Chief Pilot and Experimental Engineer. The first Bach Trimotor was finished and successfully test flown on October 5, 1927 at Clover Field, Santa Monica, California.

It was about this time that the City of Santa Monica purchased Clover Field and leased the manufacturing area to Douglas Aircraft. Waldo was asked to design a new airport to be located in the San Fernando Valley. It was called the Los Angeles Metropolitan Airport and is still very much in use today as the Van Nuys Airport. Waldo became Airport General Manager in 1928 and many of his "tenants" were celebrities who based their planes at the field. They included Wallace Beery, Bebe Daniels and Ben Lyon, Ken Maynard, Howard Hughes and "Pancho" Flo Barnes. Three factories were there--Bach, Apache Motor Corp. and Commercial Aircraft Corp.

As Chief Pilot for Bach, Waldo took a Bach Trimotor with 2220 pounds (1000 kilograms) of dead weight up to 20,800 feet on July 26, 1929. This established a new American payload record and the first official altitude record for a trimotor. The flight required two and one half hours and was accomplished with an oxygen "smoking set"--no mask, just the stem of the oxygen hose clenched between the teeth. At the 1929 National Air Races, Waldo flew a Bach Trimotor to first place in the Multi-engine Race with an average speed of 136.41 mph.

Aviation, flying and the world were pretty wonderful in the late summer of 1929, and Waldo had felt for some time that there was a definite place for an easy-to-fly, safe, economical airplane. He designed a 4 place, low-wing cabin monoplane, the 4 C.L.M. "Flex-wing", and began work on it in a wing of an airport hangar. Its wings were to be hinged to the fuselage with air-controlled shock absorbers that allowed the pilot to flex the wings to varied angles of dihedral. This provided quicker take offs, better cruising speed and slower landings.



Waterman 4 C.L.M. "Flex-Wing" of 1930. (Paul Matt)



"Flex-Wing" with its wings fully flexed. (Paul Matt)



The "Whatsit" in original configuration with small fins wings swept back 15° and extra tail wheel. (Paul Matt)

In July 1930 the airplane was finished and made its first flight.

Waldo and his wife flew the variable winged craft to the National Air Races in Chicago and, according to Western Flying for December 1930, Waldo Waterman and his "rubber duck" proved to be most unique in the 2nd California Good Will Air Tour. This tour encompassed some 26 cities and 1850 miles of flying between October 29 and November 2, 1930.

With the depression, commercial aircraft markets faded away and the "Flex-Wing" was assigned to the National Advisory Committee for Aeronautics at Langley Field, Virginia for extensive testing. It was C.A.A. type certified, but financing never became available for production.

Glenn Curtiss had said, after successfully testing his hydro-terra-aeroplane (Triad) in February 1911, "Now if we could only drive this thing down the street like an automobile, we would really have something." The words had always stuck in Waldo's mind.

Twenty years later, these words grew in importance as Waldo began giving the idea serious consideration. The idea of a flying automobile had been dreamed about and set forth in "artists conceptions", but practically no technical ground-work had ever been accomplished.

Bach Aircraft had suffered a bad fire in late 1929 and now with the depression, it became impossible to regain a sound financial footing. By mid 1930, according to Airway Age, December 1930, the New York Trust Company listed Bach Aircraft as having \$230,229 in assets and \$237,250 in deficits and liabilities. Early in 1931, the Bach doors were closed to further aircraft manufacture. Again Waldo found himself appointed plant liquidator and was able to purchase materials advantageously that he hoped to use in building a flying automobile prototype.

Setting up shop in a corner of the Bach Plant at Metropolitan Airport, he began designing, without the benefit of anyone else's previous mistakes or successes. A swept wing without a tail configuration would readily adapt itself to a road vehicle by the removal of the wings. A tricycle landing gear with a steerable nose wheel and a pusher engine with a declutchable propeller that then could be coupled to the rear wheels for road traction seemed to be the answer. With this design Waldo began building, and in July 1932 he had finished a low-wing airplane with a sweptback wing that gave it an appearance of an Australian boomerang.

"Hey, Waldo! What is it?" came the cry from the airport crowd, and they answered their own question with, "Oh that? It's a 'Whatsit'."

The name may or may not have been as good as any but Waldo liked it and the airplane has been called the "Whatsit" ever since.

The "Whatsit" was not a flying automobile as there were too many aerodynamic problems to solve before get-



"Whatsit" in late 1932 with new wing and fins, Canard surface and main gear shock absorbers. (Paul Matt)

ting involved in roadability. Several days were spent in taxiing around the airport learning the airplane's characteristics that might affect its flight. Waldo and the "Whatsit" bore the brunt of much heckling, but the confidence necessary in an untried airplane was not to be hurried and no better proof of this sanity can be expressed than the fact that Waldo is still flying 34 years later.

Metropolitan Airport in mid-1932 was not the busy airport that it had been and is today. The gophers had found this out, too, and were burrowing at random in the broad expanse of field. They had fatefully opened an entrance in what was to be a very disadvantageous spot. When Waldo felt he was ready for the first test flight, he headed across the field and into the wind. The nose wheel couldn't have been lined up more perfectly and when it sank into the gopher hole, it sheared off the nose wheel. The "Whatsit" came to a shuddering halt and flipped over on its back. Waldo received a thorough bumping around inside, but luckily, escaped injury.

In August 1932 the damage had been repaired and a "Canard" surface added. The proposed take off route was carefully checked for gopher holes and, finding none, the second test flight was begun. Reaching flying speed, Waldo eased back on the controls and felt the airplane leave the ground. Immediately he found himself and the "Whatsit" going into a loop, and he was very quickly upside down 35 feet in the air. Cutting the throttle, he prepared, as well and quickly as possible, for a fall. The "Whatsit" came down, sliding backward on the rear of the swept wing's tips which absorbed most of the impact. Again, and luckily, Waldo was not seriously hurt, but the "Whatsit's" wing was a total washout.

Following this mishap, Waldo returned to his drawing board and spent many hours going over weights and balances. Convinced that there was no flaw in the basic design, he rebuilt the wing, added 10 degrees to the sweepback and changed the airfoil section. He then clamped the jaws of a common machine shop vise to an outrigger supporting the canard surface. With a little experimentation, he had the vise in proper position to properly locate the center of gravity.

Moving over to the United Airport in Burbank, where there were paved runways long enough for a straightaway flight, he prepared for the third test attempt. This time there were no problems, and in September 1932 the "Whatsit" was successfully flown. Continuing his test flights, Waldo became aware of a very sensitive balance to the airplane, between "power on" and "power off."

Test pilot Eddie Anderson kept asking Waldo for an opportunity to fly the "Whatsit" and finally, when Waldo was convinced that the airplane was safe and that Eddie understood the delicate balance flight characteristics, he was given the "go-ahead." Coming down the runway, the "Whatsit" began leaping, with each succeeding leap becoming higher and ending in a harder bump. The

Australian Boomerang configuration was resorting to Kangaroo tactics, and after one final leap the 'Whatsit' hit the ground not to rise again for a long time. Thus in October 1932 the future of the flying automobile looked very bleak with one nearly total wreck and a complete depletion of working funds.

In desperation, Waldo wired Jack Frye, then Vice President in charge of operations with Transcontinental and Western Air in Kansas City, for a job. Because of his previous extensive trimotor experience, he was given a job as a pilot and was later placed on the Los Angeles-San Francisco run, flying Fords, Fokkers and Fleetsters. The remains of the 'Whatsit' were left in the hands of a mechanic friend who, over a one year period, rebuilt the airplane.

While Waldo was piloting and the mechanic was repairing, Eugene Vidal, Director of Air Commerce for the United States Government, produced a questionnaire that was the prelude to a survey that would eventually lead to government contracts for a safe, easy-to-fly, low-cost airplane. With the 'Whatsit' being made flyable and the parallel goal that Waldo had with the Air Commerce questionnaire, he arranged for a leave of absence from Transcontinental and Western Air late in 1933.

As soon as the 'Whatsit' was ready, she was trucked out to Rosamond Dry Lake, California (near the present site of Edwards Air Force Base). Successful test flights were made, but there were still unsatisfactory flight characteristics that would have to be resolved with the building of an entirely new airplane. Waldo felt that the low wing did not have a satisfactory relationship with the high thrust line of the pusher engine because of the low center of drag inherent in the wing.

The plans for a new aircraft were drawn up and submitted to the Bureau of Air Commerce during 1934. This was in conjunction with a design competition resulting from the Vidal questionnaire. Waldo received one of the two awards made by the government for an airplane that met the specifications for an 'every man's' airplane.

The new Waterman airplane was called the Arrowplane and was completed in May 1935. Still not a flying automobile, its flight characteristics were superior enough to give Waldo cause to now think about adapting roadable features.

The Arrowplane was turned over to the Bureau of Air Commerce in July 1935, three months ahead of the scheduled delivery date. Accepting on behalf of the Bureau was John H. Geisse, head of the competition program for the Department of Commerce. Mr. Geisse, with but 35 hours total flying time as a pilot, flew the Arrowplane back to Washington, D. C. Attired in no more than a regular business suit, he made the transcontinental flight without the slightest difficulty. Upon landing in Washington, he had nothing but the highest praise for the Arrowplane and its absolute refusal to stall or spin under any conditions.

The future of the flying automobile began to look promising and production plans were outlined. Harris M. Hanshue, former president of Transcontinental and Western Air, became interested in the plans and offered to aid in financing a corporation to build the Waterman Arrowbile.

The Arrowbile needed considerable interior mechanics to make it roadable, but the exterior was very similar to the Arrowplane. In designing the Arrowbile, Waldo had to design a gear reduction system to transmit power to the rear wheels, a declutchable propeller and detachable wings. A Studebaker automobile engine was adapted for the power plant and this gave a far greater meaning to the 'automobile' part of the airplane. Service could now be obtained at virtually any service station, including gasoline, oil and lubrication. Other components of the Studebaker automobile were also adapted, including the radiator, dash board instruments and some body trim.

The first Arrowbile was flown February 21, 1937. It was first displayed to the public at the National Pacific Aircraft Show in Los Angeles on March 13, 1937 and



The Waterman Arrowplane, completed in May 1935. (Matt)



Six Waterman Arrowbiles while under construction. (Matt)



Red and white Arrowbile, NR 18932, taking off. (Matt)

was nationally exhibited at the National Air Races in Cleveland, Ohio in 1937. Widely acclaimed, enthusiastically received, it was suddenly too late to retract the original price of \$3,000. Since that figure had been set, it had been realized that the actual cost of producing an Arrowbile was to be nearer the \$7,000 figure.

An interesting sidelight of the Arrowbile was its licensing for highway operation. Because of its three wheel landing gear, it was classified as a motorcycle and licensed as such. This, in turn, legalized a single headlight and one small rear license plate, much to the aircraft's advantage.

A total of three Arrowbiles had been completed in time for the previously-mentioned 1937 National Air Races, and they were flown to Cleveland by 'Chuck' Sisto, 'Slim' Peret and Jerry Phillips. From Cleveland the trio toured the eastern and central United States, exhibiting at various air and automobile shows. Later, Sisto returned to Hollywood to fly the airplane in

scenes for a motion picture starring Alice Faye.

Many excellent features went into the Arrowbile, making it non-spinning, non-stalling, able to take off with hands off the controls, able to land at various angles and level out almost at once and, on the automobile side, able to land and shed its wings during severe weather conditions and then be driven to the pilot's destination.

The fourth and fifth Arrowbiles were under construction when the Studebaker Corporation, which had ordered the first five Arrowbiles, was hit by a secondary recession. Although they were pledged to the five aircraft, their further financial aid was deeply curtailed. About this same time, early 1938, Mr. Hanshue died and his heirs were not interested in backing flying automobiles. Almost as suddenly as the successful flying automobile had become so promising, the financial future turned bleak.

Waldo had to leave the Arrowbile plant and make almost steady business calls, trying to interest someone in backing him. Consolidated Aircraft was offered the opportunity to absorb the Arrowbile as they had expressed an interest in its flying wing design. This interest would later manifest itself in the Convair F-102 and F-106 delta-winged fighters. However, Consolidated was not interested in peacetime aircraft at this point. So, with the completion of the fifth Arrowbile for Studebaker, and with all available funds expended due to the unfortunate error between the original price and the actual price, Waldo continued to diligently seek financing.

In July 1938, the telling pace told, at first with severe abdominal cramps and a few days later with a burst appendix. Death came closer to Waldo at this time than it ever had in an airplane, and it was only by the narrowest margin that he survived. He was hospitalized for a year, and during that time the Arrowbile plant was forced to close its doors, leaving a sixth Arrowbile unfinished.

It was not until the summer of 1939 that he left the hospital and found that several of his loyal employees had worked in their spare time to finish the sixth Arrowbile. Waldo was not strong enough to fly it himself and hired Jerry Phillips to demonstrate it. But September 1939 was upon the world, and financing for private aircraft disappeared quickly as the war in Europe began.

With the inauguration of the Civilian Pilot Training program in July 1939, one of the first schools to qualify was Pasadena (California) City College. Waldo was asked to consider a teaching position and again, as in World War I, he was happy to have a part in the development of fledgling aviators. In early 1943 he became a coordinator in the C.A.A. War Training Service Program and was frequently in Washington, D. C. for con-

sultation. By the end of 1943 he felt satisfied that the pilot training program was operating efficiently, the war was progressing favorably for the Allies, and so he retired from his position.

Almost immediately he received a telephone call from "Bill" Stout. Stout was working in Dearborn, Michigan as director of the Convair Research Division and asked Waldo to join him as Chief Engineer. Anxious to work in aviation engineering, he agreed to try the Detroit area for a year. Future arrangements were to be made after that time, depending on the status of the work there. Stout and Waterman were two of America's finest aeronautical engineers and their research into aviation was carried on with great harmony between them. Unfortunately, however, liaison between Convair in San Diego and Dearborn was often filled with misinterpretations, and this sometimes led to the complete disruption of a project.

At the termination of his year, Waldo decided to leave Convair and returned to his home in Santa Monica, California. He really retired, bought a cabin cruiser and "just went fishin'." The salt air, fishing and yachting agreed with him, and in 1951 he purchased a large sailing yacht, large enough for his family to live on very comfortably. At this time they moved down to San Diego and took up moorings near the scene of his boyhood, San Diego Harbor and North Island.

In 1947 Waldo began inventorying the parts and materials of the Arrowbile project he had stored away. With a Franklin engine that had been designed for liquid cooling as part of the defunct Tucker automobile, Waldo started building a new flying automobile. There was no commercial purpose to this, however. It was a hobby that would put into practice a new idea for a detachable wing and a new system of control. Waldo enlarged the cabin slightly to accommodate two passengers in a rear seat while the pilot sat alone in the front seat.

Construction proceeded at a leisurely pace, and it took ten years to complete the new machine. Work was interrupted by sailing ventures that often found Waldo skipping his racing yacht to first place or hooking a 200 pound marlin from his cruiser.

The new machine, named the Aerobile, was completed in 1958 and taken out to Gillespie Field near San Diego. The one piece wing was a decided improvement over the two piece wing on the Arrowbile, lending itself to a much easier detaching system. When the struts were detached from the fuselage, they were placed on the ground and the wing was raised by means of a simple jack pushing the struts upward. The "car" could then be driven out from underneath. The Aerobile was flown from Gillespie Field during the summer of 1958, and the new concepts in aviation engineering worked out to Waldo's satisfaction.

Back in 1945, the Smithsonian Institution had ac-



Aerobile's one piece wing had struts that could be angled down and used to raise the wing. (Paul Matt)



With struts jacked up and wing raised, the automobile pod of the Aerobile could be driven away. (Paul Matt)



Waldo Waterman in his modern version of a 1911 Curtiss Pusher, the "Early Bird", in August 1965. (Paul Matt)

quired the "Whatsit", and in 1959 it requested a replica of the Arrowbile for its aeronautical collection. The Aerobile, with external appearances almost identical to the Arrowbile, was offered to them at their convenience. In March 1959 a C-119 Flying Boxcar flew out to San Diego from Andrews Air Force Base on a training mission. The "Flying Automobile" was loaded aboard the C-119 and flown back to Andrews AFB. Both the "Whatsit" and the Aerobile are currently in the Smithsonian storage facility at Silver Hill, Maryland, waiting for the new National Air Museum to be completed.

During the last six years Waldo has rebuilt two replicas of the Chanute-type glider. One of these now hangs in the National Air Museum in Washington, D. C. The other hangs in the San Diego Aerospace Museum.

Every year on the anniversary of his first glider flight, July 1st, he solos an airplane. Many of these flights have taken place at Van Nuys Airport, the same Los Angeles Metropolitan Airport he designed and managed from 1928 to 1930. On July 1, 1964, Waldo celebrated his 56th year in flying by soloing a Cessna 172 Skyhawk at Van Nuys, being 70 years old at the time.

On July 1, 1965 he again soloed, but this time in San Diego and in a modern version of a 1911 Curtiss Pusher. This airplane, built to commemorate the "Early Bird" organization, an organization of those who flew solo before December 17, 1916, was named for them. It was even built with several nostalgic aviation materials--the wings from a Vought VE-7 that had been wrapped away in storage, a 150 hp Franklin engine that had been wrapped and stored in Waldo's workshop, and the landing gear from a Cessna 140. The "Early Bird" was built entirely by Waldo, with the exception of some of the welding, and was not intended to be a replica of the 1911 design as witnessed by its complete instrumentation for all-weather flying. By early 1966 the "Early Bird" with Waldo at the controls, had logged nearly one hundred hours of flying time.

His latest achievement is the completion of an exact replica of the 1903 Wright Flyer in which the Wright Brothers made the first manned flight in a heavier-than-air machine. The aircraft was constructed from 46 working drawings and was built for the Gilmore Museum of Transportation which is presently being established in Kalamazoo, Michigan. Only part of the aircraft that is not exactly like the original is the engine which is a mock-up.

Waldo Dean Waterman was duly honored for his many contributions to aviation on the evening of September 24, 1966. At the Beverly Hilton Hotel, Beverly Hills, California, he was presented with an Honorary Fellowship in the Society of Experimental Test Pilots--it was one of two such awards made each year, the other for 1966 going to Sir Frank Whittle. He thus joined such other famous men of aviation as Jimmie Doolittle, Igor Sikorsky, Alexander de Seversky, General Benjamin Foulois,



The exact reproduction of the Wright Flyer completed by Waldo Waterman at San Diego in the fall of 1966.

Roscoe Turner, Howard Hughes and Benny Howard.

FOOTNOTES: (1) A.A.H.S. JOURNAL, Vol 7, No 3, p 181, "First Western Air Meet" by Dustin W. Carter.

(2) THE UNITED STATES NAVY AND THE UNITED STATES MARINE CORPS AT SAN DIEGO, by Edward J. P. Davis. Pioneer Printers, San Diego, 1955.

ADDENDA: Mr. Paul E. Garber, Assistant Director, Education and Information Service, Smithsonian Institution, National Air Museum, has offered the following, pertaining to the "Whatsit" and the Aerobile:

"As with all of our accessions we apply a list of criteria based upon factors which we believe apply to the value of the item from various angles.

"These criteria are: Historical, associated with a notable event; Technical, embodying advancement in design, structure or performance; Biographical, representative of the work of a notable person who may be either designer, manufacturer, pilot, or other associate; Chronological, representative of the time period and of particular interest if no other specimen is available for that period; Uses, illustrating an important application of aircraft to practical purposes; Impact, having a definite effect on civilization and the progress of the art and science of flight.

"Applying those criteria (which are not necessarily written in order of importance), we consider that these Waterman aircraft are primarily of technical interest because of their unusual designs and structure. Although each of the aircraft was flown successfully, their flight accomplishments are of less interest historically than technically. Biographically they represent two accomplishments of a notable pioneer of flight who has attained recognition as a pilot, designer and builder of aircraft. Chronological is also applicable because of the time when these were produced. Although not intended for a specific Use, their Impact had its effect upon contemporary and subsequent designs. Preserved in a museum they remain available for examination by engineers, authors, historians, teachers, students and others who study the past in order to improve the present and prepare for the future."

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The three-view drawing of the "Gosling" on pages 236-37 was made available by Paul R. Matt and comes from his outstanding HISTORICAL AVIATION ALBUM series, having appeared in Volume One. Paul R. Matt's Aeronautical Collection is also responsible for virtually all of the photos appearing with this article and to him goes my greatest appreciation.