WEDELL-WILLIAMS AIR SERVICE CORP.

and

AIR RACING

by Bob Hirsch

(All drawings by the Author, and all photos from the Author's collection)

Part II-2 The Racers

The Sixth Basic Design—This basic design became the famous Wedell-Williams Air Service trio that dominated the racing scene from 1932 through 1934 and remained in the limelight through 1939. However, there were really four examples built and the first was for Roscoe Turner and registered NR-54-Y. The ill-fated aircraft had new wings and new fuselage, new outboard slanting gear struts. It was all new since it was not a rebuild from another airframe. It did have the same style of wire bracing as the earlier model 44 of 1931. Jimmy felt this system worked well for him in 1931, and was strong enough for the slightly larger wings. However, aileron flutter called "buzz" in those days, not only caused the demise of Lowell Bayes and the Gee Bee model Z in December 1931, but very shortly later in early 1932, this element of the fifth design perished into a scrap pile, and almost brought Jimmy's career to a halt before it got going.

Actually this ship was built mostly by Roscoe Turner's chief mechanic Don Young, but under the direction of Jimmy Wedell. Don Young and one of the W-W young helpers did most of the construction while Jimmy was busy rebuilding the NR-536V, No. 92, and NR-278V, No. 44. The helper would saw the tubing on a couple of wooden sawhorses with a hacksaw while Young welded them together. He copied Jimmy wherever he could, but did a lot of sizing up for himself. Although the wire bracing was copied from the 1931 model 44, the new wings were not the same in size or airfoil and the aircraft as a whole was larger and heavier. Therefore, stress would not be the same and stress harmonics was something few people knew anything about in that time era. To avoid the aileron flutter problem, balanced aileron elevator and rudder were used. Even though Jimmy was well aware of and saw film of the model Z disaster, somehow the balancing was not done on NR-54Y or was insufficient because it lasted only two flights.

Jimmy Wedell was thin and not a large man with a weight of about 150 pounds, so lead shot bags were put into the cockpit to equal Roscoe Turner's weight of 220 pounds. He was to make the first flight and feel the plane out, and then it would be Turner's turn. First flight was short and some adjustments were necessary. On his second flight, Jimmy made a normal takeoff lifting off a bit quick with a sharper climb out than earlier. He made a climbing turn and leveled off at a couple thousand feet. He did some channels and rolls and several other turning maneuvers in the general vicinity of the field, then he came back over the airport and peeled off into a dive and in a wide swinging diving turn he straightened out over the runway of about hangar-top level.

Don Young was at one end of the field with a stopwatch which had been synchronized with Harry Williams who, with Roscoe Turner, was at the other end of the field at a measured mile to clock the speed pass. About two-thirds down the mile run the airplane pitched up slightly, and then suddenly

Jimmy Wedell standing beside the wreckage of NR-54Y. This was to be Roscoe Turner's racer. For the corporation to build three racers and race them in the 1932 NAR in September after this accident must have taken a lot of courage and teamwork.

pulled up into a steep zoom. It no sooner was pointed upward than a loud bang was heard and one side of the wing gave way and ripped off. The individually operated ailerons Jimmy had designed may have helped him keep the ship from rolling too fast about its own axis and delayed the eventual tumbling, thus allowing him time to unfasten his seat belt and fall out. This was a lesson learned from the Gee Bee disaster. When it lost its right wing it rotated so fast that Bayles was thought to be unconscious when he hit. Wedell was able to hold a somewhat steady upward climb until he reached the apex which was about 700 to 800 feet when the 44 model rolled over and started its plunge to earth. Jimmy was already unbuckled at this point because he fell out of the cockpit and almost immediately his chute started opening. The chute reached full blossom with very little room to spare but being light he did not hit hard. Within seconds they were converging on him from two directions and probably less than a minute they got to him. He was wandering around in a sort of daze asking, "Have you seen my other shoe?" NR-54Y had plunged to earth not too far away.

Before any more work was done, Roscoe Turner contacted Howard Barlow in Minneapolis who was an aeronautical engineering instructor at the University of Minnesota and considered one of the finest in the country. Howard came to Patterson, took a look at the wreckage and Jimmy's stress data and test results and sat down with him and taught him several methods of calculating stresses. He did not remain at Patterson while the building of the next three examples was in progress, but his knowledge remained because the W-W trio was about the most successful racers of that era.

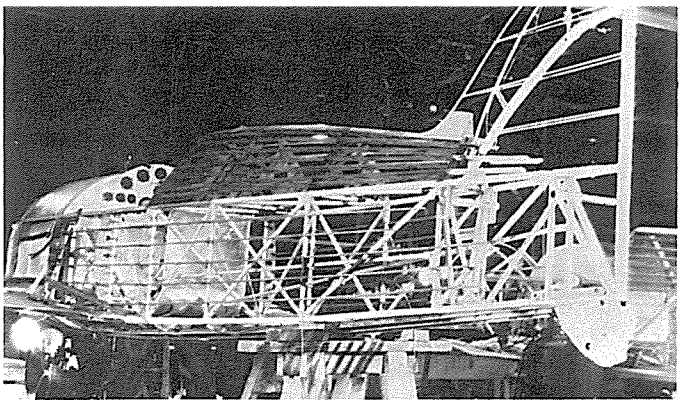
The "We-Winc" and the "We-Will' became model 44, and the third of this fifth design was built again from scratch like NR-54Y was. Only this time the flutter was being taken care of by counterbalance weights forward of the surface hinge lines on the ailerons. Each was hand-built and so they were not a production copy of each other although in general they looked alike. Roscoe Turner's airplane was purchased by the Gilmore Oil Co. and later by Turner himself, from the "Red Lion" company. Every time Wedell would do a stress calculation Turner would insist on upping it by 50 percent over Wedell's 50 percent. Consequently, Turner's ship lasted down through the years with all the modifications. It carried engines with double the horsepower and an additional 1,000 pounds in weight. It also flew faster and was subjected to higher "g" loads. It is today the only remaining example of the famous trio.

Turner's racer was the first American airplane to fly with an engine of over 1,000 hp and the first anywhere to have a 1,000-hp-plus radial engine. It carried a complete set of instruments for instrument cross-country flying and navigation. Its internal fuel tanks carried 205 gallons, but the big power plant at high power settings consumed up to 184 gallons/hour, thus giving just slightly over an hour of flying time. So, at full throttle, and about 1,000 feet, or below 2,000 feet, you had about 300 miles maximum range and maybe some fuel left over to set up a pattern and land.

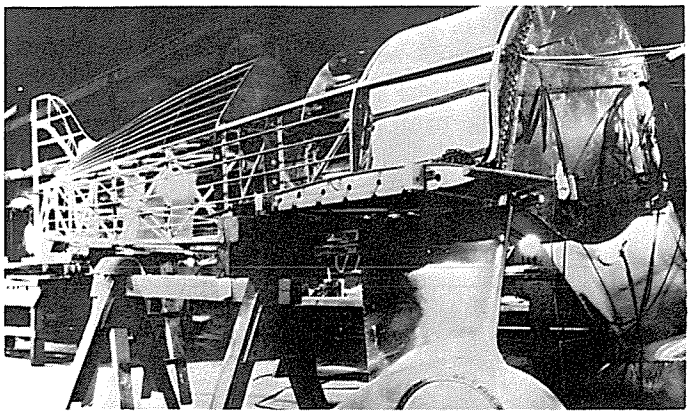
For the 1932 National Air Races all three racers had the same type engine, a Pratt & Whitney *Wasp* Jr., of 985 cubic inches, each specially beefed-up and supercharged and high-compression pistons. These were supplied by P&W and were rated as follows: 525 hp at 2,200 rpm and 550 hp at 2,300 rpm for racing only. In 1933, Roscoe Turner replaced the *Wasp* Jr. with a *Wasp* Sr. Special model E-1 (R-1344), which was rated at 745 hp at 2,200 rpm and 850 hp at 2300 rpm for racing. The same engine model was in the Gee Bee R-1 in 1932 that gave Jimmy Doolittle the Thompson Trophy. Supercharger ratio was 12:1 and compression ratio static was 6:1. Propellers for all three aircraft were Hamilton Standard two-blade, eight-foot-diameter, ground-adjustable design number 6095-18T. In 1934, Turner replaced the *Wasp* Sr. with a P&W *Hornet* (R-1690), which produced 900 hp at that time. This engine was numbered 1853 on P&W books.

It used Horley-Townsend spark plugs and all of the three P&W engines used Thompson Products valves, which became P&W standard. These were sodium filled for better heat transfer and thus made cooler running. All of which was necessary for such hot running combustion temperatures of the higher compression ratios. These valves had to be disposed of in a manner somewhat similar to our radiation materials of today. Once heated within the valve center the sodium becomes deadly poisonous making the material impossible to melt down and reuse. These P&W engines would also require the assistance of special P&W teams who were always at the races assisting all they could in fine tuning for maximum output. Without this group there probably would have been a lot more engine failures.

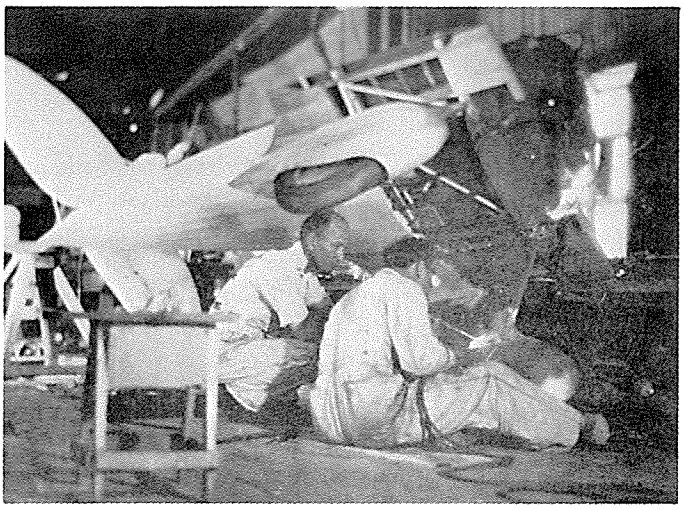
All three aircraft flew somewhat alike. Takeoffs and normal handling were good, even better than most racers. But no matter who flew what racer, the pilot was in for some jackrabbit hopping before he could settle it down. Pilots in that era all tried to three-point their airplanes because you had to get the tail skid down to create drag to slow down and give better directional control. If you didn't kill off the speed and touch at the stall point you would balloon and do it again. If you came in too high at stall you would bounce. Either way, you looked the same from the sidelines. After the 1932 National Air Races, the first thing Turner did was to put low-pressure balloon tires on his new racer and build new streamline covers, then called "pants." This also was in preparation for a larger engine.



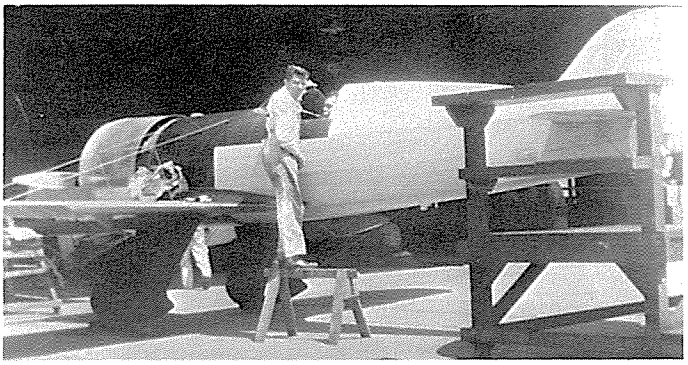
A ¾ rear view of the model 44 going into the final phase of construction. Note instrument cutouts. They appear to be the same basic layout as Turner's racer. The No. 44 would not have had all the instruments Turner's had since it did not have the Supercharged *Hornet* engine.



A ¾ front view of construction giving good detail of build-up. Note thin airfoil section. For that time era, James Wedell was an excellent self-taught designer and builder.



With fuselage now covered final touches are being put to the undercarriage. This 44 is almost ready for its wings. The engine is the last installed and then the controls hook-up and checkout.



NR-54Y being put through its final checks such as weight and balance and controls checkout. Jimmy is standing next to the cockpit on a wooden sawhorse. The object on the wing looks like a seat-type parachute.

The NR-278V retained the same registration number and race No. 44. But the surface left very little on the external looking like the 1931 version. It and Roscoe Turner's were pretty much look-a-likes except for the color schemes for the 1932 races. However, they were not built exactly the same. The 44 had a 62-inch wing chord where Turner's and the NR-536V No. 92 had a 60-inch chord. The 44 carried eight gallons more fuel and weighed 80 pounds less than Turner's. The No. 92 weight empty was 50 pounds less than the 44, and it had two separate fuselage fuel tanks where Turner's and the 44 were integrated with only one filler neck. Thus, 92 had two bumps on top of the fuselage covers.

All three aircraft had an M-10 modified airfoil with the same spars and ribs construction except the 44 had an extended leading edge. The engine cowl was of the NACA type, that is, full cowling creating a venturi effect at the trailing edge for the exhaust stacks to blow through. Turner's had a slight taper inward at the trailing edge but the 44 and 92 did not. The 92 had more of the old 1930 contour forming stringers giving it a smaller fuselage circumference which left a wide gap at the cowl trailing edge. When Jimmy Haizlip saw this he stated, "I was contracted to fly 92 and when I saw the cowling gap, I knew I had the slowest of the three."

Jimmy Haizlip and Mary were there during the final days of construction and witnessed the activities. He stated that he and Mary were there as guests of Harry Williams and so he refrained from becoming involved in the design decisions. But he did get them to add fresh air tubes from outside the exhaust slipstream into the cockpit. He was well aware of the carbon monoxide fumes in the cockpit affecting the pilot's ability. This was considered the cause of the crash of the Curtiss *Page* racer at the Chicago races in 1930. The matrix below displays differences in the three aircraft.

SPEC MATRIX FOR THE SIXTH BASIC DESIGN

Measurement Item	44	92	Turner's
Wingspan	25' 8"	26'	26'
Wing Chord	62"	60"	60"
Length	22' 3"	22' 6"	22' 3"
Weight Empty	2,000 lbs.	1,950 lbs.	2,080 lbs.
Gross Weight (Racing)	2,700 lbs.	2,650 lbs.	2,780 lbs.
Gross Weight (Cross-Country)	3,500 lbs.	3,310 lbs.	3,525 lbs.
Maximum Fuel Capacity	213 gals.	203 gals.	205 gals.
Racing Fuel Capacity	115 gals.	115 gals.	115 gals.
Oil Capacity	10 gals.	10 gals.	10 gals.

Most of the instruments were by Pioneer, but the clocks were by Elgin. Ignition cable was by Packard and changed spark plugs were by B.G., not the Horley-Townsend. The spruce and ash woods were finished by Yoho & Hooder Lumber Co. to the W-W company drawings and specs. The windshield was all plexiglass, was wide and rose only five inches above the front fuselage line and was pinched together at the top center. The turtle deck formed behind the cockpit faired away into a conventional set of tail surfaces. The seats were of sheet aluminum and tied to the top steel cross bar. Almost all of the welding on the three racers was done by Jimmy Wedell and Eddie Robertson.

One thing they all had in common was their flying charac-

teristics. They were not difficult to fly and had no surprises as did the Gee Bees. They were just difficult to land. No one, not Jimmy or Walter Wedell, Jimmy Haizlip, or Roscoe Turner was able to master a good three-point landing except by accident. For this reason Harry Williams would not fly any of the three racers himself and was very touchy about who did. He had flown 92 in its early 1930 configuration which was more like a sport plane than an all-out racer it now was. The reason basically was that all three craft had a rigid landing gear with no built-in shock absorber and small thin higher pressure tires all for low drag. The covering box frame and gear frame struts were done by Hill Aircraft Streamliners as was the engine cowlings. The springiness of the steel tubing alone was the only shock absorbing there was. The racers also had no flaps since they had relatively light wing-loading and such devices were considered unnecessary and were drag-producing. The design theme was a racer possessing light, minimum wetted area, optimum streamlining and boundary layer, with as smooth a flow as possible.

The undercarriage consisted of two independent and entirely covered legs down to the pants. The forward strut was a heavy oval steel tube running from in front of the main spar downward and slightly forward to a "Y" frame that extended on down to and held the wheel axle. The drag strut was also heavy oval steel tube that ran downward parallel to the front strut until about even with the wheel axle. The "N" strut was of the same material and welded to the bottom of the rear strut and top of the front strut. There was a smaller tubing running from the bottom of the rear strut to the top of the inverted "Y" strut. The struts were at an angle of 18 degrees 10 minutes, but the inverted "Y" strut was at 3 degrees 30 minutes. Each axle was at right angles to its strut and extended outward far enough to allow clearance for the wheel coverage. This set the wheels at a slightly towed outward position.

However, the 92 was different. It retained the original fastening points and so the gear struts and aluminum housing frames jutted straight down from the outward limits of the wing stub. Again, there were no shock struts or low-pressure tires like the Gee Bees.

The fuselage was of welded chrome-molloy steel tubing and the forming bulkheads were of ash. A fireproof aluminum sheet bulkhead was at the forward section. Longerons and stringers formed the new shape giving a much fatter fuselage than the early "44." Covering was of aluminum sheeting on the forward section and fabric covering aft to and including the empennage. The tail skid formed a steel rubbing shoe which moved within a housing integral to the empennage and on the inside it was stabilized by two opposing springs.

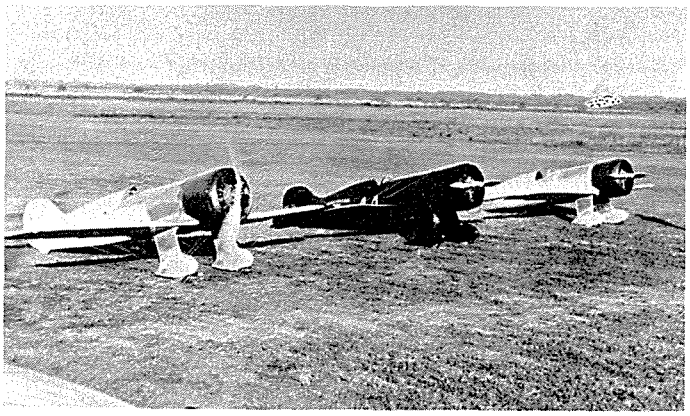
The wings were of three sections, the two outer panels of the wing were braced by external wires and the wing stub was integral with the fuselage. The front and rear spars were made up of two 4360 steel tubes welded together with two "U" plates forming a double tube welded inside a rectangular tube (shown on drawing below). Another 4360 steel tube formed the leading edge stiffener and had half oval (wood former fastened to it which became the leading edge section of the wing forming the final airfoil). This was then fastened to the airfoil ribs. The 44 was overall a slightly thinner airfoil since it had two more inches of chord. It also had a greater wing area giving it the lighter wing load factor. Number 92 was 50 pounds lighter and had a few more inches on the ailerons, but did not compare equally with 44.

The wing planform was slightly different for each of the three ships in that "92" and Turner's racers had a span of 26 feet two inches, but the ailerons had slightly different areas. The "44" had a span of 25 feet eight inches and had the same shape ailerons as did the Turner ship. The differences were so slight it has gone unnoticed by most model builders for many years. This also gave a very slight difference in wing area of all three ships thus making all specifications data different. Figures given on specifications were based on the "44." The aileron tie rods were furnished by the Mac-Whyte Co. The wing center-of-pressure was calculated to be for the most critical Cg. and design load at a point just below the maximum bending moment.

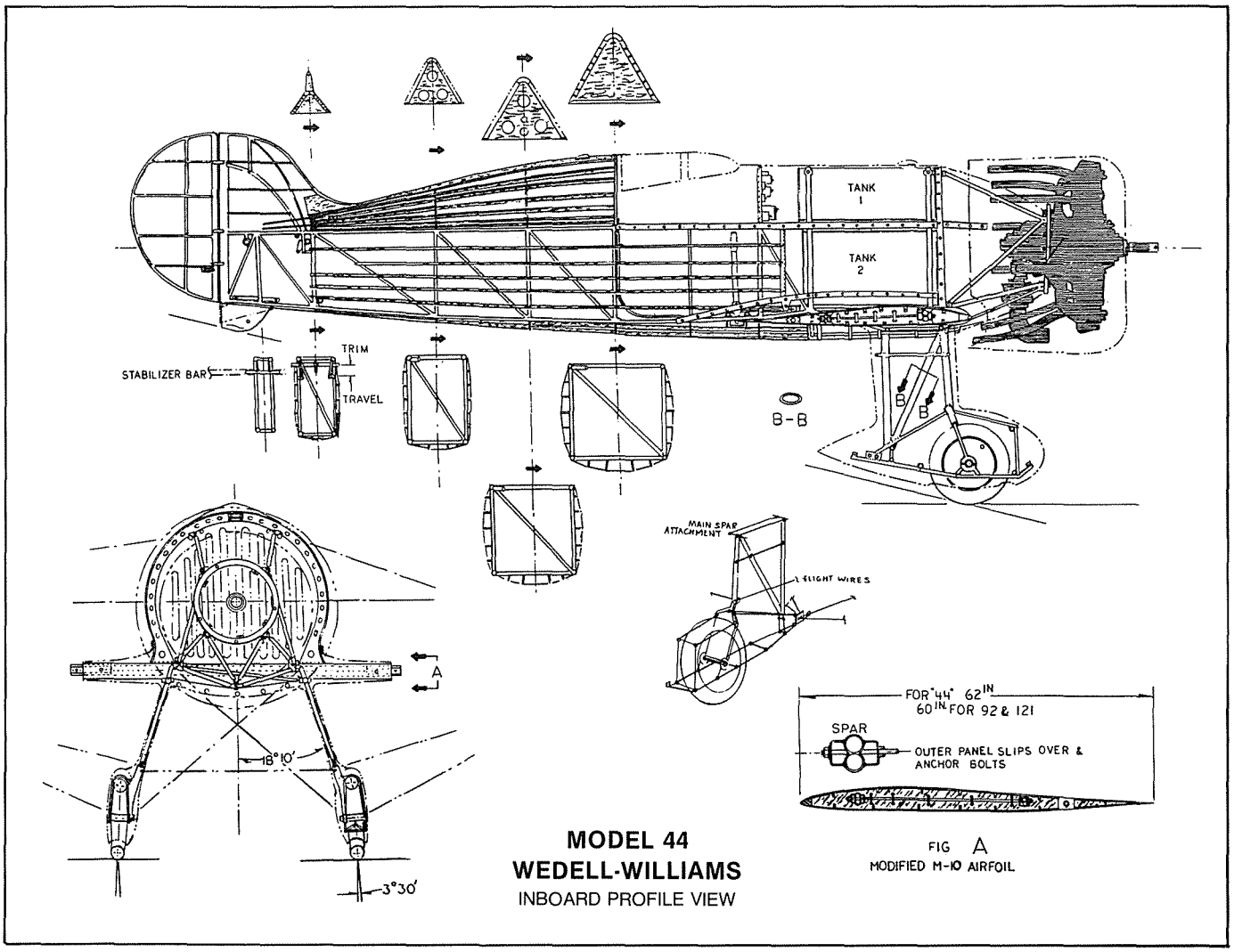
The "44" used the Smith controllable-pitch propeller when the *Wasp* Sr. from the "45" was installed. The control installed in the cockpit had a push-pull lever with three positions and a total travel of about 2½ inches. Pushing in would decrease pitch and increase rpm. To pull the lever out would increase pitch and decrease rpm. In the middle, or neutral position, the pitch angle stayed fixed. This propeller was nicknamed "The Airplane Transmission."

The propeller blades were hollow heat-treated chrome vanadium steel and cadmium plated on the outside and primed with zinc chromate on the inside. The propeller weighed 120 pounds. Pitch changes with air mass and velocity were not automatic and unlike the Standard Constant-Speed or Curtiss Electric Propellers, the pitch angle was fixed and could only be changed by selection in the cockpit and then at a very slow speed.

The motive power was supplied by the rotation of the hub around a control worm. At 1,700 rpm the blade pitch increase would be at one degree each two seconds and was related to rpm. The engine had a special thrust bearing coverplate which had left- and right-hand threads cut into the sleeve which protruded out of the control housing. The propeller hub rotated around the stationary worm without touching it when lever was in neutral. Push or pull would engage either the right- or left-hand worm gear causing pitch



The famous trio from the Wedell-Williams Air Service Corp. all lined up for final touches and flight testings. The No. 92 is being run but not at full throttle since there are no chooks in front of the wheels. The No. 44 appears to have a completed paint job. Most film was the chromatic type and not pan—the red and black will print nearly alike. The metalwork on the other two stands out.



MODEL 44
WEDELL-WILLIAMS
INBOARD PROFILE VIEW

FIG A
MODIFIED M-10 AIRFOIL

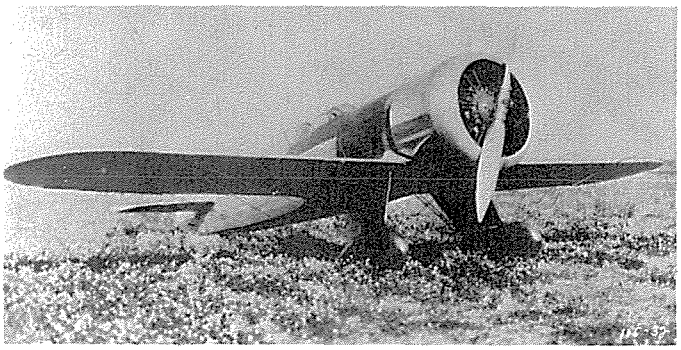
change one way or the other. Stop limit settings could be set or adjusted at installation.

Below are the spec data given to the Army Air Corps from a solicitation design request issued to the Wedell-Williams Corporation. It is based on NR-278V, which had a configuration drawing included in the data package.

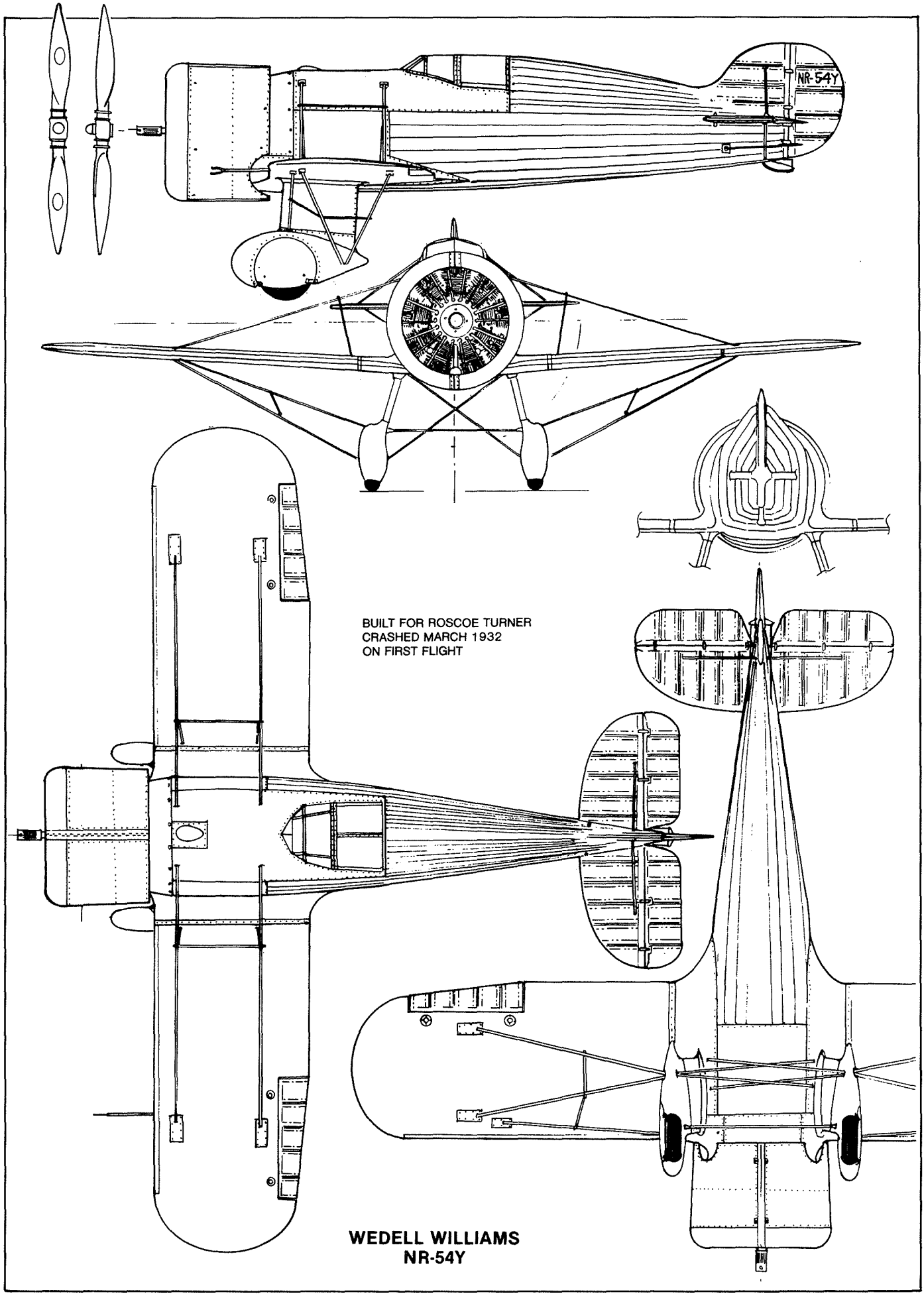
SPECS ON 44 AS GIVEN IN LETTER FORM TO ARMY AIR CORPS
(Above specs included)

Wing angle of incidence	1 deg.
Aspect ratio	6.38 ($[25.67]^{-2}/203$)
Equivalent; less wing	Ae 2.02 sq. ft.
Equivalent; with wing profile drag	Ae 2.56 sq. ft.
Wing loading (racing)	26 lbs./sq. ft.
Wing loading (cross-country)	34 lbs./sq. ft.
Power loading (racing at 850 hp)	3.18 lbs./hp
Power loading (racing at 550 hp)	3.63 lbs./hp
Power loading (cross-country)	4.7 lbs./hp
Design loads at 2,700 lbs. and 305 mph	5g pull-up
Gust loads at 2,700 lbs. and 305 mph	30 ft./sec. UP 20 ft./sec. DOWN
Design load safety factor	1.5
Wing angle to horizon at static rest	15 deg.
Horizontal reference plane at static rest	14 deg.
Wheel spread on centerline of contact	5 ft. 3 in. (Wheels angled outward 3.5 deg.)

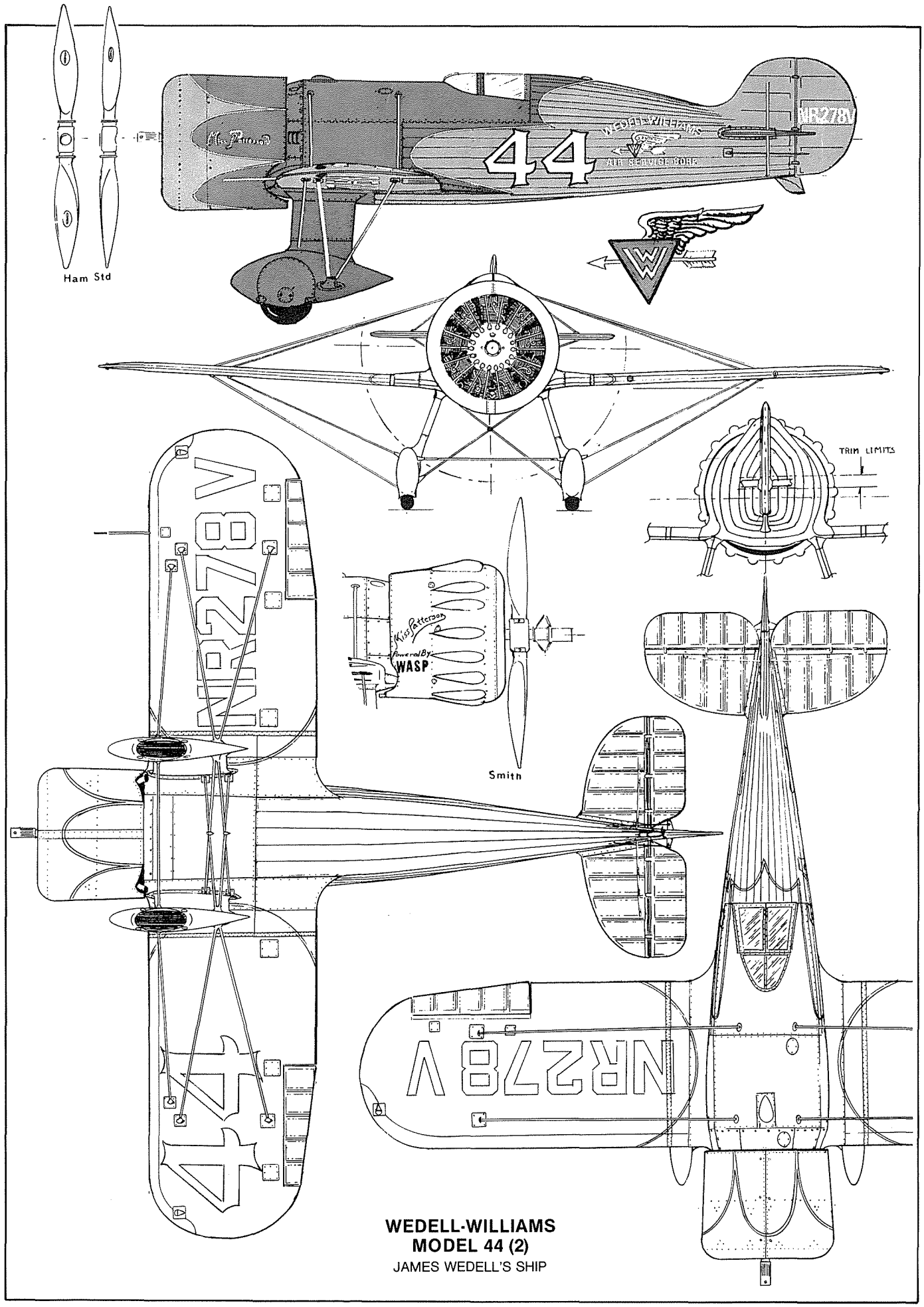
Jimmy's No. 44 in front of the hangar at Patterson.



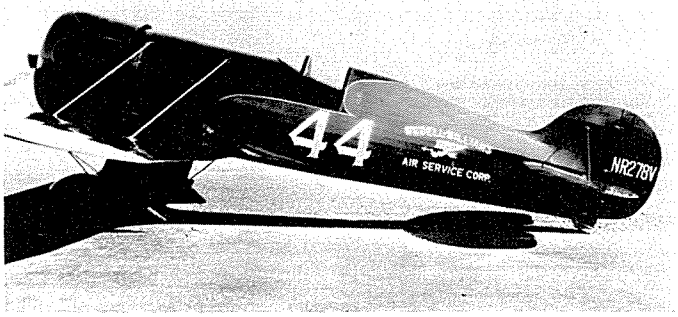
The only known publicity-type picture taken of NR-54Y taken on April 1, 1932, by the FAX Photo Co. It just seems odd that there was not a walk-around series of shots.



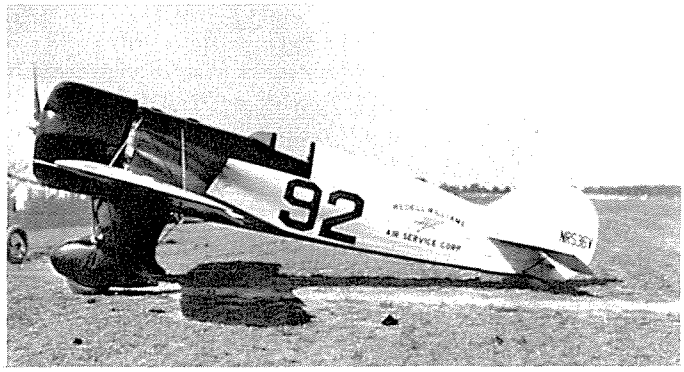
WEDELL WILLIAMS
NR-54Y



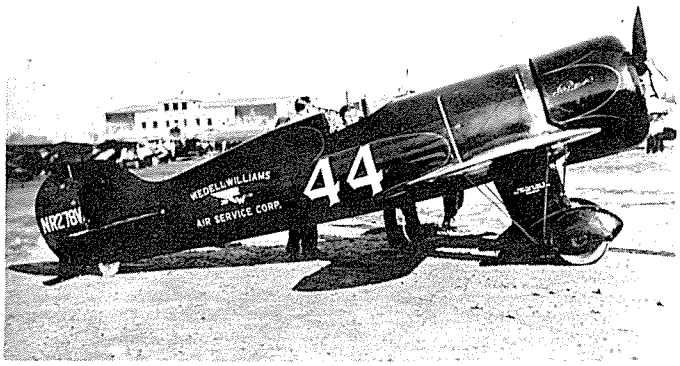
WEDELL-WILLIAMS
MODEL 44 (2)
JAMES WEDELL'S SHIP



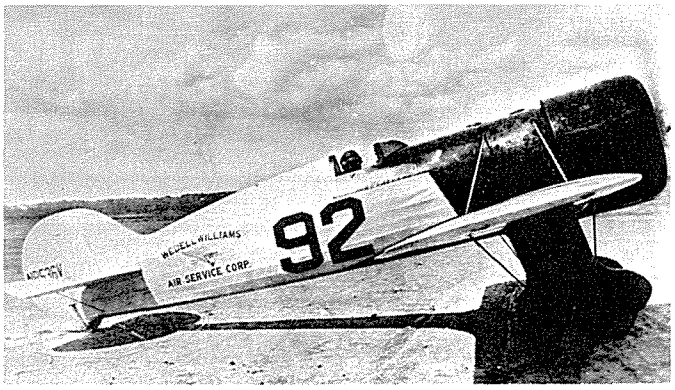
Side view of No. 44 giving good definition of the red and black and pinstripe separating colors. The No. 44 was white with black pinstripe as was the registration number on the rudder.



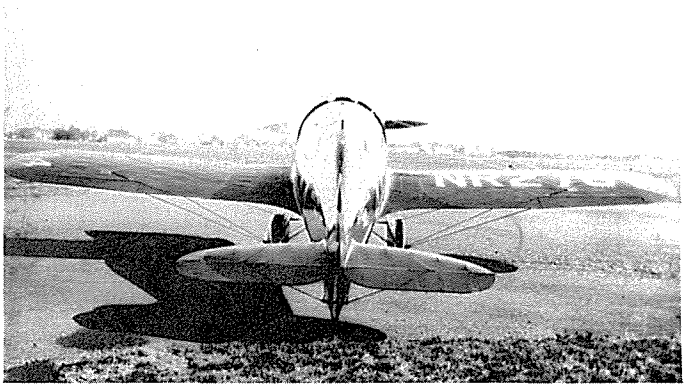
A good side view giving fairly accurate loft lines of the No. 92. Note the two fuel tank filler neck streamline covers. Wedell's and Turner's had only one.



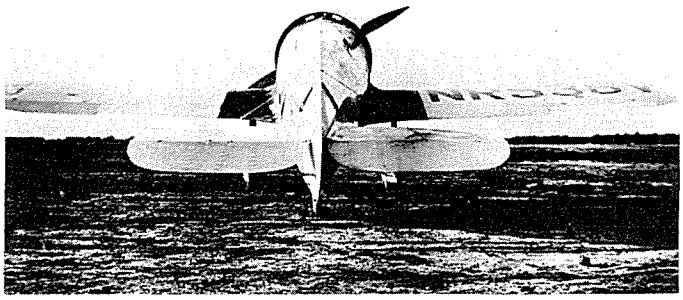
Side view taken at Cleveland. Writing on the wheel struts says "Hill Aircraft Streamliners." They are the same company that did the gear on the Gee Bees. The letters on the cowling says "Miss Patterson."



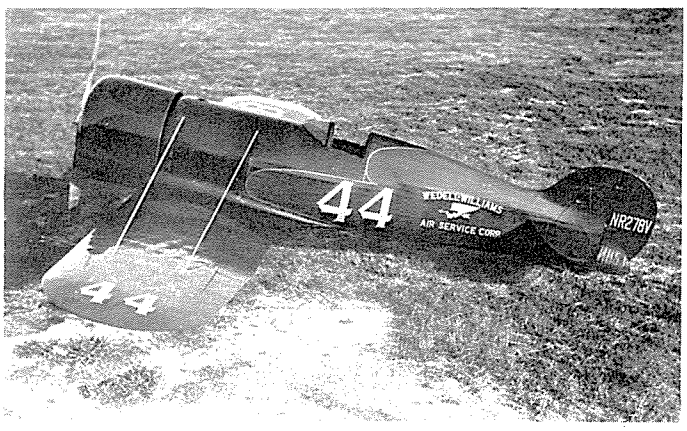
Side view of No. 92 giving good fuselage ribs detail. The black areas is where aluminum covering was applied as protection against the hot exhaust gases. After the 1933 fire on the Menasco-powered Model 22 No. 54, the aluminum skin was moved further back to the cockpit.



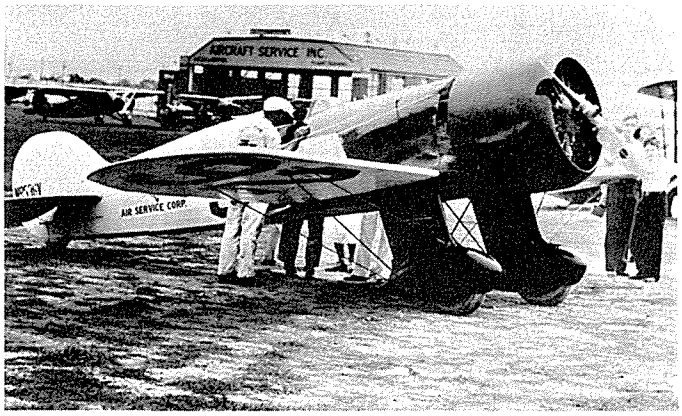
Rear view of No. 44 showing fuselage contour lines. Note the small 44 on the upper wing pointed outward so the pylon judge can read it.



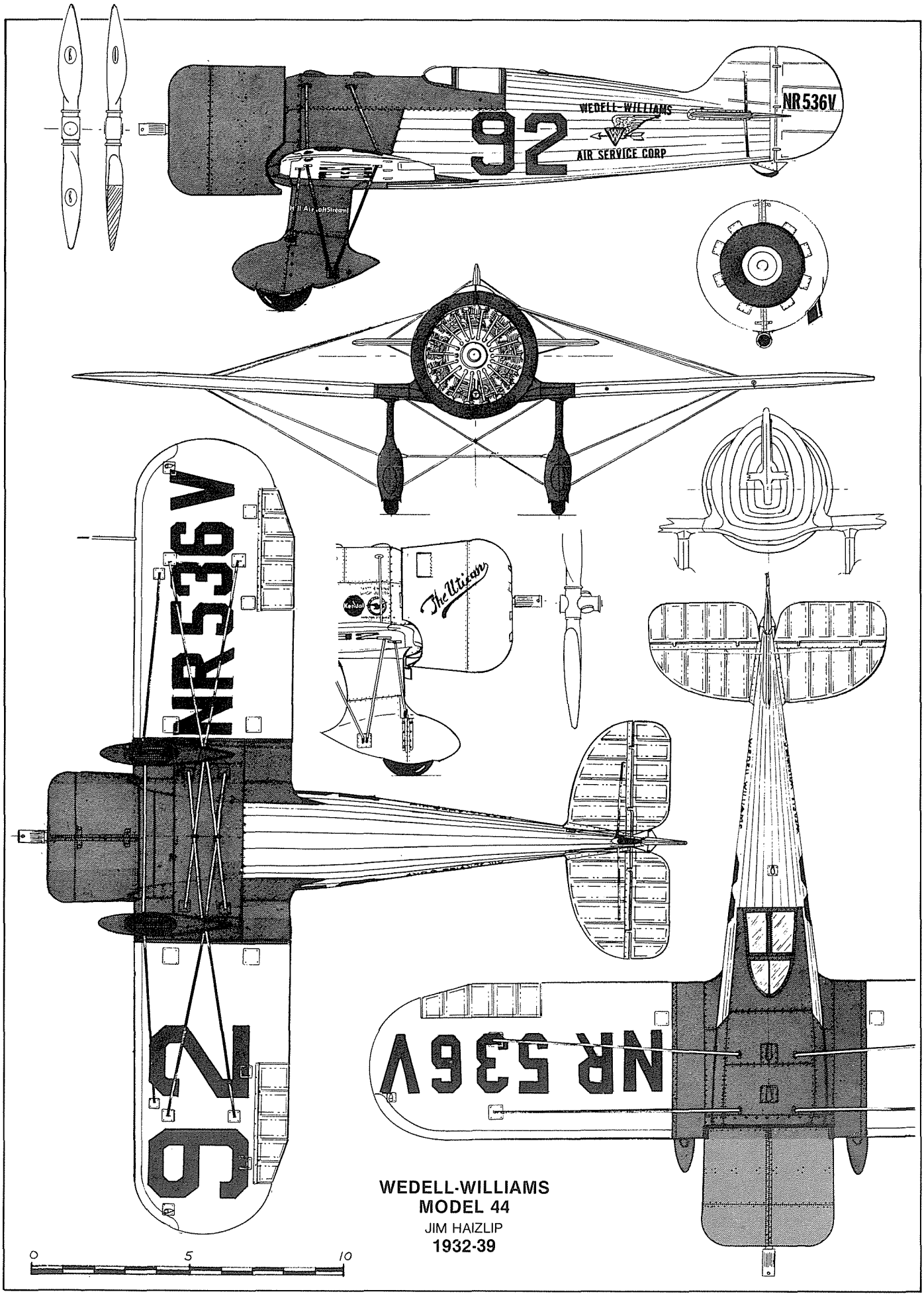
This rear view shows the cowl-fuselage mismatch. The 92 did not undergo as much of a rebuild as the 44 and Turner's. Fuselage diameter, or cross-section circumference, was smaller at the firewall.



The new 44 from above. Compare this with the 1931 model 44 for a good view of the differences.



Haizlip's No. 92 sitting on the grass lined up with other racers. Haizlip is on the other side standing on his toes to point out something to the mechanic. Note the distinct difference in the gear treatment than with the No. 44 and Turner's.



WEDELL-WILLIAMS
MODEL 44
JIM HAIZLIP
1932-39

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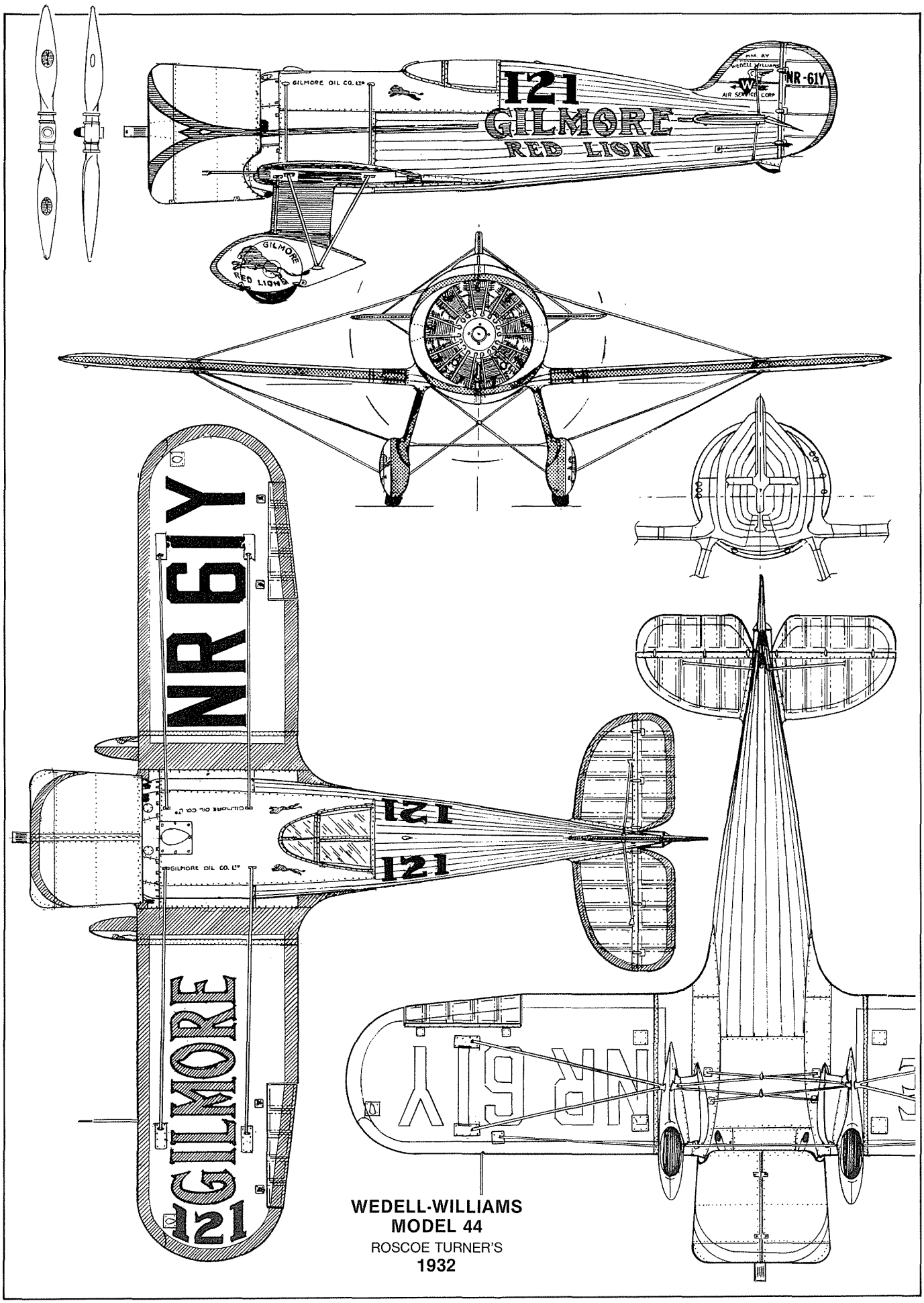
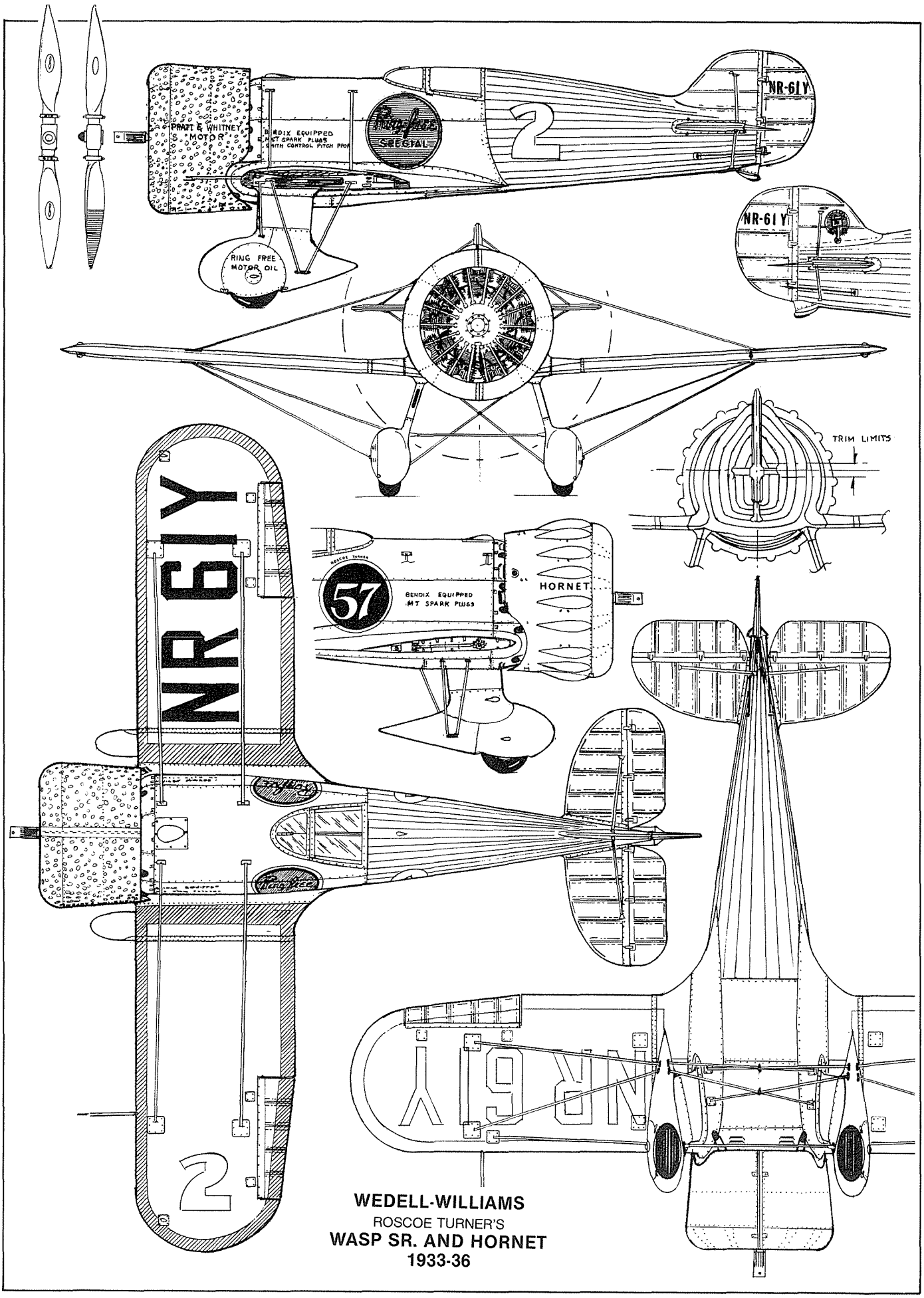
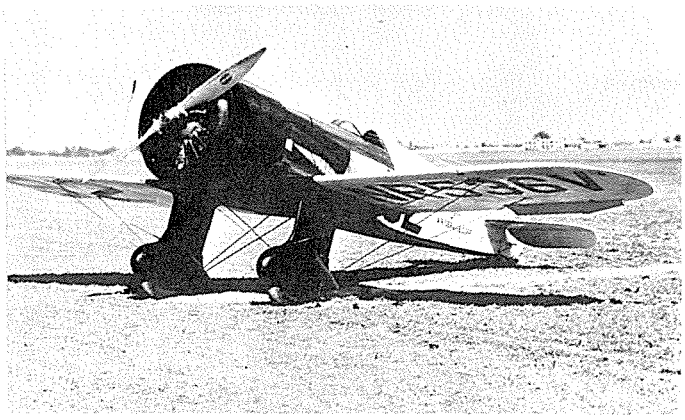


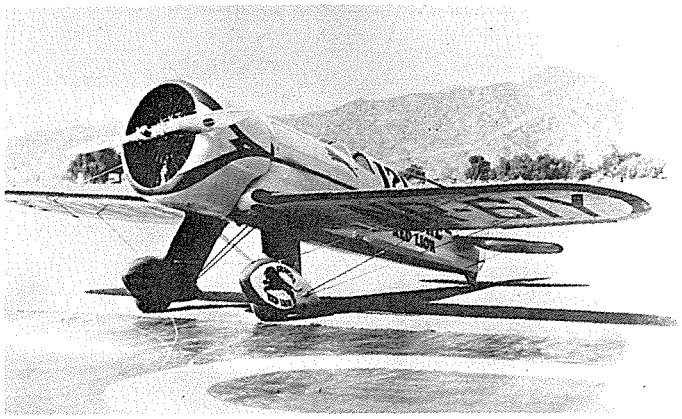
WEDELL-WILLIAMS
MODEL 44
ROSCOE TURNER'S
1932



WEDELL-WILLIAMS
ROSCOE TURNER'S
WASP SR. AND HORNET
1933-36

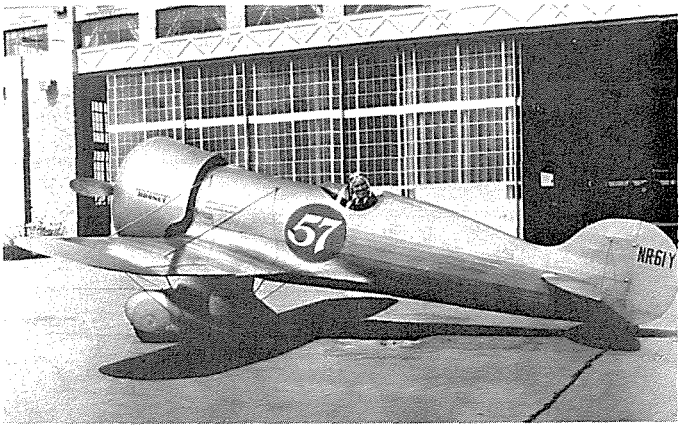


A ¾ front view of No. 92 taken at Cleveland after Jimmy Haizlip returned from the East Coast, setting a coast-to-coast speed record. It was an extension of the Bendix Cup Race.

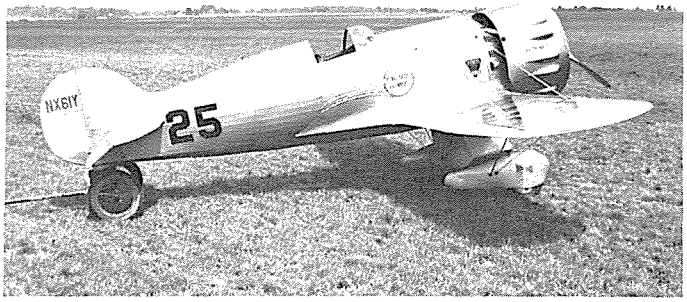


NR-61Y at Burbank, Calif., after the 1932 National Air Races. Turner was getting ready to go for the three flags speed record from Mexico to Canada.

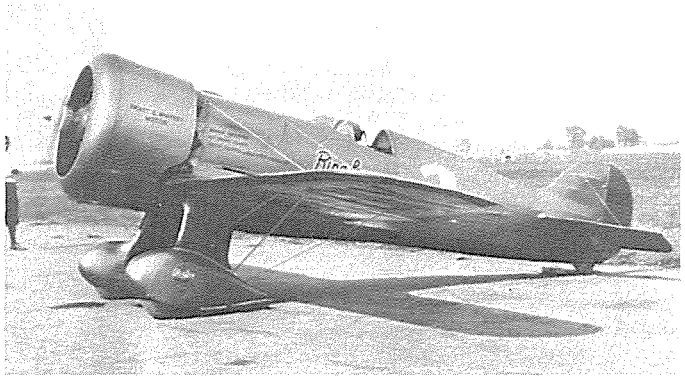
The Turner racer at Cleveland next to No. 92 flown by Jimmy and Mary Haizlip. The Model 44s placed 2nd, 3rd and 4th behind Doolittle's Gee Bee R-1 with the bigger engine. But they came in ahead of the R-2 which had the same engine.



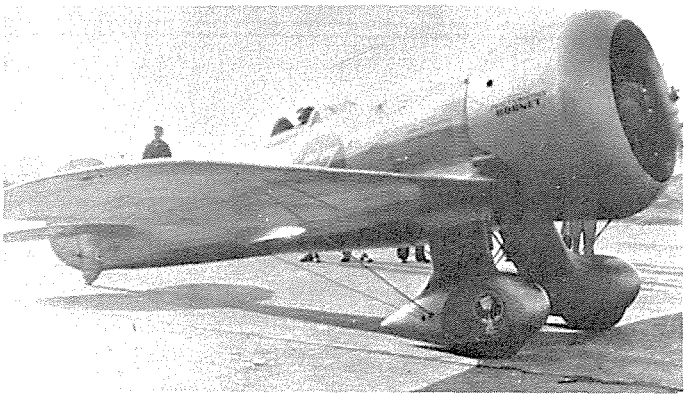
Here Turner went after even more power by installing a *Hornet* engine. It was a little faster, but not much, since the frontal area was becoming too large. The ship was then all gold with the red and white No. 57. Era is about 1934.



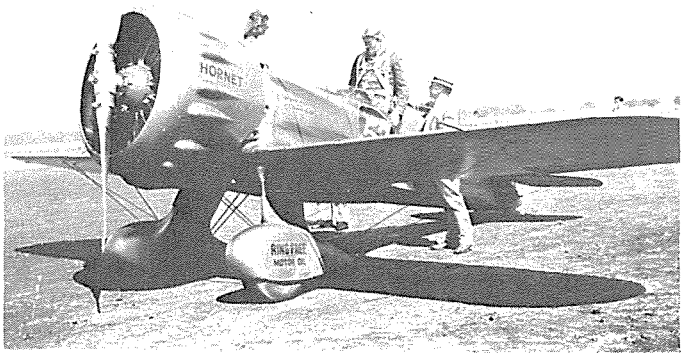
Side-view of the Turner racer in its final configuration. This gives good detail of shortened engine cowling. Also, note that since the Laird rebuild the registration number is now NX-61Y. Racer went to the Experimental category.



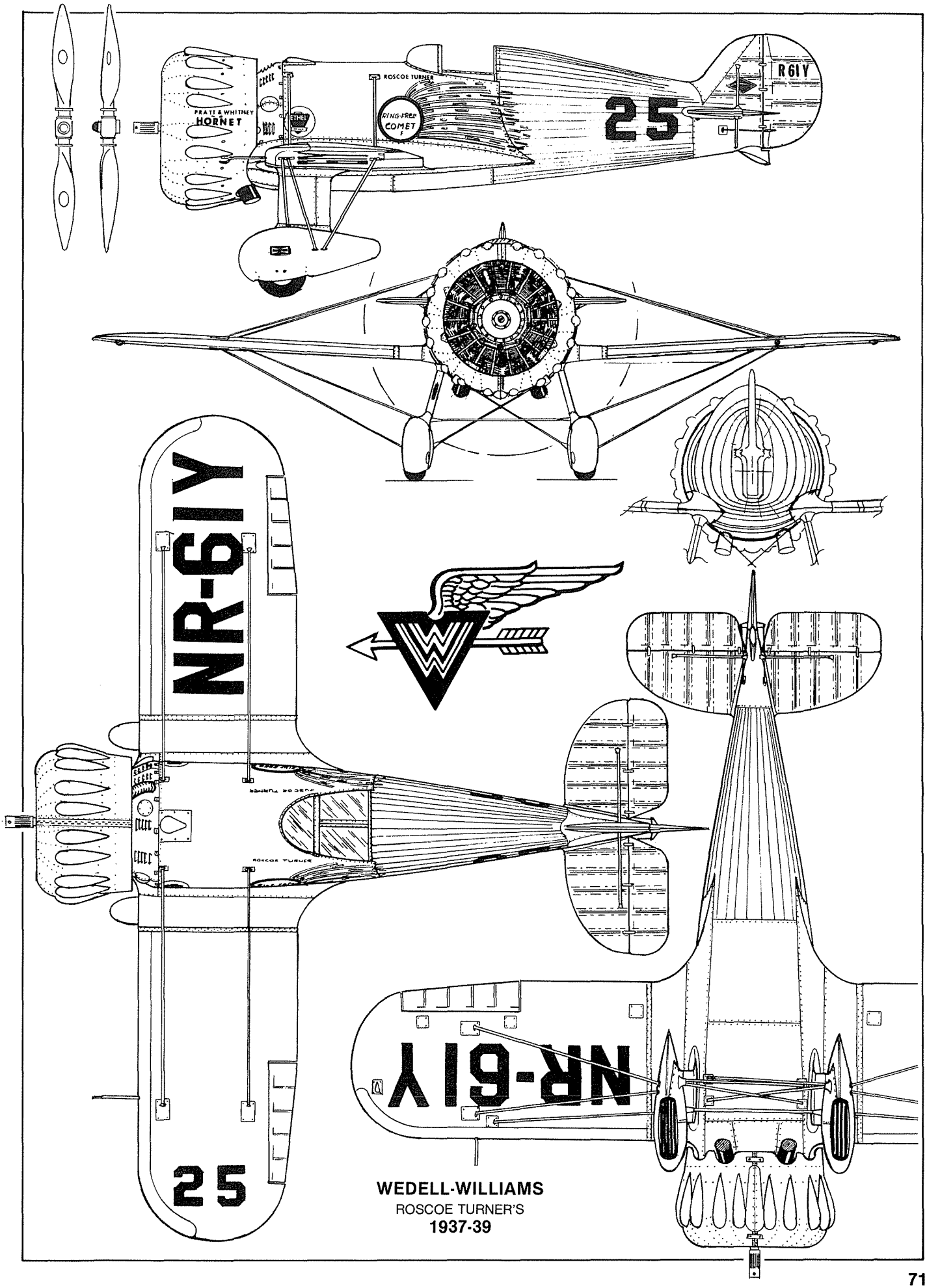
Turner's racer at the Chicago races after he lost the Thompson Trophy at the Los Angeles National Air Races. The No. 2 race number was then white. It was black at Los Angeles. Fuselage is now gold but wings still have the old cream with the Gilmore.



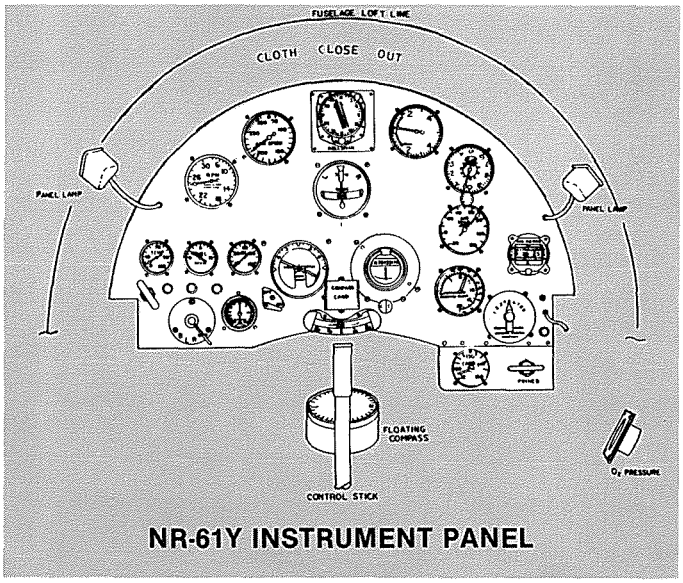
The Turner racer at Cleveland in 1934 now sporting the larger *Hornet* engine and his new sponsor's No. 57 for the Heinz 57 varieties.



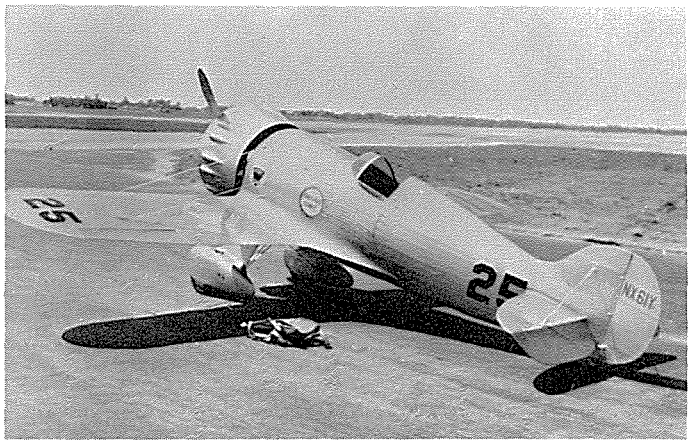
In 1936 the Turner racer was at its fastest and most streamlined configuration. However, it was not to pay off this year either. Turner cracked it up in New Mexico on the way to New York to enter the Bendix race.



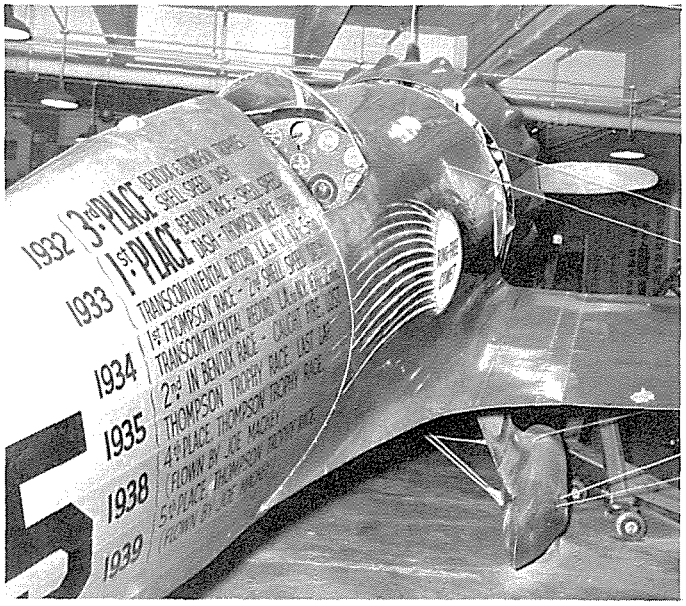
WEDELL-WILLIAMS
ROSCOE TURNER'S
1937-39

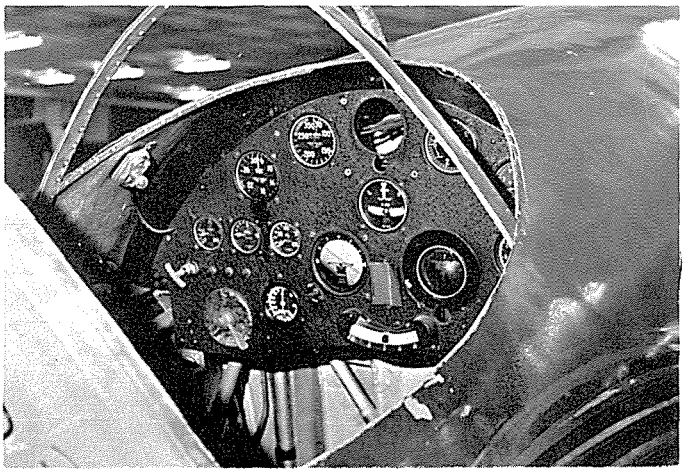


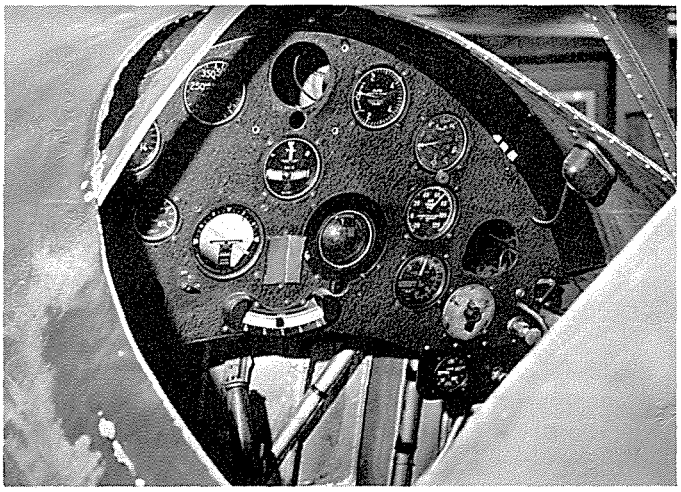
NR-61Y INSTRUMENT PANEL



This ¾ rear-view shows that the windshield is a bit higher and a little more blunt. The Comet logo and stripes are white with black trim as are all numbers and letters. Aircraft color is gold.







The only remaining Model 44 (much modified) sits in the Thompson Products museum. Note the instrumentation.