

# Bob Roe . . . No Hill Too Steep



by DICK CAVIN

Since the pin feather days of EAA, the all wood airplane has been one of the staples in the builders' market basket. Somewhat surprising, though, single place all wood biplanes have been almost non-existent.

In today's climate of sophisticated homebuilts, one would tend to think the successful test flight of a newly completed all wood single place biplane would create little if any stir among the aviation community of the Dallas-Ft. Worth metroplex or the media. Not so!

To be perfectly honest, it really wasn't the airplane that attracted all the attention, although it is indeed an eye catcher. The major share of the limelight was directed toward the builder, **Bob Roe** of Ft. Worth, TX. To fully appreciate this you would have to know that Bob spends all of his waking hours in a wheel chair and his body is wracked with painful and crippling arthritis, making even the smallest task a major project.

One might also assume that a person so severely handicapped as Bob Roe would be forced to compromise quality, at least now and then. Again, not so. Exactly the opposite is true.

If you said the 10 years of increasing arthritis, plus the age of 72, was just too much of a handicap for anyone to even think of starting to build an airplane, would you believe Bob also spent 2-1/2 rough months flat on his back in a hos-

pital in '84, fighting for his life against spinal meningitis?

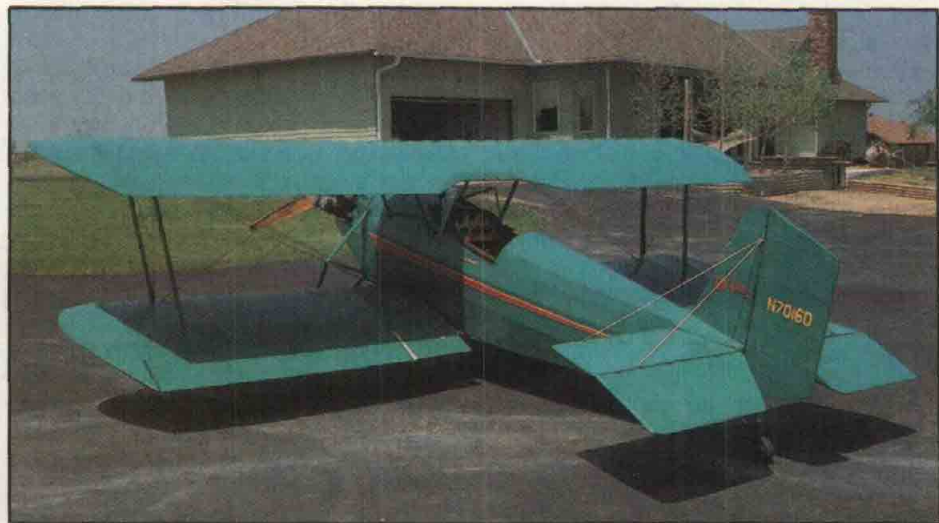
Before I tell you about the "Roe Sport", his latest airplane, you might want to go back to 1934 when Bob learned to fly. In 1939 he moved to California where he earned his A&E, then went on to work for both Douglas and North American as an inspector.

He came to Ft. Worth in 1949 and went to work in American Airlines maintenance as a crew chief for the next 30 years. Following his retirement in 1979, he has spent the last ten years as an IA. Over the years he has built, or restored, 2 Heath Parasols and 3

Pietenpols, plus a host of partial rebuilds on other people's airplanes.

Just before the Sport his previous masterpiece was a Corben Cabin Ace replica, truly a jewel of consummate perfection. Painted an all-over blood red at its maiden public appearance at the big Denton, Texas AAA-EAA fly-in, it was a hands down top prize winner. Unfortunately, it never made it to Oshkosh. It was later sold to a nearby EAA Chapter president and later suffered some wing damage. While hangared at Gainsville, TX it was stolen and hasn't been seen since.

It was just 4 years ago when Bob had





**Bob Roe and the Roe Sport**

finished a long and tedious rebuild of a Schweizer sailplane for his son-in-law that he spied 4 wood Cub spars in the loft of his 30' x 20' garage/workshop. What to do with them? Build an airplane around them, naturally. But what airplane? Why not something original this time, since it might be his last. He had always liked the Pietenpol and felt comfortable with its wood structure, so why not a "Pietenpol" biplane? Why not, indeed! It would have to be a scaled down version, otherwise it would be too big and clumsy, hard to enter, etc.

After some simple preliminary sketches, he decided on a span of 20 ft. (vs. the 29 ft. of the Pietenpol) and reduced the chord from 5' to 4'. He used the USA 27 airfoil. This gave him a wing area of 140 sq. ft. and at its estimated gross weight of 880 lbs. he still had a modest wing loading of 6.25 lbs./ft.<sup>2</sup>. This would permit a stall speed of less than 40 mph. With a 65 hp Continental it would get off and climb well and cruise at an estimated 110 mph.

His next step was to buy a load of spruce and 1/16" and 3/32" Finnish birch plywood. He had his son-in-law rip it up for cap strips, 7/8" square long-erons, and other fuselage members. Wing spars were sized to 1" thick, while aileron and tail group spars were made 3/4" thick.

He built a couple of identical wing rib jigs to speed things up a bit. He then began the time proven method of fitting all the little cap strips and other rib members together, sanding each member to exact size, applying the Weldwood glue to the hundreds of little 1/16" plywood gussets, and then nailing the gussets with tiny brass aircraft nails. I asked him how he held those nails with his crippled hand and he said he used a special set of tweezers that his father, a doctor, had left him.

When he had a pile of some 36 full length ribs and 34 fake nose ribs, he

began wing assembly, sliding them on the spars until they were about 1 ft. apart. He would put a small brush stroke of glue on the spar at the rib location, then tap the rib up against a spacer board between ribs and nail to the spar. Compression struts and drag wires were then added, along with plywood plating on the spar at strut and wing root attach points.

The top wing is built in one piece. Spar segments are joined in the center via glued plywood plates (no bolts). This allows him to get the 3 degree dihedral in the upper wing, as well as the lower. The top wing is staggered 18" ahead of the lower, which is to give better access to the cockpit and improve vision. Decalage is only 1/2 degree, as the upper wing has a 2 degree angle of incidence with 2-1/2 degrees on the lower, equalizing lift distribution between the two (due to the downwash of the upper wing) and gentling the stall.

Ailerons are on the lower wings only which simplifies their operation and they are differentially operated. They are about 1' x 6' and are attached via three piano hinges. Actuation is through a conventional cable and pulley arrangement to the control horn at the aileron mid-span point.

Each wing panel has been given 2 degrees of washout twist to delay wing tip stall and enhance aileron control at low speed. Bob built the wing tips right on each panel by starting with a 1/8" thick strip that was followed by successive laminations of more 1/8" strips glued together. The tip bow was then hand planed to final desired shape. From the pictures you might notice that the Sport uses no metal or plywood at the wing leading edge, only a shaped nose piece. This was common practice on many older airplanes (i.e. Travel Air 2000, etc.), furthering the impression that the Sport is an early '30s airplane.

After completing the wings Bob built

the tail group and these were strictly Pietenpol, with 3/4" square spars and leading edges, shaped and faired with balsa. Horizontal surfaces have 3 ribs each side, while the rudder uses 5. Control is unique, with push/pull tubes back to the stabilizer where tubes project outside the fuselage and operate bell cranks that are cable connected to elevator horns, much like the EAA Bi-plane's ancestor, the Gere Sport. Dual brace wires, top and bottom, are used in a Vee arrangement.

The fuselage was next and it, too, was strictly Pietenpol, except that it is about 5' shorter and is 17.5 ft. from prop to rudder tip. Bob didn't draw up the fuselage layout until the tail group was finished and weighed, so that he would know where to attach the wings and landing gear. Each side was built in a table top jig in the classic manner, plating the area with 3/32" plywood from the seat back forward. Completed sides were then installed in an assembly fixture, where cross members were fitted and installed, plus turtleback formers.

The cockpit is a comfortable 24" wide and has a fold down entry door on the right side. The wing is notched back to the rear spar and an assist handle attached for exceptionally easy entry. The seat is a stock molded fiberglass chair, with legs removed. Leg room is also generous and all controls are conveniently placed.

Even the simple instrument panel is a nostalgic art form. The panel is aluminum, embellished with overlapping burnished circles, much like Lindbergh's cowling was. Very popular in the '20s, it is done by spinning a small abrasive coated disk to burnish the metal. An old style ignition switch sits in the panel, accompanied by the usual basic altimeter, airspeed, compass, tachometer, oil pressure, and oil temp gauges.

The cockpit coaming edge is padded with a very neatly done roll of rich brown leather, while a 3 piece windshield adds still another Golden Age touch of artistry. This windscreen was patterned after the one on a PT-22 and has a formed metal frame. Bob made 3 of these before he got one he considered perfect.

The 18 gal. fuel tank sits forward of the cockpit and is made of fiberglass. Bob built a wooden form for this, waxed it, and coated it with resin and glass. He then cut it in half, withdrew the wood, and glassed the two halves back together. He also made the fiberglass nose cowl using a latex coated Styrofoam male form. This entailed considerable painful sanding of the cured laminate to achieve smoothness. A handmade flush circular aluminum air intake on the nose cowl adds a touch of class, too.

The landing gear is typical of the

Golden Age types. It is 6' 3" wide and the 8:00 x 6 wheels sit farther forward than modern types do. This was to put more weight on the tail skid, which was the "decelerator" in those days. This extra tail weight usually required external lift handles to raise the tail onto a dolly and, yes, the Roe Sport also has them.

The gear reminds one of a Fairchild 24's, with a long stroke oleo stabilized by Vee struts to the lower longeron and a diagonal one to the upper longeron. Bob made these struts from cut down streamline Cub lift struts. His cabane and interplane struts were also from the same material. The oleo was from an Aeronca Chief and was encased in an auto exhaust pipe tube. Bob went first class on the wheels and brakes, using brand new Clevelands. Cockpit brake pedals are the toe type, with cylinders from a Pitts.

The Continental 65 engine is a prize antique in itself. It was given to him several years back and is one of the first ones made. It is unique in that the exhaust ports are on the **top side** of the cylinders and exhaust pipes are also on the top side of the cowl. This series engine runs a little cooler than later ones and didn't require the "eyebrow" type baffles found on Cubs. The three piece cowl around the engine is indented just aft of the rear cylinders, giving a little extra boost to exiting cooling air. It is also very attractive looking. His prop is a St. Croix 74" x 40" scimitar type.

The elevated exhaust stacks pose a problem for carburetor heat, but that was "no hill for a stepper", as they say. Bob built a heat exchanger to the shape of the oil tank, encircling it to tap a rich heat source. It contains radiating elements inside, is welded to the tank and is ducted to the carb with a controllable butterfly enroute to select high heat air or low heat air from the cowl interior.

The airplane is covered with dacron, with rib stitching at 2-1/2" intervals on wings and tail with the knots on the sides. As you might suspect, it's done to perfection. Bob used 4 brush applied coats of nitrate, followed by 4 more coats of butyrate, a coat of silver, and the color coats of Nantucket green, and finally the two trim colors of orange and yellow. Each coat was followed by laborious hand sanding. Perhaps you can imagine how painful this was to Bob. He laments that this finishing job wasn't up to his usual standards, telling me of an Aeronca he once put 50 coats of dope on and was so shiny that you could use it to shave by.

The Sport uses a Pietenpol style "center section" with brace wires in an "X" arrangement between the struts, both fore and aft and spanwise. Three flying wires per side are used, with one of them doing double duty as a drag



Bob Roe, owner/builder, and Larry Schexnauldre, test pilot.

wire. Two landing wires are used. All these wires are stranded 1/8" aircraft cable, with turnbuckles for adjustment. I counted 22 turnbuckles on the airplane and at \$6.50 each that adds up to nearly \$150 worth. Of course, if you price streamline flying wires, this is still a whole lot cheaper.

Bob had the help of a retired Boeing engineer, Jim Pace, to check his design and do his weight and balance. At his 600 lb. empty weight, his CG fell right where he wanted it - on the front spar of the lower wing.

Obviously Bob's condition required his wife's help on several things (i.e., rib stitching, getting inside the cockpit to install controls, and a dozen other things), but this amazingly resourceful and gritty man did the lion's share. It took him four years, working as much everyday as he physically could stand.

Even the final paperwork path wasn't smooth for Bob, with the square wheels of bureaucracy taking four months to resolve a controversy over whether the scales for weighing were "certified".

Finally, the big day came when Bob's test pilot friend, Larry Schexnauldre,

crawled in and opened the throttle for some high speed taxi tests and lift offs, with Bob watching with just a suggestion of a tear in his eyes.

Naturally you would assume that there would be a "lived happily ever after" ending at this point in the story, but Fate wasn't through with Bob Roe just yet. On the second lift off and touch down, one of the new brakes locked up tight, resulting in a vigorous ground loop. When the dust settled, it was discovered that a cold weld in one of the landing gear Vees had let go, wiped the right gear out and had scratched the fabric on the right wing tip.

A lesser person probably would have gone off and cried in his beer at this point, but Bob just rolled with another of life's punches. He sat down and ordered enough new tubing to build a new gear. You can bet that Bob will successfully climb this latest steep hill in front of him and the doughty little Roe Sport will take to the medium it was designed for in a few weeks down the line. It probably won't make Oshkosh '90 but when that day arrives maybe we ought to rechristen it, "Miss Adversity I".

