

SPORT AVIATION

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JOHN RODENCAL'S

PL-4



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IT ALL STARTED back in 1969 when I attended the last Rockford Fly-In. For sometime I had wanted to build an airplane and that year I began looking seriously at the various designs that were available. Then, to my good fortune, EAA moved the fly-in to Oshkosh the next year — just 80 miles from my home — so this made it much easier to get to the succeeding events to continue my search.

At the 1972 Fly-In, I met Ladislao Pazmany and saw some drawings of his then new PL-4. The detail and quality instantly made them my first choice. I promptly volunteered to make some parts for his prototype PL-4A . . . and, at the same time,

test my ability in metal construction. Each time a part was completed, a second one was made for myself and soon I was hooked on airplane building. During the 1973 Fly-In, I built wing ribs in the sheet metal shop — with the expert assistance of Ralph Borden.

The metal work was quite enjoyable, and as I progressed I set no deadlines or target dates. In fact, there were periods of time that the project would be dormant for several months. I could work constructing parts in a basement work shop before assembly took place. The outer wing panels were built in this same confined space using matched-hole tooling, much like a Thorp T-18. I

recommend it highly. It saves a lot of time in the skinning of the wing panels and, if done with care and accuracy, it will give you a good straight wing. In power off stalls (which occur at 48 mph), the plane can be kept level by walking the rudder and it will mush straight with a loss of about 300 ft./min.

The original PL-4 had a Volkswagen engine with an option for the "A" series Continentals. The A-75 was my choice, but Paz was getting very busy doing a construction manual and isometric drawing book, so with his blessing and his original weight and balance figures, he consented to let me use some of my engineering training to design the

Continental installation. It was necessary to get the engine as far rearward as possible to avoid using lead in the tail to attain an acceptable range of center of gravity. By using Slick magnetos, we brought the engine back to about 8 inches from the firewall. We also incorporated 3° of side thrust and 3° of down thrust to offset engine torque. The thrust line was a compromise between propeller clearance and aesthetic look for the engine cowl.

Paz approved the project at this point and I was getting anxious to see what a cowl design would look like. The problem was that my project was not at the stage where I could build a cowl mold over the powerplant. I didn't own an engine as yet. The next best was to do it in loft lines from the drawings I had done. The cowl of the Grumman Yankee was always attractive to me so I chose to copy it to some degree. Full scale cross sections were band sawed

from plywood at 10" intervals and pine blocks were glued between each section.

For the next two months I practiced the art of pattern making. The completed male mold was finished in body filler and prime and turned over to George Rattray who cast a female mold and now sells the complete cowl. It was very satisfying to me that the cowl fit and had adequate clearance. The original thought was to use Piper J-3-type exhausts, such as are available for the CUBy, but many other configurations have also worked quite well. On N40JR I used 321 stainless 1½ inch tubing bent inward and aft and they exit at the bottom of the firewall in clusters of two. I would like to say at this point that the articles in *SPORT AVIATION* and, particularly, Tony Bingelis, gave me all the baffling and exhaust information needed.

I did incorporate a propeller spacer to give the left front cylinder more

clearance. My engine turned out to be a tapered shaft AT5 and the sketch shows the method used. Propeller bolts go through ⅝ inch aluminum bushings pressed into a ¼ inch aluminum spacer. A 10½ inch offset front plate was found at George Rattrays that is used for the back spinner plate. The propeller is counterbored to accept the propeller bushings. The front spinner plate was machined from ¼ inch aluminum plate with lightening holes. The spinner was a whole \$8.00 from Kansas City Airparts and cut down to proper size.

What works good in mounting a spinner on a tapered shaft hub is to chuck the hub backwards in a lathe, assemble the back plate, spacer, another spacer the same thickness as your propeller and the front plate in a lathe. The front plate can then be finish-machined to accept the spinner the proper depth. I then used a cone cup in the tailstock to align the tip of the spinner and drilled the



PL-4



holes in the backplate. It doesn't wobble!

Another change in N40JR from other PL-4s is the horizontal tail. Paz wanted to try a stabilizer/elevator combination in place of the stabilator style tail. He prepared a set of drawings for the tail with changed fairings at the top of the fin and a slight modification to the fin and rudder. It was decided that I would build it for "debugging" and test it on my plane. A comparison between the two style in flight characteristics is not complete until we have had pilots fly both styles. We get no tail stall on the elevator style like the stabilator style does if you attempt to pick up the tail at low speeds. Also the fairings are much tighter for air leaks at the hinge point, thus less drag for more speed. And perhaps the elevator is less sensitive in the pitch attitude, although not proven as yet.

The problem to date is working out a trim system that is effective. We started with a spring loaded bungee on the control stick, but up to now the airloads on the elevator are too high to make the spring effective.

In choosing the propeller, I talked to several PL-4 builders about proper propeller diameters and pitch, using a Continental engine. The ultimate choice has not been selected, therefore, I did some calculations for several assumed airspeeds using the information in Lu Sunderland's article of November 1973 in *SPORT AVIATION*. Considering that I was going to use wheel pants and the alternate tail, I decided on a 66 inch diameter, 58 inch pitch propeller, which I had Harold Rehm carve. To add my findings to that of other PL-4 builders I got a static rpm, with the tail tied down, of 2050 rpm. Full throttle maximum rpm in level flight is about 2450 rpm, not the 2600 rpm desired for my A75 engine. Another 150 rpm on the tach would be ideal, so a little less pitch would be desirable. The additional rpm would create more excess horsepower for better rate of climb but would not add much to top speed. The rate of climb indicates 1000 fpm at 80 mph at present, so any pitch change is going to be postponed for the time being. A quick but not accurate check of the airspeed indicator over a 4800 foot runway with a stop watch gave the following speeds.

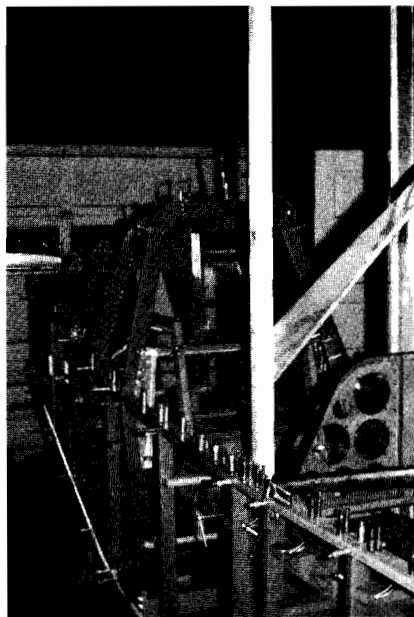
Indicated Airspeed	RPM	Time/Seconds	True Airspeed
85 mph	1450	42/40	77.9/81.8
100 mph	1700	33/32	99.2/102.2
130 mph	2100	26/27	125.9/121.2
145 mph	2325	24/24	136.4/136.4

The upwind/downwind times varied slightly and on such a short distance the data is not as accurate to give a good calibration. It did tell me that the airspeed reads high on the top end.

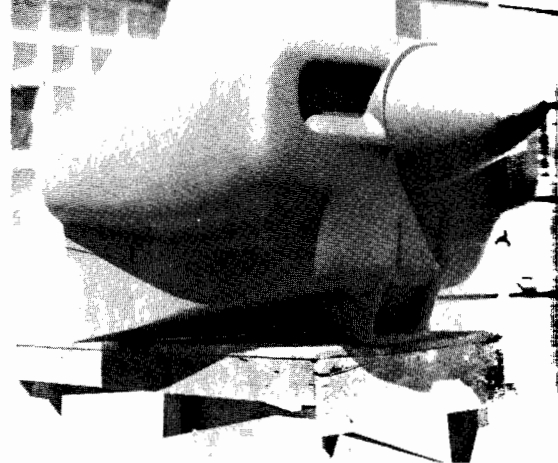
On April 9, 1981 the final inspection was made by Larry Nelson of the Minneapolis FAA office and the airworthiness certificate was issued. A couple of days later the taxi tests were made. Ground handling, although quick, was positive. On the last run the test pilot said he felt he was getting behind the aircraft so he let it fly and did some pattern flying. The test pilots are my son and his partner in a Citabria, and both report the speed and rate of climb to be excellent. They also say pylon turns and barrel rolls are a lot of fun! You ask how come test pilots? Well, I have to admit I soloed in 1969, but, as you can see, the last 8 years have been spent in building, not flying. But that's my next project.

ABOUT THE AUTHOR

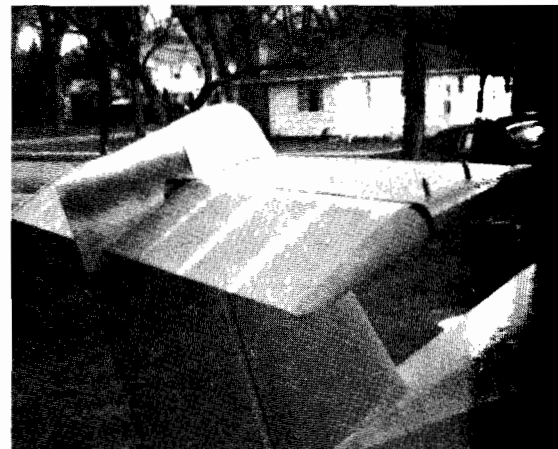
John Rodencal (EAA 53476) had his first airplane ride at Oshkosh at age 14 with "Pinky" Strehlow and remembers the "Buttercup" of S. J. Wittman in the hangar. A 1951 graduate of University of Wisconsin in electrical engineering, he presently is an auto dealer in Wisconsin Rapids, WI.



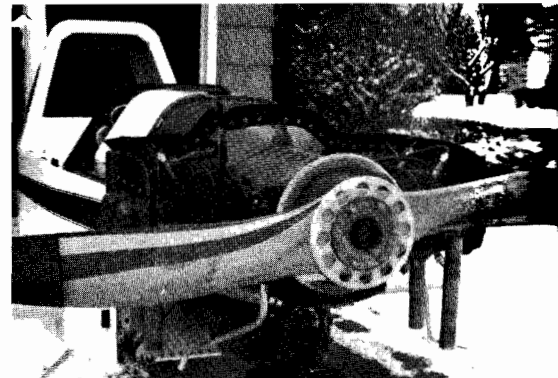
Fuselage frames jugged up prior to skinning.



Cowl mold.



The new horizontal stabilizer/elevator tail replacing the standard PL-4 stabilator.



Prop and spinner backing plate installation.

