NO. 43

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SEPTEMBER, 1993

# **ROLLING THE ACRO II**

by Don Baker, 2733 Whippoorwill Ave., Elida, OH 45807

If you are interested in aerobatics, you must eventually decide whether to go to an instructor or to go it alone. This is a decision only you can make, and no one else's advice should cause you to make a potentially wrong or dangerous decision. I decided to teach myself in the Acro II; it has been successful so far, and it provides a very big sense of accomplishment and self-satisfaction. The Acro II is a very good aerobatic trainer, and if you have never aerobatted before, then the roll is a good place to start.

The Acro II will roll well, over a very large speed range, so entry speed is not critical. However, I would recommend that rolls at low airspeeds, (near stall speed), be attempted only after much experience is gained and after recovery from stall/spins is well ingrained in your mind and body.

If this is your first roll, start at cruise speed, (120 to 130 MPH), at an altitude which is legal and safe, and in an airspace which is legal. The roll is a relatively low risk maneuver, and you should not have to worry about stalls or spins at this speed. Leave the throttle at cruise setting, quickly pull the nose up slightly, (5 to 10 degrees), neutralize elevator, and then put in full aileron and keep it there for one complete roll. Don't bother with rudder the first time, just get a mental picture of what it is like; familiarize yourself with the unusual attitudes. Then do it some more. Full aileron rolls are quick enough that almost no elevator or rudder correction is needed. Note the altitude loss or gain on these first few attempts. Adjust the initial pull-up to provide no altitude loss. Full aileron rolls in the Acro II take about three seconds; the Acro is not a really fast roller.

Slower rolls, (less than full aileron), require more attention to elevator and rudder control. During a roll, the lift changes considerably, and altitude loss is guaranteed if elevator is not used properly throughout the roll. Actually, the rudder is also needed to help keep the flight path level as well as on heading. The slower the roll, the more critical the rudder and elevator inputs become. Heavy rudder inputs used in slow rolls create a lot of drag, and therefore, you will need to add power initially; full throttle is fine.

Slow rolls require "top rudder" when passing through wings vertical, and a little forward elevator pressure when going through inverted. This will result in going through negative Gs while inverted, but if done properly, it is a smooth transition, and is quite tolerable; enjoyable actually! If you are flying with an open cockpit, you now begin to realize the importance of backup seatbelts. Keep them babies tight!

With a little practice you will soon be able to do a roll

without altitude loss or heading drift. Practice both directions to keep from being a "one way" roller.

Heading errors seem to be the most difficult to analyze and fix. Find a cloud and concentrate on keeping it perfectly centered over the nose throughout the roll. This aim point is critical for practice; it teaches you proper coordination. I roll mostly to the right, so I will describe rudder control for a right roll. Left rolls are similar but opposite.

You will find that the roll must begin with coordinated rudder, (same direction as the roll), for the first 45 degrees of roll before transitioning to top rudder. This initial rudder deflection counteracts adverse yaw and is very critical, because without it the nose will veer off heading and mess up the roll right from the start. This is true no matter how fast or slow the roll rate because any aileron input at level flight always creates yaw drag and requires coordinated rudder. Even very tiny aileron inputs cause th nose to swing off course without rudder coordination. This error is very difficult to detect as the source of a heading drift problem in rolls.

For a right roll, the rudder should cross from coordinated, (right), rudder through neutral at the 45 degree point, and proceed toward opposite rudder, (left or top rudder), and be at maximum deflection at the 90 degree point, wings vertical. At the 135 degree point, the left rudder is still needed and actually becomes coordinated rudder, (adverse yaw again), all the way through inverted to the 225 degree point. At this point the rudder should be passing through neutral proceeding toward right (top) rudder. Again maximum top rudder is at the wings vertical point, 270 degrees into the roll. Finally the rudder should remain coordinated (right rudder), but decreasing through the last 90 degrees of the roll, and be neutral right at the finish point.

Summarizing, at the beginning of the roll rudder and aileron should be coordinated, and the rudder should pass through neutral at 45 and 225 degrees, and should be at maximum deflection at the 90 and 270 degree wing vertical points. If all is done correctly, the elevator should be neutral at the 90 and 270 degree points, with a slight forward pressure passing through inverted. Keep practicing until you can consistently hold altitude and heading for one complete roll with all control surfaces neutral at the finish. Multiple rolls are good training because they tend to amplify errors, and this helps to find your mistakes.

Eventually you can slow the roll down to a very slow roll rate, about 10 to 20 seconds for one revolution, and you will be able to hold heading and altitude throughout the roll. What

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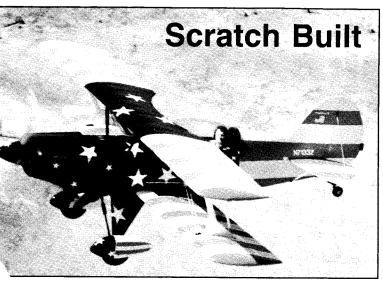
a feeling! What fun! And what an accomplishment! You will love it.

Rolling is easy, but "good ones" take a lot of consistent practice. I had several hundred under my belt before they became consistently good. I have found that practicing rolls while trailing another airplane, (with the pilot's knowledge and permission), gives tremendous insight to altitude and heading drift errors which cannot otherwise be detected. Stay at least a quarter mile behind the other guy, and always practice at a safe altitude.

Once the roll is mastered, try variations of it, i.e., at higher speed, on 45 degree up lines or down lines. Watch that Vne,

and approach rolls near stall speed with caution. The Acro II stalls very gently in any attitude, and it is easily recoverable. However, don't get caught in an inverted stall for the first time in the middle of a maneuver without first learning inverted spin recovery. By the way, you are going to wear a 'chute aren't you?

High airspeed rolls require a lot of stick force, and I have built and installed a set of spades. I like them very much, and will write about them if there is enough interest out there. Meanwhile, keep flying, keep practicing, and keep on a grin'in!



"The 180 is the ideal engine for the Acro II; all the 200 does is haul itself around —" Joe Spencer.

### by Joe Spencer, 75 Forrest Hill Cove, Grenada, MS 38901

I began construction of N7133Z in 1983, and finished it seven years later after 2200 hours of sporadic work. I felt the plans were entirely adequate and straightforward, and encountered no problems during construction other than finding time to work on it. It is scratch built; no kits used.

Initially, I installed an IO360A1B 200 H.P. Lycoming. I was a little disappointed with the performance, and after 200 hours flying time I removed it and installed an O-360A1A 180 H.P. equipped with tuned crossover stacks, (Aircraft Spruce), and an Ellison Throttle Body injector, as well as Flyweight starter and B&C alternator. Total weight loss was 60 pounds.

The plane flies much better now — lands slower, climbs faster, generally a much nicer feel. In my opinion, the 180 is the ideal engine for the Acro II; all the 200 does is haul itself around and increase the wing loading. I used the same prop on the 180 as on the 200, a Sensenich 76/60, (Cherokee 180), with about 3/4" off each tip. I moved the battery from behind the rear seat to between the passenger's feet when I made the engine change.

I installed a Pitts S2 canopy after flying it a couple of years. It was well worth the effort, (about 70 hours work). Cruise speed increased about 7-8 MPH, 135 at 2500 RPM, and rate of climb increased considerably. Visibility was surprisingly improved — now I can move my head around and not hide behind the little windshield all the time. The rudder also seems slightly more effective; it is a much nicer airplane now.

One change I made was to add a sump drain at the lowest point in the fuel sight gauge. Another was coil springs on the main gear, (slightly heavier, but less drag and maintenance). I used an electric fuel pump rather than the Christen one called for in the plans, (about \$450 savings). Wheel pants came from a Cherokee 180. Empty weight is 961#.

The Acro II is one of the most forgiving airplanes, (while in the air), that I have ever flown. I have botched any number of maneuvers, and it never seems to care. It is completely honest and easy to fly, though rather difficult to snap roll and enter a spin, (for me). The visibility on approach and during landing took a little getting used to, but soon was no problem. I fly out of a 1900' strip with tall trees at both ends. Getting out is no problem at all, but I do pay attention while getting in.

I would caution others not to make the same mistakes I did — I took my time and did a nice job until I got to the covering, then got in a hurry to finish, with the result being obvious to everyone. Take your time - especially during the final stages of construction.

Have fun and good luck!

# **EDITORIAL**

### by Bill Berrick

I used the tank designed for smoke oil on my Acro Sport for an auxiliary fuel tank. So far, my aerobatic skill isn't such that I would like to leave a trail of smoke for all to see, and I always have liked to have a few more gallons of gas when the main tank runs dry! This has worked out well for me, but I might pass on a couple of tips from my experiences with it.

The aux tank has its own 2-way valve that can isolate it from the rest of the system to make it easy to change over to smoke at a future time. A line from this valve goes to the three-way Imperial valve that I use to select MAIN, AUX, or OFF. The 2-way valve at the aux tank must be left in the ON position at all times, so that switching the fuel selector valve is all that is needed to change tanks. Early on I was returning to the airport with the main tank fuel running a little low. I switched to the aux tank as part of my pre-landing check list, and on downwind noted a sudden ominous silence! Turning

the two-way aux valve to ON quickly solved the problem, and it has been left on ever since!

My selector valve was built according to the plans, mounted on a bracket welded to the fuselage tubing, and with the shaft of the valve extending up through the plywood floor. If you used this same system, check to be sure you get a good positive click at each stop of the valve handle. I found that the selector handle was riding on the plywood surface just enough to break the seal of the valve. A spring loaded cone-shaped plug serves as the heart of these valves, and anything that holds the shaft and handle upwards will prevent a good seal. My problem was corrected by routing out a shallow circle in the plywood floor to relieve pressure against the selector handle. It is worth while to drain the gascolator with the fuel selector in the off position just once to be sure it is really off!

# **OSHKOSH'93**

The stars of the Awards Banquet on Monday night at Robins Restaurant were Paul Muhle for his Outstanding Acro Sport II, and J.J. Tomlinson for his Pober Super Ace, the first homebuilt completion. One of the judges scored the Acro II at 100%; that will be a tough act to follow! Paul's address is Rt. 5, Box 236, Richland, NE 68601. J.J.'s Super Ace was completed in less than one year! His address is 106 West Mead, Lebanon, TN 37087.

The Acro Sport forum on Monday, moderated by Don Baker featured a panel of proven experts: Maynard Engel, Paul Felkner, Wally Weber, Sam Burgess, and Bill Blake. Their presentations stimulated many questions from the 46 people in attendance, requiring continued conversations outside after we were pressed out of the tent by the following forum.

The Pixie and Ace forum on Tuesday was moderated by John Leitus, and featured a panel of an early Pixie builder, Hartwell Jewell, and Pober Super Ace builder, J.J. Tomlinson.

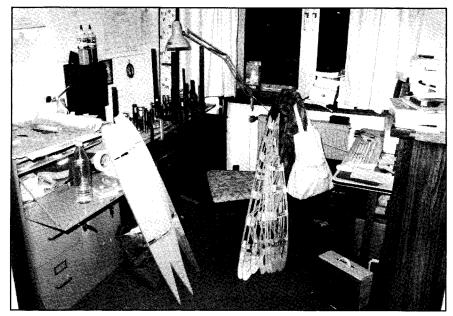
# Letters To The Editor

5 April 93

Acro Sport, Inc. P.O. Box 462 Hales Corners, WI 53130

Enclosed is my check for renewal of my Acro Sport Newsletter. I have enclosed \$24.00 for two years worth of newsletters if that is OK. Don't know what issue you are up to, but the latest I have received is number 40. An additional \$20.00 is enclosed for one extralarge, and one large T-shirt. My military tour here in Germany is finally coming to an end this summer. I have arranged my travel plans to my next duty station to coincide with the convention in Oshkosh, and look forward with excitement to experiencing the convention again after a four year absence.

It has been hard to maintain interest here when my job and location keep me so removed from sport aviation. Enclosed is a picture of my little room in my apartment here in Germany that has been the starting point on my Acro Sport II. Although I purchased the plans, No. 403, many years ago, being in the military and constantly moving around the world have always given me



Sam Oliver's storage room/computer room/Acro II building room in Germany!

an excuse for not getting started. This time, (on my fourth overseas tour in 20 years), I vowed to finally get cranking. I have managed to finish all the ribs for the upper wing, and hopefully will have the lower wing ribs finished by the time I leave Germany this summer. Since time has not been a factor. I have not used nails or staples on the ribs, but just let them stay in the jig for 24 hours each side, under clamp pressure while the glue dries. I can feel for the home builders in foreign countries who really pay a high price for material. I was able to get capstrip material through the military mail system from Aircraft Spruce & Specialty, but had to rely on European sources for the gusset material and other plywood required for the ribs. To say the least, the price was quite stiff, and makes stateside prices seem cheap. I have been saving the guestions I keep coming up with for a face to face visit with all the Acro Sport

people in Oshkosh this summer. Look forward to seeing you there!

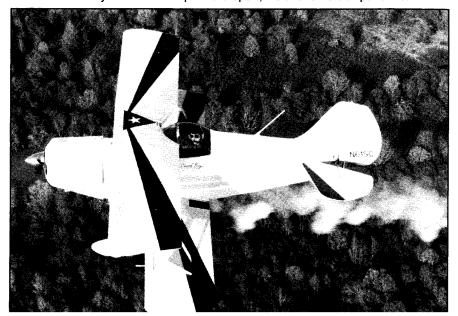
Sincerely, Samel G. Oliver HQ, 7-159th AVN RGMT CMR #416, Box 1770 APO AE 09140

Ed: My Acro fuselage was stored for 13 years while I was on the move, but I was making ribs on the kitchen table when the room temp would be up to 70 degrees, (not often in Germany!) You have the advantage of using T-88 glue which works well at lower temps.

Jean

Thanks for the card. I wish I could make it to Oshkosh, but will be unable. I really enjoyed the Forum at Sun & Fun. Here is my information packet and pictures I said I would send. Feel free to give my phone number to anyone con-

Chuck Boyd's 200 H.P. Super Acro Sport, his airshow's star performer.



sidering building an Acro I. Hope to see you in Florida next year.

Chuck Boyd Rt. 1, Box 291 Hope Mills, NC 28348 Gray's Creek Airport (919) 483-4114 Home (919) 424-7857

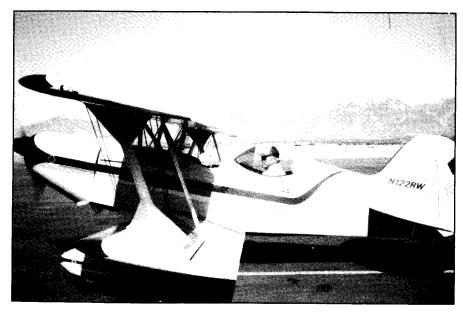
4/14/93

Dear Ben,

Hope all is well with you and EAA Headquarters. I've been making fine progress with my Pixie until a recent setback which I felt worthy of letting you know, and possibly save other builders some grief.

As you know, Stits Poly Fiber changed their D-103 fabric to the new P-103. According to one of their technical men. (John), the P-103 has a greater shrink percentage than the older D-103. John mentioned a change in manufacturing from a wet process during which required drying removed some of the "shrink" from the old D-103. The new P-103 is processed completely dry, therefore there is no pre-shrink or drying required while processing. John suggested leaving lots of slack when I cover the top. As a precaution, once I straightened the ribs, I installed a 5%" x 3/4" compression strut, (see drawing enclosed), in each bay to prevent the rear spar from moving. The other wing was covered with some left-over D-103 I had, and had no problems. John said the shrinkage of the P-103 is close to 12%, about 2% higher than D-103, plus it is stronger and better all the way around. Poly Fiber company is very cooperative, and were very helpful. All is well now. If I had used more slack on the bottom side, I probably would not have had a problem.

I was really amazed to see the ribs buckle that much without breaking. The rib interlacing was not too tight or I'm sure they would have broken. Because of the large span between compression ribs, if I had it to do over again, I would add another compression bay for added security plus use a different method of



Rand Williams is building another Acro II to replace 122 RW.

tightening drag wires.

I'm rib stitching the other wing now and will be covering the fuselage soon. Should be ready to fly in late fall. It I build another Pixie, I'd be tempted to try a metal wing, fabric covered, or perhaps all metal. Would be an interesting experiment, (I'm dreaming). Sorry I didn't get pictures.

Hope this info helps someone else.

Best regards, Doug Hagerman 6 St. Helens Lane Chico, CA 95926

Dear Jean,

Wanted to thank you for the plans corrections, and to relay my thanks to Paul for the kind letter concerning Dad's passing.

I am enclosing a small picture of our completed Acro Sport II, which was taken just one week before the accident. Pictured is Dad taxiing the airplane with his Great Grandson, (my Grandson), in the front.

As I mentioned before, I am starting to build another Acro Sport II, as much like our first as possible. All of the wood materials, and much of the longer steel is on its way from Wicks now. However, since Wag-Aero no longer deals in Acro Sport kits, I am having trouble locating such things as fiberglass wingtips, preformed metal aileron well covers, formed metal leading edges, etc. Can you help me?

I believe Dad's subscription to the Acro Sport Newsletter expired in February, so enclosed is a check for \$12.00 to start a subscription for me.

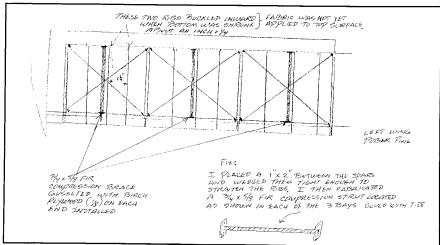
Thanks for your support!

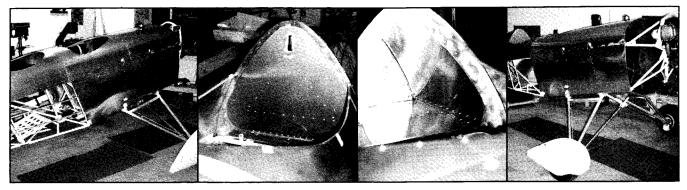
Rand W. Williams 3829 W. 5800 S. Roy, UT 84067-9179

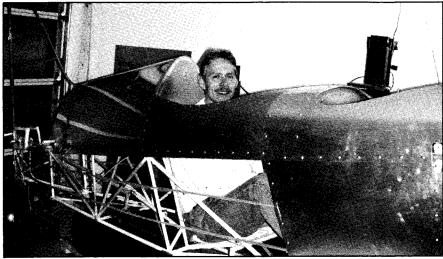
4-1-93

Ben,

As I promised Jean, I've sent along pictures of my Acro Sport II. In September of last year I bought the frame and O-320E2A from Cleone Markwell. (Casey, IL), Serial #1392. I started work on it in mid-December after moving into a new house. I quickly took over the garage, making sure I could spread out! I've since re-built the elevator horn inspection brackets, added the bottom stringer brackets and all stringers. I've added all the bottom sheet metal brackets, and as you can see, I've completed the basic fuselage sheet metal. I remade the firewall, putting stainless in place of the galvanized panel that Cleone had. By the time you receive this I'll have installed all the instruments/gauges for basic VFR, and I've almost completed the upper and lower cowl sheet metal. Once that's complete I'm going to take the fuselage components apart, sandblast, prime and paint





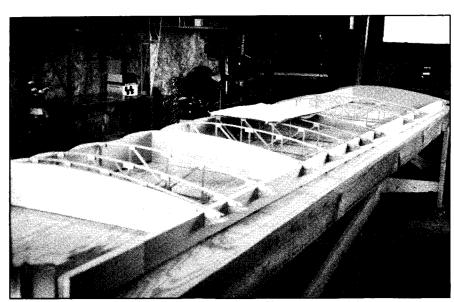


the frame . . . on to the wings.

I'd like to thank Nick Nichols of Garland, (Acro Sport II N6N), for always lending his expertise, (and plane rides), and letting me "crawl" all over his plane. I'd like to install a 2-place bubble canopy, but so far I've struck out with the canopy suppliers. I'd appreciate anyone's help. I'll have more pictures soon.

Bill Freckman 1813 Quail Hollow Drive Grapevine, TX 76051 (817) 329-1190 Dear Jean:

Good to see you at Sun & Fun. I enjoyed the Acro Forum and chatting with all of the builders, even though I am building a Pixie. Work is progressing steadily, but much slower than planned. Enclosed is a picture of one wing panel taken about two months ago. Both wings are now nearly complete. I started to put the fuselage together just last week. Having no major difficulties with the exception of me taking a long time deciding how I want to do something. Also enclosed please find a check



First class woodworking on Jeff Moczynski's Pixie!

LEFT — Bill Freckman "logging time" in his Acro II. Note beautifully detailed metal work evident on Bill's Acro II in pictures above.

for my Acro Sport Newsletter. Come on all you Pixie Builders: let's see those letters and pictures!

> Jeff Moczynski 39471 Carol Lane Zion, IL 60099

## Life-Threatening "Un-Captured" Bearings

Dear Bill:

I had the pleasure of seeing the Acro Sport I which you built, at Clarinda. Unfortunately, during my brief visit, I didn't have the chance to meet you. If we ever meet with our aircraft at the same airport, remind me not to park my Acro Sport I next to yours! Your plane would put mine to shame in terms of finished workmanship. You did a great job, and I wish mine were even close to yours. I do have a defense; I didn't make my plane, somebody else did. I have just had the good fortune to correct all the deficiencies on it. What an experience! I could give a list of over 50 things on my plane which were done improperly, some of which I would consider lifethreatening.

I managed to note some things on your plane which I intend to copy someday, time permitting. I did see one thing where you have what I would consider a life-threatening situation. It is not your fault, it is, I think, the fault of the plans. Not to worry, it is an easy fix.

If you look under your lower wing, you will notice the push tube which comes down vertically with a threaded fixture going through a bearing connected to an idler arm, which operates the lower wing's aileron. This bearing is what I will call an "un-captured" bearing. What I mean by this is the following: If this bearing were to come apart, the threaded fixture could pull through the bearing and become disconnected. The result would be that you would not have ailerons on one side of the aircraft. You see,

this bearing is not contained within a bracket or fitting wherein if the bearing came apart, it would be okay, like at the other end of the idler arm where the bearing is contained within two pieces of welded sheet metal.

The solution is easy. You need to install a wide-area washer on the outside face of the bearing. This way, if the bearing were to come apart, the threaded bolt couldn't pull its way through the bearing, resulting in a loss of aileron control. If the bearing came apart, the wide-area washer would keep everything held together. While it might be a bit on the rough side, it would still function. I've enclosed two AN970-3 widearea washers which I have put on the outside surfaces of these bearings on my plane. Aircraft Spruce sells these only in a quantity of 100. I only needed three, two to go on the push tube on the aielron, and one on the bearing assembly on the throttle. Assuming your plans have the same bearings as mine, these should work just fine.

> Gary L. Buda Acro Sport I, N44809 3251 Sky Ridge Drive Waukee, IA 50263

Ed. — Thanks Gary, my bearings are now "captured"!

### More Building Tips From Neil Sidders

### **SEALING RIBS**

Rather than varnishing the interior of the plated and compression ribs, Neil "blocks" the cut-outs for the push rods. He blocks the space around the cut out with 5/8" by 1/2" spruce, completely surrounding the cut-out area prior to cutting the plywood. By this method the interior is "sealed" and doesn't need varnishing. He also suggests that this could be done with a large block of 5/8" material which could be routed out after the glue had dried.

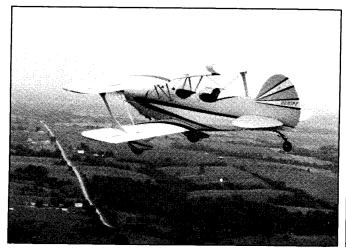
### THRUST LINE

The Acro Sport engine mount as it is drawn ends up with a thrust line 5/8" below the center line of the top longeron. The reason this is so, is that the bushings are actually centered about 5/8" below the longeron itself. If you purchase a mount from Wag Aero, the engine will be 5/8" low. In Al Smith's Grand Champion and many other Acro Sport IIs, they maintain the cowling line straight from the instrument panel to the nose bowl, and the propeller flanges end up centered 5/8" low in the hole. This

is then covered with a spinner and is hardly noticeable. Possibly on sheet #17, the dynafocal mount dimension should be changed to be 55% from the upper tube to the center line of the bushing; and on the standard 180 HP mount in zone B5 on that sheet, the 5 dimension changed to 55%; this would put the engine up 5% more, where it belongs.

### **POSA CARBURETOR**

The Posa carburetor has no mixture control. Neil found that the Posa had needle valves that weren't centered in the bore. Being a machinist, he corrected this on his Sonerai, which used a Volkswagen engine with a Posa carburetor. He is also in the business of correcting other people's Posas for very inexpensive prices. The Posa is still a desired carburetor as it is very inexpensive. One way to use mixture control on the Posa is to use a ball valve right before the carburetor. This makes it capable of very fine adjustment by a push/ pull cable. This is what he used to lean his mixture at high altitudes. A ball valve is also very useful if you have a Posa and you hand prop. Once turned on, it will start leaking fuel, and you can't start because it is too rich. The ball valve will shut off the mixture from time to time so that you can hand prop successfully.





Paul Felkner's beautiful Acro II was awarded 2nd place for the Outstanding Acro Sport II at the award dinner, Oshkosh '92.

November 4, 1992

Dear Paul.

After 11½ yers of spare time work, I am able to enclose a picture of my completed Acro II made from green plans. I started in December of 1979, and finished in May of 1992. My first flight was May 31, 1992 from my own grass strip, 2500' by 70'. Thanks Paul, for designing a beautiful airplane that is a delight to fly!

I was thrilled with the performance. I have about 900 hours in a tail dragger. The Acro II has the following specs:

Engine — IO-360 B4A, 180 Lycoming

Fabric — HS90X Stits process up to final color coat,

then I used Ditzler Duathane.

Prop — Metal Sensenich 76 x 60

Empty weight — 1069#; full electrical system

Tail wheel weight - 66#

It has a 51/4 gallon auxiliary tank ahead of the front instrument panel. Total fuel is 30 gallons. Metalized landing gear. The Acro has bungee cords for shocks. The 1280 HD would not hold up, but would stretch out in just a few hours. I put on 1380, which stopped the problem. Thanks to Ben Owen for his help on the phone concerning this problem.

I flew off my 40 hour restriction July 30 and the next day, July 31, I flew to the Oshkosh '92 convention. My only problem was my wife, who didn't get the first ride. But what a thrill to fly your own plane into Oshkosh! I was overwhelmed by the interest in my Acro II. Best of all, I came home with a bronze Lindy award for plans built plane.

Sincerely, Paul Felkner Rt. 2, Box 64 Centerville, IA 52544

# POBER SUPER ACE IN PROGRESS

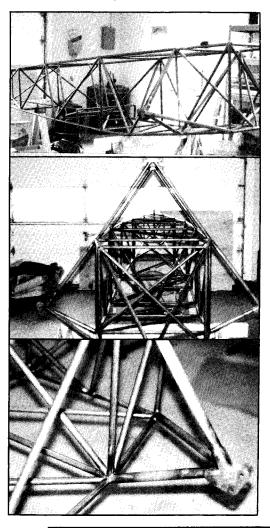
Paul.

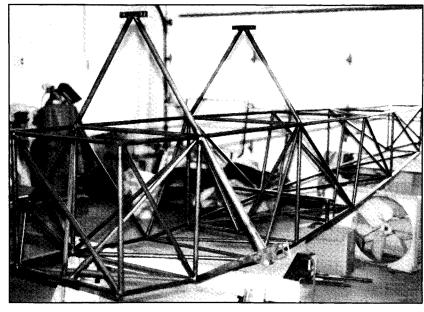
I have put the cabane braces in after these pictures were taken. At this time I have the tail stab. and elevator about 50% complete; when complete, I will send more pictures.

All the wing ribs and spar are finished, but not assembled due to room placement. The landing gear shocks are done. Hope to have the fuselage complete and on gear by years end.

Fred Bowen 312 Longfellow Drive Owensboro, KY 42303

Fred Bowen's professional level welding on Pober Super Ace.







AUTHORIZED ACRO SPORT DEALERS As reported in the September 1992 issue of SPORT AVIATION, Alexander Aeroplane Company, P.O. Box 909, Griffin, GA 30224 (1/800/358-5228) and Wicks Aircraft Supply, 410 Pine St., Highland, IL 62249 (1/800/221-9425) are authorized suppliers and dealers for materials and supplies for Acro Sport aircraft. When ordering, state the type of aircraft materials needed — Acro Sport I or II, Pober Pixie, Pober Super Ace, Pober Jr. Ace and Nesmith Cougar I.





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