ACRO SPORT Newsletter

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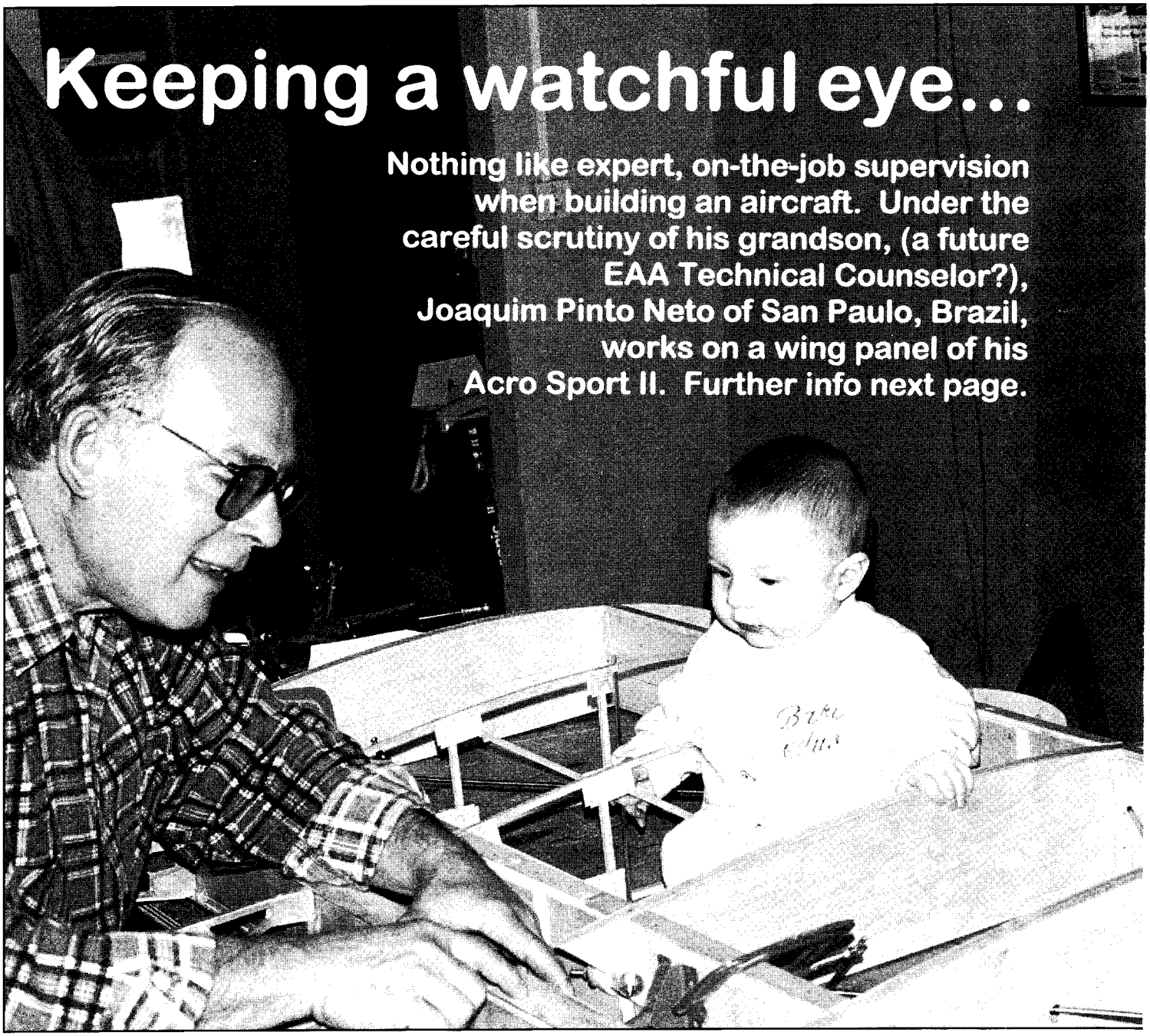


Brazilian Acro Sport II Takes Shape

Dear Fellows;

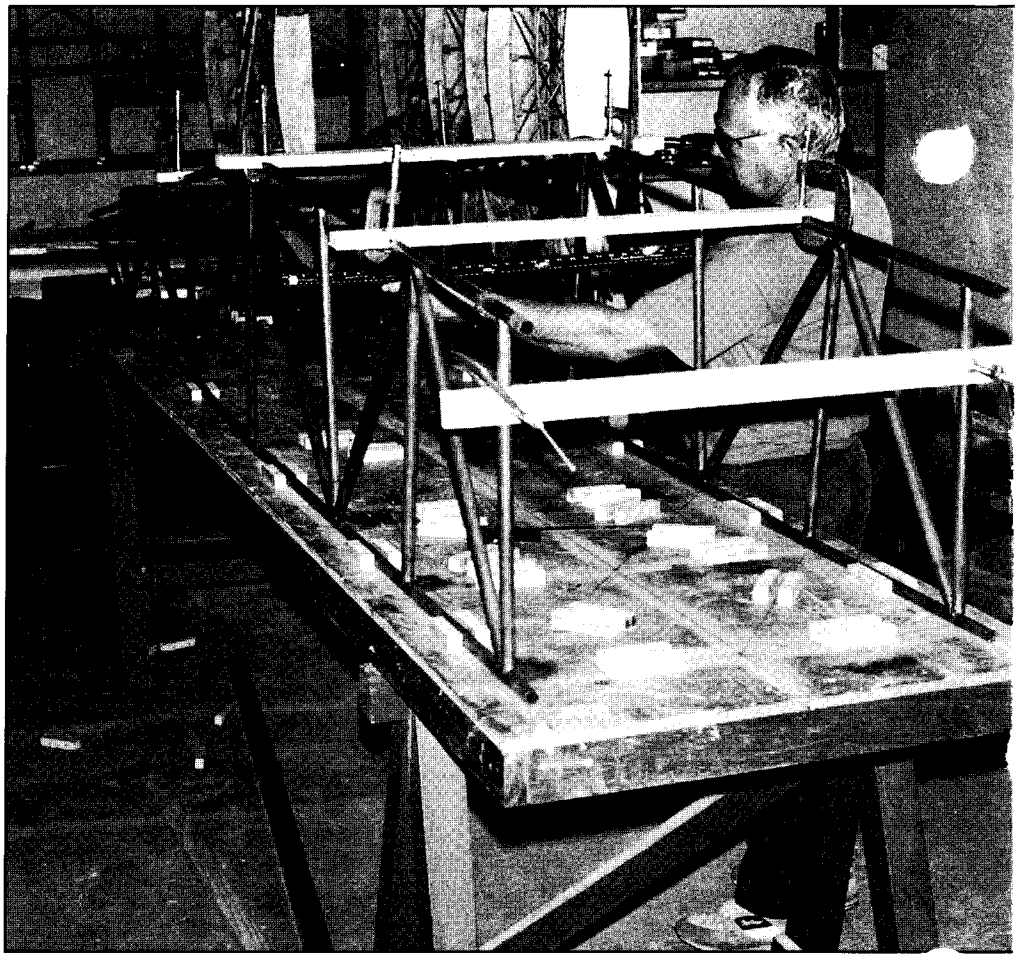
Thanks for reminding me about the renewal. I'm also sending some pictures of the construction of my Acro II. I have already approx. 500 hours of work on it. I started in 1994 and I have used my spare time to work on it, but next year, as a retired man, I intend to dedicate more time, with the help of my grandson as you can see in one of the pictures.

The wings are ready (less leading edge), and I'm working now on the fuselage, making and welding fittings. The engine, a Lycoming 0-320, is also ready, waiting for the bird.

Well, I hope that I can fly the Acro before my grandson! I'll let you know the progress. Happy New Year for all you fellows.

Best Regards;
Joaquim Pinto Neto
Rua Agisse 230 AP. 84
Sao Paulo - SP
Brazil
05439-010

1.



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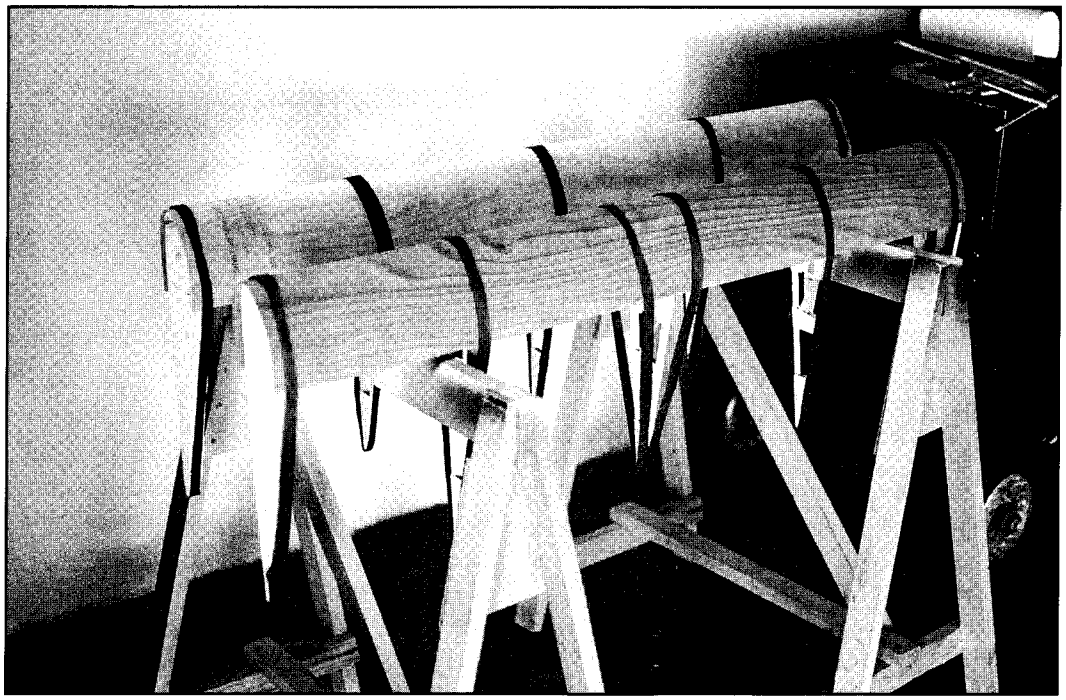
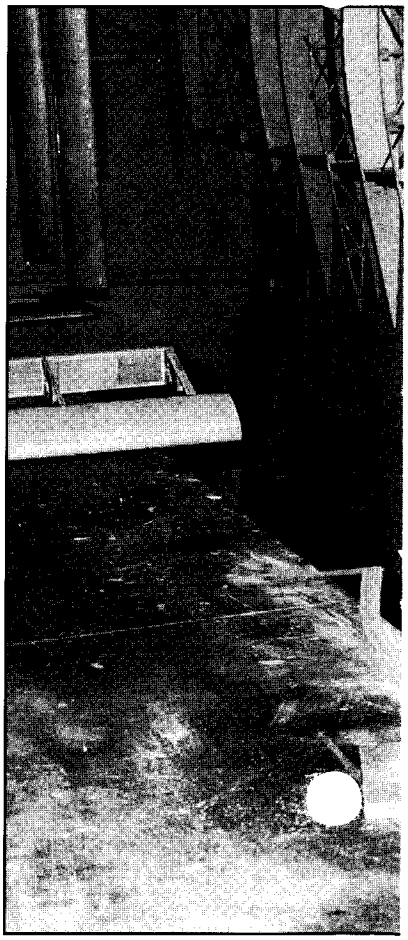
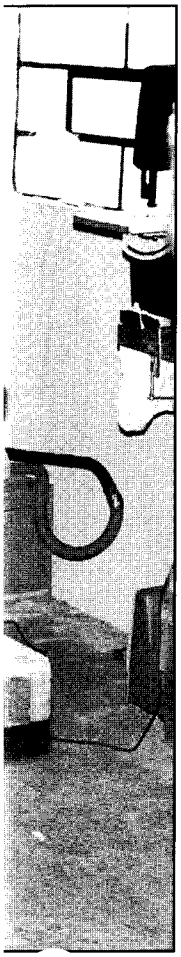




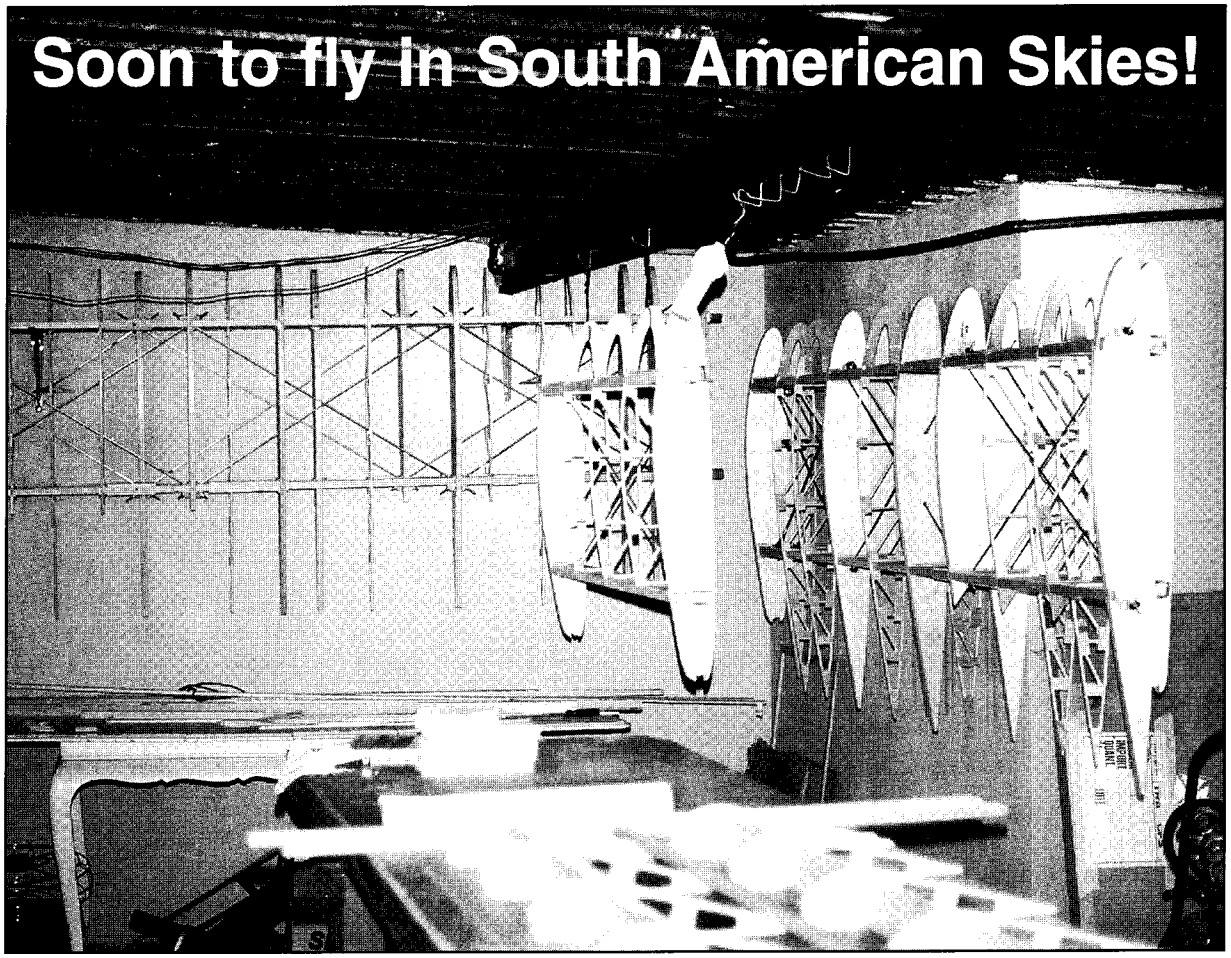
4.

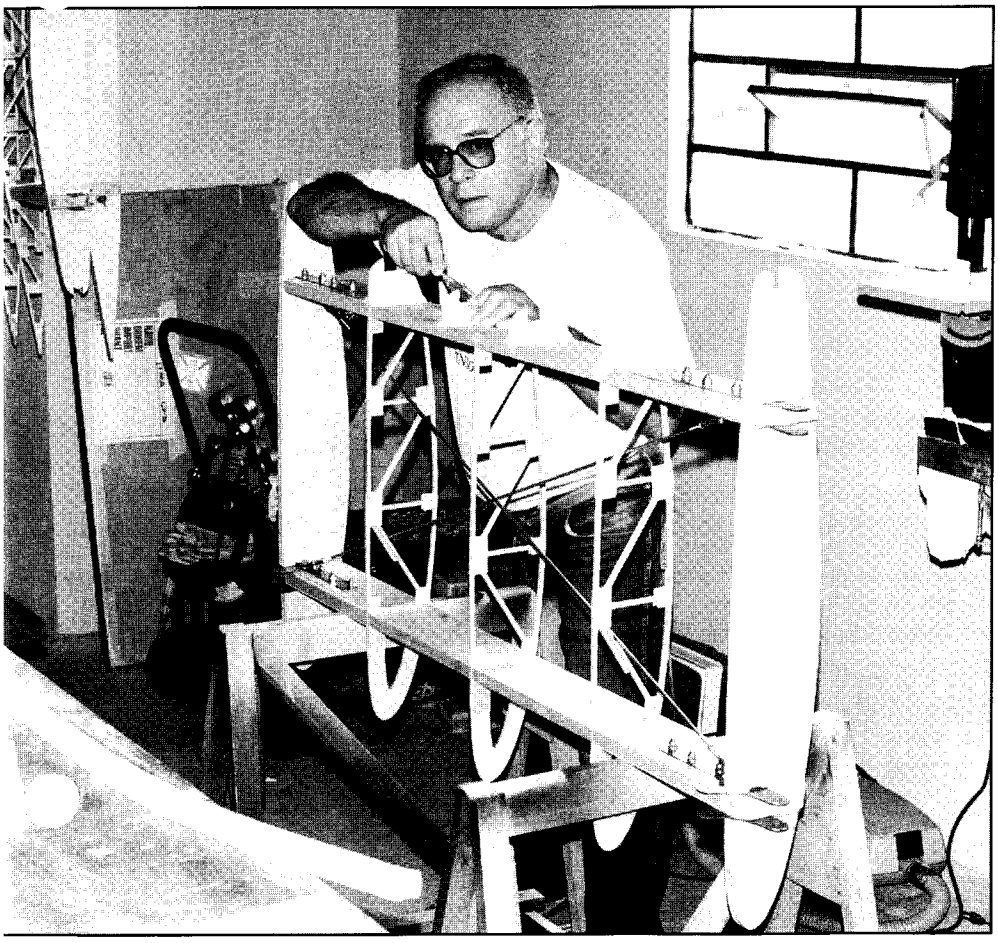
1. Joaquim squares up fuselage sides using dado cuts in wood boards to keep sides in position for fitting cross tubes.
2. Wing panels and center section nearing completion. Note excellent workmanship.
3. Fitting plywood to leading edge of ailerons.
4. Notching ribs prior to fitting center section bow. Joaquim's building skills got an enthusiastic nod of approval from his grandson.

2.



Soon to fly in South American Skies!





Letters

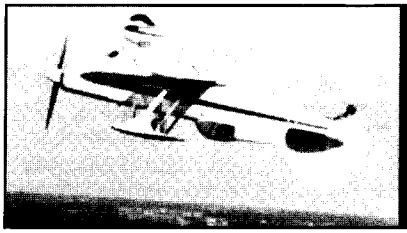
Dear Ben, Bill, Jean, Acro Sports

Well, here I am sitting down my torch to take pen and paper in hand again. I was not only very surprised to see my project featured in the newsletter but also very pleased with the fine layout and picture selection.

I'm sure that I'll never get a "Pulitzer" in creative writing, and Jack Cox and Bud Davission's jobs are probably secure for a little longer but it was a real treat for me to see it in print. My wife is the only one ticked "Oh sure, you didn't send any of the pictures that I look nice in."

Since joining and becoming a part of it, I've felt that EAA is an extended family. (I'm sure Paul would want me for his own son). When you're building an airplane there are only a few outside of that family that believe in you. But everyone in it not only believes in you and encourages you but also helps in every way possible. And when you're back safely on the ground, they reward you by doing a fine article about your efforts. Thank you for that. Thank you very, very much.

Pioneer in June
J.R. Wing



Other Passions Besides Flying?

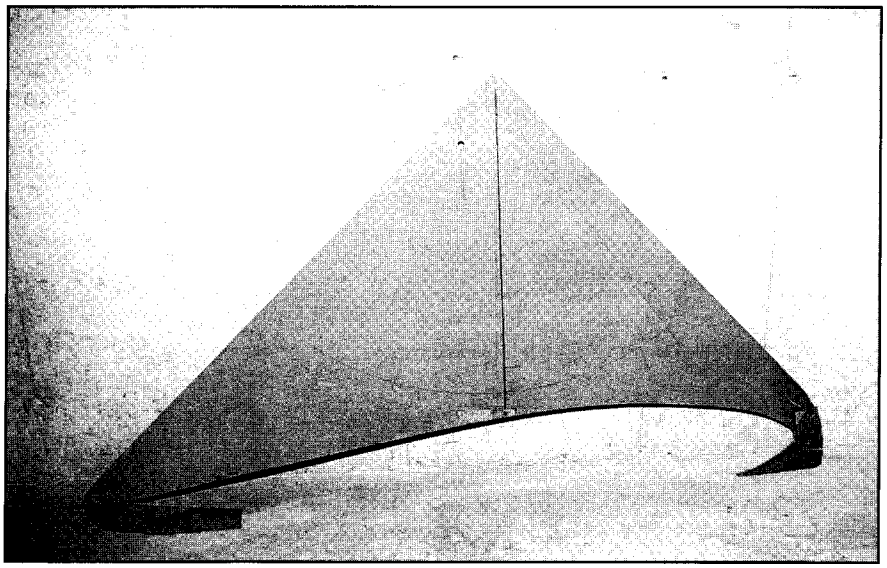
by Don E. Baker

I have never dwelled on the fact that I have another passion in my life besides my family and building and flying airplanes. It is math and science. I make my living with algebra, trigonometry, and calculus and I really love it and I highly recommend it to those young guys still hunting for a career path. Yes, it's true, I am a nerd but I try not to show it. A nerd is perceived to be a "socially incorrect" or "socially challenged" person. My daughters both deny their dad is a nerd, but I can't tell if they are being nice to the old man or if he really has them fooled. I moved up a rung on their ladder when I finally got rid of the old Chevy station wagon. According to them, a station wagon is nerd fodder. In spite of the social limitations which my engineering degree brings, however, I do find that it comes in really handy when building airplanes. I can understand why the designer did what he did. I feel confident in a set of airplane drawings when they satisfy all of my technical curiosities. What I mean is, I spend a good bit of my time analyzing the plans by calculating and verifying dimensions, angles, stress levels and so on. My appraisal of the Acro Sport is that is is a very sound design. After flying it for several years aerobatically, I am further convinced of this appraisal.

If we are to reap the benefits of this good design, then it our task, as builders, to construct the airplane as the designer has specified. Much of the design of this and other biplane designs, Pitts ets., are reasonably tolerant of slight deviations from the plans. That is, the design is tolerant of accuracy errors so that we homebuilders can use affordable tooling and measuring apparatus to build a robust and good performing airplane.

Generally, accuracy is not as much of a problem as plain old interpretation of the drawings. I will cite several examples of this as it pertains to the Acro Sport II plans. Consider the situation of wing incidence. If the wing incidence is off a tenth of a degree when we build it, how much will that affect the airplane? Trigonometry will quickly show you that 0.1 degree is equivalent to an angle represented by 0.21 inches at a distance of 10 feet. Now if I am flying along at 100 mph and my wing incidence is off 0.1 degrees, I would be hard pressed to notice it. It just means that the fuselage would be at a slightly different angle. The tail would be flying along at about 0.2 inches below (or above) the spot where it would have been had I not had the 0.1 degree error built into the incidence. Also the airplane would stall at an angle with the tail about 0.2 inches off of where it should have been. Could I possibly detect this difference? No Way! I suspect that you would need at least a degree for anyone to actually detect the difference. I also doubt that one or two tenths of a degree error in wing incidence will perceptibly influence elevator trim adjustment or horizontal stabilizer incidence. Two or three degrees is another story. Table 1 is provided so that you can get a better feel for degrees and fractions of degrees as they relate to dimensions.

On the other hand, it is much more important to get the wing incidence identical on the left and right side of the plane. Errors of a tenth of a degree between sides will be detectable and will show up as a roll tendency which can only be offset by washers under the I-strut or by applying corrective stick pressure while you fly. Neither is an attractive solution, so consistency in your incidence measuring from side to side really is more important than getting the absolute angle correct. The photo shows a very low cost incidence meter which is very accurate, probably about +/- a tenth of a degree. The accuracy is derived from a long, free-swinging pointer. I made the basic frame from 1/4 inch masonite. The cutout is made to slide over the finished rib. The pointer is made from a piece of 1/16 inch diameter music (hard) wire with a right angle bend on one end to plug into the bearing. The bearing is a short length of 1/16 inch i.d. brass tubing which is press fit into a slightly undersized hole in the masonite.



Don Baker's incidence meter made from 1/4" masonite material that incorporates a rib shaped cutout. A 23" free swing pointer completes the unit.

Calibrating is fairly easy. Draw a line through the tool representing the location of the rib chord line and clamp the tool in a vice so that this line is level. Use a bubble level to make sure the line is level. Make your pointer 23 inches in length and be sure it swings freely so it comes to rest without sticking. Carefully put a mark on the masonite precisely at the sharpened point of the pointer. This mark represents zero degrees incidence. Now lay the tool on the floor (or

workbench) and, swinging the pointer through its arc, make five marks on either side of the zero mark, spaced 0.2 inches apart. Each mark represents 0.5 degrees. Subdividing each of these marks into five equal spaces will give 0.1 degrees per mark. These marks should be 0.040 inches apart. You now have an incidence meter. Slide it on the rib or wing and it will tell you the incidence accurately and repeatably. When using the tool be sure it is vertical so that the pointer swings freely without rubbing against the masonite.

Since building the Acro Sport II, I have acquired an electronic level which is accurate to better than +/- 0.1 degree. This makes incidence measuring quite easy. Again, I made a template to slide over the rib from masonite, but it has a flat surface parallel to the chord line drawn on the template. Placing the template on the rib and putting the digital level on the parallel surface is all it takes and it is very accurate. Electronic levels are very nice because they can be easily recalibrated. The calibration procedure is in the operating manual. It can also be used for relative measurements. You can put

June Acro Sport Fly-In at EAA Pioneer Airport

This is just a reminder of the Acro Sport Fly-In scheduled at EAA for June 6 and 7 at Pioneer Airport. We would like to hear from you if you are flying or driving in so that we can make plans for the event. All interested are invited. Come on down, meet your friends and make some new ones. The following Acro Sport, Acro II, Pober Jr. and Super Ace, Pober Pixie and Cougar 1 owners, pilots, builders, and fans have made plans to attend the Acro Sport Fly-in:

For further information on the fly-in, your plans to attend, or your willingness to participate in setting-up, helping with food serving, putting on a forum, or other activity that will assist the event—please contact either L. Jean Kinnaman, 414-529-2609, or Ben Owen at EAA, 920-426-6530.

People Flying In

Bryan Jensen	3564 Willow Beach St., Prior Lake, MN 55372
Ray Wilkes	11 Schwartz Drive, Ottumwa IA 52501
Bill Berrick	11803 Hunter's Cove, Omaha NE 68123-1119
Rex Ott	14794 205 Ave., Danville, IA 52623 319-753-6539
Frank Johnson	10318 Woods Edge Lane, Fort Wayne IN 46804 219-436-3690
Don Baker	10222 Springborough Drive, Rockford IL 61167 815-889-1088
Kenneth Dannenberg	(June 5 & 6)
Tom Plodzien	(will drive in if the weather is bad)
John Wing	315-387-3111
Paul Felkner	Rt. 2, Box 64, Centerville, IA 52544
Mike Lutz	Flying in, but in his Spearman Special - Acro isn't done yet.
Skip Egdorf	Flying his Cherokee - Acro isn't done yet. 505-665-1087 (Work)
Tom De Winter	Flying in with his wife in their C172. Coal Valley IL
John Leitis	Pober Pixie 817 Roosevelt Ave., PA 814-224-2465

People Driving In

Dave Nickel	Mt. Prospect, IL 847-398-5324
Ron Palascak	57 Woodview Lane, Algonquin IL 60102
Dave Lucas	314-532-2898 home, 314-432-6330 work
Doug Aplund	715-834-1131
Matt Ferrari	218-834-3463 + Wife & Daughter
Derrick Boddy	+ 2 others

Angle (degrees)	Slope (rise/run)	Divergence at 2 feet	Divergence at 10 feet
0	0	0 inch	0 inch
0.1	.00175	.042 inch	0.21 inch
0.5	.0087	.209 inch	1.05 inch
1.0	.0175	.418 inch	2.09 inch
1.5	.026	.628 inch	3.14 inch
2.0	.035	.838 inch	4.19 inch
2.5	.044	1.047 inch	5.23 inch
3.0	.0523	1.256 inch	6.28 inch

Table 1. Angles Converted To Dimensions

the level on the longeron of the fuselage, for example, then push the "alternate zero" button and that becomes the new zero reference. Now you can go check wing incidence or horizontal stabilizer incidence with this alternate zero and get accurate results, even though the fuselage might not be exactly level. Pretty neat.....huh? I would highly recommend that you get an electronic level. I believe it is every bit as good as a water level, but much easier to use.

Also, speaking of interpreting drawings, Ben Owen mentioned in the newsletter that holes for the drag/anti-drag wires could be drilled on either the chord line reference or on the spar center line reference. Speaking as an engineer, the location of these wires is structurally best if they are directly in line (or nearly so) with the compression member inside the compression ribs. This is where the forces developed in the drag wires must be transmitted in order to take full advantage of the strength designed and built into the compression rib. Therefore, the wires should be located about the spar center lines, where the compression members are positioned for all locations except for the lower-wing butt ribs. Notice that the compression member is below the spar center line in those ribs and also notice that the drag/anti-drag wires are also lowered accordingly.

I have developed a simple method of checking the tension in drag/anti-drag wires. I derived the simple and accurate method using physics and trig. Once the wires are installed and tensioned, the technique works only if the wires are not touching at the point where they cross. By hanging a weight of four pounds at the center of the wire, the wire will deflect a measurable distance. By dividing this deflection (in inches) into the length of the wire between the anchored ends (also in inches), you will end up with the tension (in pounds) in the wire being measured. Four pounds of pull in the middle of the wire is the only force which works out to give the right answer for this rather simple method of tension measurement.

The trick is to accurately measure the small deflection which the four pound weight causes in the wire. It is difficult to do with a ruler or a set of calipers. If the wires are not initially touching, then you can get an un-deflected measurement with no weight attached by finding the drill size (number drills work best) which will just slide through the gap between the wires where they cross. Then convert this drill size to a decimal number using a drill size table or set of dial calipers. Next, hang a calibrated four pound weight on the wire being measured and remeasure this dimension. Subtract the two measurements to get the net deflection and divide this number into the length of drag wire between nuts. For example, a drag wire with 30 inches between anchor points which deflects 0.1 inches with the four pound weight in the middle will have a tension of 300 pounds. By the way, drag and antidrag wires are supposed to be pre-tensioned to about 10 percent of their rated strength.

This tension measuring process is only accurate where the length is much larger than the diameter of the wire and the length is also much larger than the deflection. In this case "very much larger" means at least 50 times larger. This

rule is satisfied for tensioned drag wires and flying wires alike. Please note that the force must be applied perpendicular to the wire being measured. With wings level on saw horses (or mounted on a leveled airframe) a hanging weight will work for drag/antidrag wires. Turn the wing panel over to do the other wires to be sure the drag wires don't touch during the measurement. For flying/landing wires, a hanging weight will not work because it will not provide a force perpendicular to the angled wires. Instead use a set of fish scales and another set of hands to pull four pounds perpendicular to the wire.

Well, that's all I've got for now. Keep on a-fly'n or build'n and most of all.....keep on a grinnin'!

Locking Tail Wheels

By Ben Owen

Many years back, my wife and I were acquainted with a lady who was quite competent in aerobatic flight. In fact, she was the U.S. Woman's World Champion. She had no difficulty in landing her Pitts three-point on grass runways, because the tail wheel tends to keep you running straight on grass. However, she did not much care for landing on hard surfaces as the "feel" of the airplane was somewhat loose on hard surfaces. She went to Curtiss Pitts, the designer of the aircraft who provided her with a method of locking the tail wheel, and she found that this solved the problems of landing on hard surface runways. A lockable tail wheel is a good asset, particularly when landing and taking off in strong crosswinds. Our aircraft have traditionally not needed them, but they may be of valuable assistance to pilots new to taildraggers (and for peace of mind to all of us). It does not take much, other than several horizontal flanges and a pin that moves in and out to lock a tail wheel. This can be attached to a cable running into the cockpit, or it can be attached to the elevator horn, so that full-forward stick would release it. You do not have to hold full-forward stick to keep the tail wheel moving once its out of the detent, but as soon as it comes back to center it will snap back into the detent with a spring loaded pin.

In the Navy taildraggers in which I trained, including the SNJ, Hellcat, AD Skyraider, and even Twins, etc., it was *imperative* that the tail wheel would be locked prior to takeoff and prior to landing to retain proper control. This is particularly true with these very high power to weight ratios and the powerful engines that are used on these aircraft. It is not a bad idea for the taildragger high-performance aircraft of today.

Thanks Bill!

Just a note of thanks to Bill Berrick, 11803 Hunters Cove, Omaha, NE 68123.

Bill was the Editor of the Acro Sport Newsletter over a period of time that included many, many completions, first flights, and submissions of building tips, not to forget Don Baker's series of articles on aerobatics in his Acro II. His presentation of materials submitted by you, the readers, was always clear and accurate. I believe we have the best homebuilders' newsletter around, and it is due to Bill's efforts.

Thanks, Bill!

(Editor's Note: Please submit articles, letters, photos, etc. for inclusion in the Acro Sport Newsletter to Acro Newsletter, P.O. Box 462, Hales Corners WI 53130, Attn. Chris Kinnaman. Don't Forget - Submit!)

ACRO SPORT DINNER

The Acro Sport Awards Dinner
will be held
Saturday, August 1, 1998
at
Robbins Restaurant,
Oshkosh, WI
Dinner at 7:30 — RSVP

MAKE PLANS NOW!
Please notify Jean or Chris at the Acro Newsletter if you plan to attend or sign up at the Acro tent at Oshkosh.

Oshkosh Forums

The Acro Sport & Acro II Forum will be held Saturday, August 1 at 10:00 in Forum Tent #11. The panel will include Paul Felkner, Lloyd Shepherd, and Dr. Richard Henry (builder of 1997's award winning Acro II). The discussion will be moderated by Don Baker.

The Pober Pixie, Pober Junior Ace, and Pober Super Ace Forum will be held Sunday, August 2 at 10:00. John Leitis, Perennial Pennsylvania Pixie Pilot (flown in for 11 appearances at Oshkosh) and Workshop contributor, is the only scheduled speaker. If any of you Pober Ace builders would like to speak, please contact the Newsletter.

Oshkosh forum tent numbers are tentative at this early date-please verify tent numbers in the Official Program!

ACRO SPORT

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