ACRO SPORT Newsletter

NO. 66 | Printed by: TIMES PRINTING CO., INC. | SUMMER 1999

Edited by: Chris Kinnaman

Spring Gear for the Acro Sport

by David Hintenlang

Throughout the process of building my Acrosport I've been looking at the various options for the landing gear since the bungees seem to be somewhat problematic in determining the correct size and ultimately wearing out. I had seen several reports of Acrosports flying with aluminum spring gear which seem to improve performance while eliminating some of the problems with the bungees. Finding sources for aluminum spring gear was not too hard (Grove Aircraft and Aircraft Spruce are two sources) but I couldn't find much information as to what changes might be necessary to reinforce the fuselage structure for this alternate gear style.

When I started putting my fuselage together I figured it was time to find out so that I could decide if I would accommodate the possibility of spring gear, and decide on the specifics later in the construction process. With that in mind I contacted Grove Aircraft to see if they had suggestions as to what would be involved to accommodate their gear. The folks there were most cooperative. I sent a schematic of the Acrosport II fuselage structure and they marked it up and faxed it back to me. What I've done here is to try to reproduce the modifications suggested by Grove as I understand them, mainly to give any-

Standard Fuselage Layout

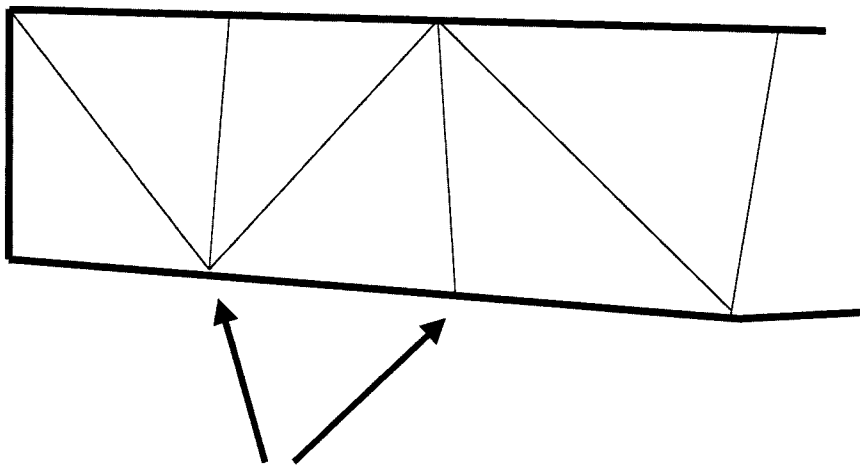
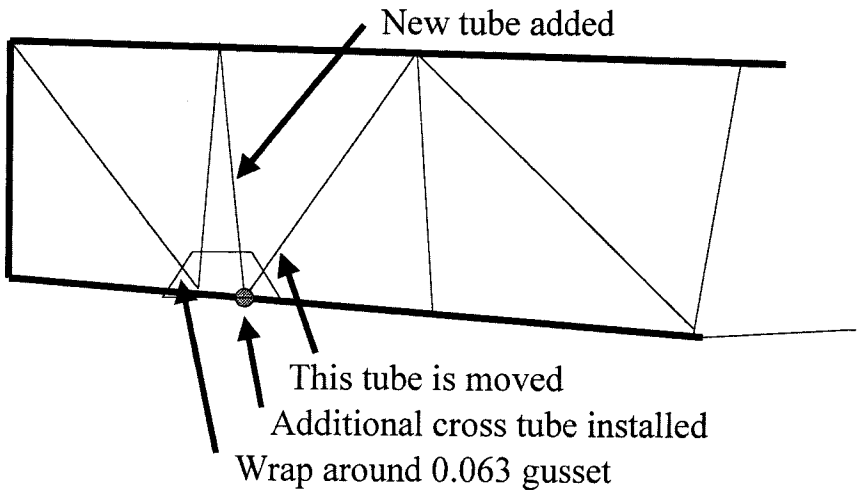


Figure 1

Figure 2

Modified Fuselage Layout



one considering going to the aluminum gear an idea of the types of changes that should be incorporated.

Figure 1 shows a schematic of the Acrosport II fuselage structure (side view) from station 1 back to station 4. The plans gear fits with two gear attachment points located below station 2 and station 3. The spring gear is a single assembly bent out of 1" thick aluminum and is attached across the bottom of the fuselage station 2. Figure 2 illustrates some of the rework of the fuselage suggested to support the spring gear assembly.

1. An additional vertical member is installed from the top longeron at station 2 to a point about 5.5 inches behind station 2 on the lower longeron.

2. The diagonal member extending from the bottom of station 2 to the top of station 3 is moved so that it now extends from the bottom of the new vertical member to the top of station 3.

3. An additional cross tube is inserted between the lower longerons where the new vertical member meets the diagonal. This cross tube will be in three pieces to accommodate the existing diagonals across the bottom of the fuselage.

4. A 0.063" 4130 gusset is added that wraps around to the bottom of the fuselage to strengthen the entire area.

Figure 3 shows this assembly from the front view. The gusset is not only wrapped around, but is notched and welded around the tubing. Four 3/4" OD x 3/8" ID 4130 steel bushings are also added at the four corners of the landing gear attachment bolts. I'm not certain, but believe that these are welded adjacent to the cross tubes and probably do not intersect them. Once this is accomplished the assembly bolts together as illustrated in Figures 3 and 4 (side view). The aluminum gear is sandwiched between and rides on the steel radius plates which can be purchased from Grove. This arrangement would seem to help distribute the stresses associated with the spring gear over a reasonable portion of the airframe.

For anyone looking for more information or engineering details on this installation I would suggest that they contact the folks at Grove Aircraft. They seem to be very helpful in both answering questions and providing feedback on design alternatives, and will quickly fax the relevant landing gear specifications. They list the aluminum spring gear for the Acrosport II as a "stocked" item, as does Aircraft Spruce, so there must be a regular demand for them. I presume that this design is flying on some aircraft and it would be interesting to hear from those who are flying the spring gear to see if this is the design that they are using, or what other options are being used, if any problems have been encountered, and, ultimately how they hold up over time. In the meantime I have decided to go with the plans gear style (using the coil springs instead of bungees) for two reasons: 1) I've decided I like the more traditional look, and 2) It will have a much smaller impact on my wallet!

David Hintenlang, 6 Marlboro Country Estates, 12691 NE 131 Place, Archer, FL 32618.

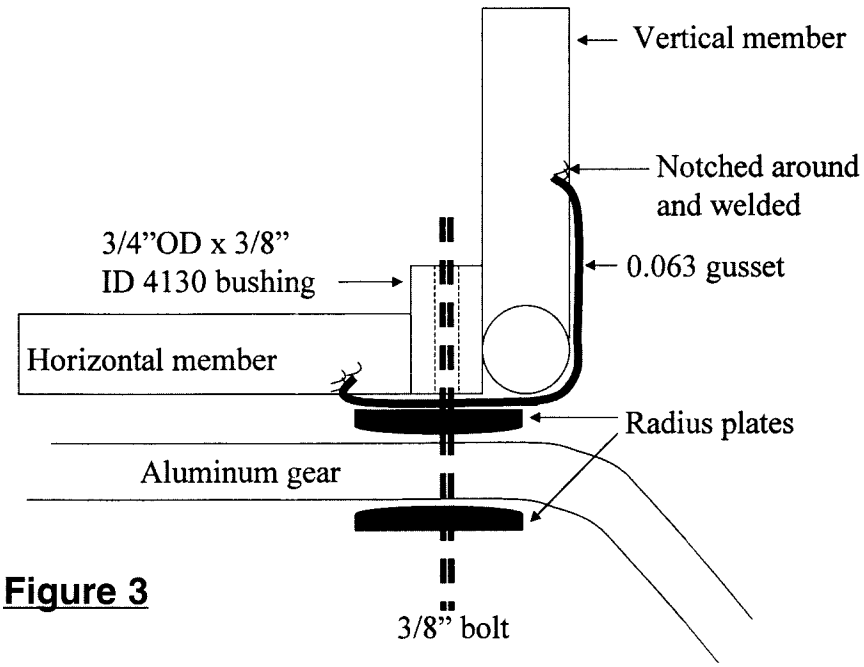


Figure 3

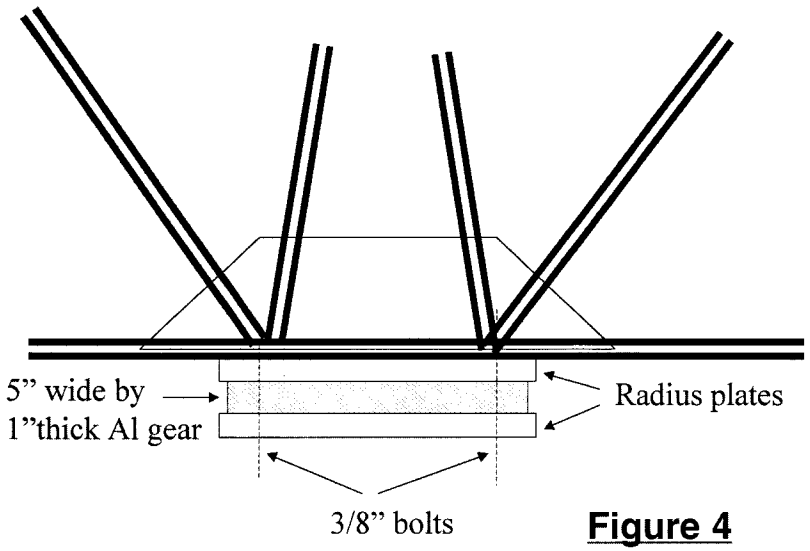


Figure 4

Acro Sport List

David Hintenlang advises that the Acro Sport on-line list can now be reached at:

Acrosport-L@lists.ufl.edu

If you need additional guidance, he can be reached at:

dhinten@UFL.EDU

If you are on-line, be sure to check out the list. Answers to many construction questions can be found there, and you will probably be able to help someone out.

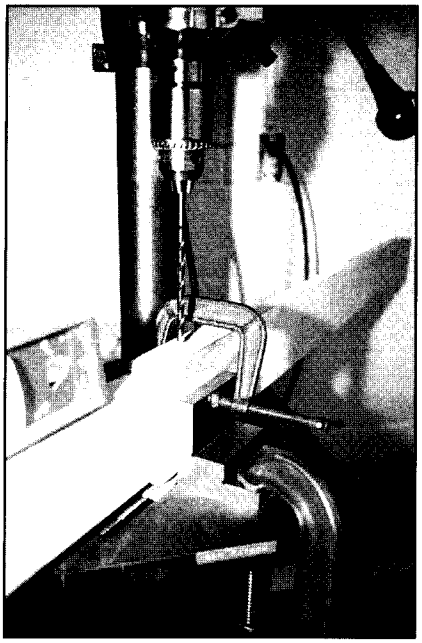
Updates From Ken Patsch

Kenneth A. Patsch, Jr.

Judy and I just got back from Oshkosh '99. This was her first trip there, and despite the heat, we had a very good time checking out the Acros and attending the banquet on Saturday. I really enjoy the camaraderie of other Acro builders – lots to talk about and everyone is willing to help out with advice on problems that they had worked out on their planes. Looking at photo albums is great too!

This past year has been very busy for us. We were offered a partnership share in a 1957 Pacer restoration with a couple of friends, Dave Ross and Bob Glime, and it was too good to pass up. This is a total restoration project, and besides learning new skills that I will use later on the Acro (Dave is a tech counselor in our chapter and was built an award winning RV-4), it will give us a good airplane to get tailwheel time in. We should be ready for cover by the end of this year. It hasn't left a lot of building time for the Acro, but we have managed to get both lower wings built plus the center section. All of the pieces are made for the upper wing panels, including the ribs, so they will be next.

In building the wings, I first trimmed a one inch piece off the end of each spar to clean up the edge and give me a piece to test for strength. After laying out the spars, I stacked all the ribs for each panel together and put a reference line down the leading edge to check alignment against a drawstring when fitting the ribs to the spars. Once all the ribs were slid on and fit, we made all the plywood doublers. It is a lot easier to trim the edges of these pieces before they are glued onto the spars. We then clamped all of these pieces to the spar dry using scrap plywood between the clamps and the doublers so as not to mar the wood. If these scrap pieces are wrapped with saran wrap,tape, or other non-stick product, they work well for clamping when the doublers are glued in place. (We have no nails in either the wing ribs or the plywood. Everything was held in place with clamps except for the intercostals, which were nailed on.)

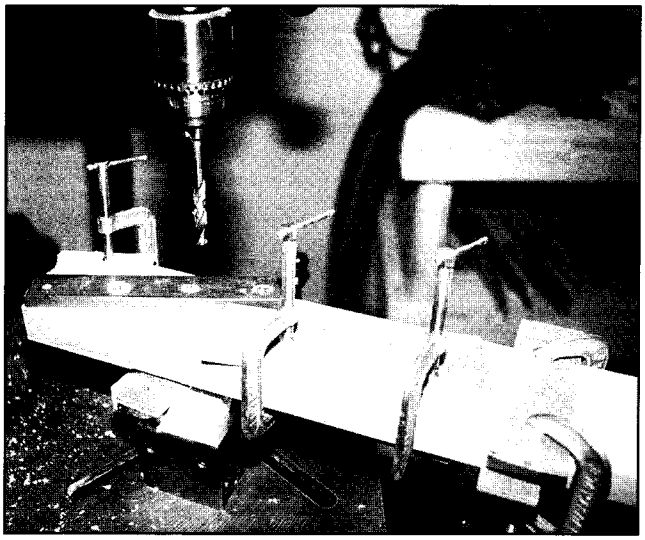


Drilling the 1/4" hole in a spar. Note angle plate and 6" drill bit.

The next pieces to be made were all of the wing fittings because I wanted to make 3/8" steel drill guides at the same time as the wing fittings so that when the spars were drilled, everything would be straight and fit well. After removing the ribs, the spars and doublers were then laid out for all bolt patterns. The 1/4" doublers that wrap the spar at the strut were then glued in place and clamped. It took my hands and Judy's both to get this done, but it turned out very well. After the glue dried, we set up to drill the 1/4" strut hole down through the spar.

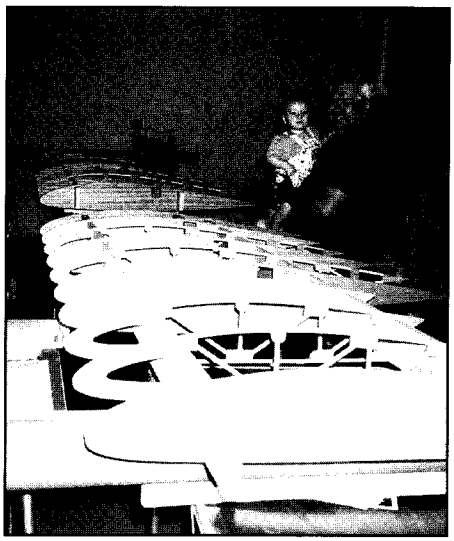
Using an angle plate clamped to the drill press, we set the spar on a tripod, leveled it in both axes, center drilled to check that the hole was centered, and then through – drilled with a 6" long drill in one pass so as not to end up with an oversized hole. We then laid out the pattern for the flying wire pin and plates. After clamping the spar down on top of a piece of poplar to prevent splintering as the drill passes through the spar, we center drilled the spar and then switched to a 5/8" end mill to bore through the spar. We had tested this on a piece of scrap spruce and got a tighter fit than from a drill bit. After the pin was inserted, we put our drill guide on over it and drilled the 3/16" holes.

We tried two methods of gluing and drilling the doublers for the wing attach fittings and both worked well. In one, the ribs were slid onto the spars and left loose while the doublers were glued and clamped in place. After drying, the hole pattern was laid out and the drill guide clamped on, then drilled. In the other method, the plates are laid out and clamped dry to the spars and



Left - Drill guide for wing fittings.

Right - Ken explains to granddaughter Shelby the steps necessary to get to this stage in building the Acro's wing panels.



drilled through the guide, putting a bolt in each hole as it is drilled. The plates are then glued on after the ribs are slid back on the spars. This method does make it easier to handle the spars while drilling, just use pins to relocate the doublers when gluing them on.

One bolt hole that was not drilled in either the attach fittings or the spar was for the bolt that holds the rear spar to the fuselage. This will be drilled after the bolt is in the fron spar and the wing is squared to the fuselage and the incidence is set. The fuselage fitting and spar will be drilled together. If the fuselage is jigged level side to side and the tail is 1-1/2 degrees high, then the wings will be installed level on the chord line.

I wanted the intercostals to fit to the ribs, yet have vents to the leading edge. To do this I put two pieces of 1/4" x 5/8" in a vise face to face and drilled three 1/4" holes down through with the hole splitting the two pieces so you end up with half circles on each piece. Lay out 2" pattern for aluminum leading edge first and space vents between these. The intercostal on top of the spar was glued with the vents facing the spar top, while the bottom ones faced the vents to the bottom so that any moisture in the leading edge would be able to run out and back to the drains at the rear spar, and not trapped in the leading edge.

All of the cross members and the 3/16" plywood for the wing walk will be left off until the wing is fitted to the fuselage. The rest of the wing walk assembly was fitted with a scrap of 3/16" plywood used as a gauge to get a flush fit with the top of the ribs.

We decided to leave the tail blocks off of the rear spar on the center section until the wing was jigged in place after all panels are made, so I just left the capstrips long and boxed in the spar with the outside ribs only. The tail pieces will be fit into the capstrips and c/s bow with gussets on both sides to fit the profile of the tail blocks we ended up with to tie everything together. In order to glue the three center ribs in, I made a jig of all-thread and aluminum blocks to hold the ribs to the spar. This works very well, and it could also take a slight twist out of a spar if needed.

Some of the other little things we did were:

– clamp the built-up 1/4" ribs to the spar when gluing with a piece of shim stock on each side so as not to nail them in.

– make test pieces of capstrip and gusset material for all of the glue batches and date each one. Also date the corresponding rib or make a notation in the log as to what each glue batch was used for, so that when I destroy each piece in testing, I will know exactly where each batch was used.

_ build leveling devices into the saw horses consisting of piece of angle alu-

Continued on page 6

Down Under With Keith Hinchliffe's Acro II

by Keith Hinchliffe

A proud builder with his beautiful Acro II.

Here is a beautiful example of an Acro II, built by Keith Hinchliffe. His first flight in the Acro II was on March 13th 1998. He observes that it flies all maneuvers well with the exception of snap rolls. He intends to alleviate the situation by installing stall strips. Note the beautiful "star-burst" paint scheme, which really emphasizes the Acro II's lines and proportions. Keith and his Acro II have appeared on the cover of a national sport flying magazine in his home country of Australia – for good reason!

Keith sends congratulations to Paul Poberezny on his excellently - designed biplane and says, "As I am now semi-retired from the work force I intend to enjoy flying this excellent aircraft." Excellent job, Keith!

Some specifications of Keith's Acro II:

Empty Weight: 475 kg

Powerplant: Lycoming IO-360 A1B, 200 horsepower, full inverted systems, Sensenich wood 76-60 propeller

Indicated airspeed: 122 knots at 2700 RPM

Keith Hinchliffe, 52 Massinger Street, Salisbury, Brisbane, Queensland 4107 Australia.

Above - Ready to roll onto a trailer for the trip to Archer Field.
Below - Completely assembled and being carefully pre-flighted prior to taking to the sky.

Letters

Bryan Jensen writes:

I was able to convert my Acro Sport II over to steel spring struts very easily after discovering an outfit in Texas that will build the landing gear struts and springs.

Makelan Corporation in New Braunfels, Texas will build the landing gear struts using steel springs for around $450. This price includes powder coating. All they need is your "pin to pin" length for both struts, along with bushing size. The springs will compress .700" per 1000 lbs. of aircraft weight, so make sure you figure this into your measurement. Makelan Corporation is producing the kits for the Hatz Biplane which uses this type of landing gear versus the bungee cord gear. The Hatz Biplane and the Acro Sport II are almost identical in gross weight, so this arrangement works well for both. I was very impressed with the quality of their workmanship. They can be reached at (830) 905-7832. As for Jeff.

Sincerely,

Bryan Jensen
3564 Willow Beach St. SW
Prior Lake, MN 55372
(612) 447-8207

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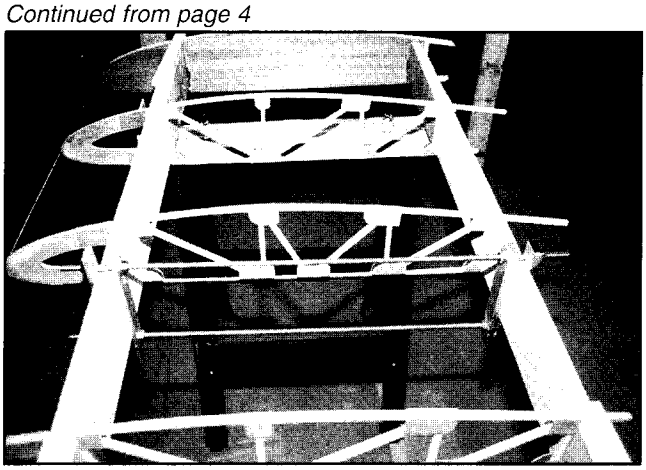

Note leveler on sawhorse top and the threaded jig to hold spars together.

minum drilled and mounted a pair of bolts coming up through the horses and locked in place with two nuts per bolt. This allows adjustment wherever needed.

We sure do enjoy working on the Acro II and the Pacer, and all of the new friendships that have been formed over this project and membership in EAA Chapter 50, Huron. OH. I just need to find a little more building time. Maybe if I get up 2 hours earlier each morning . . .

Kenneth A. Patsch Jr., 8607 St. Rt. 61, Berlin Heights, OH 44814.

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