October 1983

ACRO SPORT NEWSLETTER

Editor: Ben Owen

ISSUE 4

We would like to take this opportunity to thank Bob Stagner of Poplar Bluff, Missouri who was the team leader in the Pober Pixie construction project during this year's EAA Oshkosh convention. We would like to thank all of those fine Acro I & II and Pixie builders who, as part of the dedication of the new EAA Aviation Center, gave a hands-on demonstration in the new museum shop to thousands of people.

Though we had hoped to complete the airplane, the many questions asked of our builders could not be ignored. The purpose of the project was education and it more than fullfilled our expectations with the fuselage, turtle deck and many control system items were completed; wing ribs are ready for final wing assembly, etc.

The project was so popular with so many people that we plan to continue the project during next year's convention and again will ask you for assistance, as educators and builders, to help perpetuate our educational program.

We would like to thank Rex Taylor of H.A.P.I. engines, who has provided us with the powerplant for this project. It appears the engine should be very suitable for the Pober Pixie.

It was evident that a number of Industrial Arts teachers were in the audience and we sincerely hope that many of these fine educators have returned home with enthusiasm and the knowledge that an airplane building project is a useful hands-on project; that the educational beneifts can bring a great appreciation for quality and craftsmanship which is so very important in everyone's future employment and endeavors.

Though my daily work with EAA leaves little time for one of my greatest loves - aircraft design and building, I did find a few days to work on my Acro Sport II. I tackled the project of drilling the spars for the drag and anti-drag wires, and with the next issue of our newsletter, we will have a photo and drawings of the tool that Bill Chomo's shop made to make the task much easier, as well as accurate.

We would appreciate any comments or sketches on your ideas in drilling through the drag, anti-drag blocks and spars, or any other tips that we may be able to pass along to the readers of the newsletter.

We would also like to know how far along you are with your Acro project or if it has been completed.

The Acro Sport and Pixie forums held at Oshkosh '83 were very well attended by not only the builders of the aircraft but by those who sought knowledge on aircraft construction methods and techniques. These are useful in the many other designs that are available.

This newsletter is intended to be a forum among builders; to share knowledge and questions as well as improvements in the design of aircraft. In particular, the newsletter is an aid to those teachers having aircraft building projects in the school system, Civil Air Patrols, Air Scouts and other such groups.

The new EAA Aviation Center just completed at Oshkosh, has drawn many favorable comments from both the membership of EAA and the public. The display of aircraft was overwhelming to many, and there is still much to be done and accomplished in the coming months and years.

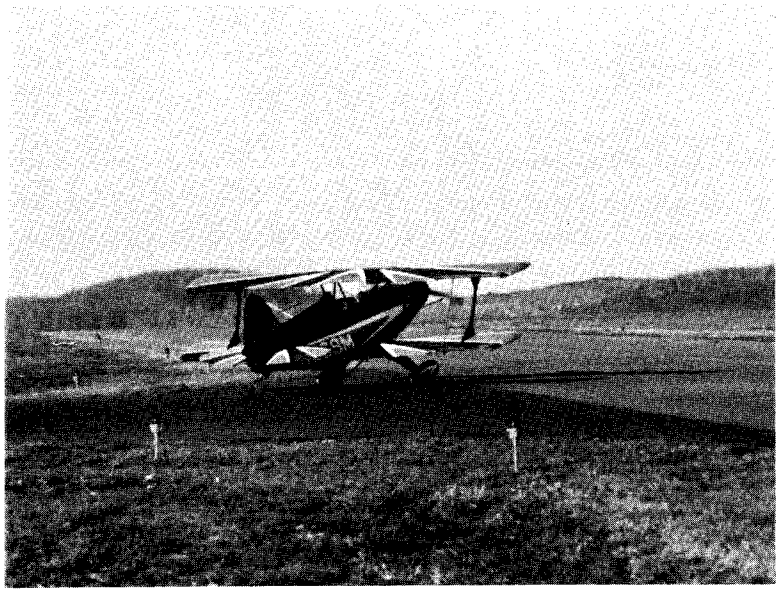
One specific area of interest to us homebuilders will be the plans for making video cassettes on such things as aircraft covering, welding, woodwork, sheet metal, etc. This new facility has the capabilities and personnel to accomplish a much needed educational program. What an aid to Project Schoolflight and the homebuilder or restorer!

— Paul H. Poberezny

ACRO SPORT PICTURE GALLERY

We are intentionally holding the gallery pictures down this issue so that we may include a great deal of technical information.

N69M below taxiing out for take-off was an early day Acro Sport built by Jim Inman. The other N20KT is another early day Acro Sport built by Ken Tate. In addition we have a "mystery ship". The aircraft in primer on the taxiway with the wooden prop is obviously an Acro Sport I but the builder is unknown to us. Does anyone know the name of this builder?



RENEWAL NOTICE

While we "hopefully" have your attention many of you will be renewing the Acro Sport Newsletter subscription after this fourth issue. This is just a friendly reminder to re-subscribe for issues 5 through 8 of the coming year.

BUILDER REPORTS AND PICTURES

Acro Sport I builder, Willard Anderson, of Great Falls, Montana has sent in the following articles with pictures. Your comments are appreciated, Willard. As far as the weight and balance goes it is probably best to stick within the limits published for the Acro Sport II. Determining the mean aerodynamic chord for the biplane is a very rigorous exercise. Additionally, a precise method for doing this was never adequately determined in the early days. The 75 per-cent method may be as good as any. The lower wing has interference over the top surface from the struts and from the wing root of the fuselage and does lose some lift. The upper wing is generally recognized to provide more lift on most biplanes. Again, the average builder would not need that information as long as he kept the aircraft within the weight and balance as recommended. His letter is as follows:

In response to your letter of 28 April 83, I will list the changes or modifications I have made, possible modifications I may make in the future, problems which arose, and solutions or questions which remain unanswered.

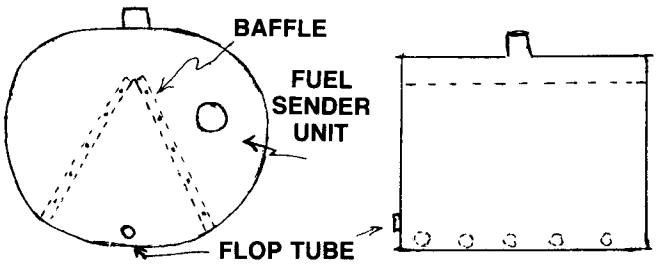
The Super Acro Sport which I have completed was built from Plans #896. Construction was started June 1978 and the first flight was made June 1981. The aircraft has an empty weight of 904 lbs. and a normal gross weight of 1296 lbs. It is powered by a Lycoming O-360-A4A with Bendix fuel injection and has a starter, alternator, Gel-Cell Battery, Edo Aire Nav-Comm radio, transponder, position lights, and wing tip strobes.

The enclosed pictures are self explanatory but when necessary, I will refer to them by their respective number.

A. Incorporated changes:

1. Since the aircraft is not built for severe competition, the shoulder harness attachment was raised from the bottom longeron to the top longeron and a supporting structure now gives about a 30° angle above the shoulders. See Pictures 1 & 2.

2. The main fuel tank has an electric sending unit and an internal baffle along with the flop tube. The fuel sending unit installation is functional but not completely satisfactory. I would suggest going to the original configuration and ensure there is a drain at the bottom of each tank. I do not have a drain.

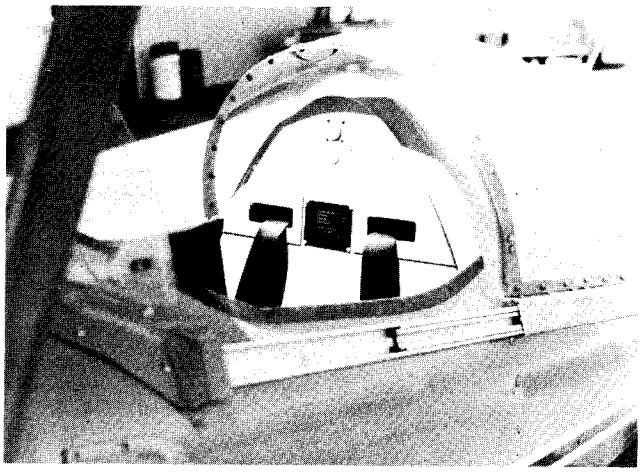


The baffle is riveted to the front and rear of the tank and has ½" holes at the bottom and 2 or 3 ¼" holes in the top bend.

3. The entire fuselage is metalized from the firewall back to the cockpit plus the bottom of the aircraft. The cockpit area on the inside has one eighth inch cork glued to the skin and then covered with naughayde. This provided insulation and sound deadening. The noise level is still high and a David Clark headset and mike are used for comfort.

4. In order to keep all wires internal, the cabane has a ½" tube welded inside it.

1



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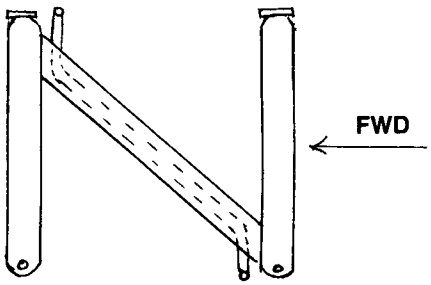
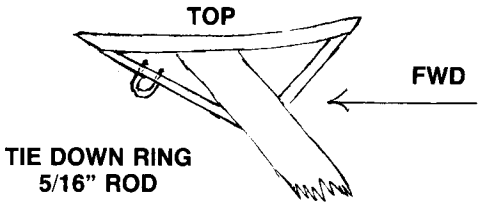
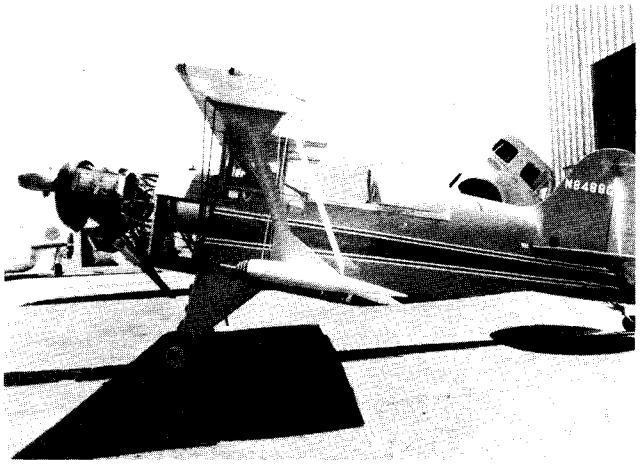


Position light and strobe wires are routed inside this tube.

5. Tie down rings were welded to the Inter-plane struts.



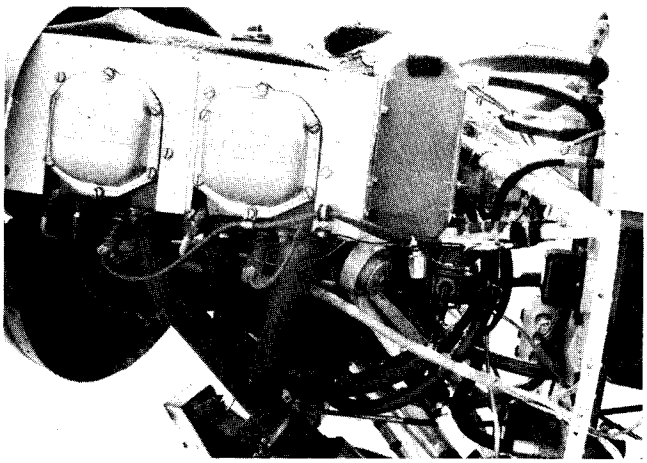
6. The instrument panel is fabricated of .100 aluminum and is completely shock mounted with 9 Lord mounts. All screws around or near the compass are brass.



3

7. The mike switch is in the throttle.
8. The tail wheel spring mount at the tail post has a .125 gusset similar to the Pitts installation.
9. The trim tab push - pull cable is almost entirely enclosed in steel tubing, except for bends. This keeps the free play and bending to a minimum. It should be well lubed when installed.
10. The wing walk area was enlarged. It covers the area between the first two ribs from the front spar to the trailing edge, and is cross braced for added strength. Both lower wings were modified.
11. The aileron bellcrank - push/pull tube area on the lower wing was covered with .025 aluminum plate allowing easier fabric attachment.
12. The forward horizontal stabilizer mount was changed from 3/4 x .035 to 3/4 x .065.
13. Since the aircraft is for day VFR, the Pitot/Static tube was made removeable.
14. The seat belt restraint system is a 4 point belt with the crotch strap attached to the seat front tube. The seat is basket weaved of 4130 strips .025 and welded to the frame.
15. The engine installation is straight forward and has a Christian Inverted oil system installed. Two heat muffs are attached to the exhaust pipes and are used for cabin heat (very satisfactory) and carburetor heat.

Severe oil heating problems were encountered at first, but since installing an oil cooler, no problems with heating exist. On the contrary, now the oil temperature has a tendency to run too cool. (Picture 4)



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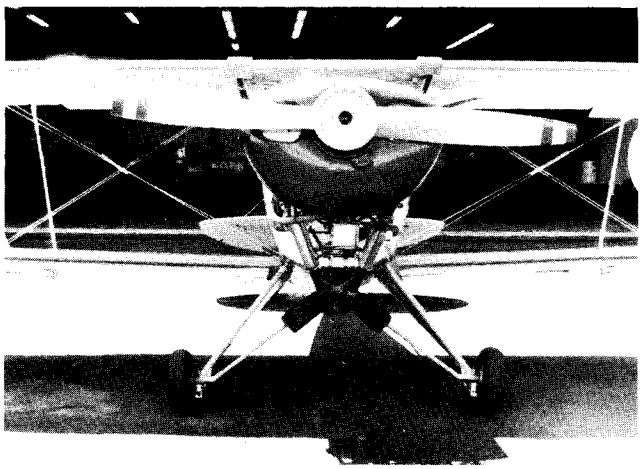
16. Although no problems from the exhaust being so close to the bungee cords exists, I change the cords every year. During the first year of use, the landing gear became splayed, so I shortened the bungee stuts 3/4".



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This insures better wheel camber and no further problems exist. (See Picture 5)
17. A full canopy/canopy rail system is installed. (Picture 1 & 2). It is locked with a simple latch system from the inside only.
18. My aircraft has 11 lbs. of ballast installed for CG adjustment.
19. The engine breather line, which runs from the firewall to the tail, is insulated with foam rubber its entire length.
20. The Gel-Cell Battery is mounted between the rudder pedals, inside a vented box, and is securely attached to the airframe.
21. The plans were followed until final assembly and rigging. Then, if any changes were required, the cut, fit, and refit method was used and no notes were made on the plans.

B. Possible Future Modifications and Suggestions:
1. Although the roll rate is satisfactory, Aileron Spades may be installed.
2. A full swivel, locking tailwheel is installed and ground handling is no problem. Therefore, tail support braces are also in the future.
3. For initial building, I suggest making larger Servo and Trim tabs, but not as a later modification. The present system is satisfactory but the tabs could be a little larger.
4. Since the shoulder harness mount is modified, I suggest a mid bulkhead in the baggage compartment. This would keep articles from going back to the tail.
5. The main problem in 2 years of flying is the left gear leg. For some reason, the point cracks from the fabric and the trailing edge tapes peel away. At present I reglue the tapes and glue and repaint the fabric/paint chips. If the problem gets worse, I may cover the gear legs with aluminum, but I do not feel this will solve the problem.

C. Questions:
1. During the final assembly and rigging, all the flying wire lengths were very close to the plans, except the landing wires. The plans called for the nominal length of 68⅜" but mine were 69⅝" and 69⅞". Since I purchased the flying wires as a set, the landing wires were too short. I made and installed 1" extenders and they are performing very satisfactorily. I feel a detailed rigging procedure, including the use of dihedral and incidence boards would be of great help, especially for first time builders.
2. Since the CG of the aircraft determines how well or if it will fly, more emphasis should be placed on it. I have listened to pilots rattle off numbers as to each CG location for different loadings but it is of absolutely

no use. It must be reduced to percentage MAC as a common denominator and here lies the problem. How do you find the CG in percentage MAC for a biplane? Enclosed is a copy of a method utilizing the 75% Gap distance method. I used the 50% Gap distance method on my Acro Sport and feel it is alright. The question is, which one is right?

I hope the above information will be of some use to present on future builders. If you desire more information in clarification on any point, please let me know. My Acro Sport is a joy to fly and was straight forward in building.

Very truly yours,
Willard C. Anderson (EAA 2736)
1208 Park Garden Rd.
Great Falls, MT 59404

In response to your inquiry on Acro Sport design changes, I have some items that definitely should be corrected. I had planned to get this information back to EAA a long time ago but I have been enjoying flying the Acro Sport so much, I keep forgetting the problems I had remaking items that I found incorrect on my plans.

My plan set number is #552. Perhaps some of the faults I will outline have already been corrected in later issues, however I will run down a list of problems I encountered as I progressed.

Each item will be referred to by Sheet Number.

Sheet 1.00 — Airframe

A. Station 3 vertical member dimensional at 20⅜" actually worked out to be 20⅝".

B. Location of det. #51 bushings for gascolator proved improper. Fuel lines running under floor must climb up to gascolator then back down again before returning to engine compartment, causing an area that could not be drained of accumulated water.

I repositioned gascolator on firewall in engine compartment for better drainage. Gas valve should also be relocated forward with a remote on-off handle in cockpit area.

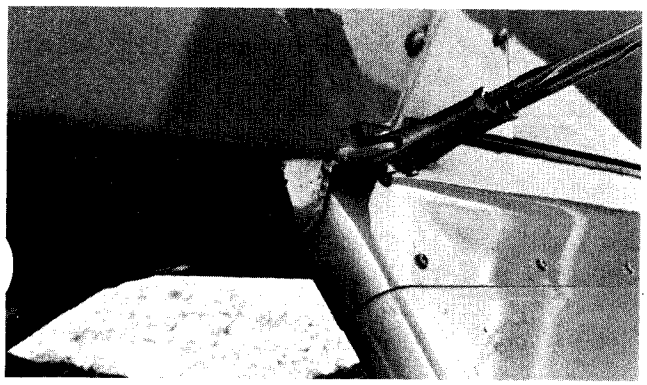
C. ½" offset of fin, detail #10, is inadequate for 150 hp. I suggest a change to at least ¾". (Other builders using 150 hp agree with me on this.)

D. Forward stabilizer mount tube, detail #1, was listed as ¾ x .035. Print should be changed to ¾ x .058 according to an update I got out of "Sport Aviation" back in 1976. (Maybe this change has already been made.)

Sheet 1.01 — Details of Brackets, etc.

A. Det. #37 would be stronger and simpler to make as a one piece unit, welded across entire bottom of airframe, rather than 2 individual details. (I made mine one piece.)

B. Det. #58 tailspring bracket not strong enough. I remade mine with .063 stock.



See comments, Sheet 1.02, Notes A and B.

Sheet 1.02

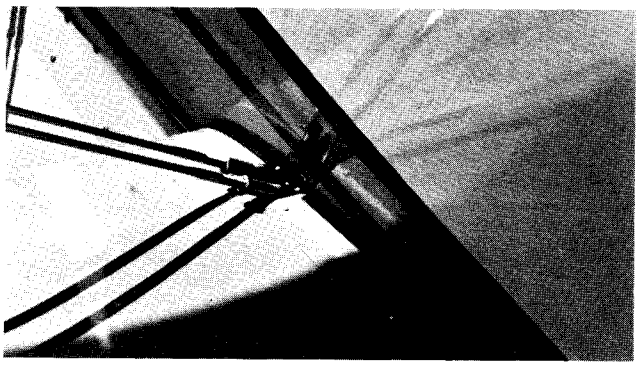
A. Det. #19 Forward Landing Gear Fitting — **"Important"** — Both of these fittings cracked on my plane after 40 hours of flying. I strongly advise heavier material be used and gussets added to strengthen forward fittings. One other Michigan builder had the same problem.

I had Paul look at my cracked fittings on his visit to Lansing, MI in 1981 and he agreed gussets should be added. I had to cut fabric to weld in gussets and my heart was in my mouth until all welding was complete. I will send photos later of my fix and the cover plates I made to close the cut-away fabric.

B. Det. #19 bend up angle of 21° is incorrect. I had to make clevis fittings for my flying wires with slots angled at 7° to get flying wire alignment. I believe the draftsman forgot to compensate for the fitting being welded to detail #32 which apparently joins the fuselage at a 7° angle at attach point.

C. According to rigging data, angle of incidence should have been 1½° on both upper and lower wings. Following airframe dimensions **exactly**, I wound up with 1¾° on lower wing and about ¾° max. on upper wing. I will discuss upper wing data at cabane discussion on Sheet 5.00.

D. 1⅝" assembled dimension of detail #54 should be longer. I had to cut into the end rib on lower wing to be able to get flying wire clevis attached.



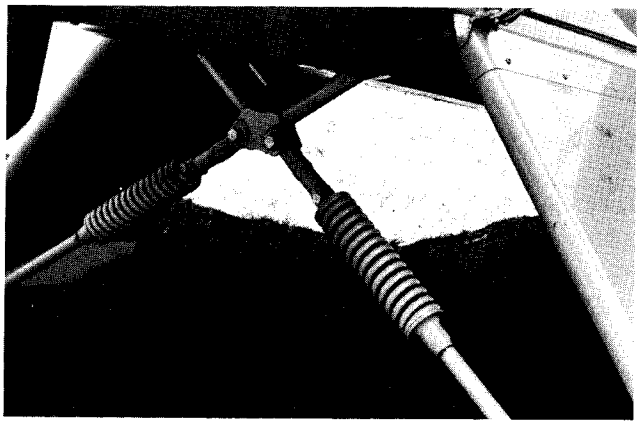
Sheet 1.02 Note D.

Sheet 1.04

A. Flat pattern of det. #2 Idler Support is drawn wrong. Eliminate the ¾" radius entirely. Form the bracket complete, then cut off forward corner at 45° angle approx. and you get a perfect fit for welding. (This applies also to detail #7 on Sheet 1.05.)

Sheet 1.05

A. Flat pattern of det. #7 should have ¾ radius eliminated from both ends. Cut after forming same as det. #2, Sheet 1.04. This works perfectly and fits like a glove.



Sheet 2.00.

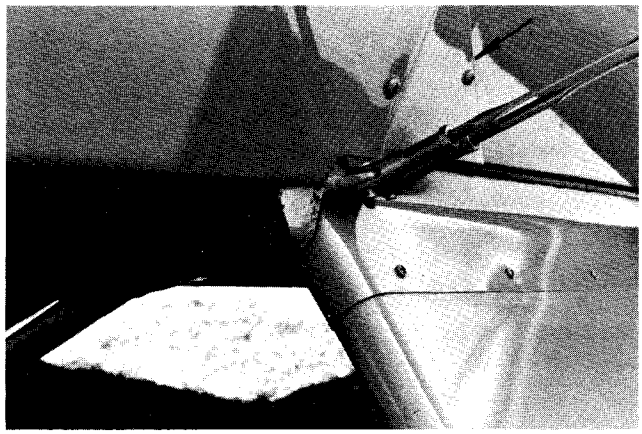
Sheet 2.00 — Landing Gear

A. I feel the dimensioning of the whole landing gear assem-

bly should be redone. I had to calculate several needed dimensions using trigonometry to figure out what I needed. By the way, I used die spring shock struts rather than print design and I am real happy with them. I had to increase tubing through to .090 since strut design of .035" tubing proved too weak under "normal" landings on other than paved runways.

I have die spring data if you want to consider an alternate design.

Forward landing gear leg was also too thin and I had to change mine per update printed in "Sport Aviation" in 1976 or 1977. I hope this change is current on all new prints.



Coverplate made to enclose area of fabric cut away to enable me to weld in forward and rear gussets to forward landing gear fitting. Cut away same on belly as on side. Cover is one piece to enclose both cut-outs.

Sheet 3.00

A. I changed the construction of my turtledeck by using wood bulkheads fore and aft with aluminum deck and turtledeck. Far simpler to make and worked out swell.

Sheet 4.00

A. I suggest addition of forward brace wires to stabilizer for anyone considering acrobatics. I have had no problem yet but I also do not do strenuous maneuvers. I think this would be wise for added safety.

Sheet 5.00

A. Cabane struts need redimensioning to correct for improper angle of incidence. Mine came out less than ¾°.

I suggest addition of a clevis or rod end for adjustment to forward member. Some dimensions on the cabane struts are very confusing also. I suggest some redimensioning.

B. I had to remake det. #11 front spar attach fitting because lug to attach rollover wires did not come below fabric line on bottom of centersection. The 2" centerline to centerline dimension had to be increased considerably. I forgot exactly, but it was something closer to 2⅝". (This change is a must.)

Sheet 6.00

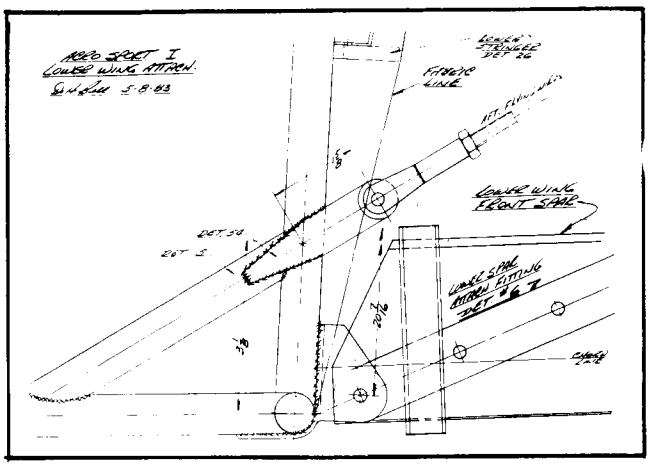
A. I found that I could not make detail #13 according to the flat pattern and have them come out right in assembly. I made each half extra long, welded them together, **then** milled out the ½" radius to fit det. #21 with the fitting set at proper angle. After parts were welded, I also drilled the two 3/16" dia. holes. This is the only way these idler arms could be made.

B. The same notes as above apply to construction of det. #24-1 bellcrank.

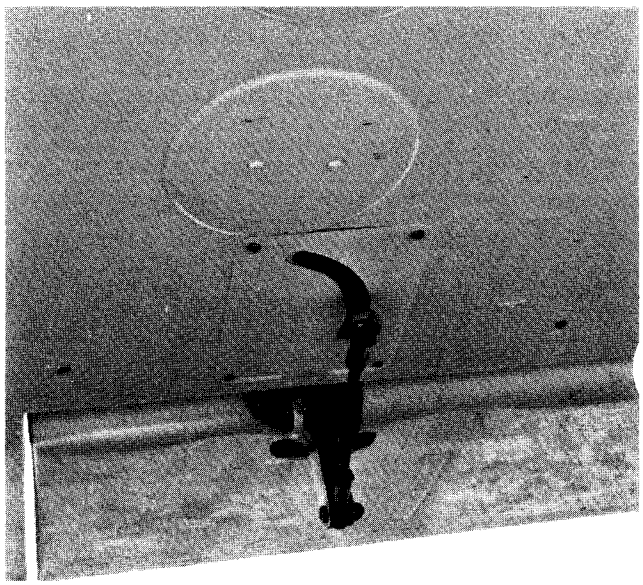
C. I also changed ⅛" plywood on wing step area to 3/16". Just my own preference for added strength.

Sheet 7.00

A. Det. #10 Wing Attach Fitting made over for same reasons as det. #11, Sheet 5.00. (I intended to make a



full scale drawing of this assembly to check for possible errors on my part in locating bolt holes thru spar. I did all drilling of both fittings on spars on a Bridgeport Mill to insure accuracy and alignment, but I still may have done something wrong.)

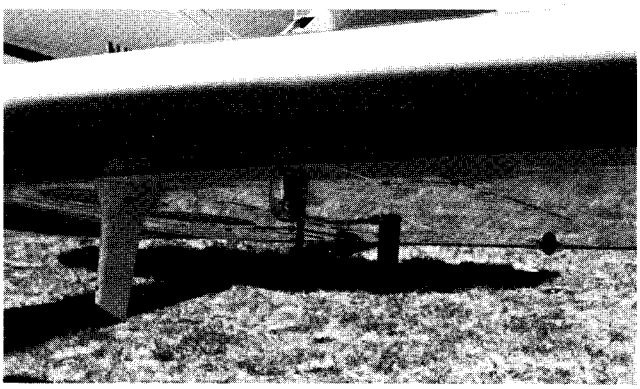


Aileron control linkage "coverplate" added to keep fabric from bending due to air scoop effect.

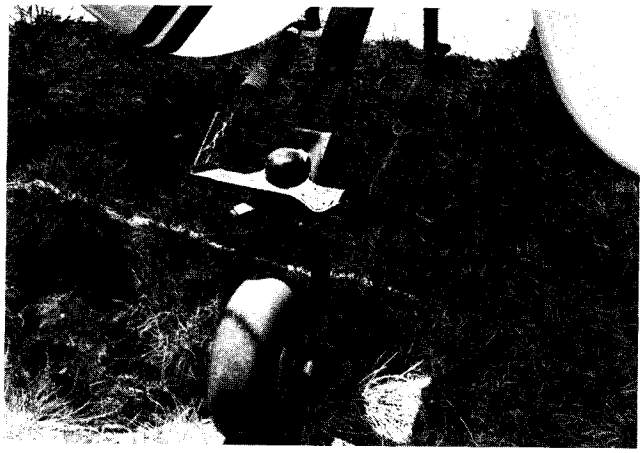
Sheet 8.00

A. There is an error in location of stub nose rib both ends of aileron near det. #11 and 12 brackets. The 1" stub rib locations should be 2".

B. I also found it necessary to alter the cut-out shapes in the aileron nose skins to enable me to get in with wrenches and bolts.



Tiedown ring instead of a nut. Very effective and neat. Note salvaged Cherokee pitot tube.



This shot shows my own design full fork tail wheel made from an old single fork full swivel tail wheel. (A Maule I think.) I remade the axle and welded on a full fork. The wheel is a 6" homebuilders wheel with new sealed bearings.

Sheet 8.01

A. I used the dynafocal mount design for my 150 hp Lycoming. If I were to make this mount again, I would build an offset into it to compensate for torque.

I have not yet made any comparisons or calculations as to how much, but I would definitely suggest notes to be added on drawings to this effect.

Sheet 12.00

A. It has been suggested to me by two older mechanics that the air scoop may be too small to get enough volume of air into the carburetor. I do not know if this is true or not, however I feel it is worth mentioning considering the experience and knowledge these men have.

Well Ben, you asked for input relative to suggestions for changes and corrections.

Hope to hear from you again once you compile notes from others.

Yours truly,
Doug Bell
Past President, Chapter 678
Designee #1468

Built from scratch — no kits. Started 1-6-76. First flight 9-6-79. Empty weight 749.9. (Full electric system included.)

Editor's Comments

Sheet 1 —

Airframe Correction "D" was already made to the plans.

Sheet 1.02 "C" —

It is generally considered good to have the incidence within one-half a degree of the plans.

Sheet 4-A —

There is an added drawing for the Acro Sport I front stabilizer. All Acro Sport I's should have this modification.

Sheet 5-A —

The cabane strut should be tack welded initially and then the incidence measured before final welding.

Sheet 8 Item A —

1" stub rib location worked well on the prototype aircraft. It is normal to make the modification he suggests in No. B.

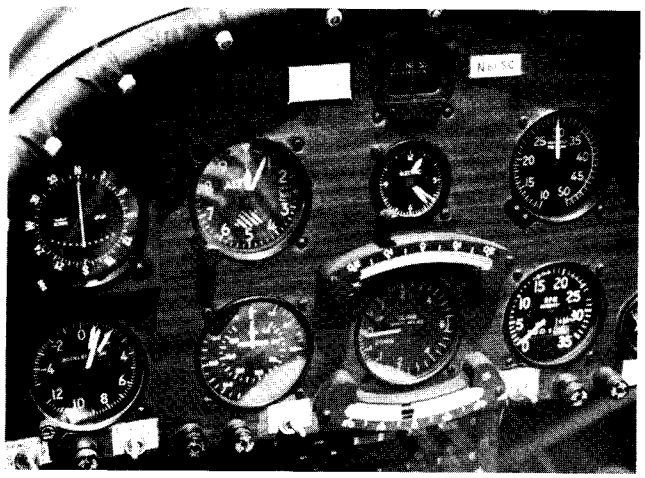
Sheet 8.01 No. A —

We do not recommend off-set for torque in the engine mount. Added fin off-set may be necessary.

Sheet 12 No. A. —

Has not been a problem including full throttle operation in aerobatics of our stock 200 hp Super Acro Sport.

Note From The Editor . . . Doug Bell's aircraft was completed and test flown September 6, 1979 and started January 6, 1976. It won the Outstanding Acro Sport I award at this Oshkosh Convention. The aircraft has a 150 hp Sensenich 76/53 prop, cruises at 120 mph at 2350 rpm at 2,000 feet MSL. Rate of climb is approximately 1,500 feet per minute, beginning at 1,306 MSL. The empty weight is 749.9 lbs. and the normal flying weight about 1,500 lbs. There is an electrical system with a battery behind the seat. Normal approach speeds for his aircraft are 90 to 95 mph and landing speed about 70 to 75 mph. Doug got the excellent finish on his aircraft using Imron. N176DB has been seen at Oshkosh during the 1980, '81 and '83 Conventions.



This aircraft was built by Ralph W. Cashen, Jr. of Harwich, Massachusetts. The instrument panel shot is shown to indicate the usage of the bank indicator. The purpose for this is to use one for regular flight and one for inverted flight. Ralph's Super Acro Sport was started 8/15/74 and completed 6/23/77. He uses a 200 hp IO360 with a Hartzell constant speed aerobatic prop. The cruise speed is about 155 mph at 2500 rpm at sea level. The aircraft has an empty weight of about 983 lbs. The climb he describes as "WOW!" The aircraft was soloed by him and he sold it in October of 1980 after flying it about 200 hours. He states: "I had no problem with the plans." . . .

I enjoy receiving the Acro Sport Newsletter and do want to have some material in it on my plane. You are doing a marvelous job with it. Enclosed also is a write-up on my Acro Sport which appeared in a local weekly publication. This is sent to you for your own personal reading.

With regards to the plans for the Acro Sport, I don't have much to recommend as far as changes are concerned. They are very good and easy to follow. I have been flying my plane for nearly five years and I had some problems which I corrected as follows.

(1) The aileron interconnect struts would sometimes flutter. Adding washers and tightening up the upper bearing helped a bit. The ultimate fix however, was to tape a length of 1/16" welding rod on one side of the strut. This distorted the air flow on one side of the streamlined tubing and eliminated the flutter.

(2) The gas tank developed some small cracks in both the rear and front ends. I tried using liquid aluminum which worked only temporarily and seepage always persisted. Finally I removed the tank, TIG welded the cracks and epoxy glued aluminum patches over the welded areas. I also realized that I had used solid lines to the tank and these were replaced with flexible lines. Now after two more years of flying there are no more leaks. It is quite possible that the stiffening ribs on the tank ends are not adequate. I have a new spare tank on hand just in case it happens again.

(3) The dope on the fabric on the landing gear legs developed cracks along the edge of the front and rear tubes, and also in the central area. This was due I believe to the fact that there is quite a large area of fabric with no stitching to hold down the fabric. Also the prop wash turbulence is quite severe in this area. My cure was to metalize the gear legs.

The picture shows how this was done. A wrapper of .025 aluminum was made and it was pop riveted to a V channel at the back. Sheet metal screws hold it onto the channel at the top of the gear leg. No extra mounting tabs were needed.

Another thing I did was to remove the starter, generator and battery. This reduced the weight by 54 pounds. Also I removed the mufflers and put straight pipes onto the crossover exhaust system. You wouldn't believe the difference this made to the performance of my Acro Sport. The C of G moved aft to where it should be and it now trims up better. It gets off the ground quicker, due in part to the increased horsepower from removing the mufflers. My initial rate of climb increased from about 1700 fpm to 2000 fpm, I get 10 mph more on the top of my loops, and now I can do a full vertical roll with an easy hammerhead off the top. This is with 150 hp and a fixed pitch prop of 74/57. For cross country flying I install a fully charged battery which powers my Genave 200B radio a long time.

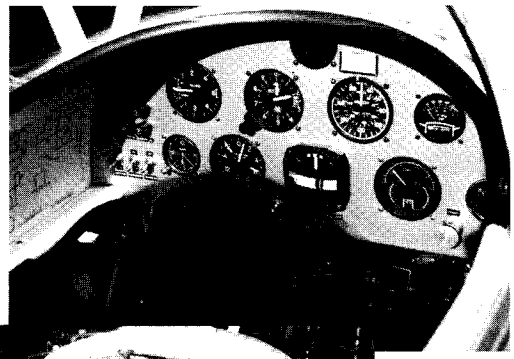
The pictures enclosed are self explanatory. The three of the Acro Sport under construction are copies of some color prints I have., Some of the data on my Acro Sport C-GZWM are as follows. It took 5½ years to build. First flight September 1978. Engine — Lycoming O-320-A2B 150 hp. PS5C pressure carb. Christen inverted oil system. Empty weight 874 lbs. Gross weight 1295 lbs. Wing loading gross 11.3, aerobatic 9.9. Power loading gross 8.6, aerobatic 7.5 lbs. per hp. Cruise 120 mph, stall 60. R of C 2000 fpm at 1500 ft. Fuel 82 imp. gal. Range 330 miles plus reserve. Endurance 2 hours 45 minutes plus 45 minutes reserve.

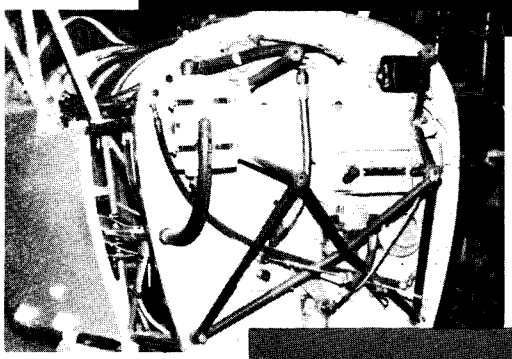
I have a Toshiba IK1900 video camera which I mount on the right cabane strut with a shock proof bracket which I designed. The recorder sits on the seat by my left side and I strap it to my waist. Needless to say I have some spectacular tapes taken of my sequences. You sure can tell if the 4 and 8 point rolls are done properly.

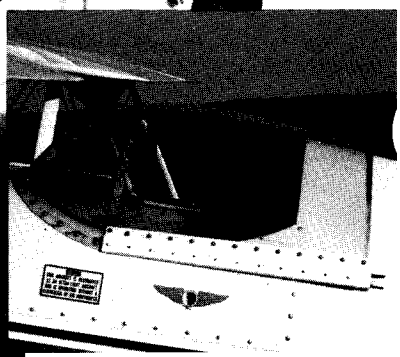
This report is starting to get lengthy so will end it here. You can see that I am filled with enthusiasm for flying my Acro Sport and now have about 275 hours on it. It sure is an eye catcher at all the fly-ins and air shows that I go to.

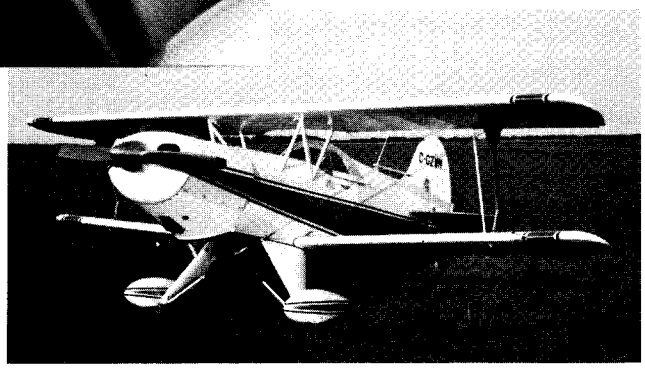
Hope you can use some of this material.

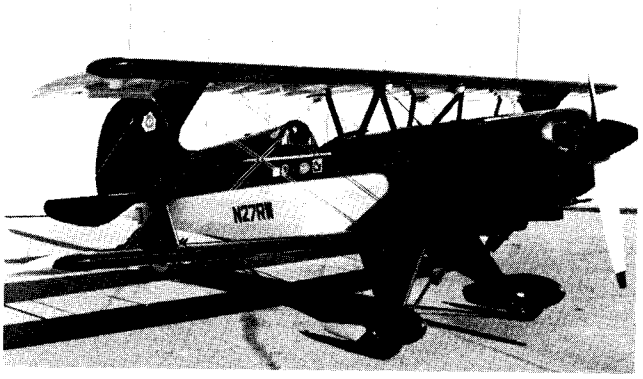
Best regards,
Archie McDonald











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My son and I built the airplane over a four-year period beginning in the summer of 1974 and completing in September of 1978. We flew it for about 25 hours and decided it needed some major surgery. It flew very nicely, but, was inherently too stable for very responsive aerobatics. The CG was too far forward and over 15 pounds of lead on the tail spring would not overcome the condition. Elevator pressures required were strenuous (especially in outside manuevers) and snap rolls were not crisp at all. To further compound the need for a modification, the airplane was without starter, generator and battery. I quickly learned that hand propping a fuel injected 180 H.P. engine was a troublesome and dangerous arrangement. But, to add an electrical system would only aggravate the forward CG problem. So, back to the plans and with some arithmetic I found the solution to all these problems by moving the engine back 3 inches. We did this by cutting the first bay of the fuselage back the required 3 inches. We used the 11 inch engine mount that is available from Wag Aero. I'm told you can get shorter ones, but, as you can see from the picture of the engine installation (No. 2) it's pretty crowded between the firewall and rear of the engine case already. To make this change of course required the main gas tank to be cut down as well. (We lost a little over 5 gallons of capacity in the main tank). If I were to make this modification in an AcroSport being newly built, I would take the 3" out of the first two bays of the fuselage instead of just one. In this way, I doubt if you would need to cut the main gas tank down at all. Incidentally, our smoke oil tank is convertible to fuel using a 3-way valve. So, the loss of main tank gas capacity was no big deal. When I flew the airplane from San Francisco to Oshkosh last year I validated well over two hours range (and that's really more than your fanny should be asked to endure anyway). At any rate I test flew the airplane again in August of 1979 after the modification. I'm very happy with the change and recommend it if you plan to do any serious aerobatics at all. The airplane is very responsive in all regimes and with light control pressures. The directional stability on landing and takeoff did not suffer that much from reducing the nose heavy CG (and we now have an electrical system with the battery mounted in the extreme rear of the turtle deck).

Regarding your interest in the symmetrical wing, I can only tell you that I used the "Super AcroSport" airfoil option available from Wag Aero. As you may know, it isn't precisely symmetrical. It does do the job though. I have flown both the flat and "symmetrical" wings and inverted flight is significantly improved using the latter without too noticeable degradation of slow flight characteristics. Again, if you are at all interested in aerobatics, I would heartily recommend the "Super AcroSport" airfoil.

The other modifications we made were mostly cosmetic and generally to clean up drag where possible. The pictures shown on page 10 show the results.

No. 1 is a quarter view showing the modified EAA paint scheme. We used Dupont Imron paint - Firethorn red, white, metallic gold and black.

No. 2 shows the Lycoming IO-360-B4A engine installation. It is, of course, fuel injected and has a Christen inverted oil system.

Nos. 3 and 4 show the landing and flying wire brace detail. The front and rear pieces were turned and milled out of solid aluminum stock and joined by an appropriate length of aluminum tube.

Nos. 5 and 6 show the detail of the modifications to the front fuselage wrapper. No. 5 shows the two tank filler necks recessed under flush access doors. No. 6 shows the cabane strut cut outs without splitting and patching the wrapper.

Nos. 7 and 8 show the changes to the landing gear fairings. No. 7 reflects the treatment of the gear legs using a sheet of aluminum wrap around instead of fabric. (It's also great for access to inside the gear). No. 8 shows the clean up where the gear fairing transitions to the wheel fairing. This was accomplished with molding fiberglass over a positive clay mold after the landing gear and wheel fairings were in place.

Nos. 9, 10, 11 & 12 reflect the "I" strut treatment with sheet aluminum wrap around fairings instead of fabric covering. (Again, great for access). No. 9 shows the Pitot tube flush mounting on the lower wing to avoid external tubing for an upper wing mount. You can see that we used rubber trim around all of the fairing parts. Incidentally, the rubber trim that you see for the landing and flying wires where they enter the wing (No. 11 lower wing and No. 12 upper wing) is an insulator for a large electrical alligator clip. A large rubber grommet trims the hole in the wing for the aileron slave strut. (No. 10) Another valuable modification to the aileron slave strut is just barely visible. It consists of a welding rod epoxied on one side of the streamlined tube. This performs the function of stalling one side of the strut airfoil and eliminates flying vibration. (Before making this modification we actually had an inflight failure of an aileron control arm from a vibrating slave strut).

Nos. 13, 14 and 15 show the fairing treatment of the upper and lower wing attach points and the landing and roll wire fittings. No. 13 shows a fiberglass streamlined bubble molded from a female rubber mold and used to fair in unsightly attach fittings. We used the same bubbles around the exposed aileron control arm, fuel drain, etc. You'll notice that we did not use wood or metal screws to hold down the wing attach fairing wrappers. In No. 14 you can see an access hole at the trailing edge of the wrapper. Inside is a screw that when tightened the wrapper acts as a large clamp around the wing. (Much more sanitary)

I would also highly recommend the modification that strengthens the cross support tube where the rear set of flying wires and lower wing attach to the fuselage. (It does bend when high positive G loads are put on the wings). Another good one for security sake is the heavier tube for the stabilizer to fuselage attachment and the stabilizer leading edge brace. These mods have been detailed in "Sport Aviation" along with the AD for the heavier front landing gear tube.

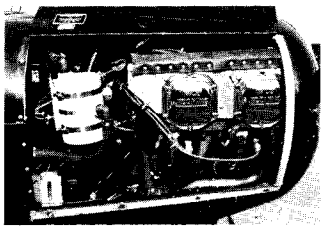
I'm very pleased overall with the AcroSport — it gets attention wherever it goes. It has won trophies at Watsonville, Merced, Hollister and Columbia Air Shows. Oddly enough, it wasn't even noticed by the judges at the Oshkosh 1980 EAA convention, where the design was born. (They were too busy looking at Vari Ezes).

If I can be of any more help, let me know.

Good luck!

R. A. White

Editor's Note: Awards presentation at Oshkosh by AcroSport started in 1982.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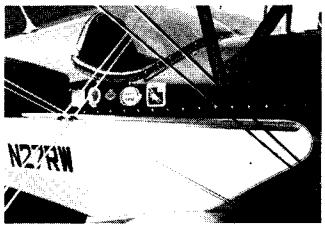

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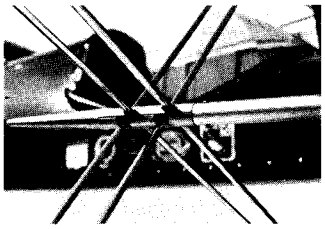
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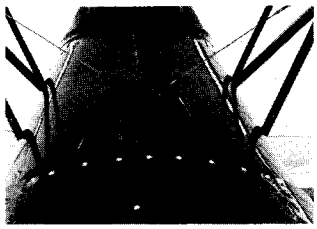
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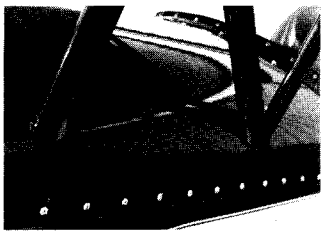
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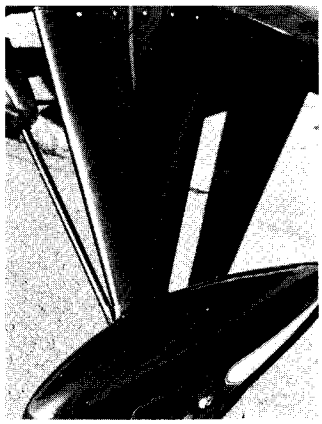
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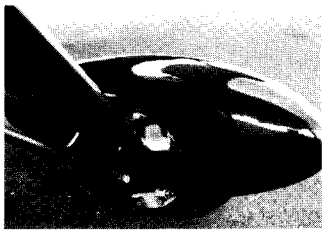
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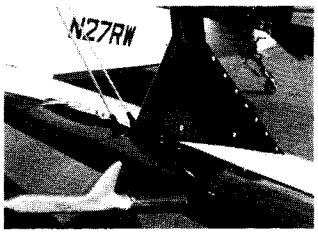

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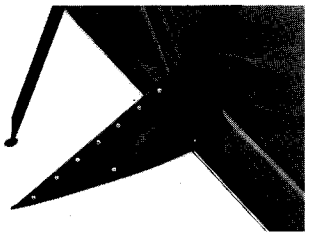
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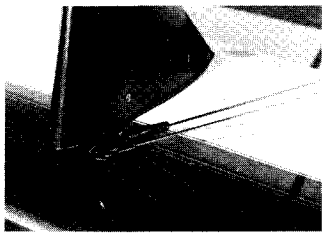
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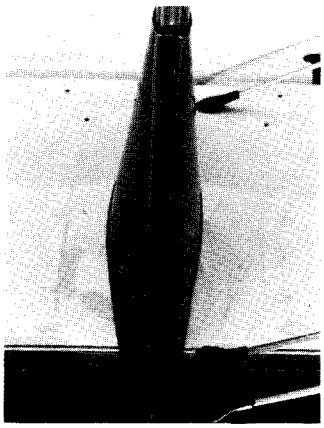
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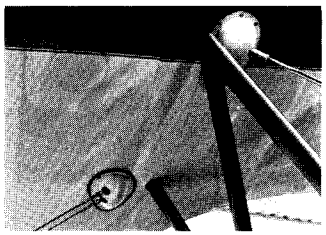
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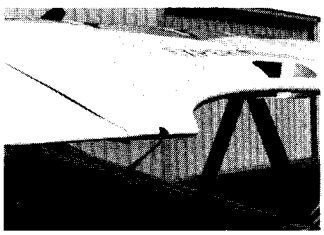
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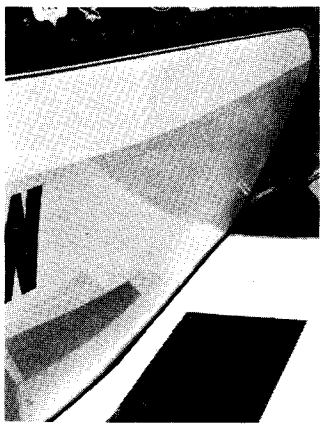
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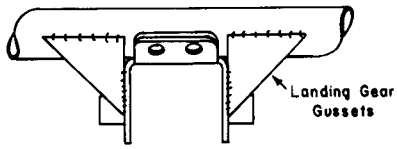
ACRO SPORT/POBER PIXIE TECHNICAL TIPS

By Ben Owen

1. The IAC has a book titled "Technical Tips Manual" at $7.00 ppd. It is a good investment for someone building an aerobatic aircraft. For one thing, one of the articles by Frank Christensen shows that the pressure limit for wobble pumps should be set at 7 psi for a float type carburetor, 15 psi for a PS-5C injection carburetor or 22 psi for a fuel injector. Most pumps were set at the 7 psi max when they were originally manufactured and this is not sufficient to supply the pressure carburetor or the fuel injectors which are commonly used in aerobatic aircraft.

2. The question has arisen as to why are the outer wing upper panel fittings of .090" 4130N steel, when the center section fittings are .063"' 4130N steel on the Acro Sport I. The reason for this is that the landing wire pulls attach to the rear spar on the outer panel.

3. The Acro Sport II, Sheet No. 3, Zone B5, there are some gussets shown reinforcing landing gear fittings. These gussets are triangular in shape, 4130 .090 approximately 1⅛" on a side. They were installed on the prototype and it would be a good idea for both the Acro I and the Acro II if they are heavier. The excellent article in this issue by Doug Bell indicates how he strengthened his at that point and that is also a good guide. Our gussets were welded only on the outside to facilitate ease in construction. Apparently a landing gear on an Acro Sport had cracked at that point. The aircraft is located in the New Orleans area. However, no accident resulted.



4. Some of the larger engines used in our aircraft do tend to shake on start-up or shut-down. The plans as they are drawn do give sufficient clearance side to side for the engine to rotate. Also, all three of our aircraft; the Acro Sport I, the Pixie and the Acro Sport II have the engines set up with zero side thrust and zero down thrust. In other words their offset in both planes is zero degrees to each

side or up and down. Side or down thrust was never found necessary in the aircraft to date.

5. Some of the Acro Sport I and II builders have inquired about the various engines. Most 180 HP 0360's have an overhaul period of 2,000 hours and the 200 HP 0360's have either a 1,200 hour period for the A-10 or 1,800 hours for the I0360-A, C, D & J. The reason for this is simply the added stress placed on the engine by the extra HP or in the case of the "A", engine, its aerobatic use. It may also be acceptable to use either a fuel injected engine or the PS5-C for aerobatic flight. Most people are aware that starting a fuel injection engine takes a while to get used to but it is acceptable for aerobatic use. The usual recommendation for aerobatic flying is the solid crank engine. Most people are aware of the cost of Sensenich props; a 76/60 running about $1,060.00, a 76/56 about $50.00 less and 74/54 about $940.00. The re-manufactured Hartzell propellers with the I0360A1A would be a stock number HC-C2YK-4CS for the hub. Average price of these propellers, new, is $2,574.00 plus tax. Whenever they are overhauled the costs are running approximately $643.00. Builders should be cautioned that the Hartzell propeller weighs about 74 pounds and it may have an adverse effect on weight and balance. For further information you can contact Hartzell Propellers, P. O. Box 1458, 5465 W. State Route 185, Piqua, OH 45356. However, you should be advised that there is an airworthiness directive on these propellers, No. 1206. It requires a complete overhaul every 1,500 flying hours or 4 years. If you are flying the propeller in aerobatics it requires a complete overhaul every 500 flying hours or 4 years. The blade numbers for the Hartzell are: FC76-66A-2. It is also recommended to have a good tachometer. If the tachometer is off as much as 250 RPM the purchaser is warned that an overspeed means an overhaul at the very least. Actually, the solid shaft engine is considered "better" for aerobatics anyway due to past experience with the hollow shaft crank needed for a constant speed prop. The hollow shaft crank has had a tendency to crack when the aircraft is flown in multiple snaps, etc.

6. Bob Stegner of Poplar Bluffs, Missouri is working on an Acro II. He found the tubing cutting very easy with a pair of aviation snips. He then uses a heavy duty ball bearing industrial Dremel tool with a No. 488 sanding drum in it to finish off the tubing end. He is getting very good fits and rarely uses his pedestal grinder.

7. One of the tools that can be used to check field rigging of aircraft was actually invented by old time racing pilot, Johnny Livingston. He cut a ½" wooden Dowel about 1½" long and drilled a small hole in one end and screwed this to a small suction cup. He then sprayed the dowel red. He then used four of these to stick them vertically to the trailing edge of an airplane to determine if there was a wash-in or wash-out. By stepping back and sighting along the tops of the dowels the incidence of the wing could be checked by eye. Plus, they can be carried in your pocket, unlike most rigging tools. Johnny Livingston was the one that the seagull was named after. He was quite an accomplished test pilot although well along in years. It was worth your while to invite him out to check the rigging of your airplane and test fly it as it usually ended up flying about 10 miles an hour better. He re-rigged airplanes using these tools as a hobby for many years in South Florida.

8. We have made mention of escalating gross weights on aircraft before. We, here, believe that the lighter the aircraft the better it flies. A WW II fighter pilot training book discussed this showing a 10% reduction in gross weight gives you a 14% better climb at sea level; 13% less on your take-off run, 5% less on your landing speed and decreases your turning radius by 10%. We have some of our builders of Acro Sport and Pixie aircraft who have had the good sense to remove some of the equipment they have put in their aircraft and have been really astonished at the performance increases. The Acro Sports and the Pixies are intended to give you the superior manueverability of the large wing, lightly loaded airplane. As some of you may have already found out, this permits you to turn and climb inside of other aircraft which is also a decided safety advantage. Build your airplanes as light as possible!

9. Regarding the shock struts on the Pober Pixies, these are built similar to the Acro Sport I and II. The total shock strut of the Pober Pixie is 27¼". You should tack weld it, fit it to the fuselage and check for possible fuselage tilt, (one wing down), before final weld. The length of the outer strut is 18¾". The length of the slot on the inner strut is 5" and the slot begins 1" from the end of the inner strut. We use 1280 HD shock cords on each side and when they are weak we add one more. The horizontal dimensions from station 2 to station 3 is 17⅛" and this should be matched to the fuselage. As an added note, some of the Acro Sport II and I builders are using the 1388HD Bungee cords on their aircraft.

10. When welding, the gap that is left, is strictly to accomodate the expansion of tubing during heating. For this reason the exact spacing is not given as it can vary between 1/32" to about 1/16". A good welder can close a gap of up to about ⅛" but it is best to fit the tubing fairly precisely. These remarks apply to tubing clustered joints. If you have a finger strap or plate welded to the tubing it is always butted right against it with no gap. Most of the people building our category of aircraft use 1/16" welding rods when welding.

11. As far as bending tubing for rounding curved structures such as tails and engine mounts there are several methods. If it is light tubing it can be bent over the knee very carefully in small increments. The other way is to make a form and bend it slowly. A mandrill is a large disc of plywood usually slotted at the edge to accept the tubing size. This can be used with a smaller pulley to help keep the tubing from crimping while bending. You may have to go to the commercial substance used that is very similar to lead that is melted and poured inside the tubing which is bent with the substance inside to keep it from failing. Sand will also work when dry and packed into the tubing very densely with a hard plug at both ends.

12. Inspectors are requiring our aircraft airspeed indicators to be marked. For the Acro II the maximum never exceeds speed is approximately 180 MPH. The maneuvering speed for the Acro II for full control deflection is approximately 130 MPH. This would also be the maximum structural cruise speed in calm air. There would be a green arc from a stall speed to 130 MPH and a yellow arc from 130 MPH to 180 MPH. For other aircraft this is fairly simple to determine. The tachometer should be red-lined at 2,700 RPM and possibly at about 700 RPM or higher for the low end. By the way, a manifold pressure gauge is not required for your aircraft unless you have a constant speed prop. The cylinder head/temperature should have a maximum and minimum red-line but it could also have a green arc. The oil pressure gauge should have similar indications. The fuel indicator should have red-lines at minimum and maximum and probably it would be a good idea to establish a minimum for aerobatic flight at around 6 gallons on board. This will insure pick-up in the flop tube. Other placards required might include one on the baggage compartment. For the 0320 engine the desired temperature of the oil is 180 degrees farenheit and 245 degrees farenheit max. The oil pressure should be 25 psi idling and the maximum for start and warm-up is 100 psi according to the 0320 book that I have. You will want to use similar markings on your aircraft as the FAA is getting stricter on the markings and the placards required before the aircraft is licensed.

OSHKOSH WINNERS

The winners of trophies from Acro Sport, Inc. at the Oshkosh '83 Convention include: Donald A. Smith, Jr. "Al" who won the best Acro Sport II award. Mike Brown of Allegan, Michigan was runner up and received a well deserved trophy. Both of these airplanes were hard to fault. Doug Bell of Cadillac, Michigan won the best Acro Sport I at the convention. Congratulations to all of you! The presentation of trophies will be a continuing feature at every Oshkosh Convention. Unfortunately we did not have a Pixie at the Convention to give an award for.

TIME TO RENEW YOUR ACRO SPORT NEWSLETTER

It is time to renew your subscription to the Acro Sport Newsletter. If you would send a check for $10.00 to Acro Sport, Inc., P. O. Box 462, Hales Corners, Wisconsin 53130, we will be happy to renew your subscription for the coming year. Acro Sport Newsletter is published 4 times annually and is definitely a recommended subscription for those building or those who have built aircraft.

THANK YOU

All those Acro Sport I, Pixie and Acro Sport II builders who have sent in information and photographs for use in the Newsletter. Your support is appreciated.

DISCLAIMER

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Note: "How To Build The AcroSport Manuals" are now $10.00 P.P. from AcroSport Inc., P.O. Box 462, Hales Corners, WI 53130.

Manual is useful for any steel tube - wood wing airplane.