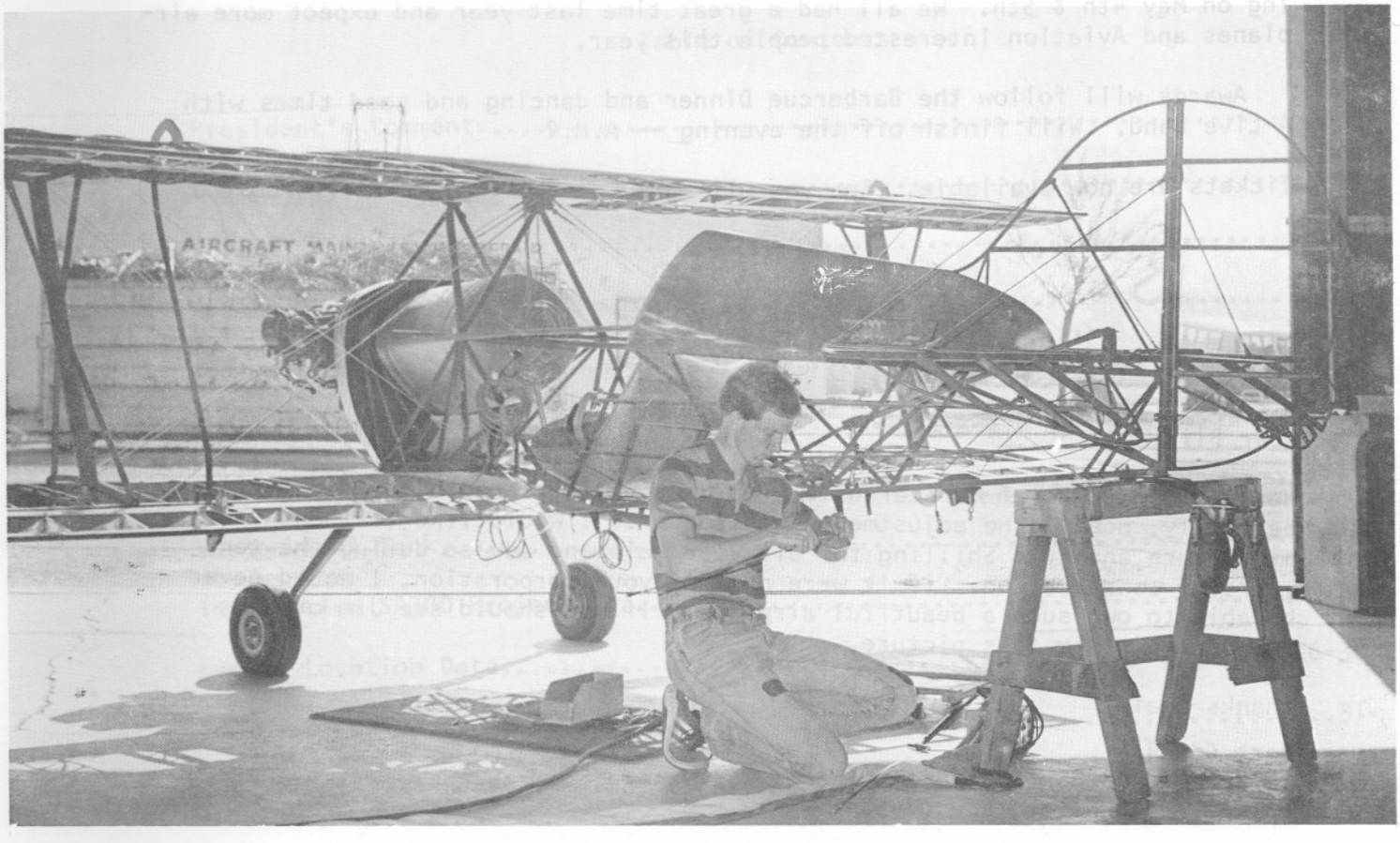
Starduster



Dedicated to the ACTIVE Homebuilders

January 1985

1984 has passed and was a successful year for Starduster and our builders. Several new Stardusters and Acrodusters are now flying. The interest in our Airplanes is still strong and growing --- attested by the number of plans and brochures that are sent out weekly and the kits and components going out all over the World.

Our East Coast Store is in final stages of opening. Dave Spencer of Martinsville, VA, whom we introduced to you in the last issue of "Starduster", has a business address as follows!

STARDUSTER EAST
819 Corntassel Trail
Martinsville, VA 24112
(703) 632-1790

It is our goal to improve service (time) and save shipping costs to our East Coast Builders. We are sure that you will all help Dave with his new venture!

We are making plans now for our "STARDUSTER" Fly In, which will be occuring on May 4th & 5th. We all had a great time last year and expect more airplanes and Aviation interested people this year.

Awards will follow the Barbercue Dinner and dancing and good times with A-Live Band. Will finish off the evening -- A.M.?

Tickets are now available. See you all here.

B.C.
"PREZ"

Bill Lowe

Dear Bill,

Here is a picture of my Starduster, which took 10 years to build. It flew perfectly, needing no adjustments whatsoever. I would like to thank you, Jim Osburn and Eric Shilling for all your help and advise during the ten years of construction. If it were not for your corporation, I would never be able to own such a beautiful airplane. If you should see Jim or Eric Please show them this picture.

Thanks again,

Bert Cocks
18 Rambling Brook Road
Upper Saddle River, NJ 07458

Bert,

It is our pleasure and goal to be of assistance to all Homebuilders.

Your aircraft is a fine example of patiences and craftmanship. Your reward is a fine flying machine which you will enjoy for years to come. And again I think we all owe thanks to Lou Stolp for designing such a beautiful BiPlane.

Thanks for the beautiful picture which graces our full size back cover.

Bill,

B.C.

January STARDUSTER MAGAZINE 1985

Table of Contents

FRONT COVER: Carsten Reuter from Germany, working on a highly modified Pitts in our shop. Carsten is an Aeronautical Engineer and has completed some stress analysis for our Acroduster Too and Super Starduster - We are happy to have his talent with us.

BACK COVER: This beautiful Starduster belongs to Bert Cocks of Upper Saddle River, NJ.

WHAT IS AN

AEROBATIC ENGINE?

A Flyer reader wrote to express interest in a Lycoming 10-360 engine. He went on to say that the engine would be used in an aircraft capable of unlimited aerobatics. A statement like this indicates a need for explanation of the differences between the standard Lycoming engine and the aerobatic Lycoming engine. Unlimited aerobatic flight with a non-aerobatic engine could result in engine stoppage from either fuel or oil starvation.

It should first be explained that unlimited aerobatic flight implies that the aircraft may be flown in any attitude with no limitations. For this reason, any engine which employs a float type carburetor for fuel metering is immediately eliminated from use in a fully aerobatic aircraft. Inverted flight would quickly cause the carburetor to stop metering fuel and the engine to stop running. While carbureted engines are used in some aircraft with limited aerobatic capability, only positive G maneuvers and very brief periods of inverted flight are possible.

To operate correctly, an engine must have fuel which is properly metered in proportion to the air entering the engine induction system. The fuel injector measures air flow and meters fuel to the inlet ports of each cylinder. Unlike the carburetor, a fuel injector is not affected by unusual aircraft attitudes. Therefore, all Lycoming engines which are designed for aerobatic flight are equipped with a fuel injector.

Delivery of metered fuel to the combustion chamber is not the only challenge addressed in designing an aerobatic aircraft engine. It is also necessary to provide lubricating oil to many points in an operating engine regardless of the aircraft attitude. Two different methods have been used to provide oil for aerobatic engines manufactured by Avco Lycoming.

The flat, opposed cylinder aerobatic engines first offered by Avco Lycoming were designated AIO-320 or AIO-360. These engines were the dry sump type with appropriate oil inlet and outlet connections as well as two crankcase breather connections. Necessary lines and an external oil tank with a revolving pickup capable of reaching oil in almost any aircraft attitude were then supplied by the aircraft manufacturer. This type of installation provided aerobatic capability, but it was complicated enough to be very expensive. A simpler, more universally usable system was needed.

Most Lycoming engines are termed "wet sump" engines because oil is stored internally in a sump at the bottom of the crankcase. When the engine is inverted, the oil will be in the top of the crankcase rather than in the oil sump. To maintain a continuous flow of oil during inverted flight, an oil pick-up line must be provided near the top of the engine as well as in the oil sump. Lycoming aerobatic engines carrying an AEIO designation use inverted oil system hardware to adapt oil pick-up lines at the top and bottom of the wet sump engine.

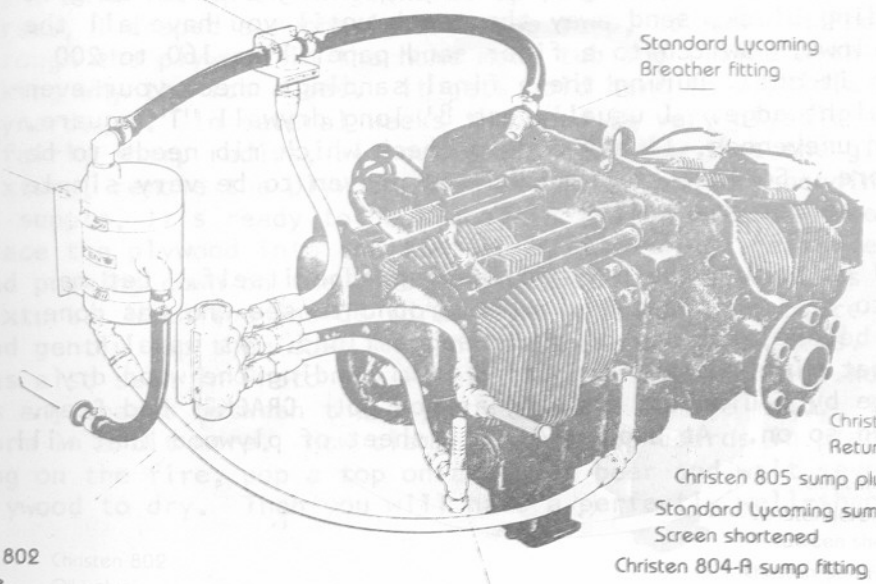
This inverted oil system is comprised of two major components, the oil valve and the oil separator. Several other items of hardware adapt the system to the Lycoming engine so that oil is available to the oil pump in either the upright or inverted position. These hardware items include a standpipe in the sump which acts as the engine breather during inverted flight, a special adapter or plug at the oil sump suction screen, and other hoses and fittings.

In addition to the inverted oil system, Lycoming mades other engine modifications to adapt standard engine models to aerobatic use. Some models of the AEIO-540 engine have a baffle added in the oil sump to eliminate oil loss through the oil separator. Also the flow of oil to the oil pickup in the accessory case is limited in the inverted position. To improve this oil flow holes are machined in the upper rear wall of the crankcase.

With these changes completed, the engine is capable of unlimited periods of inverted flight in addition to normal upright flight. Because the oil pick up points are at the top and bottom of the engine, knife edge flight or flight at very high up or down pitch angles have some limitations; the limitations do not prevent engines from being used in aircraft which perform all the maneuvers required for international aerobatic competition. Engines built with the inverted oil system and incorporating the other modifications discussed earlier are certified by the FAA as aerobatic engines.

The meanings of the letters and numbers in the Lycoming engine designation were fully esplained in Flyer 39, but the AE part of the AEIO indicates "aerobatic engine." Lycoming is currently producing AEIO-320, AEIO-360 and AEIO-540 aerobatic engines which range from 150 to 300 horsepower. One of these models should be installed in a gereral aviation aircraft which is designed for aerobatic flight.

CREDITS TO: AVCO LYCOMING "FLYER"



Horizontal-Screen Sump Type

Bill,

First things first: Enclosed, you will find a check for those aileron bushings you sent. Once again, I apologize and thank you for your patiences with me. Now, down to more fun things.

As the tempo of the winter season comes on colder and colder by the week, the project has fully moved back into the limited space of the workshop. The renewed odor of the wood stove puffing smoke of burning oak, and other scraps of pine has changed my priorities on the project.

Most of the project is roughed out now and it is merely finishing parts. I spent my time sanding and painting or adding those dreams that homebuilts are made of.

As you remember that crazy fellow, "Maynard Ingels", who talked me into building my leading edges of my wings out of wood. Well, I have started on this project and have come up with another way of doing this. By using an aluminum angle, several "C" clamps and a Dremel tool, with a router base attachment. So, check this out, Maynard and tell me what you think of it.....

Photo #1: Shows how I clamped the aluminum angle to the wing. "C" clamps had to be moved to another location of course in order to make cuts in the areas first clamped.

Phopt #2: Shows the Dremel tool and it's router base using the angle as a guide. Set the depth of the cutter to accommodate the thickness of .090, (1.5mm) plywood that will wrap over the leading edge of the wiring. Now, slide the cutter along the angle and you will make a smooth and even cut every time. Advance the angle toward the front of the wing in short increments and make another pass. By doing this you will have a series of notches on each rib, at the proper depth. When each rib is cut you will have a gang of saw like teeth sticking up. Now, by using a 60 or 80 grit sand paper on a sanding block, sand away the teeth until you have all the highs even with the lows. Switch to a finer sand paper like 160 to 200 and finish smoothing it out. During these final sandings check your evenness with a long straight edge. I usually use 8' long drywall "T" square. This is to check for uneveness, if any and to check which rib needs to be cut down a little more. So far, this method has proven to be very simple and accurate. Okay, so far Maynard?

Now, let's see how I am making the plywood leading edge itself. Let me stop for a minute, to tell you that I checked around to see who has done something like this before, for any of these suggestions. As usual I found umteen ways that might work. It ranged from bending the wood dry over the leading edge by gluing and nailing as you go. CRACK? Bad Seam. I went elsewhere, and so on. At about $70.00 a sheet of plywood that will

cover two leading edges. I checked further, I went to some wood working places in the area and found out just what old Maynard suggested.

Build a fixture, soak your wood in water and clamp it in the fixture until dry. When you take it out, it will look like one of those fiber-glass molded parts.

Here is how I nade my jig; Take some pieces of plywood. I used some 3/8" exterior material 9" by 12". I centered the 9" side against the wing root using the starting point from the back side of the front spar. Trace around the nose rib to establish the shape. Of course, use the original shape before cutting the 1.5mm off. I cut 14 of these sheets. Saw the shape out and save the inside pieces, please! The inside pieces are to be cut down 1.5mm to fit inside the plywood in the fixture.

Now, by using 4 each 1" by 4" boards by 8' long; Locate the centers of each nose rib on one of the boards. Lay out a 3/8" slot at each one of the marks. Clamp the 4 boards together and with a radial arm or some other type saw, cut a slot about 1" deep to accommadate the 3/8" plywood. Now using glue, assemble the female forms into each slot as shown in #3 Photo. The two top boards should be even with the inside face of the fixture. This allows the leading edge plywood to conform to the shape of the wing when assembled.

While all of this glue is drying, start to prepare the plywood for the leading edge. Just to check things out, measure the amount of plywood that will be required to cover the leading edge. Measure from the back side of the front spar around the leading edge rib and back to the back side of the spar, again. For the SA 300 wing, I require about 20' plus. I cut my material 22" wide by 8'. This will allow me plenty of material to trim off later.

Now; How will I soak this material in water, you ask! My neighbors swimming pool, Naw, Bath tub, no, too small, Wash tub, Naw, Dig a hole, NO, no Light bulb lit-up and I gathered up some materials. Using several saw horses, I draped a rubberized canvas tarp, as seen in Photo #4, I placed it through the plywood in the home made tub and filled with water. Never mind asking why the ice cubes. It gets cold here in Virginia this time of year, Maynard..... In several weeks the wood is very plyable and can be bent with a fairly sharp radius, without cracking. Now that the glue is dry on the fixture, remove the plywood from the water and try bending it. If the wood is supple, it's ready to be placed in the fixture. As seen in Photo #5, place the plywood into the fixture by squeezing the rolled plywood nose and pushing down on the upper edges until the plywood is snug in the female fixture. With the inside forms that were cut out, place these pieces inside and gently tap them down in line with the outside forms. Place two boards (as also seen in Photo #5) in place and clamp lightly..Now, see if there is any spaces between the plywood and the female mold. If so, tap the male form in a bit more. Now clamp the two top boards in place. Throw another log on the fire, pop a top on a can of beer and wait several weeks for the plywood to dry. Then you will have a perfectly well-shaped prefornical

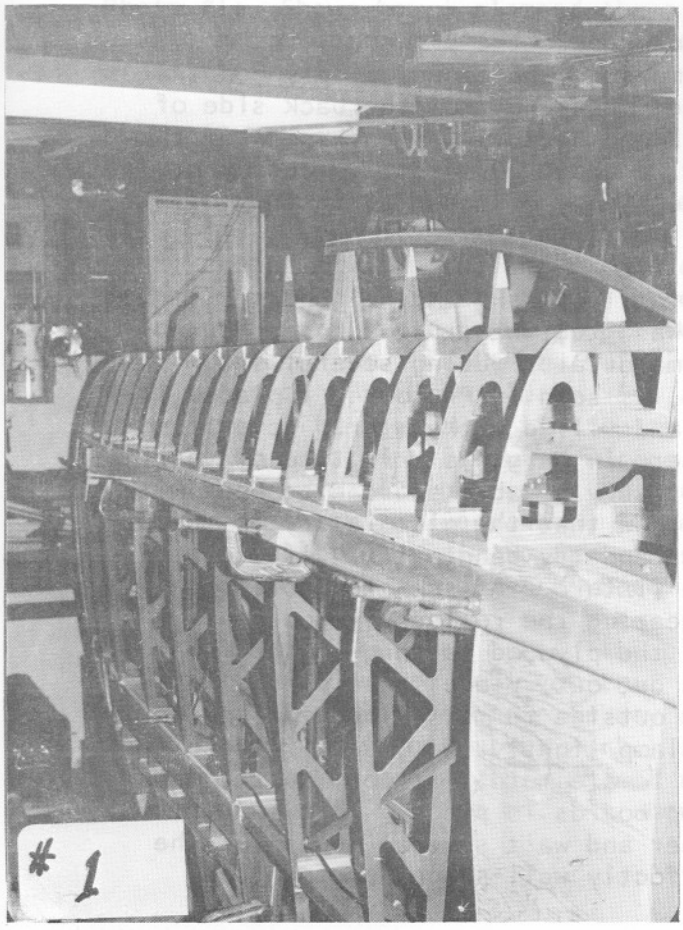
leading edge without any splits or cracks.

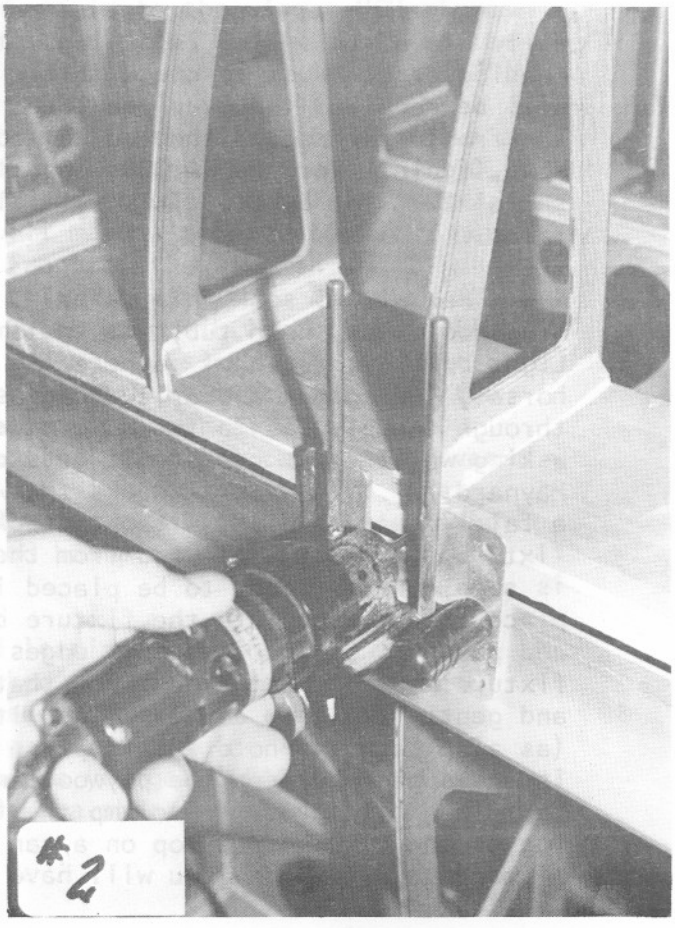
If your fixture is cut and shaped correctly it shoud be able to be used as a clamping fixture, when you glue this part to the wing. As I am not as yet, ready to do this, I have my fingers crossed that the gluing clamp will work.

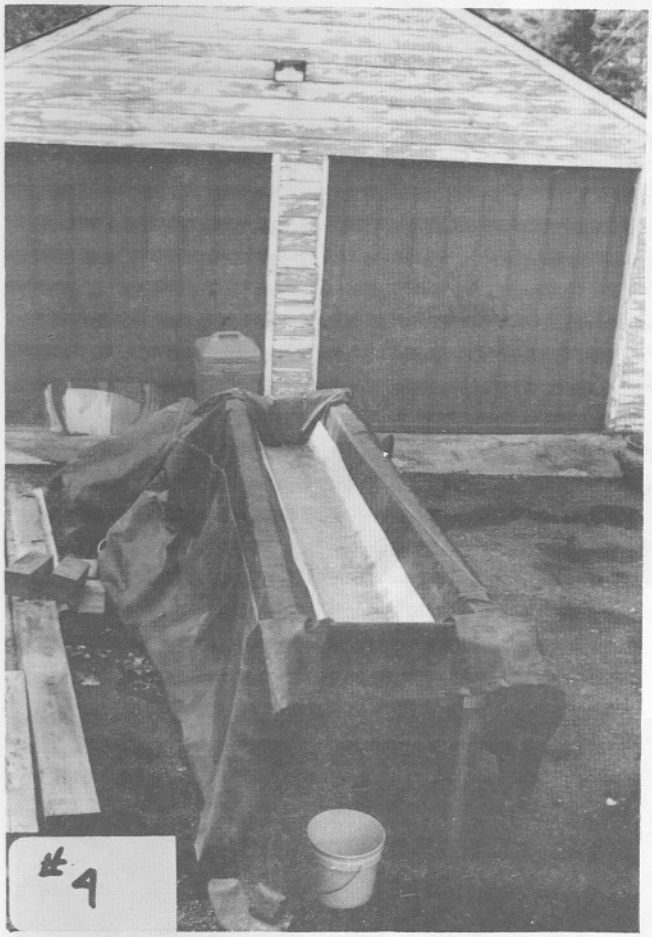
Photo#6. Is to show how tight the work space has become since all the wings, and the fuselage are now basically completed. In the background you will see the old stove with the coffee pot brewing on it. Parts hanging from the ceiling and walls. Notice also, the wooden wing tips and running lights.

Next time, I will tell you how I have installed my landing lights and my NAV antenna in the wing.

"DR. HOMEBUILDER"



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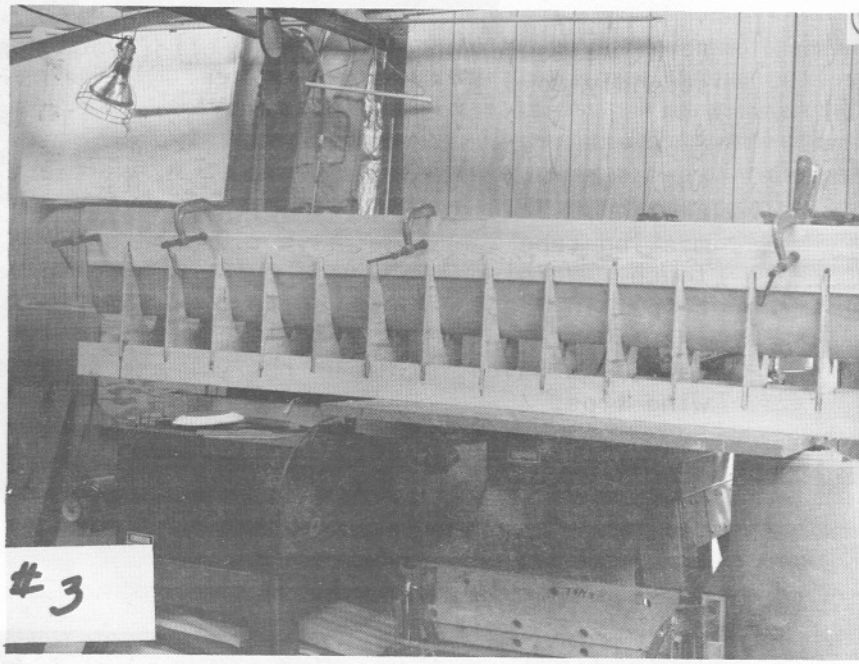
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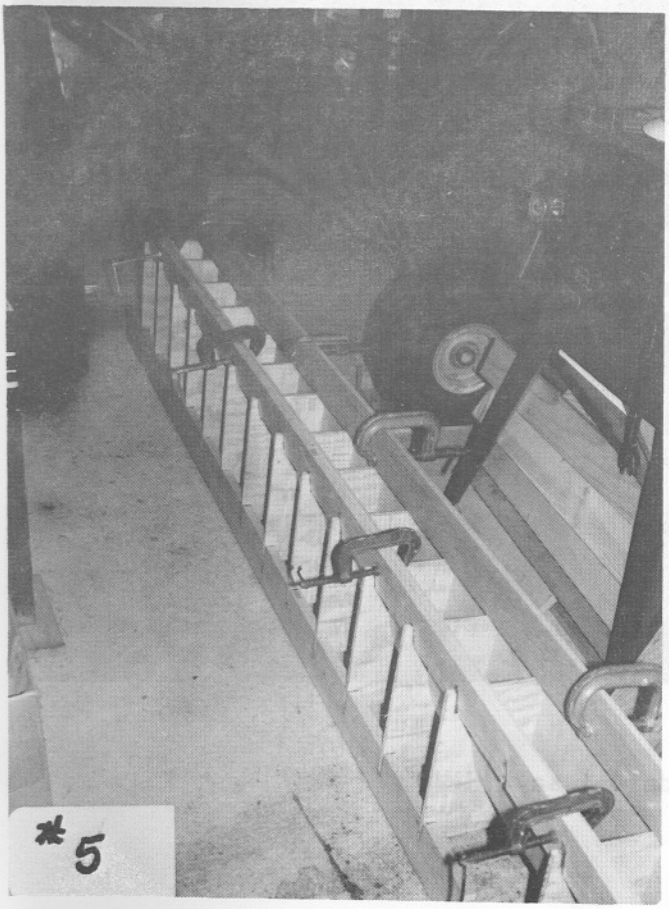

#5


#6

Hello Walt,

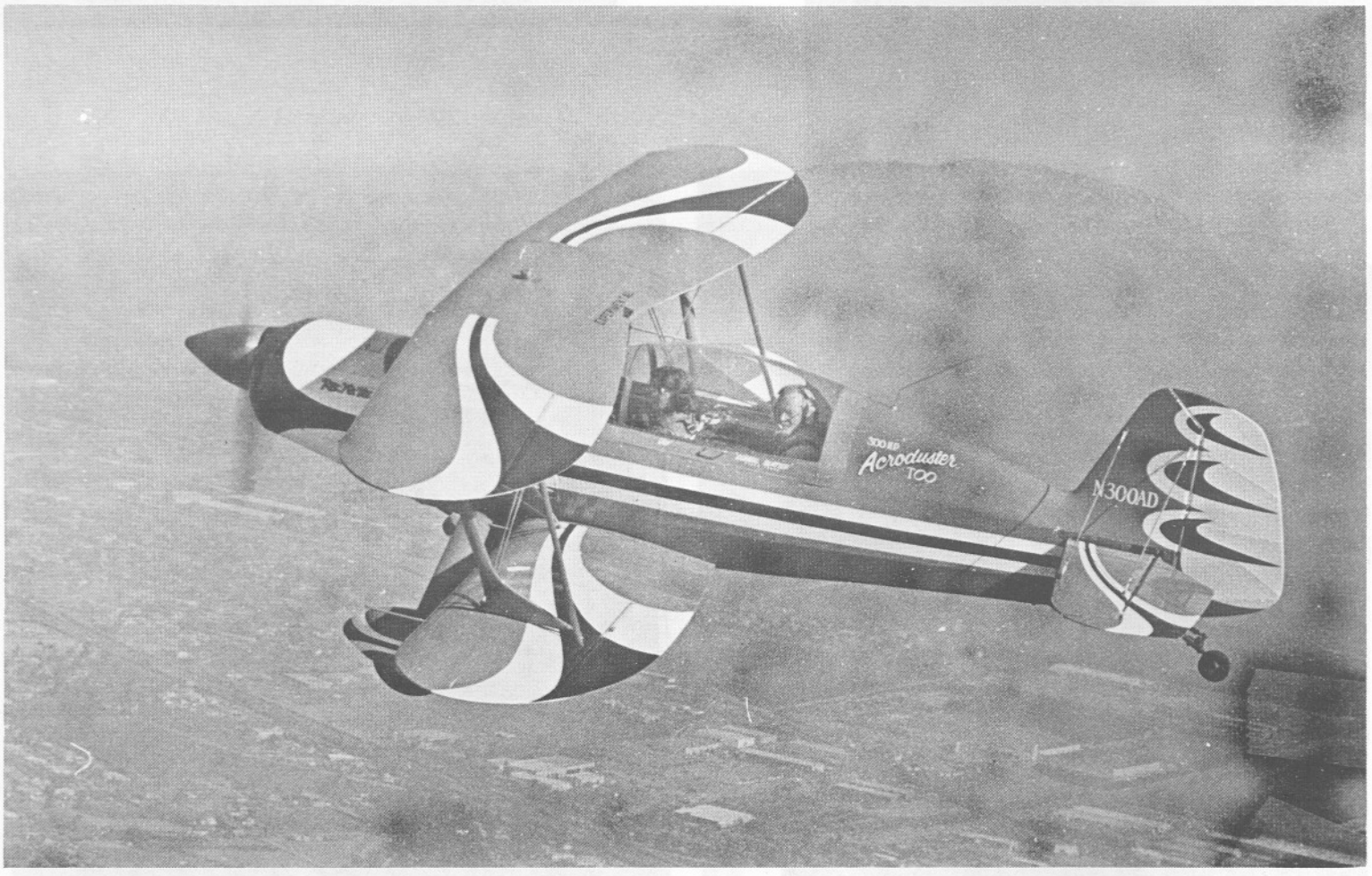
First we would like to thank you for your contribution to the magazine and secondly compliment you on a very good looking set of wings.

I personally prefer the wooden leading edges, because it is very hard to get satisfactory results with aluminum, you will want to be careful when glueing them on. The inside of leading edges should be varnished first. We use 1/4" masking tape where the nose ribs contact the skin and 3/4" tape where the spars touch. Varnish, then remove tape, apply glue and install. Small holes should be put in leading edge in front of Spar for water drainage.

Walt, you haven't told us how you are going to do the compound curves of the wing tips.

We are looking forward to you next feature.

"B.C."



Over the Warm, Sunny skies of Riverside, Brenda & I say "Hi"

January 23, 1985

Dear Bill,

Enclosed you will find a photo of my Starduster 32ME. The first flight was August 25, 1984, ten years after I started the project (September 1974).

It is powered by a Lyc. HIO-360 CIB, 200 HP with a Hartzell C/S prop. Take off is quick to say the least and Cruise speed in air easy 130 MPH.

Our weather is too cold to fly at present so I am looking forward to spring and much time in the air. The aircraft is a fine flying machine.

Thank you for all the help through the past 10 years.

Sincerely,
Marvin Easter
645 Beautyview Ct.
Columbus, Ohio
43214

Dear Marvin,

Another Beautiful Starduster in an appropiate setting. As always it is our aim to be of as much assistance to our builders as possible. You are so close to Oshkosh. We hope to see you there. Would like to meet you again. -- On the line or booth K-6 or at our meeting at the "ACEY DUCEY".

Bill,

ULTRALIGHT PLANE INDUSTRY TAKES NOSEDIVE IN WAKE OF ACCIDENTS

LOS ANGELES (AP) - The fledgling ultralight aircraft industry has gone into a tallspin, partly because of 179 accidents in less than two years, but some manufacturers believe they may yet pull out of it.

"We're predicting that there's still a tremendous future. We are building better and better products, and the safety record is improving." said John Lasko, vice president of Elipper Aircraft Inc. of Rancho California.

B But for now, the ultralight is having a hard time getting back off the ground, and sales this year have been down 60 percent from last year. Lasko said his firm's deliveries have dropped from 2,200 in 1983 to less than 1,000 this year. Elipper is said to be the largest ultralight manufacturer in the nation.

(Three veteran pilots, including the owner of an firm that manufactures ultralights, were at the controls of ultralights that went down in fatal crashes in Riverside County during the past 13 months.

(Two of the accidents involved flights from the Elsinore Ultralite Flight Park in Lake Elsinore, while the third fatal crash occurred shortly after takeoff from Perris Airport.

(The National Transportation Safety Board found that a owner of a Huntington Beach Ultralight production plant was attempting unsafe aerobatic maneuvers when his aircraft crashed last May near Perris Airport.)

"It's the fastest rise and fall of a recreational industry I've ever seen," said Steven Fry of Laguna Niguel, who led an unsuccessful effort to get Orange County to approve a park for ultralight aviation. "...It's a horror story. A lot of people lost their shirts."

The Federal Aviation Administration has said the 20-mph lightweight aircraft, powered basically by a lawnmower engine, must not be flown over populated areas - so such parks are necessary for the ultralight fad to take flight.

The planes sell for $3,000 to $8,000 compared with more than $45,000 for a new single-engine Cessna or $10,000 and up for a flightworthy used small plane. But Fry complained that ultralights are made of wear-prone materials that often must be replaced and that people couldn't learn how to fly them.

"It was the unwillingness of manufacturers to build their products with good materials and to provide training," he said....After 250 to 300 hours of flying, you end up replacing all the (tubing) on the aircraft, while you can go thousands of hours without problems on a regular aircraft."

Keefe Aldstadt, ultralight, distributor for Robertson Aircraft of La Habra, says often the problems weren't the planes' fault.

"A lot of the accidents that happened occurred not because of bad weather or the machinery but because people were simply not prepared to fly them," Aldstadt said.

The National Transportation Safety Board in Washington said 93 people died and 81 were seriously injured in the 179 ultralight accidents that have occurred since February 1983 when the NTSB started keeping statistics on the craft.

Lasko said some people thought they wouldn't need training. He called this the "machoman syndrome - people saying, " I can learn this by myself."

//

Johnson Controls, Inc.
900 East Keefe Avenue
Milwaukee, WI 53212
Tel. 414/228 2401

JOHNSON CONTROLS
Globe Battery Division

Mr. Dale Larue Arnould
STOLP Starduster Corp.
4301 Twining Flabob Airport
Riverside, CA 92509

November 28, 1984

Dear Mr. Arnould

This is to acknowledge your letter of 9/4/84 and accompanying U-128 battery.

We found nothing mechanically or electrically wrong with the battery.

The polypropylene case material we use in the U-128 battery is a very strong yet flexible plastic. End wall defection is a normal condition due to the pressurized venting system. You may in fact find batteries with a concave end wall which again is normal. We have imposed an internal specification of 1/8" max. bow out to insure a mechanical fit problem does not exist in service. The returned battery was within this specification.

We have repackaged the U-128 battery. It will provide over 30 A.H. capacity within the same physical size and retain the U-128 part number. As part of the redesign we have made the end walls thicker. This will minimize the end wall defection which was cosmetically questionable but had no impact on performance.

You will see the redesigned U-128 shortly after Jan. 1, 1985. In the mean time I can assure you that end wall defection on the U-128 current design will not affect performance.

Looking forward to servicing you in the future.

Sincerely,

Frank M. Kowalczyk
Regional Sales Manager
Industrial Products Unit

FMK/kha

SERVOS - VS - SPADES

Before we get into this subject, it is mandatory that any control surface that we are intending to boost must be balanced, no slack or slop in the linkage and finally no friction or binding.

Servos and Spades have been around for many years but are relatively new in their use in our type of aircraft; In our never ending search for more aerobatic performance, we tend to use "Add On" devices rather than Redesign. Typical of the California Hot Rod Days of the "50's".

WE AT STARDUSTER CHOOSE THE SERVO OVER THE SPADE FOR THE FOLLOWING REASONS:

1. SERVOS HAVE A LONGER MOMENT ARM FROM CONTROL SURFACE HINGE LINE AND CAN BE SMALLER IN SIZE.
2. NO STICK SNATCH TENDANCIES.
3. SERVOS ARE EASILY ADJUSTABLE IN TRAVEL AND SIZE.
4. MORE STREAMLINED, LESS DRAG AND LIGHTER.
5. EASILY REMOVED.
6. BETTER LOOKING AND A PROVEN DESIGN.

SOME OF THE REQUIREMENTS WHEN DESIGNING, FABRICATING AND INSTALLING SERVOS:

1. SURFACE AREA SHOULD NEVER EXCEED 3% OF THE CONTROL SURFACE.
2. LONG AND NARROW IS BETTER THAN SHORT AND DEEP.
3. AN EXTRUDED ALUMINUM HINGE OR STAINLESS STEEL HINGE SHOULD BE USED FOR DURABILITY AND CLOSE TOLERANCE, USUALLY THE DESIRED SIZE OF EXTRUDED HINGE CAN BE FOUND TO USE AS THE SERVO SUCH AS USED ON ALL FOUR AILERONS ON "SUPERUSTARDUSTER".
4. SERVO TRAVEL SHOULD NEVER TRAVEL MORE IN DEGREES THAN THE CONTROL SURFACE-IDEALLY THE SERVO SHOULD ALWAYS BE PARALELL TO THE CORD LINE OF WING OR STABILIZER. IF SERVO EXCEEDS 30° IT TENDS TO STALL AND LOSE EFECTIVENESS.
5. ALL LINKAGE, PINS, OR CABLES SHOULD BE HIGH QUALITY AND CLOSE TOLERANCE TO ACHIEVE NO SLACK OR PLAY IN CONTROLS.

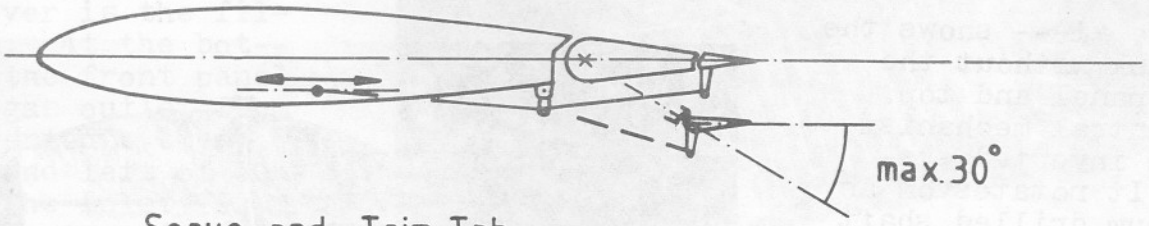
SPADES OR SHOVELS ARE INSTALLED AHEAD AND BELOW THE HINGE LINE OF A CONTROL SURFACE PARALELL TO THE CORD LINE - DISPLACEMENT OF CONTROL SURFACE PUTS SPADE IN A HIGH DRAG CONDITION AND BOOSTS, OR LOWERES, STICK FORCES.

ADVANTAGES OF SPADES ARE;

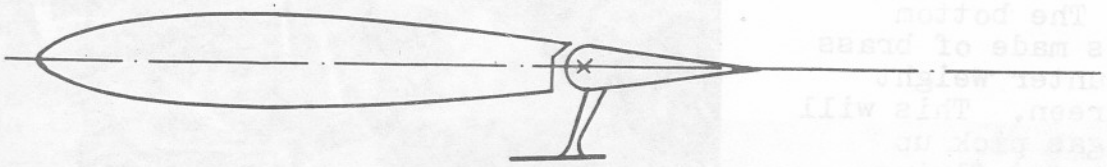
1. EASILY INSTALLED ON EXISTING HARDWARE, USUALLY ON AILERON HORN.
2. NO CONTROL LINKAGE IS USED.
3. SPADES TEND TO BALANCE CONTROL SURFACE BECAUSE IT IS INSTALLED AHEAD OF HINGE LINE.

DISADVANTAGES:

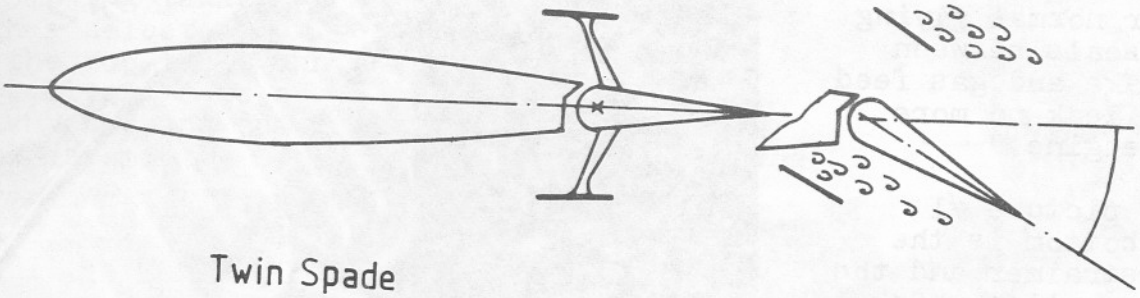
1. FIRST A SPADE IS INSTALLED ON A SPAR OR HORN THAT WAS NOT DESIGNED FOR THE NEW LOADS IMPOSED ON IT.
2. ON SOME AIRCRAFT, THE SPADE IS DANGEROUSLY CLOSE TO THE GROUND AND CAN STRIKE THE GROUND ON CROSSWIND LANDINGS, RESULTING IN INTERNAL DAMAGE OR HAZARDOUS FLIGHT CONDITIONS - BECAUSE ANY BENDING OF A SPADE WILL PUT IT OUT OF CORDLINE, RELATIVE WIND, AND CREATE UN-DISIRABLE STICK FORCES.



Servo and Trim Tab



Spade



Twin Spade

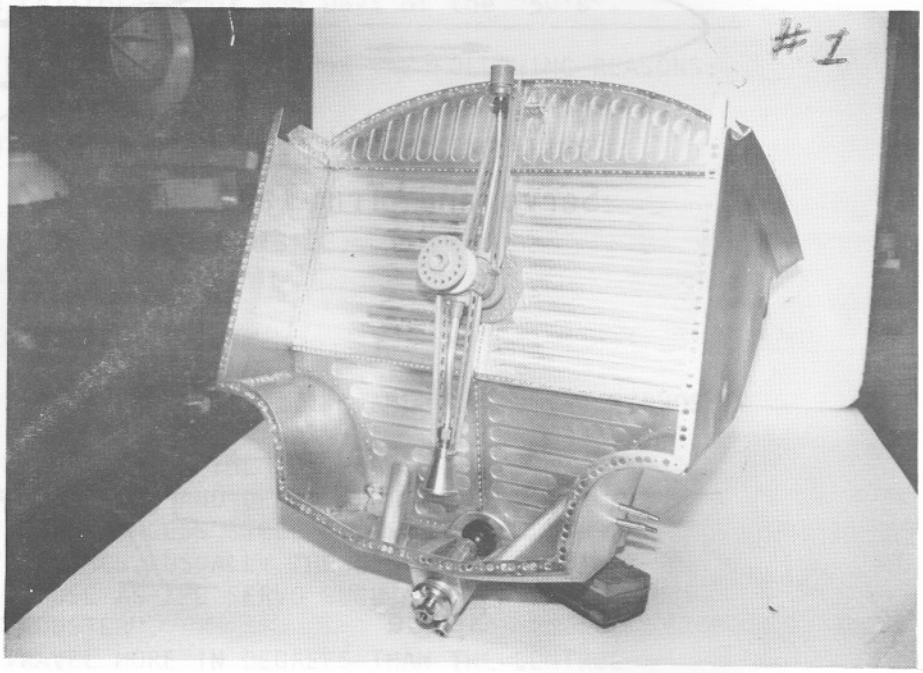
SCALED DRAWINGS ARE INTENIONALLY OMITTED---WE WILL COMMUNICATE WITH ANYONE WHO IS INTERESTED IN INSTALLING SERVOS OR SPADES---

Dear Bill,

Enclosed find check for $8.00 to renew my subscription which expires with the October issue.

Also some pictures of the gas tank and rear turtle deck for my Stardaster Too project. (Just that added two year to my project.)

Picture #1--- shows the gas tank without the front panel and top. The central mechanism is the inverted system. It rotates on an aluminum drilled shaft with "O" rings as seals The top piece is the air intake to the tank made out of aluminum with baffles inside. Since it rotates it is always ? above gas level. The bottom piece is made of brass as a counter weight with screen. This will be the gas pick up for inverted flying.

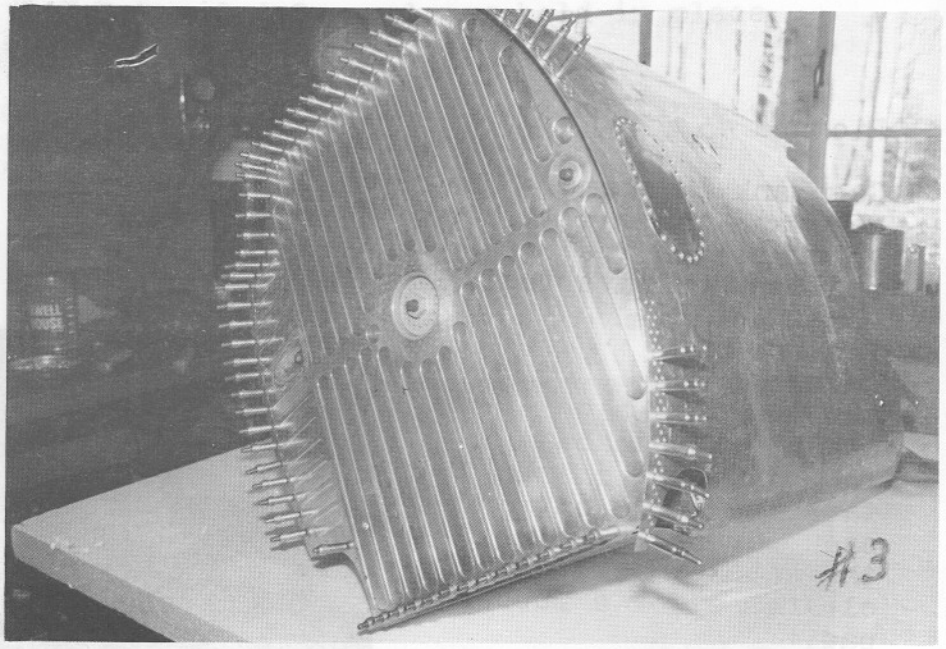


Details on picture #2 Another gas pick up is built at the bottom of rank for normal flying if the seals between air intake and gas feed were to leak no more gas to engine.

Back to picture #1 On the bottom is the finger strainer and the main gas outlet. Below that is the gas tank drain. The lowest point when on the ground The dark circle in back of the strainer is a valve to keep the gas in the front section when climbing.

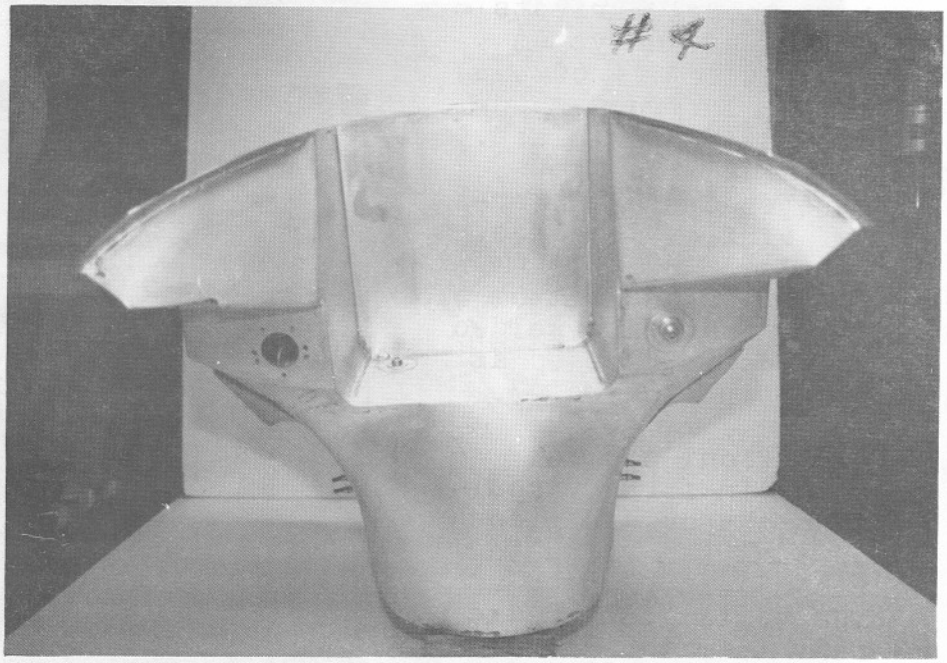
Picture #3---

Gas tank with top and front panel in place. The oval cover on top (curved to match the tank) is to be able to remove inverted system for repairs. At approximately 2 oclock from oval cover is the filler cap. At the bottom of the front panel is the gas outlet from the inverted system. On top and left of center is the inlet for the gas return from carburator.



Picture #44

Back of gas tank without top the large recess is for the front instrument panel. The hole on the left is for the gas gauge sending unit. On the right is the air inlet to the inverted system. At the left bottom of cut out for instrument panel is the inlet for gas from wing tanks. Through a selector valve the top tanks can also be diverted to a christen pump and selector system.



Picture #5

Gas tank in frame - The gas tank shape will keep your feet on the rudder pedels when inverted.

Picture #6

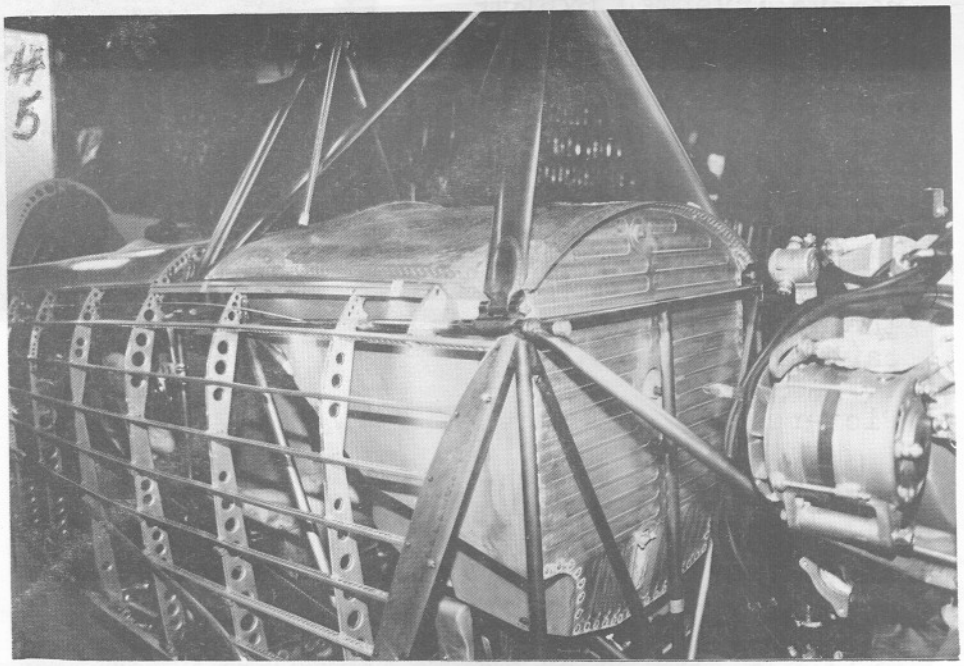
The tank is held in place by the cabane. The top front of the tank has a cut out on each corner matching the cabane + 1/8 inch clearance for a rubber pad.

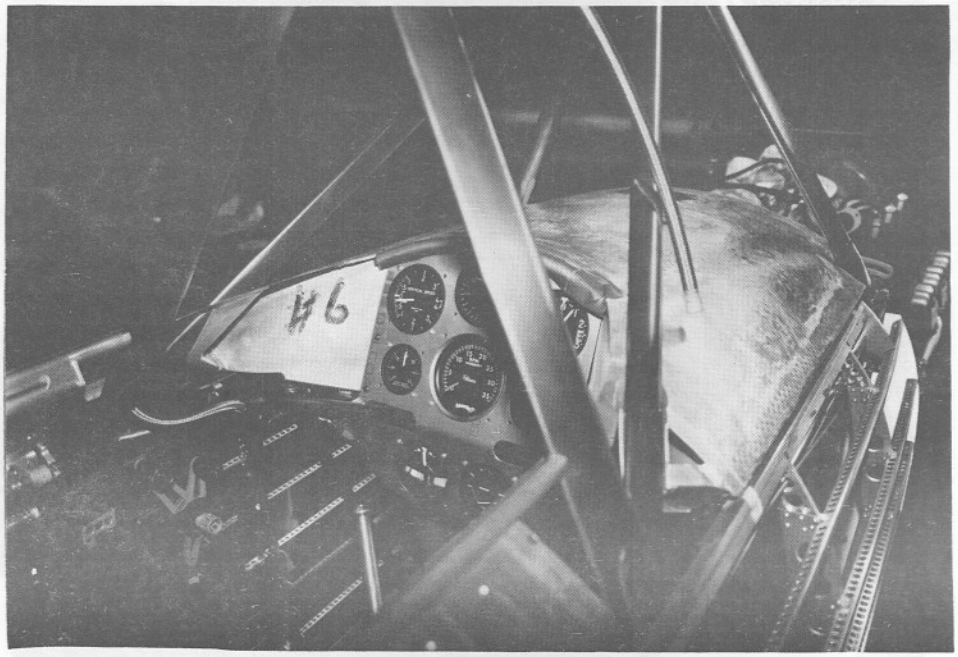
At the rear, I had to build out the tank to match the cabane. The tank is trapped between cabane and frame mostraps read.

Some notes on the tank. The top has 901 rivets + another 192 rivets for inverted system flanges ect. + 60 pop rivets in front then spot selded in place. * A couple hundred rivets holding internel baffles in place.

The sides and bottom of front panel are welded the top is riveted as shown in picture #3.

With front control stick in forward position the curved piece on tank (as shown in pic #4) is slanted at the bottom toward the rear to match the control stick angle. (+ clearance for your knuckless,)



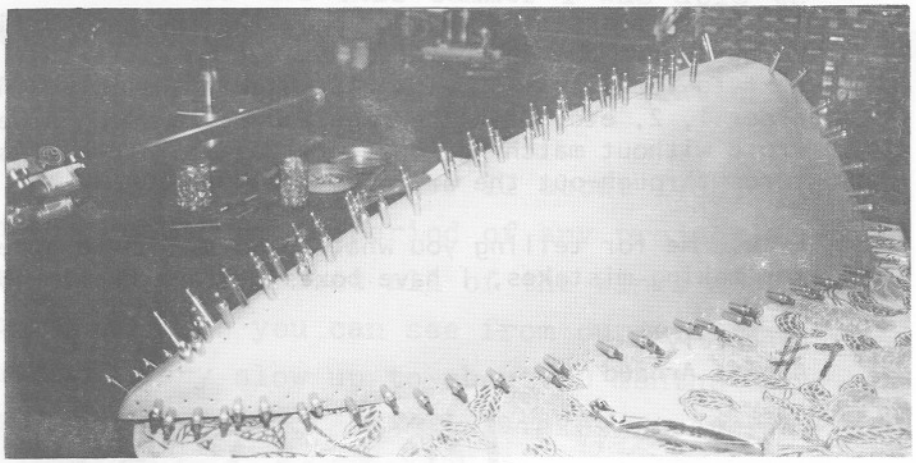


Not realizing at the time that it put the bottom rear of the tank past the cross piece of tubing on top of frame. By that time the rear of tank was welded in place. The front panel was held in place with duct tape, not yet rivited. (Lucky Me)

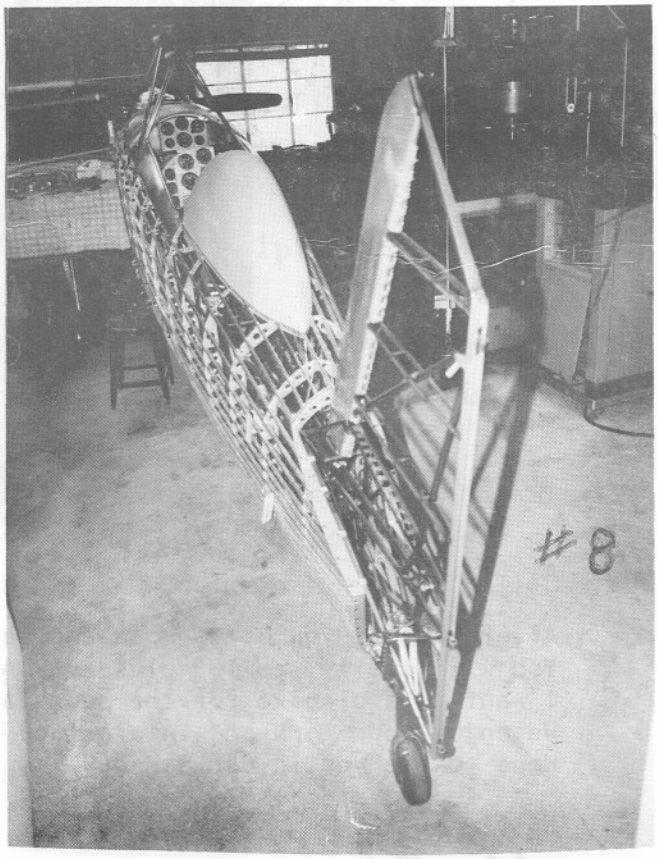
On trying to put tank in frame it did not fit. Ha! Ha! Almost passed out, got off step ladder, left tank on frame, said my favorit word that can't be printed and sat in chair for over an hour.

Had to cut back-bottom front of tank at an angle approximately 1½" back and 6" up then used that to mount the inverted system outlet. (As shown in pic #3)

Picture #7
The rear turtle deck is of two pieces of aluminum compound curved and rivited to a frame.



Picture #8
Turtle deck mounted on frame. It's mounted by sliding forward on internal wedging action along bottom of frame. Removal takes about a minute.



I am now starting the engine cowling and exhaust system.

Sincerely,
Albert Arnaud

Al,

I hope our readers and builders appreciate your workmanship and innovation, not to mention your persistance and tenacity with your custom project. You really out did yourself on the fuel tank.

Bill

Bill Clouse

ALBERT ARNALD
158 FOREST AVE.
PARAMUS N.J. 07652

Bill,
I just thought to add a personal touch to all this technical stuff.

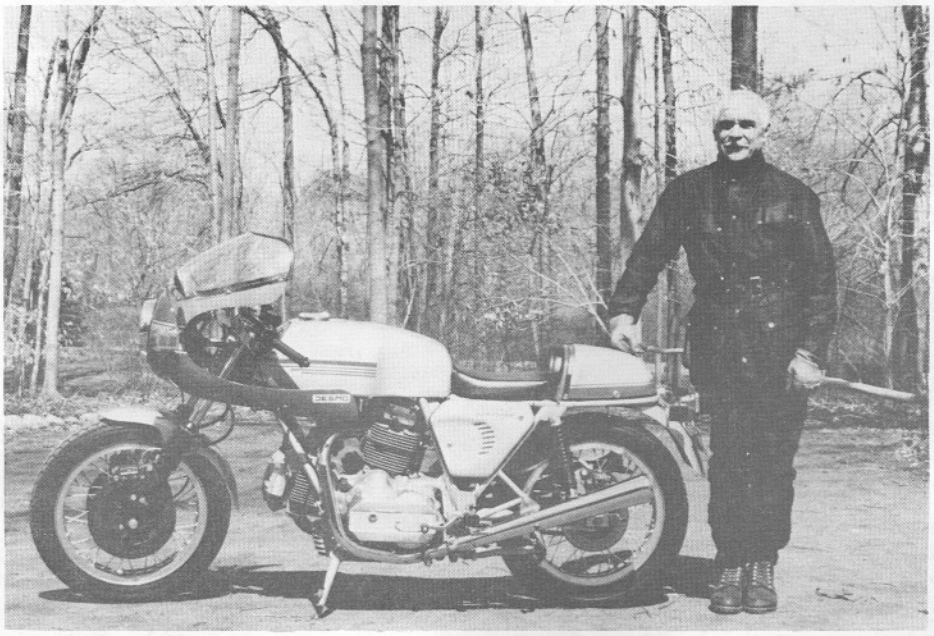
To finish this project, I will have to live to be 100 as I am now 69 years.

The final picture is of me with my Ducaty Super Sport 900 cc. Desmo Motorcycle. Have been riding morotcycles for the past 52 years.

In the last articles in your magazine about my project, you cut up the pictures to fit but in doing so you cut up parts that was explained in the column next to the pictures. I would suggest the following, run all the pictures in order 1, 2, etc. down the page and write along side the pictures just as I wrote without matching to a perticular picture. As I have numbered the pictures through-out the article.

Excuse me for telling you what to do as I have never put out a magazine. And for making mistakes, I have boxes of them from my project.

Sincerely,
Albert Arnaud



Al,

After meeting you at Oshkosh and being aware of how healthy and active you are-
You will easily see 100 plus----- A very nice looking riding machine----------
I want to apologize for the poor layout of your last article----------
We enjoy your work and interest...
Hope to see you in Oshkosh 85".

Bill
Bill

November 26, 1984
R.D.2, Box 379
New Wilmington, Pa.

Dear Bill,

It was good to talk to you and to know you are willing to act as a sounding board for questions and various problems. I enjoy working on my Starduster II and this summer I was able to review back issues of the Starduster Magazine. Many good articles made me feel good to know I am still on track with modifications etc. on my craft.

My father and I started our Starduster II about 1968, (this has to be the longest construction period of any project). Dad, who has since passed away, built most all of the wings and I worked on the metal portions. As you can see from our starting date, progress has been very, very slow up to about 20 months ago. Since then progress has been steady, but it still takes forever to accomplish anything.

Enclosed are the calculations for placement of the engine you requested. The basis for the calculations comes from the construction manual by Fred Meyer purchased about 1970. Final position of engine is 44 5/8" from firewall to face of hub. I will use an overhauled Aeromatic prop.

Enclosed are photos of my project. Description of photos follow:

Nos. 1 &2 PAGE 23 Overall view of the project. The seats are wood mock-ups to check clearance of controls. One wing panel may be seen overhead in photo #1.

Nos. 3,4,5 PAGE 23, 24 Showing engine & mount on a wooden "firewall" in place while I locate various items that attach to or pass thru the firewall. Also note the wooden mock-up for throttle & mixture controls. The engine is a 6 cylinder Continental. QUESTION There is an engine driven fuel pump mounted on this engine. Is it worth the effort to connect into the fuel system?

No. 6 Rudder pedal and brake
pg. 24
No. 7 Push-pull control to elevator and rudder cable
pg 24
No. 8 Connections to elevator and rudder
pg. 24

I would appreciate your comments on photos no. 9 thru 13 as the method of installation of the torque tube assembly has been modified in part with suggestions made by Fred Meyer and in part with my own thoughts. All tubing sizes remain as specified on the drawings.

No. 9 Shows the retaining collars located at the rear cockpit as opposed to the front cockpit location as shown on the drawings.
pg. 25

No. 10 (Arrow A) The entire torque tube assembly can be removed by removing two $\frac{1}{4}$" diameter bolts at each bearing front and rear.
pg. 25

(Arrow B) Each collar is held in place with machine screws (6-32 thread). This allows the collar and bearing to be slid forward for inspection, cleaning, and lubrication. The black band forward of the collar is electrical tape over bare metal to protect its surface. There are washers under the machine screw head, the head is drilled for safety wire. There is no interference with the push-pull tube inside.

No. 11 Top view of retaining collar. Note the $\frac{1}{4}$" diameter hole in the bracket attached to the streamline tubing. This exposes an 1/8" diameter hole in the bearing for oil.
pg. 25

No. 12 Bottom view of retaining collar. Note the 1/8th point offset of front and rear collar machine screws. The rear collar has only three screws (the top of the rear collar is tight to weld of the support bracket of the control stick).
pg. 25

No. 13 Bottom view of forward bearing. This also can be slid forward for inspection, cleaning and lubrication. This also has the same hole in top for oil.
pg. 26

A couple more questions and I will let you go. How do you seal the push rods as they pass thru the firewall, and is there an easy way to connect the carb heat with dual controls?

I am looking forward to receiving the Starduster Magazine and also would like to get a copy of your catalog. Let me know the cost and I will send same.

Received the shipment of tubing etc. and all in good shape except for one item. You shipped 6'0" of ½"x.058 instead of 6" length as ordered. I will keep the additional tubing, enclosed is a check to cover the additional tubing cost of $12.37.

Looking forward to future correspondence,

Jim Smith

Dear Jim,

Your contribution to this magazine is going to please many builders, including this Corporation. We always strive to have "Starduster Magazine", be the best form of communication between builders and us.

To answer your questions; #1 - Definitely put fuel pump into your fuel system. #2 - On photos 9-13, control assembly installation - We admire the concideration of being able to lubricate and inspect the torque tube and bearing surfaces. However, I question the ability of the 6-32 screws holding the retaining collors to carry the loads, in extreme cases, of the elevation. We will calculate this and let you know our final answer.

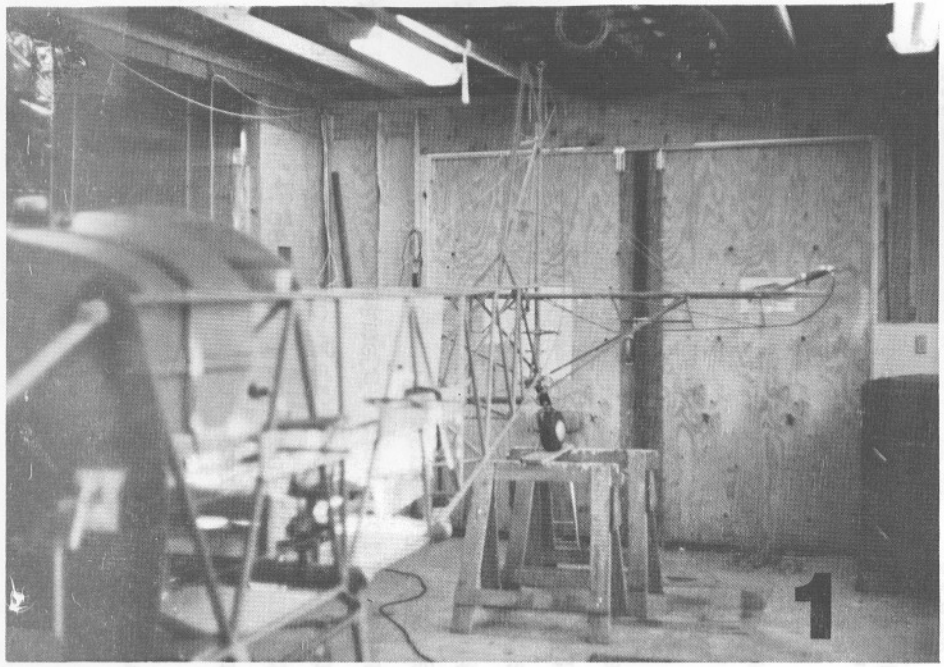
On sealing push rods at fire wall, we use slotted meoprene with a silicone type lubricant, if your using a cable, use a modified bulkhead fitting, cut all excess threads off and just use nut and remaining fitting to act as a seal.

If you want carb heat control in both cockpits use a 3 lever quadrant in both cockpits - Throttle, mixture and carb heat - You don't need prop control because you are using an aeromatic prop.

If we can be of further assistance, please write or call.

Thanks for your inputs, Jim.

Bill,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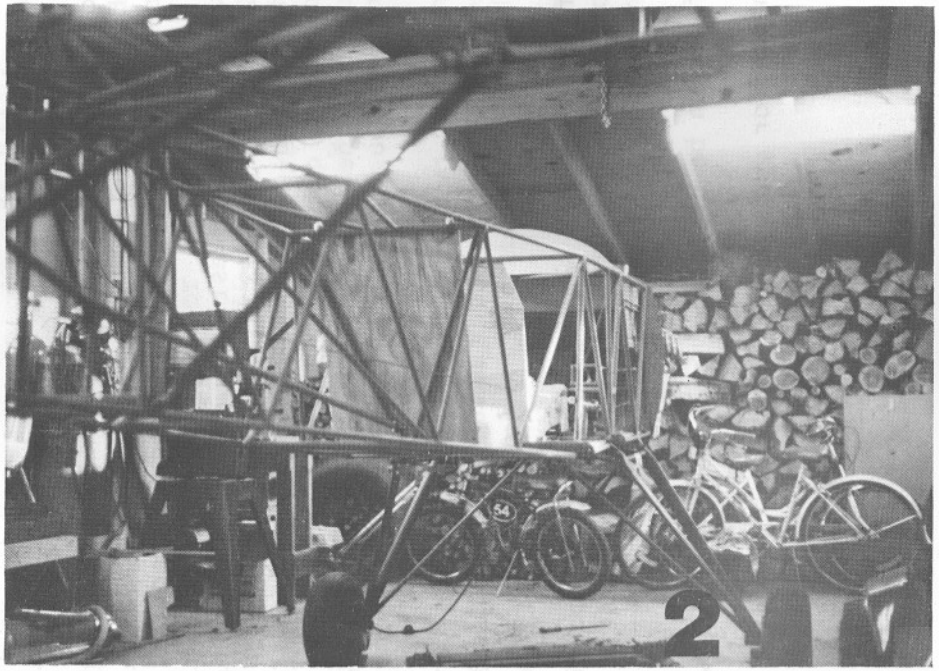
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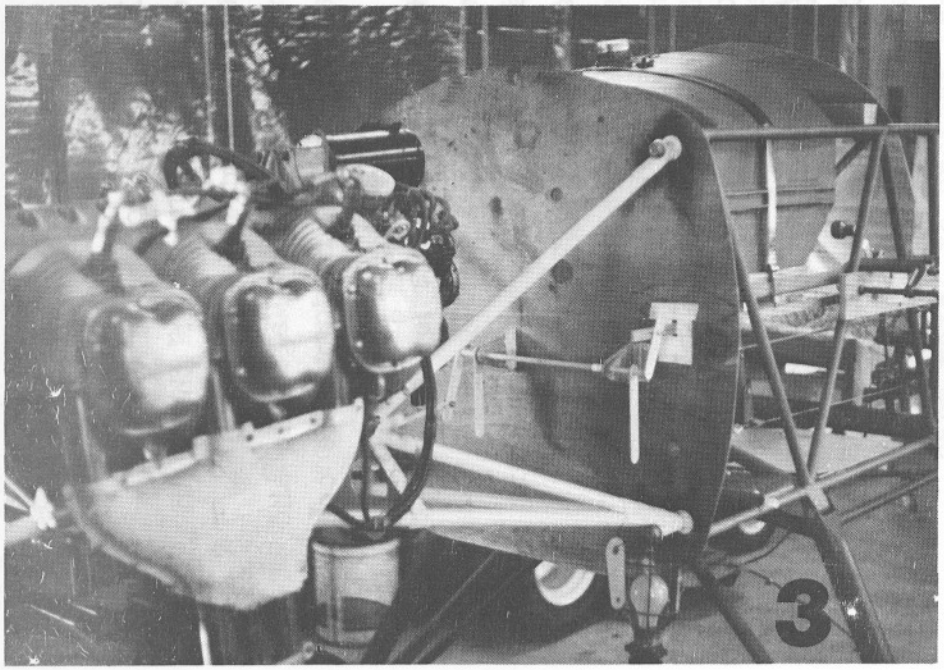
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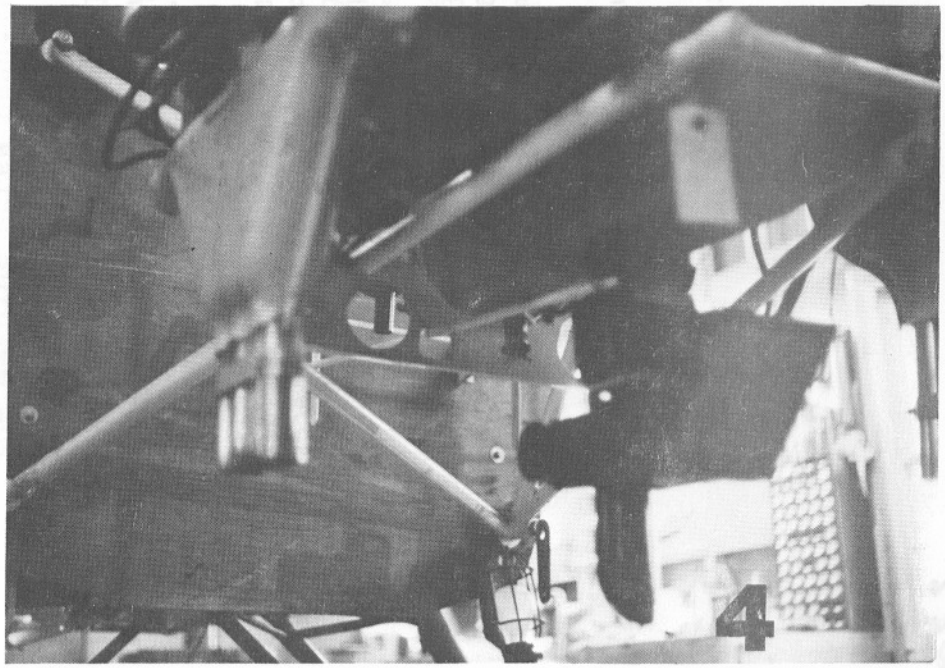
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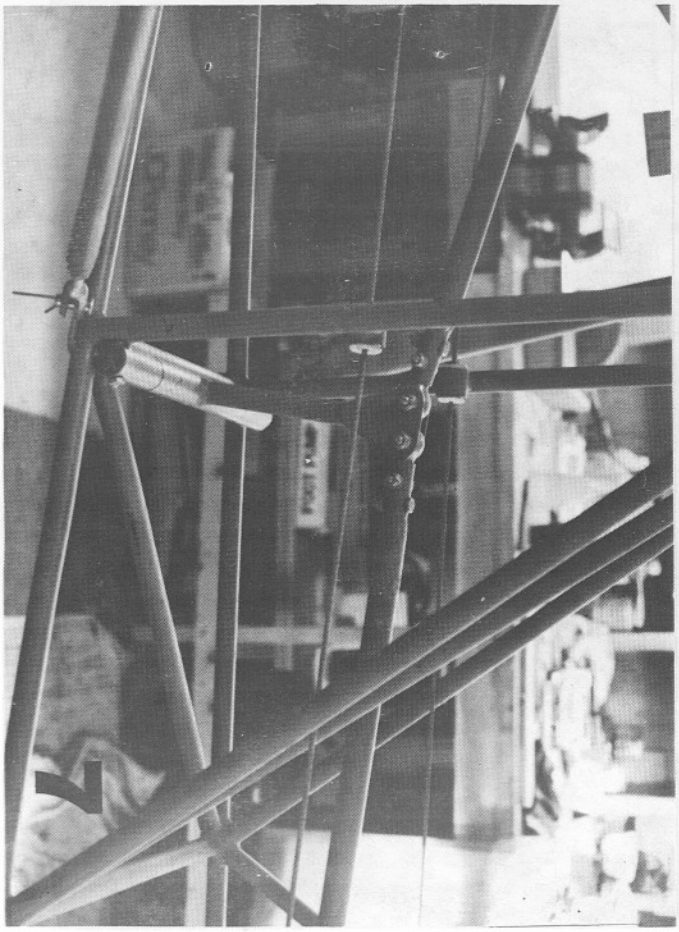
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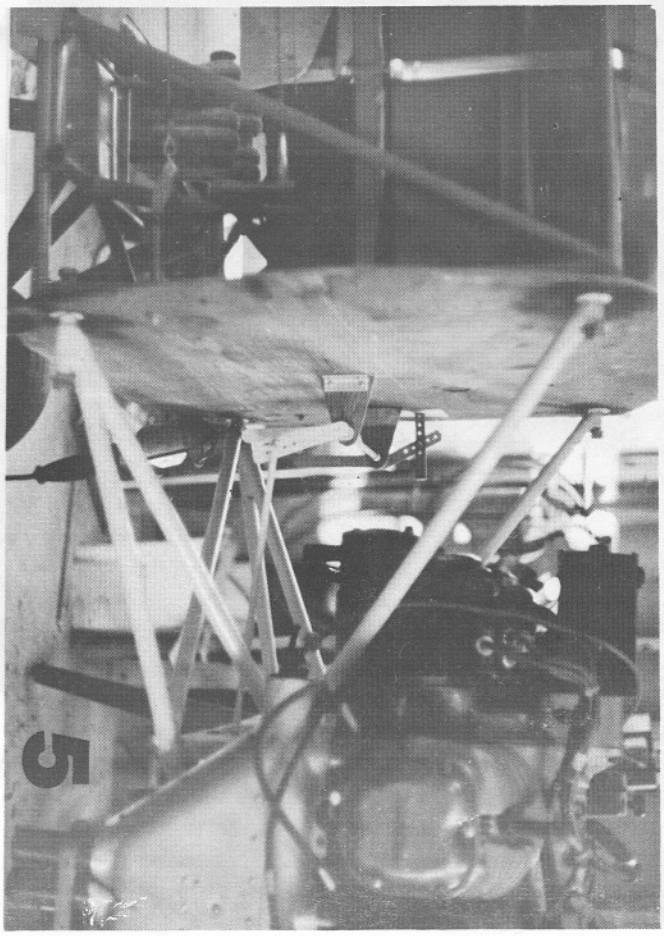
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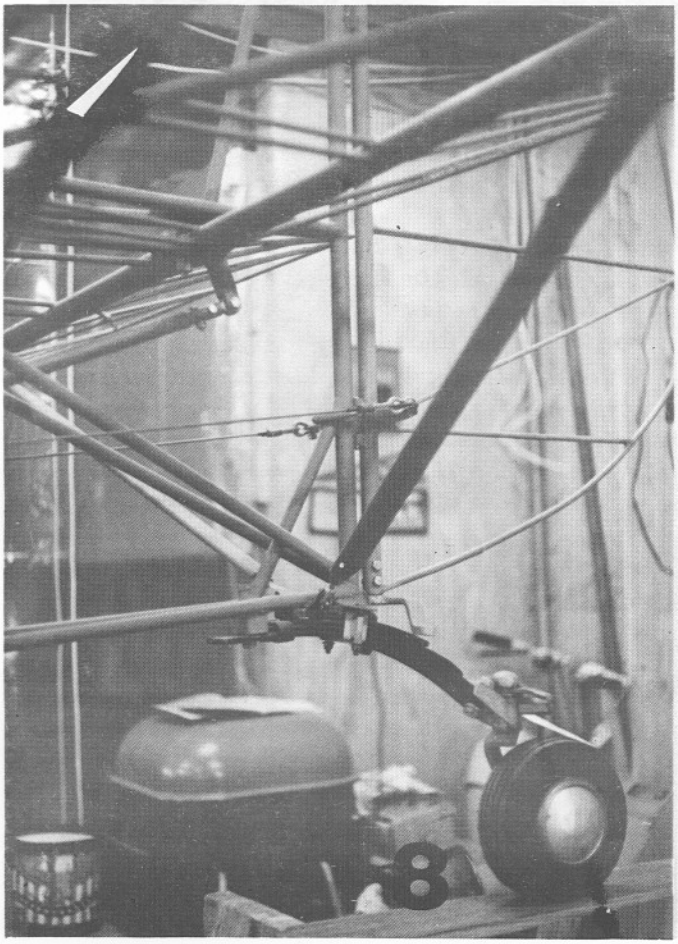
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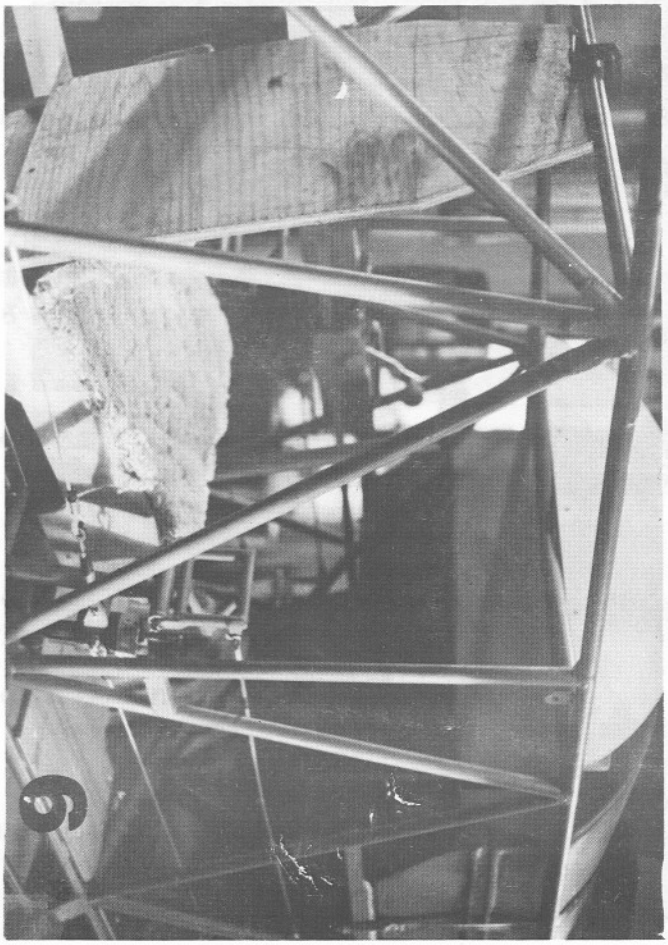
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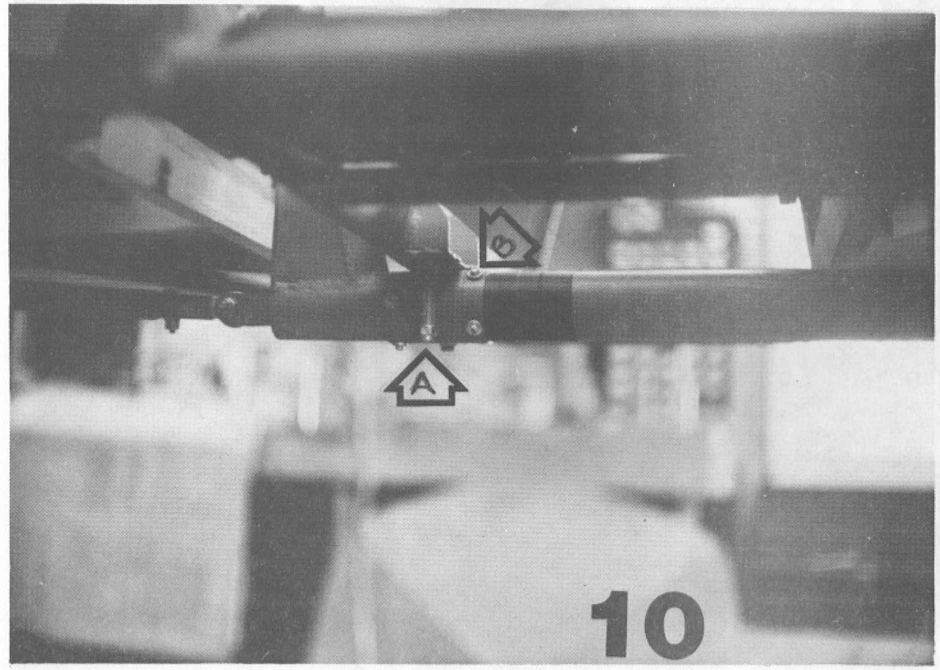
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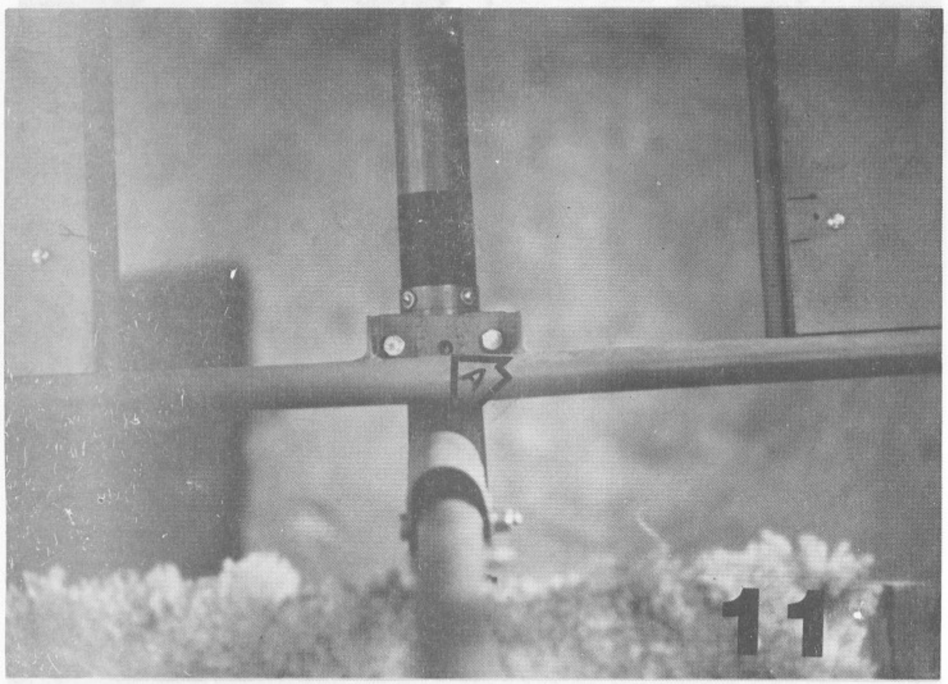
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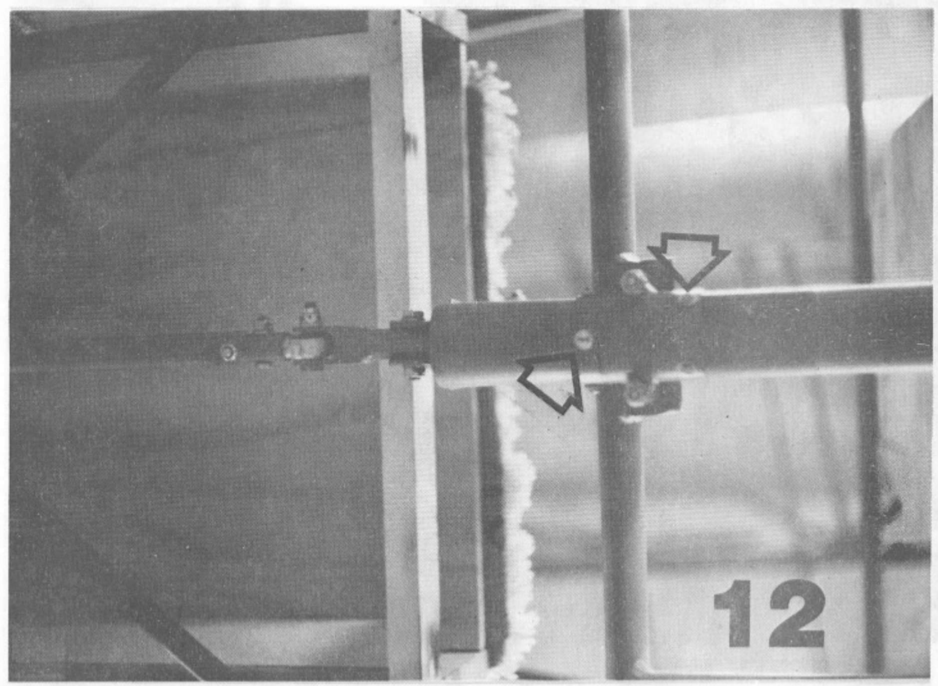
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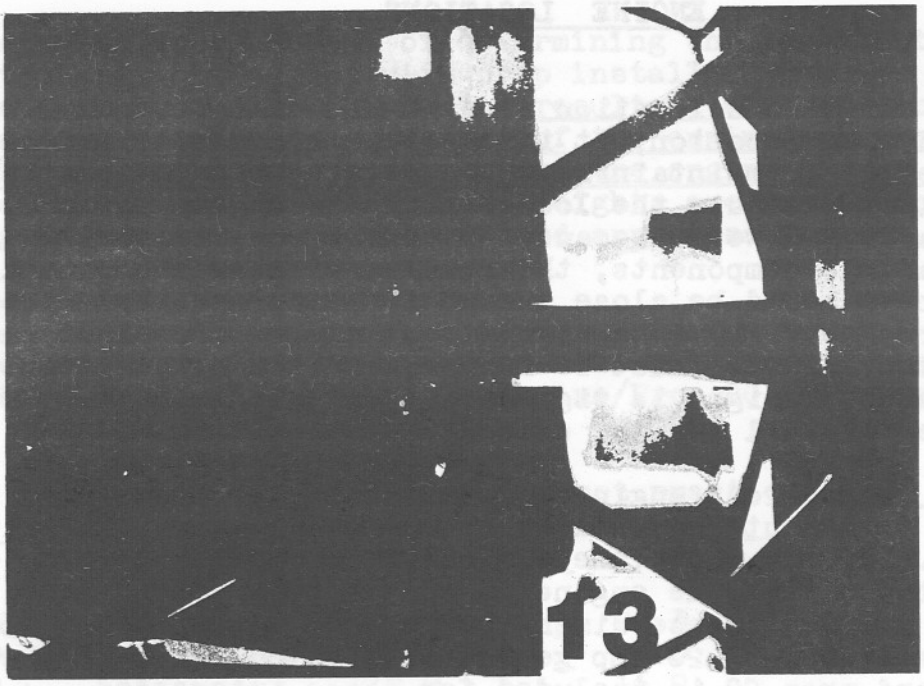


"ENGINE LOCATION DATA"

1. The "Engine Location" data is from a construction manual for the Starduster Too which I am building. The formuals used for locating the engine are from this manual, I put my figures into these for the desired data.

2. Table of specifications are from the Continental Aircraft Engine, Overhall Manual for Model C-125. This was used for weights and dimensions.

3. Computations No. 1 "Engine w/Prop. C.G. Location"
Center Line of mount was assumed to be half way between the front and rear engine mounting bolts, but I am not sure of this assumption.

4. Computations No. 2 "Engine Location w/C.G. @20.56 inches"
This puts engine too close to firewall for the removal of accessories.

5. Computations No. 3 "Engine Location w/ C.G. @ 19 inches"
Clearance @ rear of engine approx. 7½"
Min. clearance is 2"
See note on 19" C.G. page 27 of "Engine Location" manual

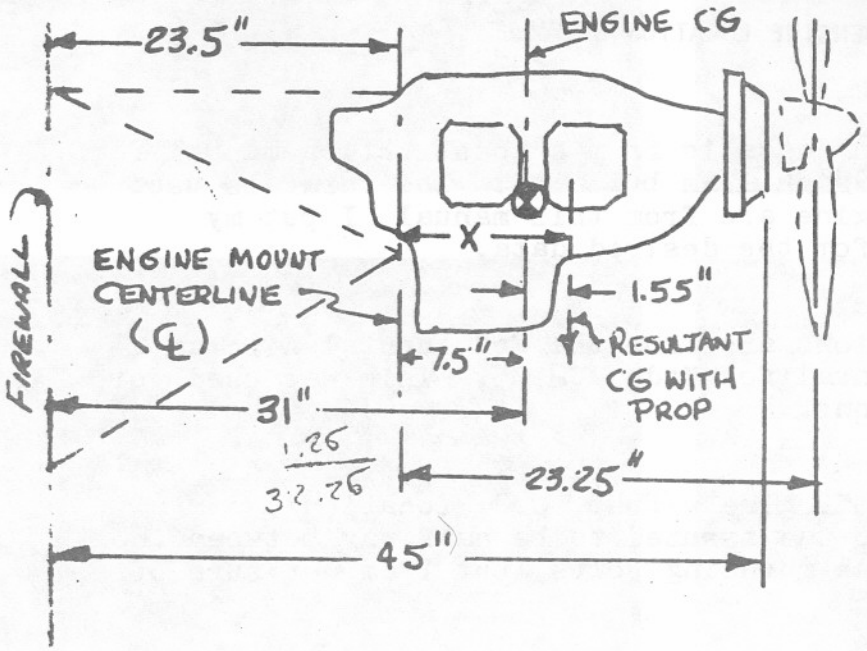
"JIM$' COMMENTATION IS AVAILABLE UPON REQUEST"

ENGINE LOCATIONS

Knowing the weight and location of my O-320 engine, and knowing the empty aircraft CG location, it is possible to compute the location of other engines while maintaining the same aircraft CG location. It is also possible to compute the location of the engine for a desired aircraft CG change. However because of variations in cowling weights and other various components, the results will not be exactly correct. But they should be close enough for all practical purposes. Since the prop contributes a significant amount of weight and a significant moment arm, it must be included in the calculations. Also, since the battery weight is significant, its location must remain fixed at the firewall for the calculations to be valid.

Not knowing the various engine dimensions and CG locations, the best approach is to compute a distance to the resultant engine with prop CG location. If one knows the engine CG location, the prop weight, and the distance from the engine CG to the prop center line, the computation is simple. These dimensions are shown in Figure 25 for the O-320 with starter and 20 amp generator. Calculation of the resultant engine and prop CG is included for those interested.

(1)



	265
ENGINE	272 lbs
PROP	30 lbs
TOTAL	302 lbs

DISTANCE FROM FIREWALL TO ENGINE CG = 31"

DISTANCE FROM FIREWALL TO RESULTANT ENGINE + PROP CG = 32.55", OR APPROXIMATELY 32.5" ANS.

$\Sigma M_{℄} = 302X$

X = DISTANCE FROM ENGINE MOUNT ℄ TO RESULTANT ENGINE/PROP CG

$(272)(7.5) + (23.25)(30) = 302X$

SOLVE FOR X, $X = 9.05"$ OR, $9.05 - 7.5 = 1.55"$ FWD.

FIGURE 25

The most accurate and sure way of determining the resultant CG location is to hang the engine with prop installed from its balance point. The balance point will be the resultant CG location. With this information and the total weight of the engine and prop, the data in Table 1 can be applied to locate the engine in the airplane. If the exact weight is not shown, the weights are broken down into small enough increments such that a good approximation can still be achieved.

	Engine Weight with 30 lb. prop	Distance From Firewall To Resultant Engine/Prop CG 20.56"CG	19.0"CG	Approx. Aircraft Empty Weight
O-320	302	32.5*	not practical	1097
O-360 series	330	27.9	32.0	1125
	355	24.4	29.5	1150
& series	380	21.5	26.3	1175
	430	16.6	21.0	1225
	480	12.9	16.9	1275

* This dimension should not be exceeded without a complete analysis of the engine mount truss used.

All data in this table based on an O-320 A2B installation in Starduster Too N1698 with 25 lb battery at firewall and 30 lb propellor. (See CG data pp. 23)

All weights in pounds, distances in inches.

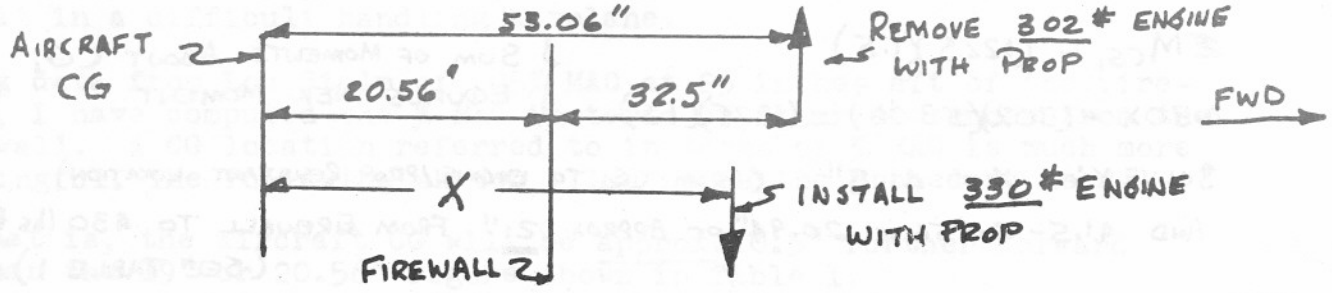
TABLE 1

ENGINE WITH PROP RESULTANT CG LOCATIONS
FOR EMPTY AIRCRAFT CG LOCATIONS OF
19 AND 20.56 INCHES AFT OF FIREWALL

(2)

The results of Table 1 were obtained by summing moments about the aircraft empty CG (20.56 in. aft of firewall). The resultant engine CG location of 32.5 in. forward of the firewall for a 272 lb. engine with lt. prop was used as a reference for locating other engines. A sample calculation of how these results were obtained is as follows:

Problem: Remove a 302 lb engine and prop and install a 330 lb engine and prop such that the aircraft CG location of 20.56 in. is not changed.



$\Sigma M_{CG} = 0$ (Sum of the moments about aircraft CG equals 0.)

$330X - (53.06)(302) = 0$ AND $48.5" - 20.56" = 27.94"$

$X = 16{,}000/330 = 48.5"$

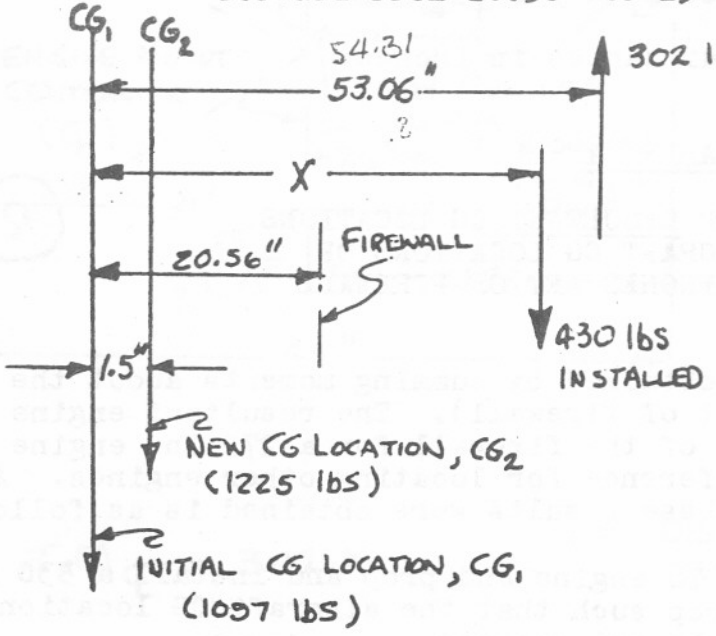
Thus, place the resultant engine/prop CG 48.5" from aircraft CG, which is also 27.94" from the firewall. (SEE TABLE 1)

Also shown on Table 1 are engine locations for an aircraft CG location of 19" aft of the firewall. For some of the heavier engines, it is obvious from Table 1 that the engine cannot be moved far enough aft to keep the CG at 20.56". However, an empty CG of 19" aft of the firewall is well within the limits, and is actually <u>more</u> desirable. But I would <u>not</u> attempt to obtain the 19" CG by extending the engine location any further than the longest distance shown on Table 1 (O-320 engine). The engine mount truss angles required become undesirable. From the foregoing discussion, one might get the impression that the optimum engine for a Starduster Too is of the O-360 series (180 to 200 HP). I agree if your going in for akro stuff. Otherwise, 150 HP is <u>plenty</u> for sport and x-country flying.

(3)

Again for those concerned, a sample calculation of how the 19" CG location was obtained is as follows:

Problem: Remove a 302 lb engine and prop, and install a 430 lb engine and prop such that the aircraft CG moves forward from 20.56" to 19" aft of the firewall.



Difference in Engine Weights:
430 - 302 = <u>128 lbs.</u>

New Aircraft Weight:
1097 + 128 = <u>1225 lbs</u>

Aircraft CG change Approx. 1.5", Desired.

$\Sigma M_{CG_1} = (1225)(1.5)$

$430X - (302)(53.06) = (1225)(1.5)$

{ Sum of Moments About CG_1 Equals New Moment

Solve X: $X = 41.5"$ (From CG_1 to Engine/Prop Resultant Location)

And $41.5 - 20.56 = 20.94"$ or Approx. <u>21"</u> From Firewall to 430 lbs Engine. (SEE TABLE 1)

t should be mentioned again that the dimensions of Table 1 apply only if a relatively "standard " Starduster Too has been built, with the battery at the firewall. If 4 lbs. of lead is not used for elevator balancing, the aircraft CG will be approximately 0.5 in. further forward.* Incidentally, the elevator balancing is not "standard", but is a good idea if you are going in for akro stuff.

TYPICAL COMPONENT WEIGHTS

Engine Mount (See Fig. 26)	10 lbs.	
Exhaust Stacks (Wag Aero)	6	
Engine Cowl (Top, bottom, sides, with hinges)	16	
Battery (depending on size)	20 to 25	
Nose Cowl (Stolp)	3	
Turtledeck (Stolp) With bulkheads, 1/4" floor	7.5	
Fuel Tank (Stolp)	13	
Center Section uncovered no tank	25	← 30 covered 4 coats poly spray
Wing Panel Upper, uncovered no ailerons	33	
Rudder uncovered	5	
Stabilizer uncovered	13	
Elevators uncovered (no lead)	7.5	
covered, 1 coat poly spray, no lead	9	
Firewall galv.iron approx 18 ga.	6.5	

O-320 LYCOMING ENGINE MOUNT
(Lord Mount Type)

own in Figure 26 is a sketch of the engine mount used in Starduster 16[illegible]. Complete stress calculations were performed on this mount r an engine weight of 300 lbs. Data were obtained from hand calculations and checked using a computor program. For a sustained 20g oad, the critical member as shown in Figure 26, could fail (column cking). NOTE: This engine mount has not been tested to these ads. Substitution of 1"x049 for all the 7/8" x 049 tubing would d t... the safety factor without too much increase in weight.

SOME NOTES ON MEAN AERODYNAMIC CHORD (MAC)

he relationship of an aircraft CG location with respect to the MAC s very important. The range of CG travel usually has to be within 5% to 30% of the MAC. However, these figures can vary depending on a particular design. Many factors have to be considered. I think it valid to say, however, that a CG location of 35% MAC could result in a difficult handling airplane.

Using data from Lou Stolp of 25% MAC at 25 inches aft of the firewall, I have computed the % MAC in terms of other distances from the firewall. A CG location referred to in terms of % MAC is much more meaningful. The following sketch illustrates the procedure used:

* That is, the aircraft CG will be approx. 0.5" further forward than the 19" or 20.56" figure shown in Table 1.

"AN ODESSY OF A TOO"

Once upon a time (A Fairy Tale) There was this aviator who fell in love with the Starduster Design, and decided to build one. He was stationed in Germany - Built the airplane and relocated to Florida, U.S.A. (Retired)
The SA 300 was purchased by a gentleman from Liverpool, England and had its 2nd ocean crossing.

For reasons unknown to me, it went on the market, and fortunatley Frank Holmes, London, purchased it and called us with questions of usual nature, and his end goal is a 260 HP II.

Brenda and I recently visited him and even though ceilings were not my usual California CAVU, I eagerly accepted his offer to fly G-KEEN. Needless to say the flight was enjoyable and the 1st for me outside Continental U.S..

Thanks again Frank, for your hospitality. May your days always enjoy A "Bit O Sun" to let you exercise your II.

Bill

Oscar Bayer's Starduster is getting very close to cover. We know you all look very closley at other builders projects to see what you can see - Oscar has the new "X" Airfoil with slave struts forward of aileron spar. Self designed turtle back (I Like). Looks all rigged out. Where is your elevator, Oscar?

10/29/84

Starduster
Bill Clouse,

Thank you for taking care of the flying wire problem so promptly. Enclosed, pictures were taken in September, so not a great deal more has been done that shows. Engine is a Jacobs 245 HP and cowling is off of a VC78. Makes a nice package. Hopes for a fall first flight is fading rapidly, but there's always next year.

Yours truly,
Dan Conway

"Glad to see another round power being born!"

Are you counting, CRASH????

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ADVERTISING CLOSING DATE: JANUARY1, APRIL1, JULY 1, OCTOBER 1.
CLASSIFIED ADVERTISING RATE: $3.00 PER COLUMN INCH--MINIMUM CHARGE $3.00
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STARDUSTER "1" Partially complete (0-290G) engine. Modified to "D". Ready to run less, harness & Carb Float. Wheels, brakes, w/plans and many instruments, Aero Prop.
Call Clyde Pray
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Propeller For Sale:
one wood prop 60"x30" pitch. For Volkswagon powered aircraft. All interested parties contact Bill Clouse at Starduster Corp. 686-7943

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For sale, 80% complete, full canopy, 0-435 Engine. For more info, phone (206)525-2067

Starduster Too Wings:
And center section. Ready for cover. All Steel in shipping tubes. Turtle Back. Quality workmanship. Make offer.
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Starduster Smoke System:
Redesigned & improved! New solenid & pump. Complete with nozzles, all lines, & flop tube. $335.00 With custom tank, add $25.00

New wings for Starduster Too 23012 Airfoil:
Better performance inverted Faster and lighter ailerons Available ready-built from Starduster Corporation $600.00 Ready for cover.

Starduster Smoke Pump:
Available separately for your own smoke system. Very light & very small! Only $49.95 From Stolp Starduster Corporation.

Hose and Fitting Kit:
Needed to complete your inverted oil system. For 4 cylinder Lycoming $297.00 For 6 cylinder Lycoming $310.00
Order from Stolp Starduster

Padding for Cockpit Coaming:
1 1/4" O.D. x 7/16" I.D. Soft rubber padding. Install over small dia. metal tube and cover with leather or plastic. Excellent crash protection for the head. Only $6.95 for 6' length. Order from Starduster Corporation.

Christen Inverted Oil System:
#801-4 Basic System for 4 cyl. Lycoming $275.00
#801-6 Basic System for 6 cyl. Lycoming $295.00
Contact Starduster Corp.

Acroduster Too Patches Now Available:
4" length. Same design as Starduster patches. Very nice detail and workmanship. Lt. blue, red, and yellow. Only $3.95 Contact Starduster.

Engine for Sale:
0290D Majored Mags & Carb. $3000.00 Contact Lou Stolp thru' Starduster.

Starduster Too Professionally Built by A & P

The beautiful color scheme of white with lime green, black and trimmed out in navy blue, is just one of the many features of this Starduster Too. This plane has 200 hours TT AF, 970 hours on a Lycoming 150 HP since new, with a full inverted oil and fuel system with PS5C pressure carb. She has been built for 9 positive and 9 negative G's. She has a Hush-A-Com intercom system, is simply a joy to fly and has been hangared since day one. It is a steal at $19,900.00.

For further information please call (312) 832-7691.

THREE "G" AVIATION

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