Build the MI Baby Ace

by Paul Poberezny

Part I

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Ever since MI published "They Build 'Em and Fly 'Em" in March 1954, I have been deluged with letters asking how and where to obtain information and plans for a home-built airplane. This series of articles on the MI Baby Ace will enable you to get started on such a project, and I know that you will have just as much fun building your plane as you will flying it.

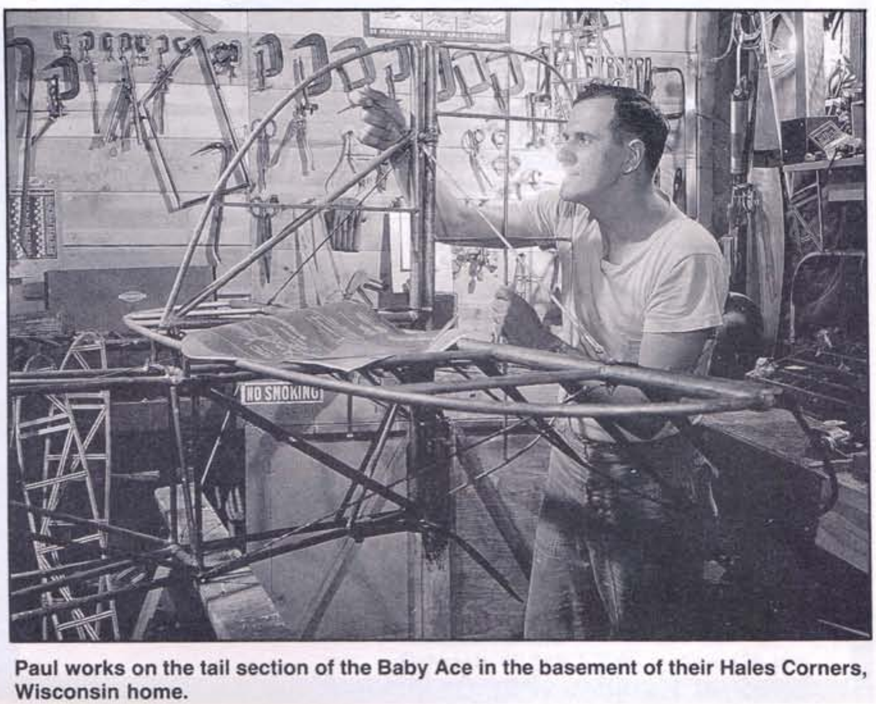
It was noted in the original article that EAA and Trade-A-Plane of Crossville, Tennessee were sources of information in obtaining materials for the construction of the Baby Ace. Today, in 1990, as the result of the success of the homebuilt, sources of materials have greatly expanded as advertisements in SPORT AVIATION and EAA EXPERIMENTER have shown.

The cutting up of Cessna T-50 and other aircraft have long gone.

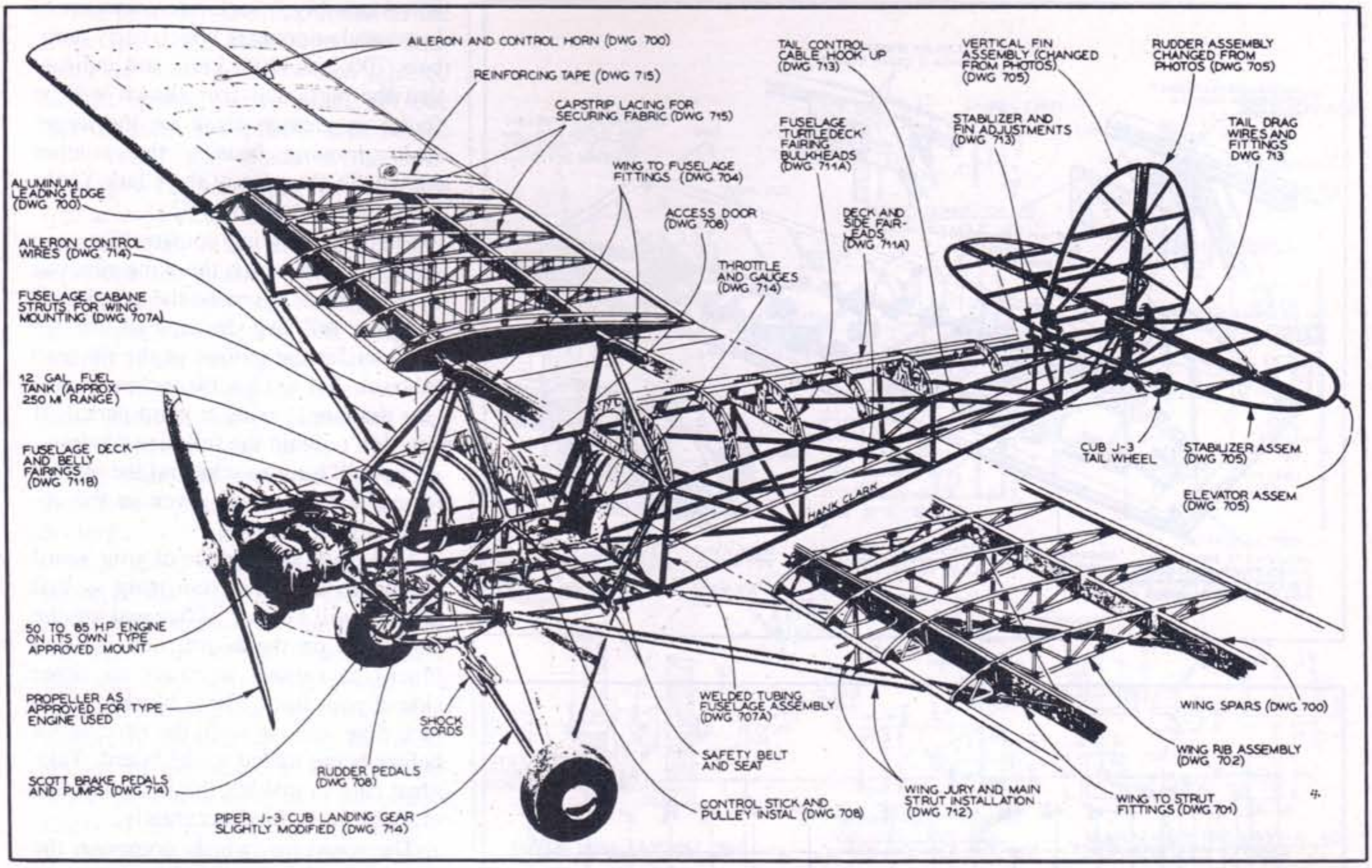
The article also stated that the Pober Baby Ace C used several items from the Piper J-3. Items used were fuel tank, front landing gear, strut and axles, nose cowl, front upper and lower pieces and the engine mount were adapted to the fuselage.

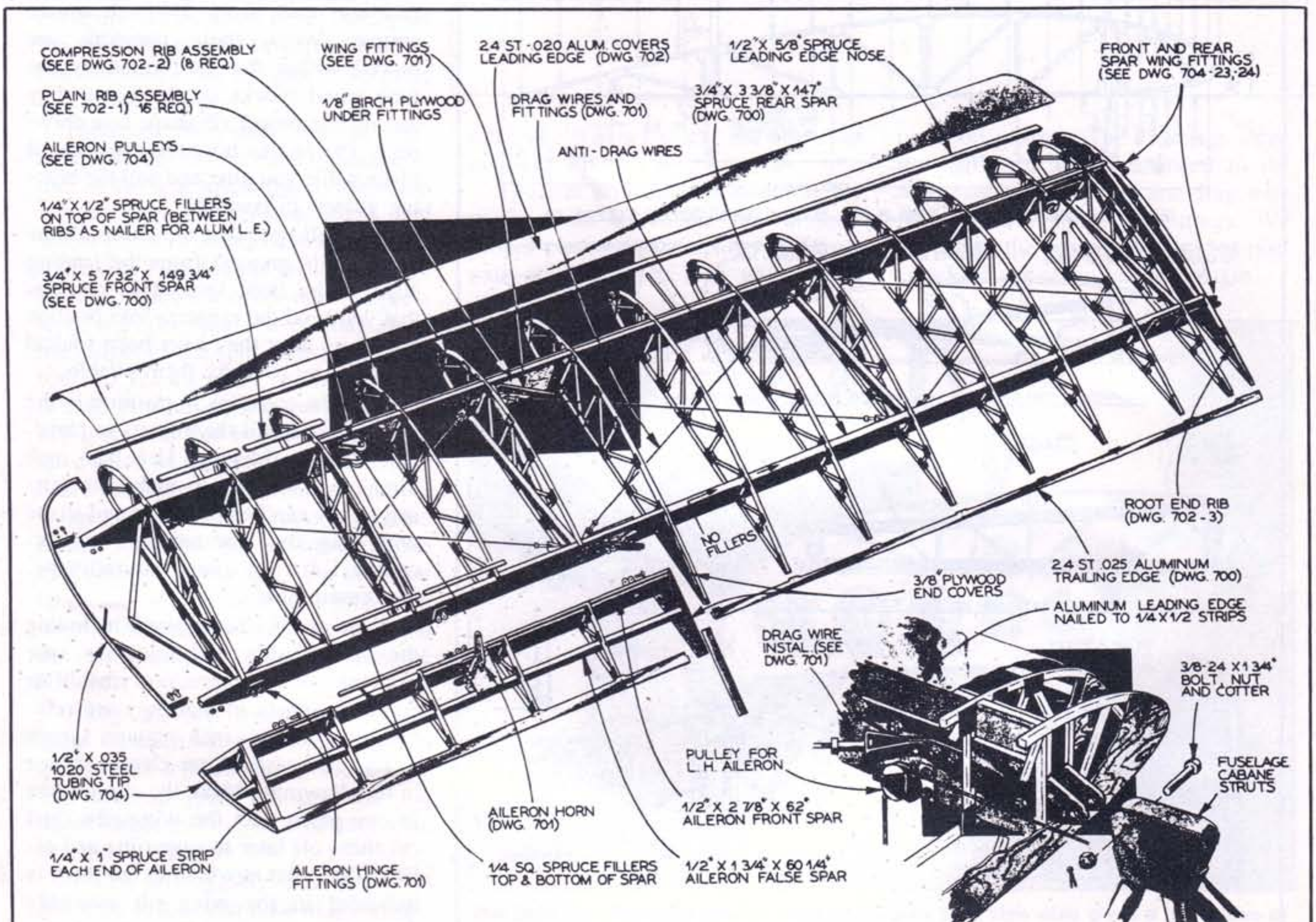
As construction of your Baby Ace progresses, it must be inspected by a CAA *(now FAA)* Safety Agent. Therefore, to make certain you follow CAA regulations governing home-built aircraft construction, obtain a copy of the regulations. I'll be glad to send you a printed copy, free, if you'll enclose a stamped, addressed envelope with your inquiry.

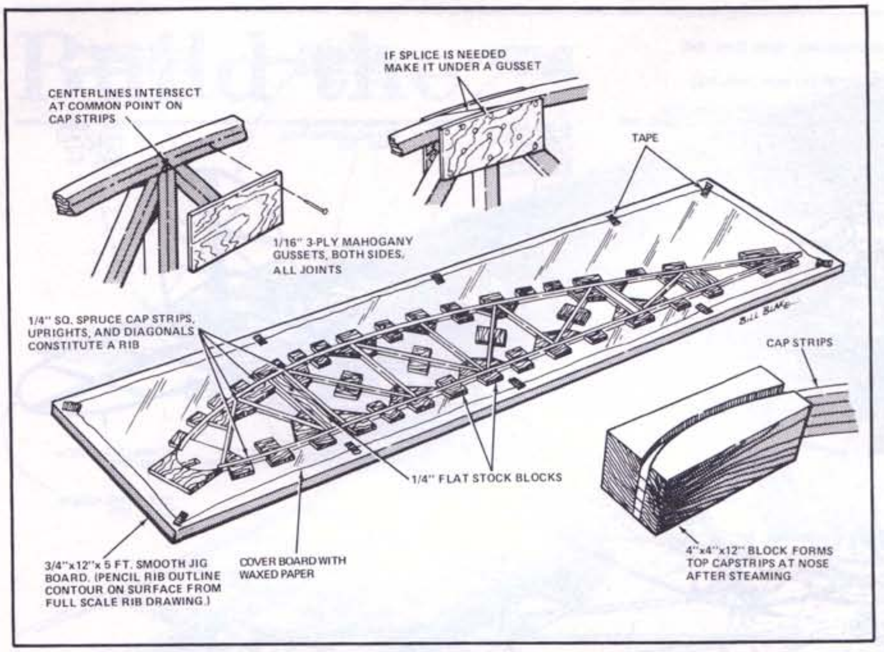
A word about the accompanying drawings. You will note that there are many places where numerals appear in parentheses. For example, in the drawing of the wing rib assembly on page 125 *(page 20),* you'll find ("DWG 702") following the words "Clark Y

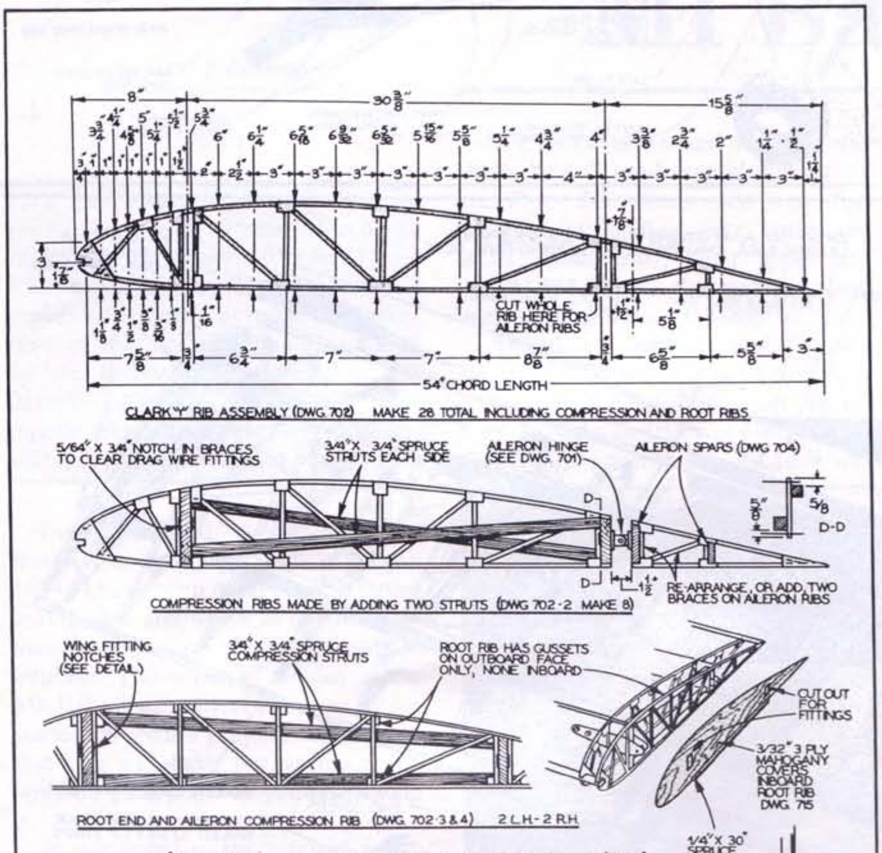


Paul works on the tail section of the Baby Ace in the basement of their Hales Corners, Wisconsin home.


AILERON AND CONTROL HORN (DWG 700)
REINFORCING TAPE (DWG 715)
CAPSTRIP LACING FOR SECURING FABRIC (DWG 715)
WING TO FUSELAGE FITTINGS (DWG 704)
ALUMINUM LEADING EDGE (DWG 700)
ACCESS DOOR (DWG 708)
AILERON CONTROL WIRES (DWG 714)
THROTTLE AND GAUGES (DWG 714)
FUSELAGE CABANE STRUTS FOR WING MOUNTING (DWG 707A)
TAIL CONTROL CABLE HOOK UP (DWG 713)
FUSELAGE 'TURTLEDECK' FAIRING BULKHEADS (DWG 711A)
DECK AND SIDE FAIR-LEADS (DWG 711A)
VERTICAL FIN ASSEMBLY (CHANGED FROM PHOTOS) (DWG 705)
STABILIZER AND FIN ADJUSTMENTS (DWG 713)
RUDDER ASSEMBLY CHANGED FROM PHOTOS (DWG 705)
TAIL DRAG WIRES AND FITTINGS DWG 713
12 GAL FUEL TANK (APPROX 250 M RANGE)
FUSELAGE DECK AND BELLY FAIRINGS (DWG 711B)
CUB J-3 TAIL WHEEL
STABILIZER ASSEM (DWG 705)
ELEVATOR ASSEM (DWG 705)
HANK CLARK
50 TO 85 H.P. ENGINE ON IT'S OWN TYPE APPROVED MOUNT
PROPELLER AS APPROVED FOR TYPE ENGINE USED
SHOCK CORDS
WELDED TUBING FUSELAGE ASSEMBLY (DWG 707A)
WING SPARS (DWG 700)
WING RIB ASSEMBLY (DWG 702)
SAFETY BELT AND SEAT
RUDDER PEDALS (DWG 708)
SCOTT BRAKE PEDALS AND PUMPS (DWG 714)
CONTROL STICK AND PULLEY INSTAL (DWG 708)
WING JURY AND MAIN STRUT INSTALLATION (DWG 712)
WING TO STRUT FITTINGS (DWG 701)
PIPER J-3 CUB LANDING GEAR SLIGHTLY MODIFIED (DWG 714)


COMPRESSION RIB ASSEMBLY (SEE DWG 702-2) (8 REQ)
WING FITTINGS (SEE DWG 701)
24 ST -020 ALUM. COVERS LEADING EDGE (DWG 702)
1/2" X 5/8" SPRUCE LEADING EDGE NOSE
FRONT AND REAR SPAR WING FITTINGS (SEE DWG 704-23,-24)
PLAIN RIB ASSEMBLY (SEE 702-1) 16 REQ)
1/8" BIRCH PLYWOOD UNDER FITTINGS
DRAG WIRES AND FITTINGS (DWG 701)
3/4" X 3 3/8" X 147" SPRUCE REAR SPAR (DWG 700)
AILERON PULLEYS (SEE DWG 704)
ANTI-DRAG WIRES
1/4" X 1/2" SPRUCE FILLERS ON TOP OF SPAR (BETWEEN RIBS AS NAILER FOR ALUM L.E.)
3/4" X 5 7/32" X 149 3/4" SPRUCE FRONT SPAR (SEE DWG 700)
NO FILLERS
ROOT END RIB (DWG 702-3)
24 ST .025 ALUMINUM TRAILING EDGE (DWG 700)
3/8" PLYWOOD END COVERS
ALUMINUM LEADING EDGE NAILED TO 1/4 X 1/2 STRIPS
DRAG WIRE INSTAL (SEE DWG 701)
3/8-24 X 1 3/4" BOLT, NUT AND COTTER
PULLEY FOR L.H. AILERON
FUSELAGE CABANE STRUTS
1/2" X .035 1020 STEEL TUBING TIP (DWG 704)
AILERON HORN (DWG 701)
1/2" X 2 7/8" X 62" AILERON FRONT SPAR
1/4" X 1" SPRUCE STRIP EACH END OF AILERON
AILERON HINGE FITTINGS (DWG 701)
1/4 SQ. SPRUCE FILLERS TOP & BOTTOM OF SPAR
1/2" X 1 3/4" X 60 1/4" AILERON FALSE SPAR





Rib Assembly." Such references are to large-scale drawings which carry numbers 700,702, 704, etc., and indicate that the particular part shown will be found in greater detail on the large-scale drawing bearing the number shown. In the case of the Clark Y rib, it would be Drawing 702.

First step in wing construction is to make a jig in which the wing ribs can be assembled. To make the simple jig, obtain a full-size drawing of the rib and transfer the outline of the rib onto a board, 3/4 x 12 x 60 inches in size (see drawing), using a sharp pencil. If you don't obtain the full-size rib drawing, you'll have to scale out the outline from the dimensions given in the accompanying drawing.

Make sure the surface of your board is smooth and free from warp so that the ribs will be true. After making the rib layout on the board, nail wooden blocks at various intervals on either side of your lines. These blocks, of 1/4 inch pine, are cut to fit the rib contour before being nailed to the board. Take great care in making the jig as the ribs must be assembled accurately.

The capstrips which comprise the ribs are made from 1/4 inch square spruce. When these capstrips are placed within the jig formed by the pine wood blocks on the board they assume the proper rib shape (see drawing). The blocks hold the capstrips in place while you glue and nail the bracing gussets in position.

You will note that the curve on the wing rib is greatest from the leading edge to the front spar. This requires that you bend the capstrips into position on the jig after they have been soaked in hot water to make them pliable.

With the capstrips in position in the jig, glue and nail the gussets in place, as shown in drawing. Use 1/16 inch birch or mahogany to make the gussets. They can be cut to size and shape with a jig saw. The nails are cement-coated 1/4 x 20 guage aircraft type. Use casein glue.

There are 28 ribs required, including the compression and root ribs (see drawing). The compression ribs differ from the others in that they are reinforced with 3/4 inch square spruce struts. These struts are clearly shown in the drawings. Make the aileron ribs in one piece with the wing ribs, and cut them off later to save time and effort. The point at which to cut them is indicated in the wing rib assembly drawing.

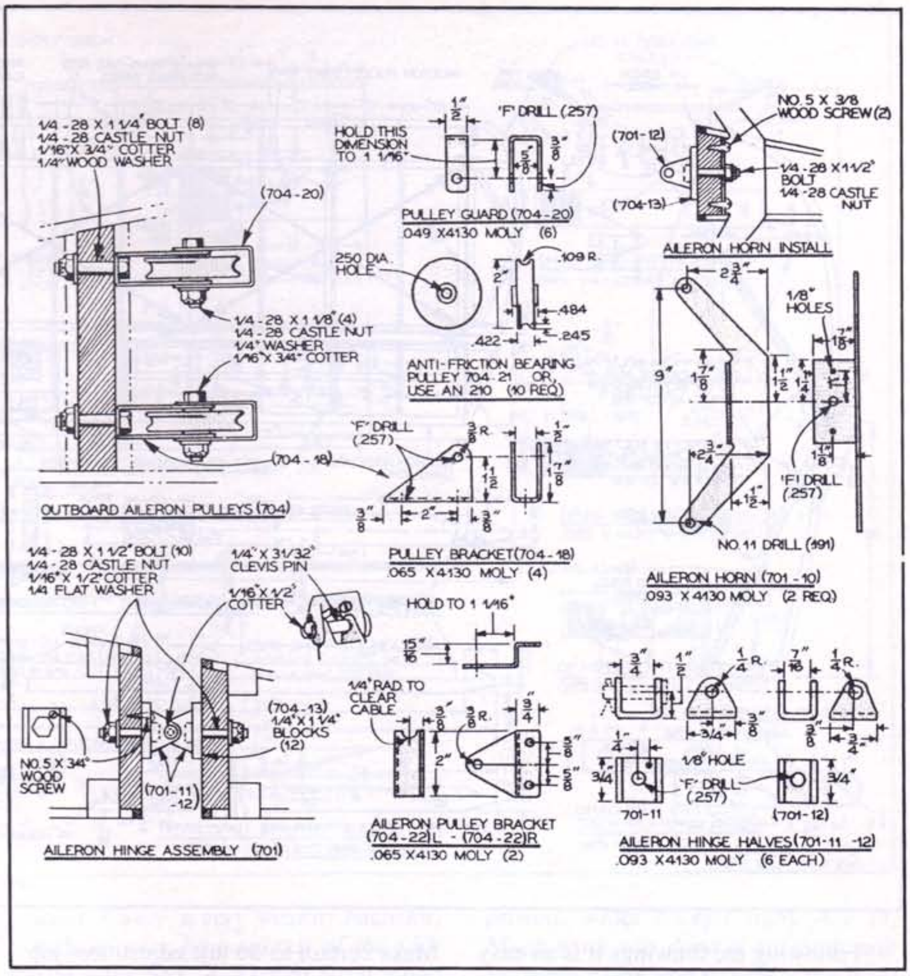
The next step is construction of the wing spars. To start with, the four spars are made from 3/4 inch selected aircraft spruce. First, square off one end of each spar. These will be the "root ends" that attach to the fuselage. Now cut the proper bevel on each spar as indicated in the drawing. Measure and draw a line along the spar to represent the neutral axis, which is 2-9/16 inch from the bottom of the front spar and 1-1/16 inch from the bottom of the rear spar. Next, lay out the spars for drilling the holes as indicated in the drawings. In making such measurements, start at the root end of the spar. Be sure that all of the dimensions check before you start drilling.

Now just a short explanation of the action of the spars under stress so that a full understanding of the term "neutral axis" can be had. When a beam, like the wing spar, is subjected to a bending stress or load, this stress is not uniformly applied all over the cross-section of the beam. If the lift is upward, as in this case, then the bottom fibers of the spar will be in "tension" so that the load tends to pull these fibers apart. At the same time, the top of the spar is placed in "compression" so that the load tends to squeeze the parts together at this point.

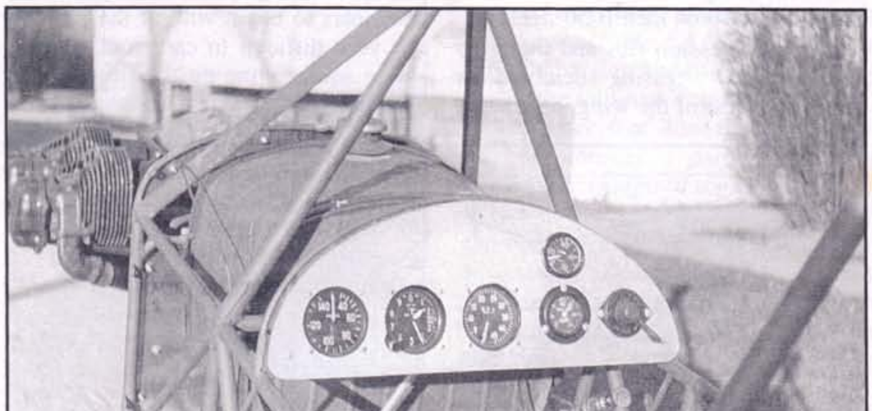
Therefore, there must be some intermediate point between the top and bottom of the spar where the compression merges into the tension stress and where neither compression nor tension will exist. This point in the spar, where there is neither tension nor compression, is a horizontal line running along the length of the spar called "the neutral axis" of the spar. The neutral axis is used as a basis for measurement on the spars and that is the reason that I have taken so much time explaining it. Since this spar is not "symmetrical" or balanced about the neutral axis, the neutral axis does not pass through the exact center of the spar. On the front spar, the neutral axis is 2-9/16 inch above the bottom of the spar while on the rear spar it is 1-11/16 inch from the bottom.

There are two left and two right spars for each wing. In short, there is a right and left front spar and a right and left rear spar. Be sure that you don't forget this or you will have a lot of wasted material.

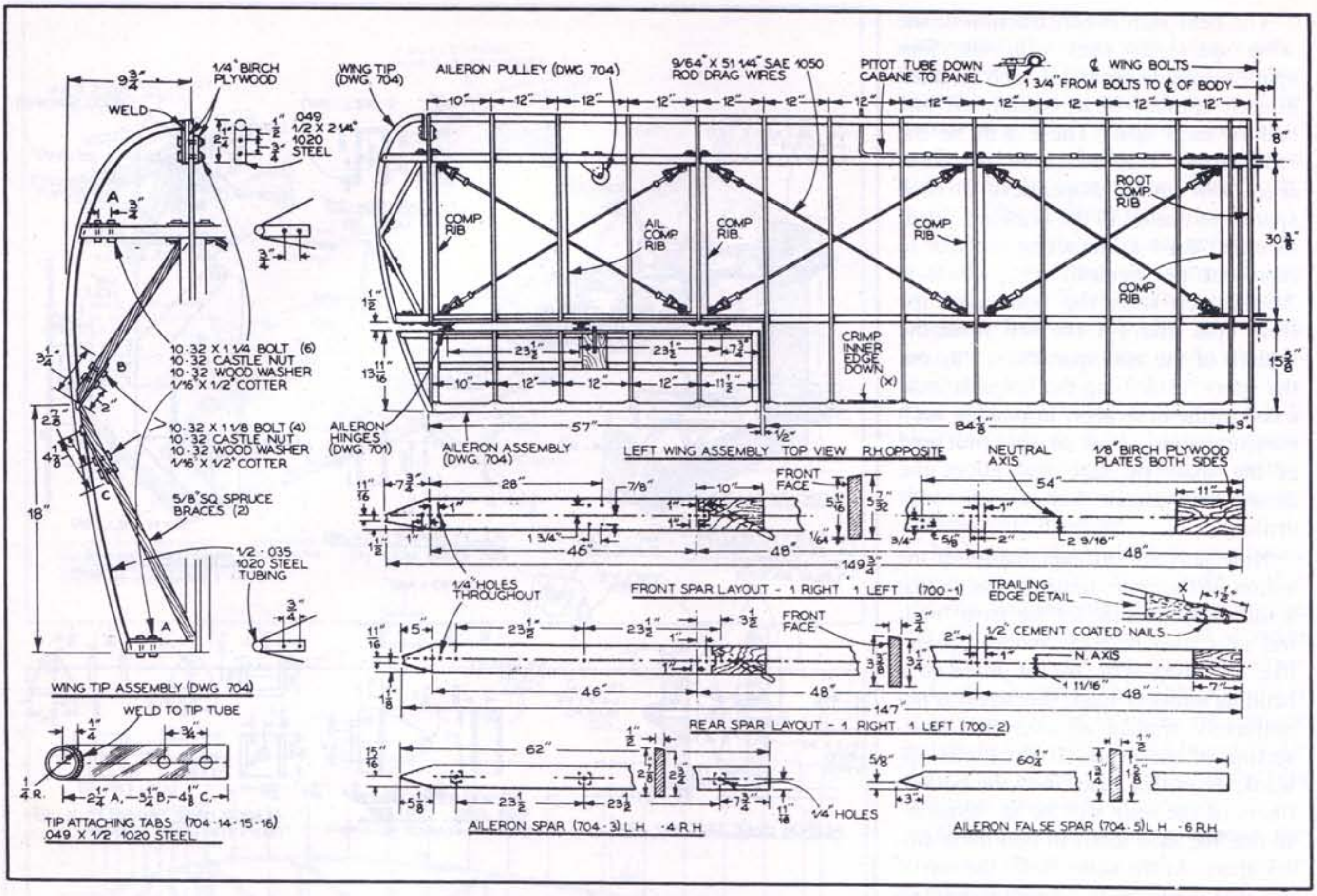
Before drilling, lay out the tips of the spars at the outer ends of the wings. Now drill the holes to the proper sizes, after which you can cut the angles at the outer tips.



You can now start to assemble the wing. Slide all of the ribs in their proper places on the spars but do not nail at this time. Cut and fit all plywood gussets. The drawings show the hardware that is attached to the wing, such as drag and anti-drag wire fittings, strut and wing fittings. We have kept the design as simple as possible and yet of sufficient strength.



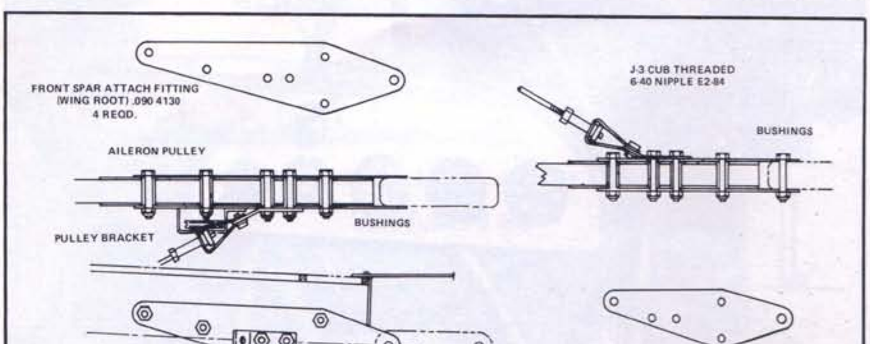
The Baby Ace featured simple instrumentation. This view also gives a good idea of the crash protection provided the pilot.



Following the drawings it is an easy task to make and install your fittings. Next will be the installation of the drag and anti-drag wires. By obtaining the complete fittings from a J-3 Cub you will have enough material on hand to complete the installation of your wires. The wires will have to be cut to length and threaded, using a 6-40 die. Your material should be 9/64 inch 1050 steel rod.

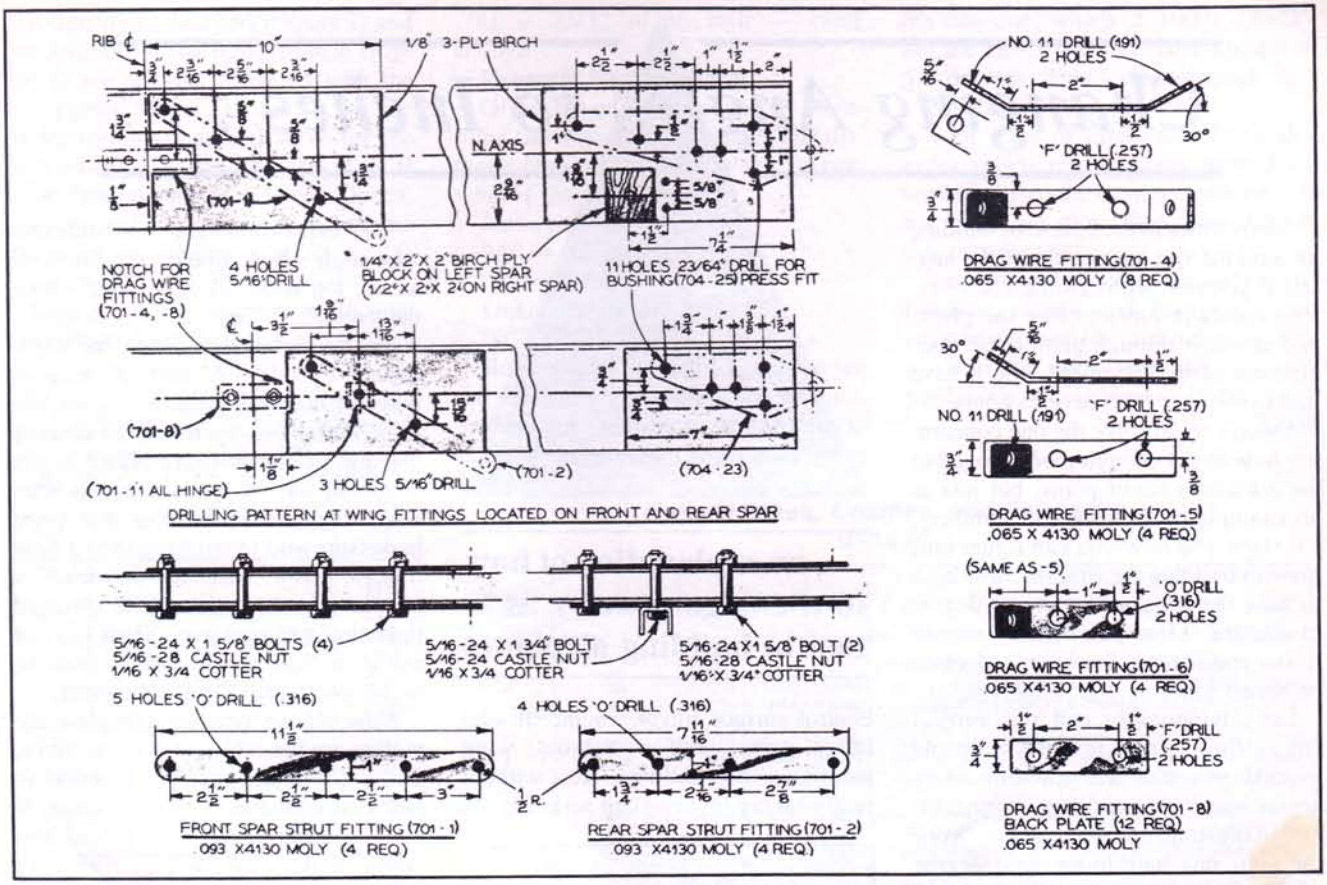
The compression ribs and the drag-wires are the stressing members for pulling the rest of the wing into shape. Make certain to do this adjustment job carefully, taking plenty of time, so that the spars and edging will be parallel and so that all of the ribs will be square with the spars.

First, nail and glue all of the compression ribs into place and you will then be ready to true up the wing. The compression ribs should be square with the spars to begin with or the job will be very difficult to carry out. With a large square, line up the front bay at the root end of the wing by adjusting the two drag-wires at the end. Make sure that the end rib at the root end of the wing is exactly square with the spars and when this is done, stretch a string along the front spar, extending from the root end to the tip. With this reference line before you, line up the remaining wing bays by adjusting the drag and anti-drag wires in the same way. After this is done, better check back again to ensure that the first bays have not been disturbed by the adjustments on the final bays.



After the wing is true, line up, nail and glue the rest of the ribs in place, avoiding contact between the drag-wires and the ribs. In some cases it may be necessary to move the ribs a little so that they will not touch the drag wires. If there is contact, rattles and vibration will result when the engine is running and this vibration may ultimately loosen up the wing. Be sure that all of the drag-wires are drawn up tight, then tape up the ribs and wires at the point where they cross each other so that they will not touch. Electrical tape can be used for this purpose.

When the framework of the wing is completed it is to be laid aside until the other parts of the structure are finished, for the wing covering or fabric should



not be applied until the fuselage, tail group and other parts are also ready for covering. It is better to do all of the covering at one time rather than to cover the individual items as soon as they are completed.

Welding of the wingtip in place will be explained in the June issue of MI, *(April, 1990 issue of Experimenter)* as will be the construction of fuselage and tail group assembly.

Author Note: The MI article had a great impact on the development of the fledgling EAA then some two years old. Interest in building the Baby Ace was high. Drawings were furnished at no cost to EAAer Bob Blacker, head of the industrial arts program at St. Rita's High School in Chicago, Illinois to become the first EAA Project Schoolflight airplane. It was completed in record time and appeared in our early Milwaukee EAA fly-ins. Most students, as the result of that project, attained careers in aviation and Bob Blacker went on to a career with FAA.

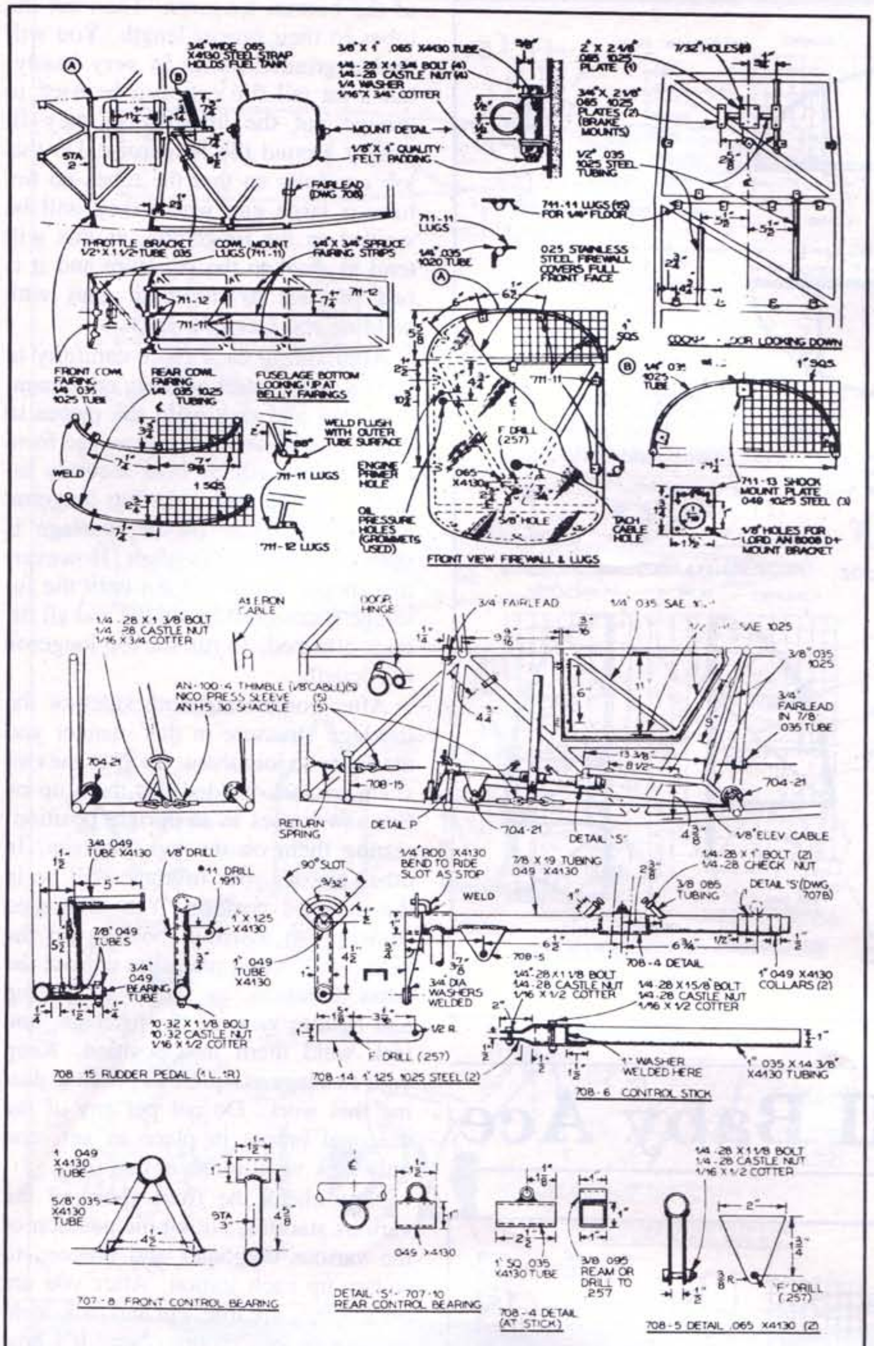
The arrival one day of a well-known pilot, Casey Lambert of St.Louis (Lambert Field being named after his uncle) with a copy of MI is a story in itself. Casey, a very wealthy bachelor, had the very best aircraft of the '30s — Curtiss SNC, Lockheed Sirius, latest models of Stearmans, etc.

Being a large man, Casey wanted a Baby Ace on floats to be powered by at least a 135 hp engine. As the result of his invitation to his Minocqua, Wisconsin estate, I started on a new, improved, wider cockpit Baby Ace D. Much work was done at his estate and the project was later moved to the West Bend headquarters of Aerial Blight Control and Cliff DuCharme. The airplane was finished and I made its test flight on floats. The aircraft was later destroyed as the result of hitting a wire when Casey was landing on a lake. A second Baby Ace D was constructed and flown some 50 hours. It was donated to the EAA Museum upon Casey's passing and can be seen hanging in the museum's restoration shop.

FAA inspector Tony Maugeri congratulates Paul after a test flight of the Baby Ace.

Ace Aircraft of West Bend, Wisconsin was formed. I participated with Cliff in the design of the Baby Ace E, a two-place, side-by-side version of the Baby Ace D. Mr. DuCharme later sold the two designs and Ace Aircraft to Mr. Thurman Baird of North Carolina. Plans are still available from the present owners in Chesapeake, West Virginia as listed in the advertising section of SPORT AVIATION.

It should be noted that the Pober Junior Ace and Pober Baby Ace are very much changed from the original Corbin Junior Ace and Baby Ace. The Pober Junior Ace and Baby Ace are not the same designs as the Baby Ace D and E models currently sold by the Chesapeake owners. EXP



member, both top and bottom. Now sketch a line along the length of the fuselage and line up the center marks with a string. After you are certain that the fuselage is true, you can start your welding. I believe the best method in completing the welding job is to start at the front of the fuselage, completely welding each point in Station 1. Then proceed to Station 2 and Station 3 and so on.

The cabane struts come next. These are fitted and welded in place as shown in the drawing. The landing gear and wing strut fittings are welded into place with 4130 aircraft steel because of the strength value, and when forming the fitting allow enough of a radius to prevent "tearing" of the metal. EAA has a good supply of 4130 tubing on hand which is cut to the proper widths for the various fittings.

EAA drawing No. 707A shows you how to weld the gussets on the cabane struts for additional strength. In putting the gussets on, tack weld them in place. Heat them to a cherry red and form them along the point with a hammer. Be careful not to crush the metal. Then weld the edges in place.

In EAA drawing 707B you will find all the tail group attachment fittings, as well as the tail spring fitting. EAA drawings carry many of these fittings in full size. Make a permanent weld only when you are assured everything is in order. The control units and fittings can be made at this time and fitted into position as shown in the various drawings.

You will notice that the seat construction and attachment is of a very simple design, as is the floorboard arrangement. The turtleback formers are made up from plywood, which is cut, notched and then fastened to the fuselage clips with 10-32 screws and nuts. Do not notch the formers any deeper than necessary to seat the stringers, for if you do the formers will show rough spots when the fabric is attached and will result in a poor appearance.

The tail group is constructed in the same manner. That is, make up a jig to hold the tubing in position while you tack-weld the pieces together prior to complete welding. If you have enough experience to assemble the fuselage as outlined you will certainly experience no difficulty in putting the tail group together.

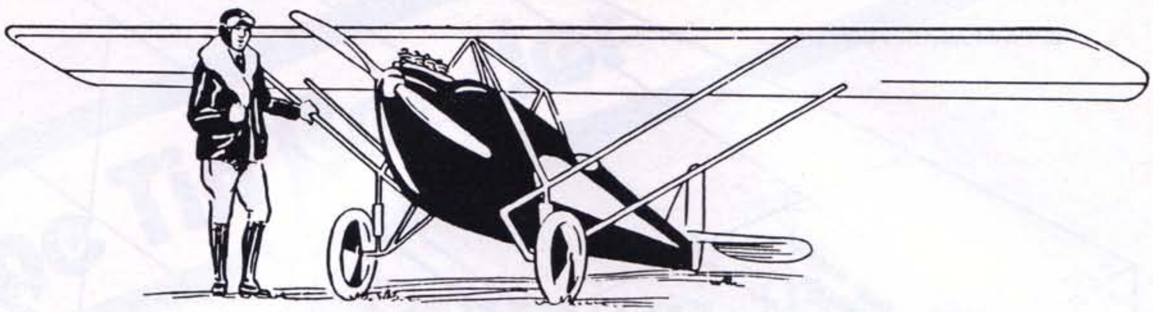
Next month we will provide the final details in the construction, licensing and operation of the Baby Ace. **EXP**

PLANNING YOUR EXHAUST SYSTEM

(Continued from Page 19)

Moisture often condenses in exhaust pipes and this combined with extreme heat concentrations, seems to accelerate the development of rust. Gradually the metal is eroded away and pin holes and failures develop. You may have noticed this characteristic particularly in aircraft equipped with automotive pipes as rust forms in their exhaust system components more quickly than on any other parts of the aircraft. Prolonging the life of exhaust pipes has always been a problem and properly accomplished, the painting of the pipes with a high temperature paint will help. A little trick used by the automotive hot rod buffs to obtain a more durable, longer lasting coating of paint is to preheat the exhaust pipes prior to spraying them with the high temperature paint.

An exhaust system is a snap to construct and install . . . and if you do not have to install mufflers and heat muffs. A system complete with a muffler and heat exchangers can be a bit difficult to design and to construct properly and may be troublesome to maintain, but the result is a quiet airplane and that's worth it. **EXP**



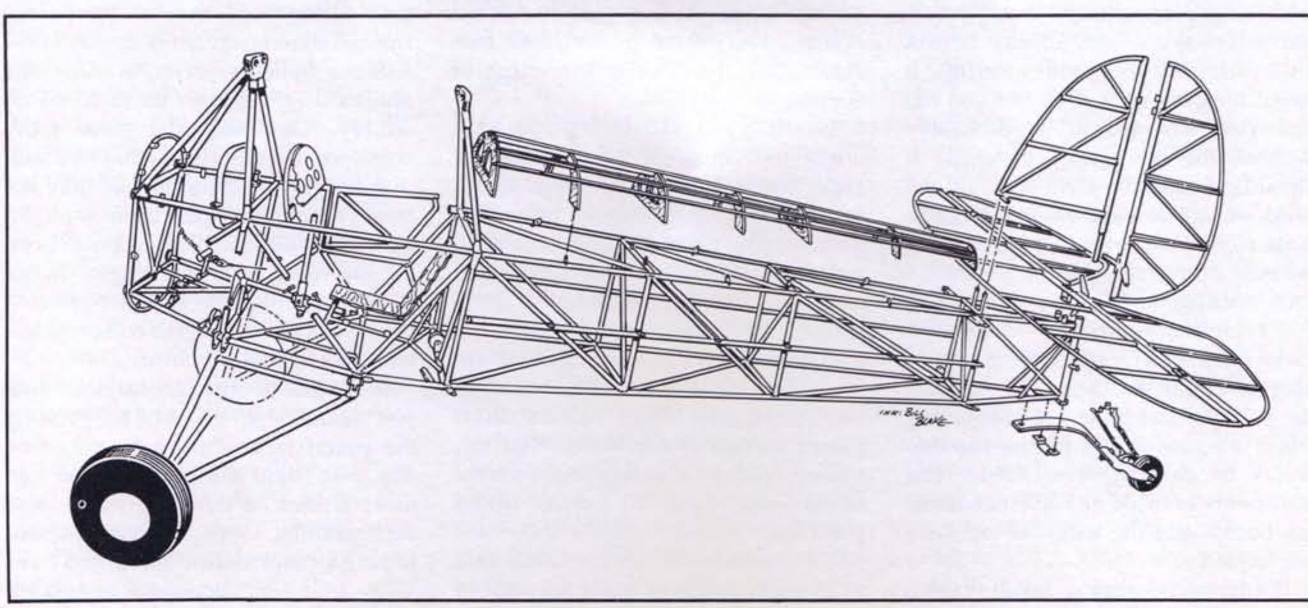
Build the MI Baby Ace

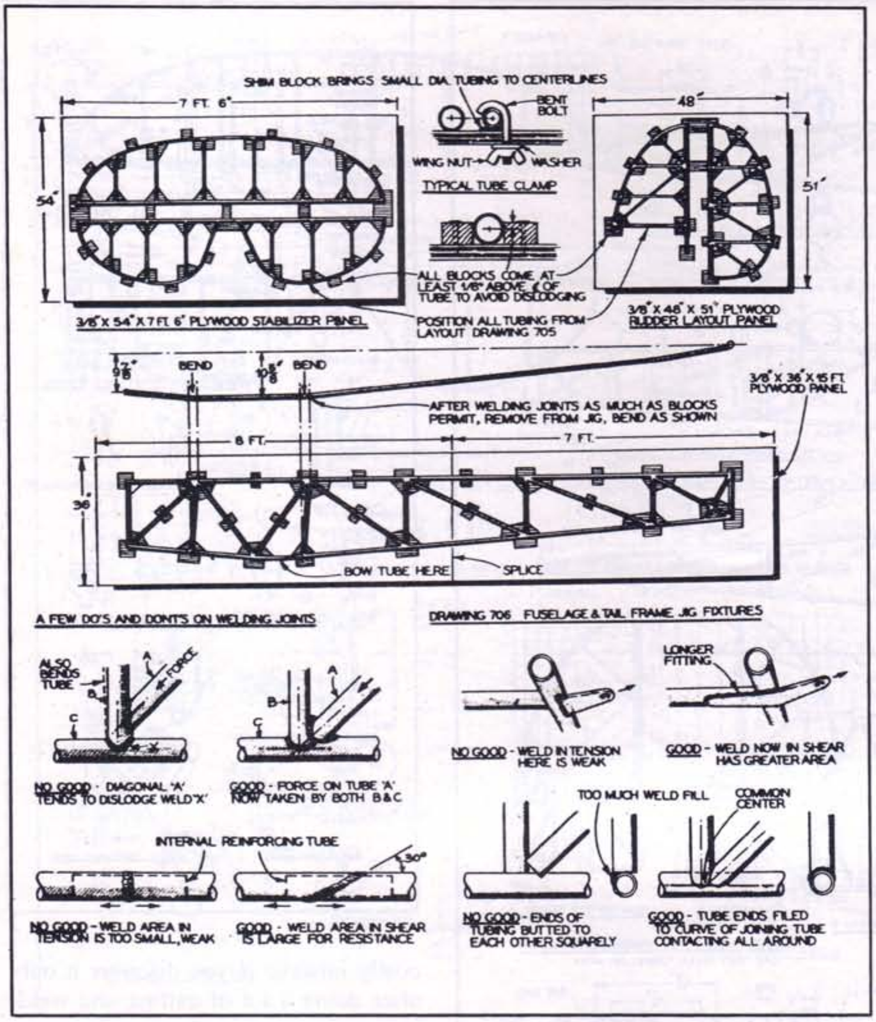
by Paul Poberezny

Part II

(The following article is reprinted by permission from Home Mechanix magazine, copyright 1955 by Times Mirror Magazines. Home Mechanix makes no warranty as to the airworthiness of this design. Part III will follow in the May issue.)

Paul Poberezny, circa 1955, pauses beside the MI Baby Ace, which was powered by 65 hp Continental engine.





Probably the most difficult job you will encounter in building your MI Baby Ace will be welding the various components of the fuselage and tail group together. Particularly since this is a job that must be done accurately and well if it is to pass the inspection of your local Civil Aeronautics Administration Safety Agent, as explained in MI last month.

Of course, if you already know how to do welding that will meet aircraft standards, you have nothing to worry about. It is then simply a matter of studying the drawings, cutting tubing to proper size and welding the components together while they are held in proper position in a jig. However, even if you know little or nothing about welding you have a choice as to the manner in which the job can be tackled.

First — you can learn to weld at one of the free evening vocational schools, which may be complicated by the fact that such schools are some distance from your home. Quite a few EAA members have attended such schools to learn welding.

Second — you may be able to obtain the services of an aircraft mechanic at your local airport and since he will probably do the job in his off time it should not be too costly.

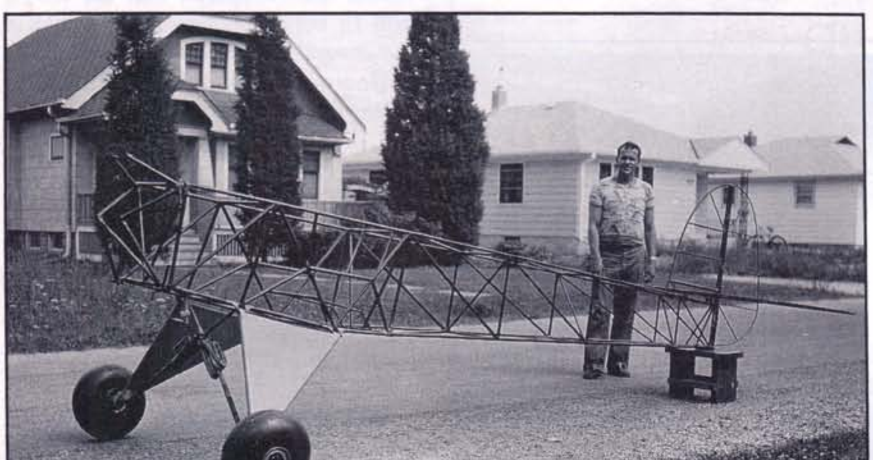
Third — you can have the fuselage frames tack-welded by the Experimental Aircraft Association and then have the job fully completed by a local aircraft welder. Or, the EAA can provide the fuselage completely welded at a fair price.

In making up the estimate of cost for building the MI Baby Ace we figured that the average builder would have the fuselage welded for him. That is why we set the figure at $800 as compared to the $500 it cost to build my plane. The difference was allowed to take care of the cost of a professional welding job, a used 65 hp engine, etc.

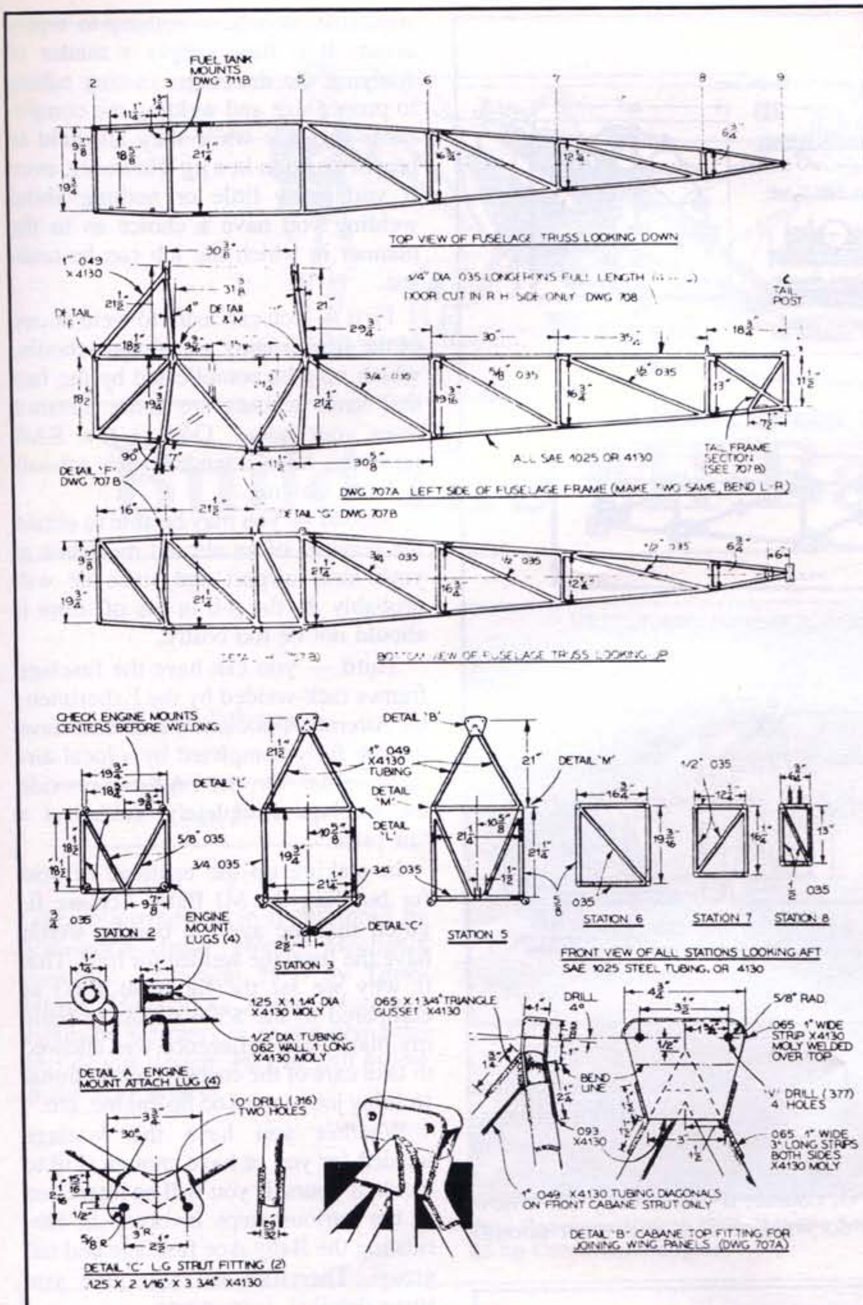
Whether you have the fuselage welded for you or have enough skill to tackle it yourself you will be interested in the various steps involved in fabricating the Baby Ace fuselage and tail group. Therefore we will give you some detailed instructions.

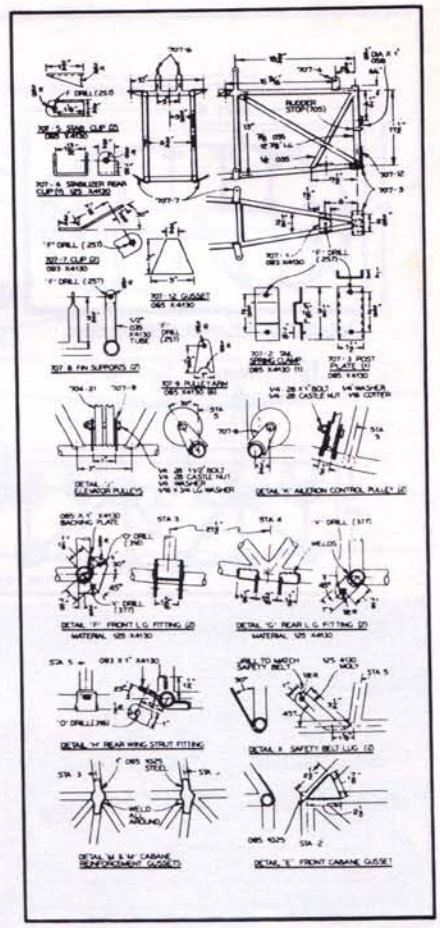
The first step is to carefully study the drawings and become familiar with the general fuselage construction details. Then start making a welding jig by laying out full-size fuselage side drawings on a suitably sized wooden platform, using the top longeron as a reference point to pencil out a complete fuselage side. Be very careful to make correct measurements of the various tubes so that when the wood blocks comprising the jig are nailed down on either side of the drawn lines the correct size tubing will fit in snugly between the blocks (see drawing).

Upon completing your layout go back over the drawing and recheck your layout against it so as to find any mistakes. It would become a very



The bare bones fuselage of the Baby Ace on the street in Milwaukee, Wisconsin.





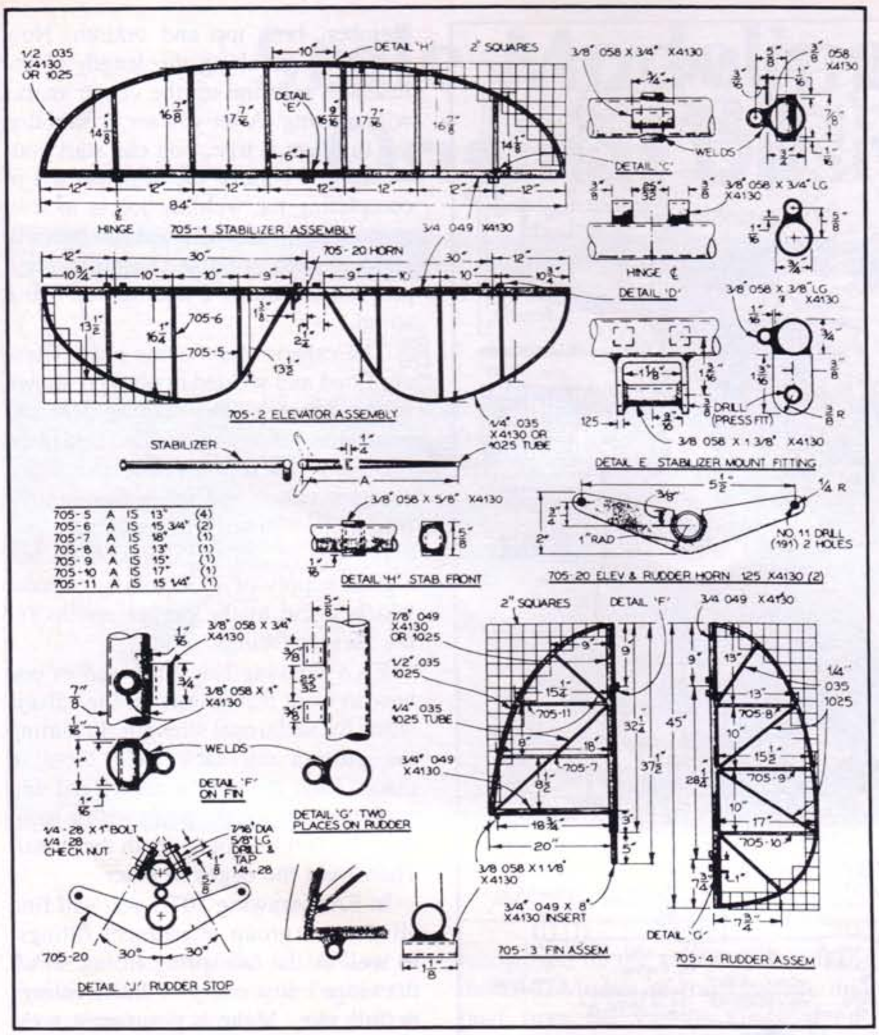
costly mistake if you discover it only after doing a lot of cutting and welding.

To form the jig, cut out a number of 3/4 x 1 inch wood blocks and place these parallel to the lines of the fuselage drawing on both sides of the lines, much in the same manner as you used when making the wing rib jig, which was explained in MI last month. These blocks are so spaced that the tubing will fit between them and be held in the desired position for tack welding.

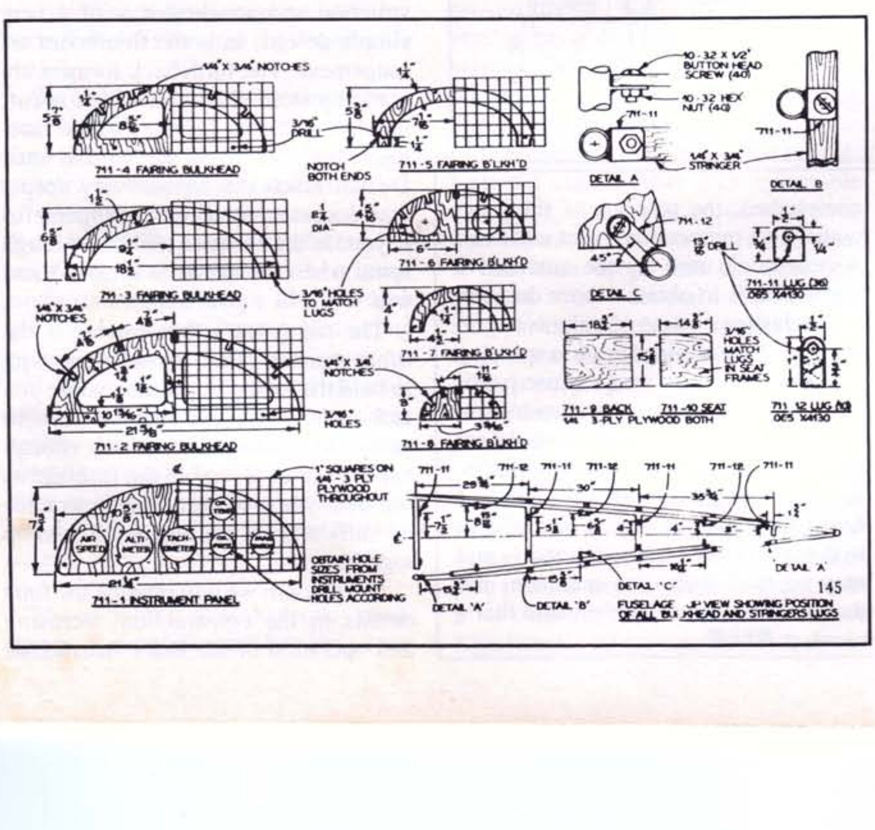
Now we are ready to start fitting the tubing in the jig. Select the top longeron, a 3/4 x .035 tube cut to proper length, and place it in position as indicated in your drawing. Next, select the bottom longeron and put it in its position on the jig between the wooden blocks. Notice that Station 3 has a sharper radius and that the tubing will have to be formed to fit the jig carefully. Station 4, though not as difficult, is handled the same way. We now have the top and bottom longeron fitted into position and are ready for the upright members.

Take your measurements for the uprights from the jig, measuring from the center of the top longeron to the center

The Baby Ace fuselage after painting, minus wings, outside the Poberezny home, is ready for transport to the airport to have the wings attached.



Build the MI Baby Ace



of the bottom longeron. Then cut the tubes to their proper length. You will find a grinder comes in very handy, but a rat tail file can also be used to groove out the uprights so they fit snugly around the longerons. Do this job carefully so that the tubes do not have a large gap where they will be welded to the longerons, as this will tend to weaken the structure and it is bad practice to fill these gaps with welding rod (see drawing).

After fitting each piece carefully in the jig, bring your welding equipment into play and tack-weld the pieces to each other so that when removed from the jig they will be held securely together. In the plans, the top longeron on the right side of the fuselage is shown "broken" at the door. However, this should not be cut out until the fuselage is completely welded and all fittings attached, so run the top longeron full length.

After completing both sides of the fuselage structure in this manner you are ready to join them. So after the two sides are tack-welded, set them up on two saw horses in an upright position, resting them on the top longeron. In other words, your fuselage will be in the inverted position. You will need someone to assist in holding up the sides while you proceed to cut out the cross members, as shown in the top and bottom view of the fuselage, and tack weld them into position. Keep your fuselage as square as possible during this work. Do not put any of the diagonal braces in place as yet, and only tack weld joints at this time.

Now check the front views of the various stations, noting the position of the various diagonals and proceed to square up each station. After you are certain they are true, cut and tack-weld the tubing into proper place. It's best to start at the front of the fuselage and work aft. While building a fuselage you can't help but note that many problems of alignment are the same as experienced in model aircraft building.

I would like to mention here that CAA Manual 18 should be consulted regarding the fitting of your tubing and welding of various components. This very intersting manual, which was not available to the homebuilt aircraft enthusiast of the "old days," will solve many problems that might arise while building the Baby Ace.

With all the diagonal pieces tack-welded in place, measure and draw a line at the center of each cross

Build the MI Baby Ace

The third and final article on MI's homebuilt plane deals with engine, fuel system, instruments, landing gear and wing strut installation, covering, licensing and flying.

by Paul H. Poberezny

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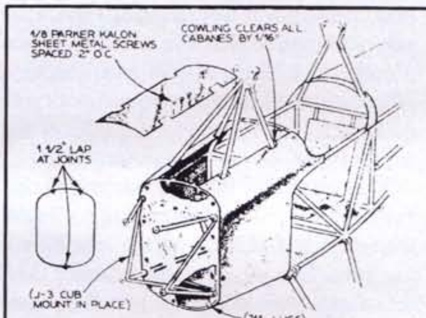
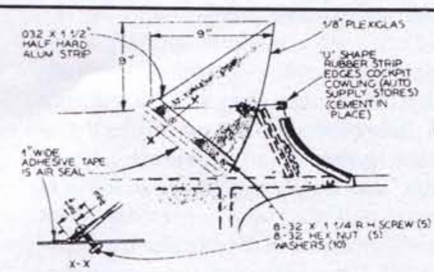
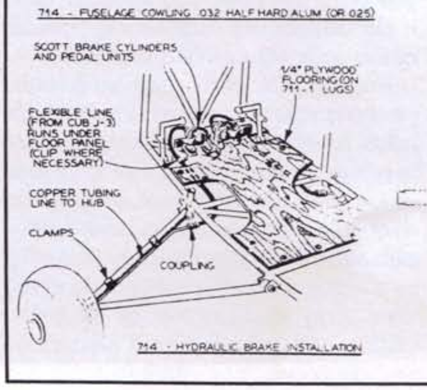


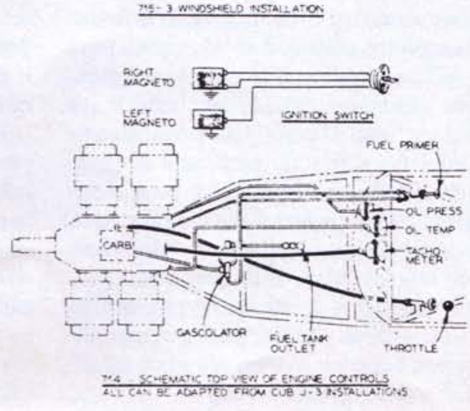
714 - FUSELAGE COWLING .032 HALF HARD ALUM (OR .025)



715 - 3 WINDSHIELD INSTALLATION



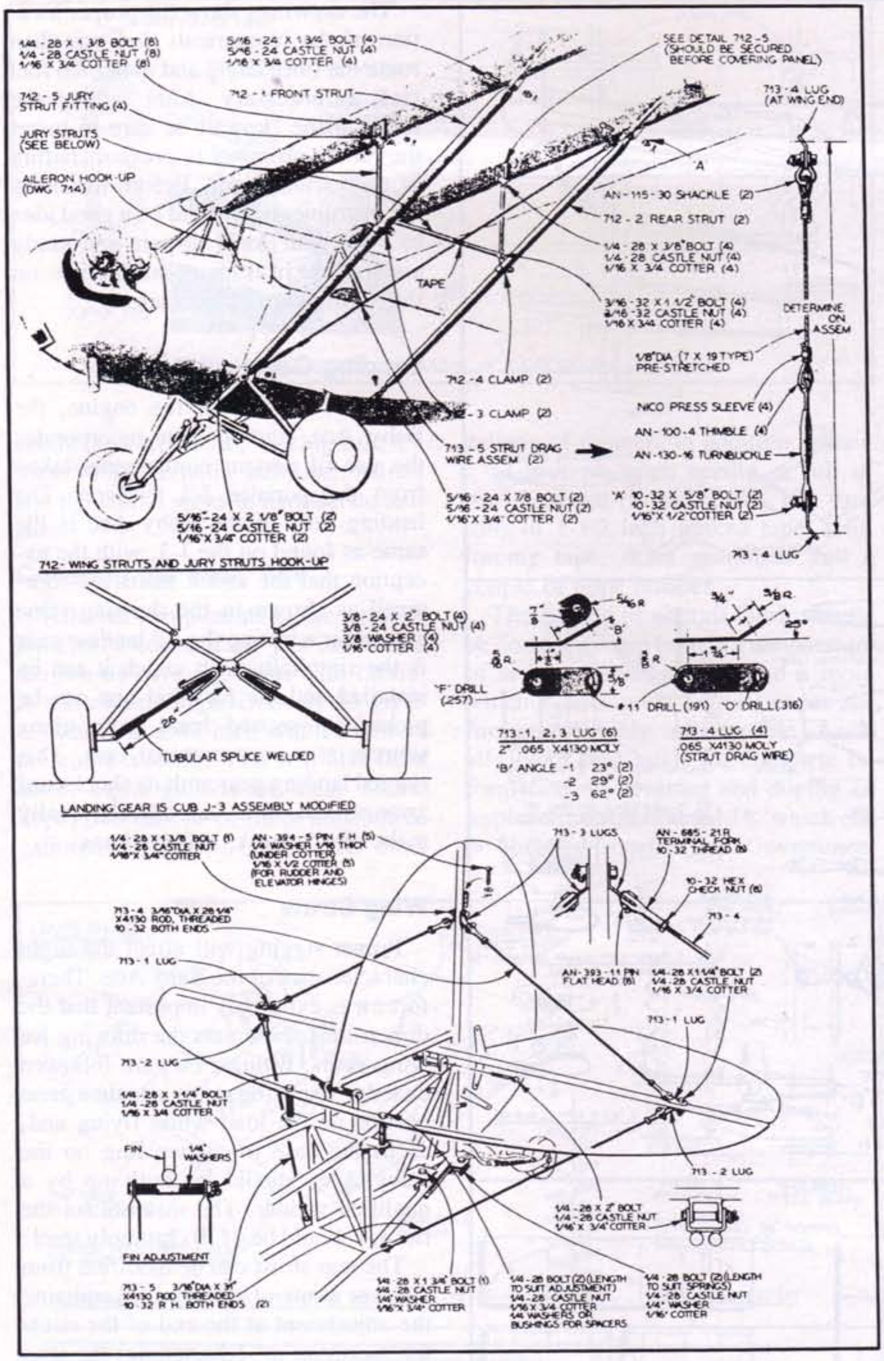
714 - HYDRAULIC BRAKE INSTALLATION



714 - SCHEMATIC TOP VIEW OF ENGINE CONTROLS
ALL CAN BE ADAPTED FROM CUB J-3 INSTALLATIONS

Engine and Cowl Installation

The Baby Ace was redesigned so as to be able to use one of the various engines found on the famous Piper J-3



light plane. It will fly well with any of the following engines: Lycoming, Franklin and Continental with horsepower ranging from 55 to 90, depending on the model used. The forward section of the fuselage was modified to use the various engine mounts for these engines.

When buying your used engine and mount, it would also be advisable to get the engine cowl with it as this will save you time and trouble locating the proper cowl later on. The cowlings are not interchangeable for the various engines. You may still have to do a little modifying of the cowl to obtain a proper fit, but the change will be of a minor nature.

Fuel System

The fuel system incorporated in the Baby Ace is a simple arrangement. The fuel tank is the same as used on a J-3 Piper Cub. The tank is of 12-gallon capacity and is held in place against the fuselage by four metal straps bolted to four lugs welded on the longerons. A felt strap should be cemented to the hold-down straps to prevent chafing of the tank. The fuel shut-off is located at the bottom of the tank and it is recommended that a flexible hose be used as this will not be subject to the same vibration as a metal line.

The fuel sediment bowl is mounted on the fire wall as shown in the drawing, and the outlet line, a flexible hose, will lead to the carburetor inlet. The hole in the firewall should be enlarged slightly and a rubber grommet installed to prevent chafing of the fuel line.

The primer is located on the right side of the cockpit. It has two lines — for the inlet of fuel from the sediment bowl, and an outline to take the fuel to the throat of the intake manifold above to the carburetor. The primer lines should be carefully routed along the right side of the fuel tank, taking precaution to prevent chafing and to clear the aileron control cable.

There are two systems that can be used for running lines through the firewall; either make firewall fittings, or enlarge the firewall holes and run the lines directly to their respective positions. Install small rubber grommets in the firewall to protect the lines from chafing. Before cowling up the front section of the fuselage, be sure to check the complete fuel system for possible leaks.

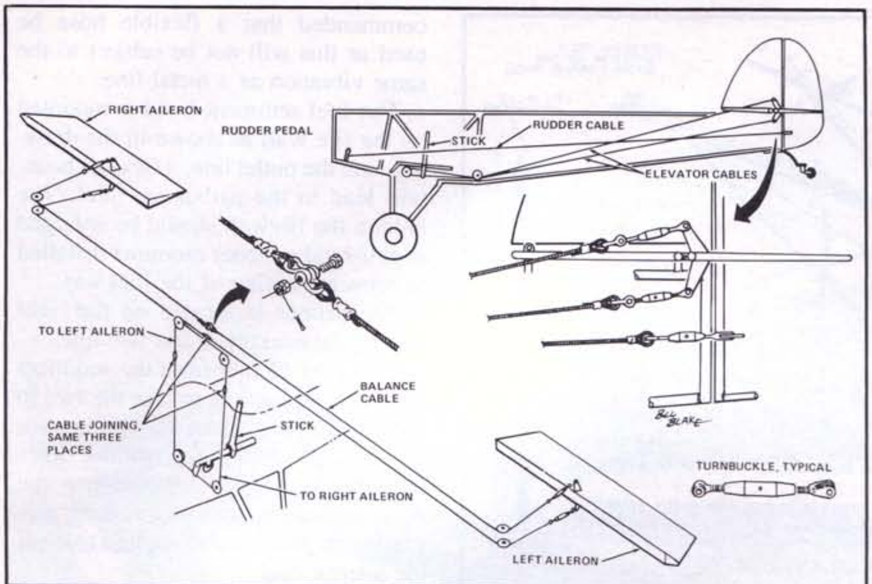
Carburetor Heat

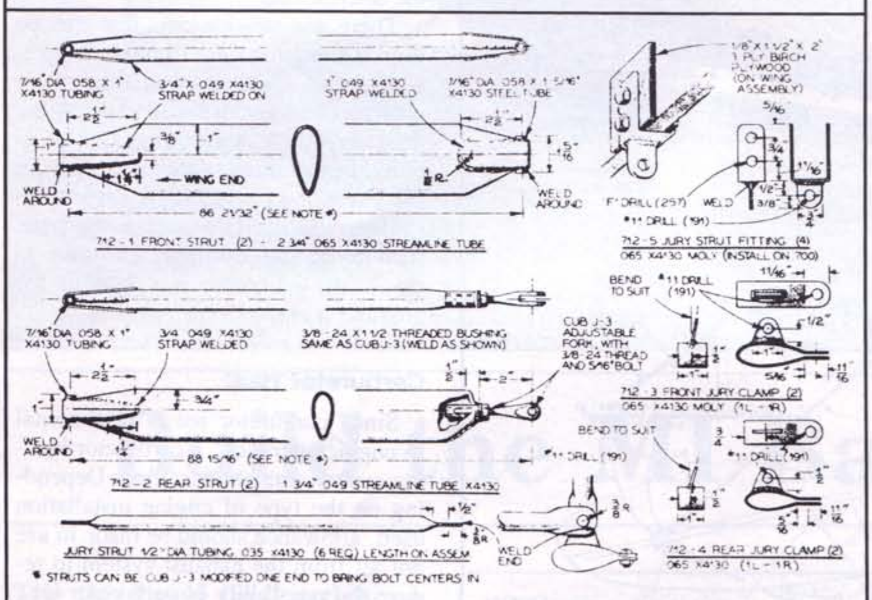
Since carburetor ice is detrimental to engine operation, a carburetor heating system must be installed. Depending on the type of engine installation used, allowance should be made to use hot air from the exhaust system to reduce the possibility of carburetor ice.

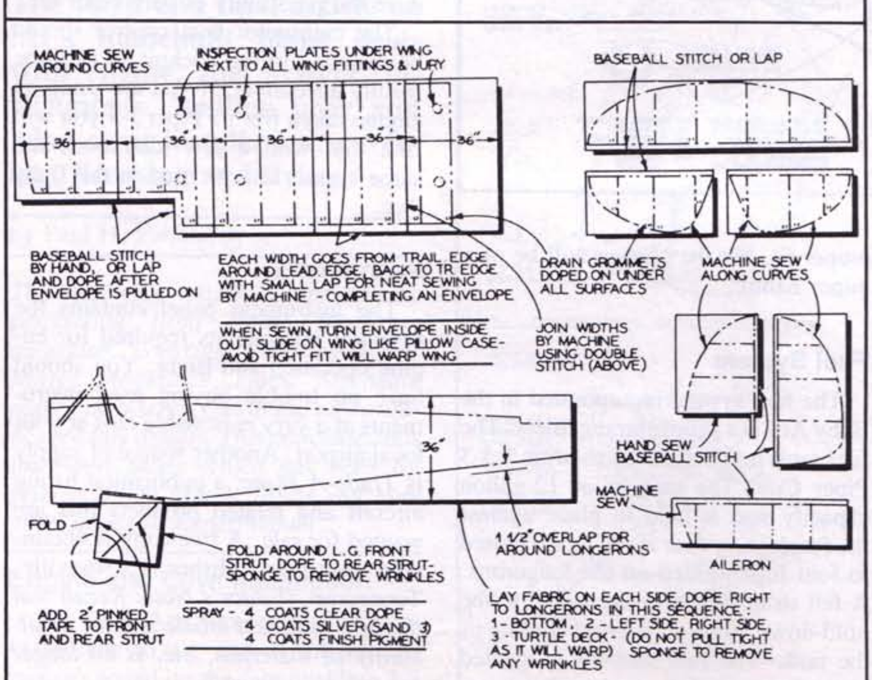
The carburetor heat control should be installed in the cockpit so as to be readily accessible. If you are using an engine taken from a Piper J-3 you will find that with a few alterations the same system can be used in the Baby Ace.

Instruments

The instrument panel contains the essential instruments required for engine operation and flight. You should have no trouble buying used instruments at a very reasonable cost at your local airport. Another source of supply is *Trade-A-Plane*, a publication listing aircraft and related products that are wanted for sale. A free copy is obtainable from the publisher in Crossville, Tennessee. ***(Editor's Note: Recall that this is a reprinted article and the availability of materials, etc. is no longer necessarily current.)***







The drawings show the proper location of the instruments and you then route the lines along and under the fuel tank as necessary. After cutting the holes in the firewall be sure to insert the rubber grommet to prevent chafing of the various lines. Before installing the instruments it would be a good idea to visit your local airport and study some of the instrument installations on the light planes based there.

Landing Gear

As in the case of the engine, the Baby Ace landing gear incorporates the use of certain components taken from the popular J-3 airplane. The landing gear of the Baby Ace is the same as found on the J-3, with the exception that the shock struts are shortened as shown in the drawing. One reason for adapting the J-3 landing gear is the simplicity with which it can be installed and the fact that one can be picked up second hand from many sources at a very nominal cost. This rugged landing gear with its shock cord arrangement, plus air wheels, really makes for smooth, soft landings.

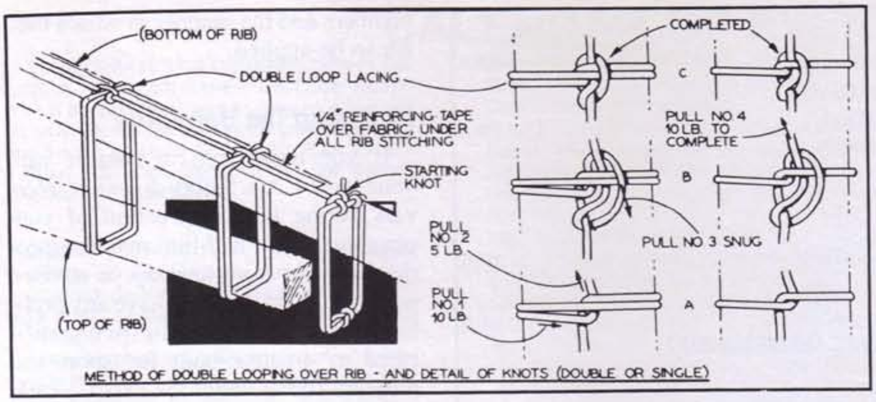
Wing Struts

Proper rigging will affect the flight characteristics of the Baby Ace. Therefore, it is extremely important that the dimensions shown on the drawing for wing struts, fittings, etc. are followed exactly. The wing struts sustain a great portion of the load while flying and, as in the case of all welding on the Baby Ace, should be built up by a qualified welder. The material for the fittings should be 4130 chromoly steel.

The rear struts can be modified from the rear struts of a Piper J-3, utilizing the adjustment at the end of the struts for "washing in" (shortening) the strut so as to pull the wing down to produce more lift, or "washing out" (lengthening) the struts to decrease the lift. The front struts can also be modified from the front struts of a Piper J-3, Aeronca or Taylorcraft airplane.

The Baby Ace has a stabilizer which can be adjusted to eliminate any nose or tail-heavy tendencies noted on the first test flights. The vertical fin is also adjustable and can be offset to counteract propeller torque.

The tail group is braced by adjustable wires and adjustments should be made with the airplane in a level position. Install and level the horizontal stabilizer by adjusting the wires. Then



METHOD OF DOUBLE LOOPING OVER RIB - AND DETAIL OF KNOTS (DOUBLE OR SINGLE)

install the vertical fin, making sure it's set at 90 dgrees to the stabilizer. Adjust and tighten all wires to a moderate tension.

Covering the Baby Ace

After all components of the airplane have been constructed you can tackle the job of covering them with fabric. It will require approximately 55 yards of fabric of a 42-inch width to cover the entire aircraft. You will also need about eight gallons of clear nitrate dope, two gallons of silver dope, three gallons of pigment (color) and three gallons of thinner. In addition, obtain a 12-inch rib-stitch needle, a roll of No. 7 waxed rib cord, two 100 yard rolls of 1-1/2 inch pinked tape, reinforcing tape, drain grommets and a couple of dope brushes.

The doping of aircraft fabric should be done in a room having a temperature of at least 70 degrees F. and a room which boasts good ventilation as the fumes are highly inflammable. Actually, your best guide for complete information on covering and doping an airplane is CAA Manual 18, which can be obtained from the U.S. Government Printing Office, Washington, D. C. We sincerely urge you to obtain this Manual inasmuch as it would be impossible to give detailed covering and doping instructions in a single short article. However, here are a few highlights which, together with the drawings and photos, will enable you to get started on the job.

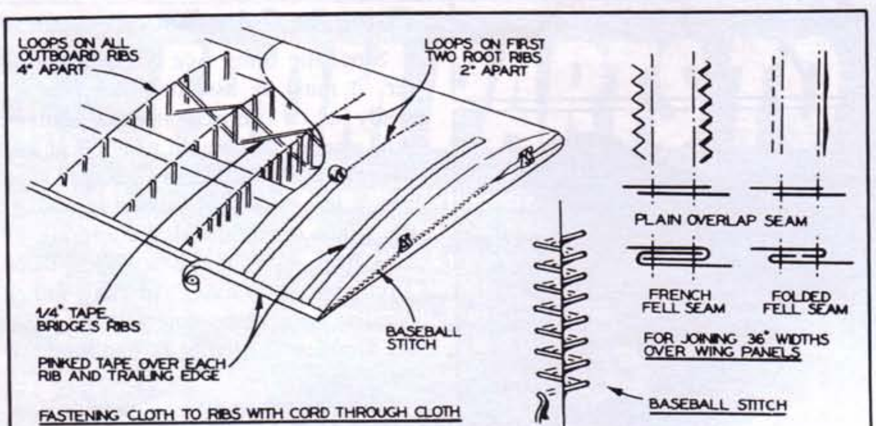
The easiest method is probably to fold the fabric under the trailing edge and tack lightly to the leading edge. Of course, you must sew the 42-inch wide length of fabric together before placing it on the wings. The seams for this sewing should run parallel to the ribs.

Rest the fabric around the wing and tack the cloth completely here and there along the leading edge. Tack it along the rib butt and sew it together around the wing tip. Gradually tighten the cloth by retacking and resewing to remove all fullness and wrinkles. If your fabric has wrinkles or creases, a sponge and water will remove them. Trim away excess cloth and cut away the cloth for the aileron opening leaving about a two-inch overlap. Tack the cloth to the rear wing spar in the aileron opening and to the web of the last regular rib. Wrap one inch along the leading edge, around the aileron opening and across the wing butt rib.

Do a neat, smooth job, but it is not necessary to pull the cloth very tightly as the wing dope will give the fabric the tautness of a drum head. However, the cloth may be stitched and very tightly across the leading edge from end to end to prevent it being pulled down between the ribs when the dope is applied.

Cut 9 foot lengths of the reinforcing tape and wrap one length securely around the wing over each rib, tacking the ends down at the leading edge. Thread the 12-inch rib stitch needle with the waxed rib cord and starting at the trailing edge, push the needle clear, through the wing on one side of the rib and bring it back through the wing on the other side of the rib. The result will be a loop of cord clear around the rib, including both top and bottom reinforcing tapes and wing fabric under the tapes. Draw the loop tight and knot it on top of the rib. Move forward along the rib at four-inch intervals, letting the cord lay in a single strand along the rib, repeating this operation until the leading edge is reached. Do this to all the ribs (see drawing).

Now take 9-foot lengths of the 1-1/2 inch pinked-edged tape and wrap them



FASTENING CLOTH TO RIBS WITH CORD THROUGH CLOTH


UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE—CIVIL AERONAUTICS ADMINISTRATION
CERTIFICATE OF AIRWORTHINESS

1. NATIONALITY AND REGISTRATION MARKS: N9050C
2. AIRCRAFT AIRWORTHINESS CLASSIFICATION: EXPERIMENTAL
3. **This Certificate of Airworthiness is issued pursuant to the Civil Aeronautics Act of 1938 as amended. The aircraft identified hereon is considered airworthy when maintained and operated in accordance with the Civil Air Regulations and applicable aircraft Operation Limitations.**
4. UNLESS SOONER SURRENDERED, SUSPENDED, REVOKED, OR A TERMINATION DATE IS OTHERWISE ESTABLISHED BY THE CIVIL AERONAUTICS BOARD THIS CERTIFICATE WILL EXPIRE
JUNE 22, 1957
5. DATE OF ISSUANCE OR RENEWAL: 6/22/56
6. CAA REPRESENTATIVE: A. MAUGERI
7. DESIGNATION NO.: KC-3-13
8. ***Any alteration or misuse of this Certificate is punishable by a fine of not exceeding $1,000 or imprisonment not exceeding 3 years, or both.***

GPO 16—63778-1 Form ACA-1362 (12-50)

IN REPLY ADDRESS
REGIONAL ADMINISTRATOR
CIVIL AERONAUTICS ADMINISTRATION

DEPARTMENT OF COMMERCE
CIVIL AERONAUTICS ADMINISTRATION
General Mitchell Field
Milwaukee 7, Wisconsin

May 26, 1955

OPERATION LIMITATION FOR N9050C (EXPERIMENTAL)

1. This aircraft is certificated under the provision of CAR-1 as an amateur built aircraft.
2. Only day VFR flights will be authorized.
3. Flights limited to Continental limits of the United States.
4. Aircraft will not be used for the carriage of cargo nor in connection with any business or employment.
5. Aircraft must be flown by properly certificated pilots with private pilot certificate or higher.

A. Maugeri
Aviation Safety Agent.

Extended to June 22/56
A Maugeri

on just as you did with the reinforcing tape, with the ends meeting at the leading edge. This is a finishing tape to cover the stitches that hold the reinforcing tape and should be heavily saturated with wing dope and stuck down in position with a brush. Run a tape across the leading edge, along the wing tip and across the trailing edge as a reinforcement and to hide the rows of stitches. Cut large strips of cloth to tape the butt rib and edges of the aileron opening.

Five or six coats of clear dope are required. Follow this with four coats of silver. Sand the fabric lightly with fine sandpaper between coats of dope to give a smooth finish and to fill pores of the fabric. If you desire a color for your airplane, select a good grade of pigmented dope and apply at least four coats.

The aircraft registraton number which will be issued by your local CAA Agent is put on last. The CAA Manual 18 prescribes the size of the numbers and the manner in which they are to be applied.

Licensing the Baby Ace

If you have been in contact with your local CAA Safety Agent at intervals during the construction of your plane and have had him make inspections of your workmanship, as advised previously, you will not have any problem in getting your Baby Ace certificated as amateur-built for sport and pleasure flying under the experimental category. That is why this series of articles has constantly urged you to maintain a close contact with your local CAA Agent.

We will not go into details regarding the steps involved in licensing your Baby Ace. Your CAA Safety Agent will provide you with the proper forms and help you file the proper papers. Remember — do not fly your Baby Ace without the supervision of a CAA Agent. He must be present for the first flight and probably your second and third, depending on the adjustments which will have to be made on your plane.

Flying the Baby Ace

Since the Baby Ace is a single-seater, it must be assumed that you already are a licensed aircraft pilot or you would not be able to fly it at all. Therefore, we are simply going to give you a few words of advice regarding the flight operation of the aircraft. If you have ever flown a Piper Cub, Taylorcraft, Aeronca or any other popular light plane you will not have the slightest difficulty in handling the Baby Ace.

The Baby Ace was not designed as an aerobatic plane. All normal maneuvers are permitted, including spins. The recommendations of air speeds are: stall - 30 mph, cruising speed 95 to 100 mph. Maximum diving speed is 125 mph. If you operate the aircraft within this speed range you will have no need to worry about structural failure.

Again, make certain that your first flight in the Baby Ace is made under the supervision of your local CAA Agent. He will discuss your flight path and propose maneuvers before allowing you to "take her up." He will also make suggestions that will result in safe and sane flying for you and those who may fly the plane after it is certified. HAPPY LANDINGS! EXP