JDT MINI-MAX LLC MODEL 1100 CONSTRUCTION MANUAL
BASIC MINIMAX, ROTAX ENGINE

IMPORTANT NOTICE TO PURCHASER

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MODIFICATIONS

JDT MINI-MAX LLC cannot sanction any modifications to the MINIMAX design from the published plans. We are aware that some individuals purchase plans with intent to modify them and we do not mean to abridge this freedom. However, any changes may create an unsafe aircraft and therefore void the use of the name MINIMAX in any form, such as "Smith MINIMAX". Persons modifying the aircraft must use another dissimilar name, particularly if the aircraft is to be registered as "Experimental", under the amateur built regulations. The intent of this policy is to protect our product image against another's experimentation, hence all parties are enjoined from the use of our product name in connection with such experimentation.

PLANS

Photo reduction processes make it impractical that drawings be scaled. The only exception is the wing rib drawing which is full scale. At first glance, the drawings may appear to be quite confusing, and may discourage the builder from even attempting to build this aircraft. However an aircraft can be built more simply from a very highly detailed set of plans than from plans that look very simple but give little information. The best procedure is to pick a plans sheet or sheets showing the details of one part that you wish to build first, such as the elevator and stabilizer assembly. Thoroughly study these details first to become familiar with the processes needed to build the part. Do not go on to the rest of the plans at this point. By the time you have built one or two pieces of the aircraft, the rest of the procedures will become much clearer and will readily fall into place.

Plans Only Customers: If you decide to order a miniMAX kit within 3 months of receipt of your Plans/Construction Manual, the cost of the Plans/Construction Manual will be deducted from the price of your kit.

WORKING AREA AND CONDITIONS

Building an airplane is not a single big job, but rather a large collection of small jobs whose degree of simplicity or difficulty independent of the builders skill is influenced to a large degree by the available work area and conditions. Airplanes similar to MINIMAX have been built in surprisingly illogical places, so the task can be done without formal shop facilities. However, a suitable space where the work can be left standing is desirable. Since the MINIMAX disassembles into components of convenient size, the standard one car garage with a workbench across one side is suitable for the entire job. The minimum bench area recommended is approximately four feet wide by fourteen feet long. The ideal workbench construction would be to build a frame of 2X4 s or 2X6 s to support two 4 foot by 8 foot panels of either plywood or particle board 5/8 or 3/4 inches thick that may be set on sawhorses to allow moving the entire assembly as required. In building the bench, it is very important that the surfaces be flat and true, that is, there should be no twist from end to end and no bow in the center of the bench. If these are present, you will build them into the wing structure, or the fuselage, which will result in a warped or twisted structure. We recommend that all structures be glued with epoxy supplied with the kit. This is a very simple, easy to mix, two-part resin that has very good gap filling properties and is not critical on temperature. Therefore, any temperature suitable or comfortable for the builder will be suitable for the glue. However, the resin will flow, mix, and spread in an optimum manner when kept at about 75 degrees F.

TOOLS

As with the work area, MINIMAX may be built with the minimum of tools, but the job will be greatly simplified and the plane will be built much faster by having a good selection of power equipment and hand tools. For minimum building effort and maximum speed, we recommend the use of, or access to, a table or radial arm saw, saber saw, band saw with metal cutting capability, drill press, electric hand drill, wood file or rotary rasp that may be used in the hand drill, numerous small C-clamps and spring clamps, vise, tack hammer, small hammer, screw drivers, tin snips, carpenters square, measuring tape, saw horses, open end wrenches, etc.

WORK PRACTICES

Many work hours may be saved and the various jobs simplified by organizing the work in an efficient manner. While circumstances will dictate different procedures for different people because of equipment, availability of materials, and so forth, a few time saving suggestions can be followed by almost everyone:

1. Cut as many pieces of a size as possible at one time. Much time is wasted resetting the tool (power saw, drill press, etc.) when pieces are cut singly or a few at a time on an as needed basis.

2. Mix glue with specific jobs in mind. Much glue is wasted by mixing too much for a particular job. Pot life of the epoxy is about 30 minutes, so it cannot be saved for another job. If quite a few items are to be glued over a fairly long continuous period, such as installing all of the wing ribs, etc., plan on mixing several small batches of glue over that period of time. Small batches are easier to mix and there is no question of approaching the pot life as the job goes on. Similarly, take precautions against running out of glue in the middle of a big job such as wing spars, and so forth. Mix small batches instead of one big one, or have a helper mixing glue as you are using it. The best applicator for applying the epoxy is a small stick cut from Lexan plastic about 1/16 inch thick, 3/8 inch wide and about 3 inches long. Taper the end and thin it with a sandpaper block to make the end flexible. This mixing and spreading stick may be used over and over by sanding off the cured glue.

3. Use systematic work habits. Try to plan the work on individual jobs ahead for several days so as to have all the materials on hand and organize the most efficient sequence for doing things. Much time can be lost by wondering what to do next and then figuring out how to go about it. Try to work on related jobs in sequence so that wood parts for several can be cut at one time, etc. Try to set up specific times for working with an ideal objective of being able to get some little thing done every day, even if it is just removing clamps from the previous day's work.

4. Avoid obstacles to progress. One of the major roadblocks of any shop project is the objection by family members that domestic obligations and relations are neglected for the project. This is an internal matter beyond the scope of this document, but is still a major item for consideration. Other than the family situation, there are three major human causes of wasted time in construction projects. The first is the eager friend who is anxious to be helpful but doesn't know anything about building airplanes or even handling tools. By the time you show him how, check his work, and usually do it over, you could have done it several times yourself in addition to the job you are working on. The exact and highly desirable opposite to this type, and unfortunately very rare, is the experienced person that can be handed a job and be forgotten for a while as he gets the job done with no fuss. The second time killer, more often plural than singular, is the curious and friendly type who comes around from time to time to see how you're doing, and brings a friend along who has to have the whole project explained in detail from the beginning. No work can be done at all during most of these visits and the visitors are very seldom inclined or qualified to help. A sub-category of this type is the one with whom a little knowledge is a dangerous thing and who is always trying to improve your design to death by suggesting all sorts of things - from little refinements to major rearrangements - that will be made with your time, money, and materials. One unforeseen by-product of both categories is the added expense to the overall job resulting from the amount of your groceries, beer, coffee, etc. that they consume while sitting around keeping you from working. The third major theft of your working time is yourself. As the plane begins to go together, it is entirely too easy to gaze dreamily at it by the hour admiring your own handiwork and engaging in all sorts of flights of fantasy while sitting in the cockpit of an unfinished fuselage perched on a couple of sawhorses. Even if you don't feel particularly ambitious when you go out to the shop, or time is short, try to make some tangible progress. Don't goof off for the whole work period by kidding yourself with the thought that you will really bear down tomorrow, or next week. Overdoing the improvements can often be a problem, although in some cases it stems from improved skills as the job progresses. There may be a big difference between the first rib build and the last so that it may be desirable to scrap the first few and do them over. Your own standards and cost considerations will be your only guide here.

RECORDS AND PAPERWORK

It is a very good idea to keep track of all purchases of material, whether it is from the kit or from the hardware store, as you build the aircraft. Also, keep track of the time involved in making various components, so that you will be able to pass this information on to those who will ask you just how long it took you to build the aircraft. It is best to start a logbook on both cost of materials and time, especially if the aircraft is to be registered as a homebuilt with the FAA, since they will require that you keep records and receipts of the materials used in the aircraft.

CONSTRUCTION PROCEDURES

Those who are generally familiar with aircraft construction and repair should have no problem at all with any phase of building MINIMAX. Those unfamiliar with aircraft practice or skilled in only one specialized field should consult with their more experienced friends before proceeding if at all possible. In any case, it is strongly recommended that anyone building MINIMAX or any other aircraft obtain information from the Experimental Aircraft Association regarding the many manuals and publications available related to procedures for construction of aircraft. It is impossible here to detail procedures down to the fundamental level of how to hold a hammer. The drawings and instructions, by necessity, presuppose a certain level of competency. There are, however, certain construction procedures associated with aircraft construction that should be mentioned as follows:

WOOD:

Wood aircraft construction differs considerably from traditional wood furniture or cabinet making procedures. There are no mortise, tenon, or dovetail joints in aircraft. All wood to wood joints are by glue in shear or by bolting. Bolt heads or nuts bearing against the wood opposite a metal fitting should be backed up by large diameter wood washers. Wood screws are never used as a primary means of joining parts. Small nails are used only to hold glue joints together under pressure while drying and then become entirely redundant. Wood surfaces should be protected from damage during clamping by means of back up blocks to distribute the load. If you are cutting your own wood parts from scratch such as lonerons and spar caps and are not familiar with the grades used for certified aircraft, it is recommended that you use wood certified for aircraft use, available from reputable suppliers, or that you get publications detailing how to select proper grain, grain runout, annular rings per inch, etc., and get expert assistance before attempting to make parts for these critical areas. If you have no prior experience in this field, do not try to grade wood from your local lumber company yourself. Before cutting any wood, select the longest, straightest pieces to be used for the spar caps and longerons and cut smaller pieces from the remainder. Some of the parts included in your kit, such as Spar Caps and Longerons, are specifically selected and cut for grain quality. DO NOT use these pieces for any other parts or attempt to substitute other wood in the kit for them.

METAL:

There is very little metal, with the exception of tubing, used in MINIMAX. Most of the fittings are cut from aluminum bar, angle, and tubing. A small number of fittings are cut from 4130 steel. Very little bending is required. No welding is necessary. Make every effort to hold dimensions on the metal parts as closely as possible since several of the parts must fit together. It is highly recommended that holes be drilled slightly undersized (about 1/64 inch smaller than specified) so that as the parts are assembled they may be line drilled to ensure that they will line up properly for bolting purposes.

HARDWARE:

Aircraft are assembled with special high strength fasteners manufactured to close tolerances, therefore never use hardware store items. Plans call out all hardware by an "AN" number, "AN" meaning "Army-Navy" standard . Use of other than AN hardware unless otherwise stated on the drawings is unacceptable.

RAW STOCK NUMBERS

All of the material used in this aircraft has been given a "raw stock" (RS) number. This indicates that you will use that numbered material to fabricate the part where the given number is indicated on the plan. Several different shaped parts may be made from the same basic RS number. In the case of most solid wood and plywood parts the indicated RS number will be for material cut to thickness and width. You will cut to length as required. Note from the following list that each material has a series number - for example, all aluminum angle will have numbers from 200 through 299, steel tubing will have 600 series numbers, etc.

To help you better identify pre-cut material, the following list is provided:

RS-0	Uncut Pine lumber, 3/4 inch thick
RS-1 thru RS-50	Cut Pine.
RS-51 thru RS-99	Cut Plywood.
RS-100 thru RS-199	Aluminum Bar.
RS-200 thru RS-299	Aluminum Angle.
RS-300 thru RS-399	Aluminum Channel.
RS-400 thru RS-499	Aluminum Tubing.
RS-500 thru RS-599	Aluminum Sheet.
RS-600 thru RS-699	Steel Tubing.
RS-700 thru RS-799	Steel Sheet, Bar, Etc.
RS-800 thru RS-899	Misc. Materials, Plastics, Etc.

FUSELAGE

Fuselage Sides:

1. Per drawing 1, snap a chalk line at the top edge of your work bench. Nail down a 3/4 " thick strip per print. Be sure it is perfectly straight as it will be used throughout the entire construction and assembly of the aircraft.

2. Draw in the reference line at 90 degrees to the strip. From this line and the 3/4 " strip locate the various dimensioned points and draw all connecting lines.

3. Draw in all vertical and diagonal members. Note that members 2 and 4 are not quite vertical.

4. Roll heavy duty wax paper across the fixture to cover all areas where glue joints will be located.

5. Cut locating blocks from 1/2" plywood about 1" X 2".

6. Place the top longeron in the fixture with the diagonal scarf joint between station 3 and 4.

7. Place 2 or 3 plywood blocks to hold longeron in place.

8. Install lower longerons and locate with plywood blocks.

9. Cut all vertical and diagonal members and block in place. Don't overdo the blocking, as many of the members will stay in place by themselves.

Note: Try to keep all joints as accurate and tight as possible. One of the best ways to do this is as follows: Lay the RS piece on the fixture and mark only one end at the correct angle. Cut this end and fit into place. Now mark the other end at the correct cut off angle and cut it slightly over length. Check for fit and trim as necessary using a belt or disc sander. If members tend to slide out of position during fit up, hold in place with a staple.

10. After all parts have been cut and fitted, began the gluing operation. Remove one part at a time, starting with the upper longeron scarf joint, and glue. Next add verticals and diagonals. A few staples will hold joints tight until the glue dries, then remove staples.

11. Allow the assembly to dry overnight. Pull staples and sand joints to remove the glue "squeeze out". Do not remove from the fixture.

12. Build another side directly over the first. Place small strips of wax paper between the sides at all glue joints. Locate members over each other with small wood blocks and C-clamps, and staple as required.

13. Remove the sides when dry and clamp plywood sides (RS-657) in position. Draw pencil lines all around outside edges per dwg. 1. Cut to shape and reclamp to the side frame.

14. Now with soft pencil draw around all uprights, diagonals, longerons, etc. Remove and reclamp on opposite side of frame. Again, draw around all the members. This permits you to know exactly where to scuff sand plywood before gluing, where to place glue, and on the opposite side, where staples and nails are to be placed.

15. Side plywood panels may now be glued permanently in place. Use 5/16 staples on the centerline of members, about 1" to 2" apart.

16. Trim plywood end panel (RS-655) to shape shown in dwg. 1 and locate on side frame.

17. Cut ply strips from RS-651 and fit to sides.

18. These parts may now be glued in place. Be sure to make one left and one right hand side.

19. Glue RS-654 to inside of forward fuselage. These will be the insides of the engine compartment. Cut and glue RS-562 seat belt doublers to inside of both sides, per drawing 1.

Time to take a break!

Fuselage bulkheads:

1. On plywood panel RS-668, locate notches, the access opening, etc., and cut, per drawing 2.

2. Glue RS-9 member to bottom as shown. When dry, set table saw blade to 9 degrees and bevel cut as shown, or use a block plane if a table saw is not available.

3. Next, build up rear spar carry through and motor mount base per drawing 2.

4. Check all corner notches for fit by placing on fuselage sides.

Fuselage assembly:

1. Snap a chalk line down the center of the workbench. This is the centerline shown on drawing 3.

2. Place sides on the bench top with top longeron against bench top.

3. Slide station 4 member into position between sides. Note straight area between stations 2 and 4.

4. Nail wood strips into bench on the outside of the fuselage sides to maintain this straight section.

5. RS-11 cross member at station 2 is 22-3/4 inches long. Cut and locate in place, per drawing 4.

6. Cut two members the same length from RS-8 per drawing 3 and drill holes as shown. Locate these on lower longeron at 43-3/8 and 52-1/8 inches per the drawing .

7. Glue all of the above in place. Glue the rear spar carry through to the back of the station 4 bulkhead per drawing 2. Note that the fuselage side uprights are sandwiched between the plywood bulkheads.

8. A couple of crank-up bar clamps will hold sides together while the glue cures. Staple and/or nail plywood bulkheads to uprights as required.

9. When dry, fit motor mount base into front of fuselage and bend sides inward until contact is made. Base will rest on the horizontal RS-8 members located about 1/3 of the way up on either fuselage side.

10. If fit is OK, glue in place. Again note straight section in dwg. 3. Pull the fuselage side panels tight against the motor mount base sides using wood screws with a flat washer under the heads. When dry remove screws and plug holes with glued in wood plugs.

11. Cut top cross members (located at 17-1/2 inches and 31 inches), and bottom cross member (located at 17-1/2 inches) from RS-6 and install. Also cut and install RS-9 member at the front edge. Allow to dry. Use framing square to make sure fuselage sides are perpendicular to bench top at all times throughout assembly.

12. Locate plywood panel RS-670 over bottom of fuselage per dwg. 3. Draw around side and end and cut to shape.

13. Glue and staple into position.

14. When assembly is dry, join both rear ends together with RS-0 blocks, as shown in drawing 3.

15. Use locating blocks nailed to bench to ensure longerons are straight from station 5 to rear.

16. Cut all cross members from RS-6 and fit in place on both top and bottom of fuselage.

17. Glue all members in place. Be sure to place scraps of wax paper under all joints in contact with work bench.

18. Cut slots in RS-651 as required to permit bend in area between station 4 and 5. Glue in place, as shown in drawings 3 and 4.

19. At the top of drawing 3 are views of stations 5, 6, and 7. Note gussets in corners. Cut them at 45 degrees from RS-652, and glue in place per the dwg.. Due to fuselage taper, the gussets will not lay flat on both uprights and crossmembers. Use small 'C' clamps and/or staples to pull them in as tight as possible.

20. Now add the diagonals cut from RS-6 shown on bottom view, drawing 3. Also glue in the diagonals across the fuselage, as shown in the views of stations 5, 6, and 7.

21. When dry, remove from bench top and turn upright.

22. Cut cockpit opening pieces shown on drawing 4.

23. Glue RS-8 doublers to longerons along the cockpit sides. Glue RS-6, RS-9, and RS-5 cockpit corner bracing members in place. Let glue cure.

24. Glue RS-651 strips to top longerons and doublers. Glue 1/8 inch plywood triangular reinforcements as shown.

25. Cut and fit but do not glue plywood RS-670 over front end of fuselage. The short section behind the seat back may be glued in place.

26. Cut plywood front seat support bulkhead from RS-661 per drawing 4. Add RS-8 and RS-5 upper and lower crossmembers. Bevel top to match the seat angle and install in fuselage.

27. Cut seat board RS-592, but do not glue into fuselage. It is held in place with two wood screws so that it may be removed for inspection of the control assembly. Attach seat back, RS-676, to seat board with aluminum hinge and 3/16" bolts and nuts (from local hardware store).

28. Cut RS-654 plywood panel to dimensions shown at top left of drawing 3 and glue to rear end of motor mount base. Notch top corners to clear the upper longerons.

29. Sand or plane the front end of fuselage sides square or straight across so that the plywood nose skin, RS-542, may be glued in place, as shown on drawing 10.

30. All edges of the fuselage are rounded off by planing and sanding, or with a router. The exception to this is where the landing gear legs mount, directly under the stabilizer, and a small area where the top of the airfoil meets the top edge of the fuselage. Just let the radius run out to square edges in those areas.

EMPENNAGE

There is no way to build a structure of this size that is very light, very strong, and also very simple without some compromise. Ultralights require components that are both strong and light. The problem is to make it as simple as possible.