

Hints For Building Vacu-formed Plastic & Resin Models



BASIC INSTRUCTIONS FOR BUILDING ANY MODEL KIT. (please read/understand the instructions and become familiar with **all parts BEFORE** starting assembly of your kit!)

Removing vacuformed parts. Start by outlining the plastic parts with a **sharp-pointed "Sharpie" permanent marker pen** with the pen held at a 45° angle to the flat surface of the plastic sheet with the mark being made in the angle where the "kit part" and the surplus "non-part" plastic meet. Next, most modelers use a # 11 Exacto blade drawn backwards (and held at a 45° angle to the flat surface of the plastic sheet) to make a scribed line around the model parts. Then, snap off the unwanted plastic from around the parts - it may take a couple of times scribing to get the plastic to snap off easily. Any mistakes can usually be repaired with model putty or gap-filling super glue (work carefully & don't make mistakes!). Once the parts have been cut out, the "45° angle raw edge" of the plastic part must be removed by filing/sanding. Sand/file the parts to make a smooth perfectly-mating edge with its mirror twin. In the sanding/filing process, I use a fine-cut double-bastard file (a mill cut file is OK, but the other works faster to get down to the sanding process). Start sanding just prior to filing off **all** of the "45° raw edge" - to sand, place a large sheet of 150-200-grit sandpaper on a flat surface like a piece of glass/table-top and move the plastic part in a gentle circular rubbing motion over the sandpaper (rubber cement will help hold the sandpaper in place). You will **know when to stop** the filing/sanding process when the **sanded edge** reaches the **remaining permanent marker line**. If you choose to cut the parts out using scissors, leave a very small edge of the main plastic sheet projecting out from the part - use this edge as your guide to know when to stop filing/sanding - stop sanding/filing the part when there is only a paper-thin feather-edge remaining.

Resin parts: Carefully remove any resin flash by filing or carefully cutting with a modeler's knife. Examine resin parts for any evidence of distortion or bending. If any parts are bent/distorted, soak in 160-180 ° hot water for 3-4 minutes, then using your fingers, carefully re-align the part and let it cool on a flat surface. Carefully wash **all** of the parts in alcohol then in warm soapy water to remove any mold release agent remaining on the resin (for Wings Models, this is normally only a very faint coat of vaseline dissolved in mineral spirits, and thus, is easily removed.). File/sand off any casting defects and/or fill small holes/scratches with putty, then sand carefully. For parts that must mate with other resin parts, use the 150-200 grit sandpaper sanding technique mentioned above to make the mating part edges perfectly flat & smooth (sand until there is evidence of "sanding" on all edges and "mirrored" parts mate properly.) Correcting tiny dimensional differences/cracks in joints, etc. should be withheld until the major sub-components (fuselage, wings, etc.) have been assembled. Sanding with a finer grit of sandpaper is not needed because a little "tooth" on the edges is helpful in making the glue hold better. CA glue, epoxy glue or Elmer's white glue can be used to join resin parts. I prefer to use a "5-minute two part" epoxy glue (sets in about 5 minutes & you mix equal parts of epoxy & hardener) - this glue gives time to make adjustments to perfectly align the parts before the glue hardens. White glue takes 30-40 minutes to set and CA glue gives you only about 20 seconds or less before hardening. Where possible, use rubber bands, clamps or a jig to hold the parts in perfect alignment - holding the parts with your fingers makes the setting time seem to take at least ten times longer! **Resin dust is harmful when inhaled** - wear a paper dust mask when filing/sanding resin.

Two-piece Wings, elevators, rudders, etc must be filed/sanded so that the edges form a natural contour, which means the trailing **inside edges** are filed/sanded to a very sharp angle with a very thin sharp edge (a thick trailing edge spoils a nicely done model!) If there is a small gap every now and then, fill it with gap-filling super-glue, thick model paint or model putty. There will be some imperfections on the plastic caused by the tiny holes in the model's mold through which the vacuum is created when the model is made; these and any other imperfections must be sanded off/filled with putty/gap-filling CA glue/model paint as needed.

Cutting flat parts: Often, the flat parts such as struts, instrument panels, etc. are very hard to see on the plastic sheet because their engraved outline is very faint. This can be remedied by taking a sharp pencil and while holding it nearly flat, rubbing back and forth across the flat pieces - this will make the engraved lines become nicely visible (rubbing with carbon paper will also do the trick, if you can find any carbon paper these days). For removing these pieces, I generally use a sharp pair of regular scissors to cut them out rather than using the normal scribing technique.

General info: Occasionally, after a part is removed from the plastic sheet, "tension" created during the vacuform molding process will cause the part to bow slightly (mainly fuselage halves). If this causes problems with the joining process, gently cut the bowed part's edges in several places, deep enough to allow the part to lie flat, then using scrap material, glue a reinforcement piece *inside* the fuselage to correct the warp - when the glue has dried completely, fill the cut areas with putty/gap-filling CA (I use gap-filling CA glue with an "accelerator" spray to dry the CA instantly). When using CA glue as a gap-filler, sand/file it soon after it sets - if you wait until the next day, the glue area will be VERY hard and difficult to sand/file. Next, sand the repaired areas smooth. Occasionally, a part will

not fit properly - **MAKE IT FIT!** - carefully cut/file/sand the part down to size or fill any gaps/cracks with model putty (or cut a new larger part from scrap plastic).

Model assembly: Do a lot of test-fitting prior to assembly! It will help to glue small tabs of scrap plastic on alternating sides inside the edges of the two fuselage halves to give the glue more holding surface. You can also glue a .030/.040 thick styrene strip inside the model cavity along entire edge thus doubling/trebling the edge thickness (preferred technique) To get full benefit from this technique, make sure you glue the strip along the edge of the plastic part, then sand off any of the strip material that prevents the mating edges from joining perfectly.

Some modelers use expanding plastic foam to fill the cavities of large wing/fuselage halves (allow the expanded foam to cure/harden completely before filing/sanding the foam to enable the parts to mate properly). This really gives rigidity to large model fuselages and wings! Test your foam on a small piece of plastic to see if they're compatible before filling the fuselage cavities! If you use foam, glue a styrene strip along the part edges, as described above - this gives you a heavier & stronger gluing surface, then wait until the foam has fully cured and file/sand the foam-filled part smooth.

Keep the vertical and horizontal axes of your model in mind and do not allow the model to become warped/skewed/twisted during the joining/assembly process. This is especially essential during the joining of wings/horizontal stabilizers to the fuselage, mounting landing gear and engine nacelles, etc. If the vertical stabilizer/rudder is cast as an integral part of the fuselage, use it as the reference guide in keeping other parts properly aligned. If this is not the case, drill a tiny hole in the center-line of the fuselage and insert a small pin/straight wire to act as the alignment reference - later remove the pin & fill/sand the hole. Warped/miss-aligned parts should be carefully broken/cut apart, re-aligned and re-joined. If your model does not include wing "spars", it will strengthen the wing/fuselage joint if a "spar" is crafted from scrap material - it should fit into and be glued to the fuselage body, have the correct dihedral for the wing joint and fit snugly inside the upper/lower wing halves. Small wooden dowels work fine as spars for joining the horizontal stabilizer. In gluing the wing/horizontal stabilizer halves to the main fuselage, a "jig" is useful to maintain correct alignment during the joining process. On **tricycle landing-gear** models, don't forget to put some **weight** in the nose **prior** to gluing the fuselage halves so the model will sit correctly on it's landing gear - this saves cutting a hole to insert the weight and then repairing the hole!

Check for small defects: Prior to assembly, spray component parts with a very thin light coat of gray/light blue flat-finish model paint - defects will show up very clearly. **Do Not** paint areas to be glued/joined later during assembly because paint interferes with making strong glue joints! **Do Not** use a brush because you will put on too thick a paint coat which will over-fill panel lines, etc and will be difficult to remove. Use a scribe tool or the back of a #11 Exacto blade tip to remove excess paint/other material from panel lines - be sure to use a firmly held/securely taped light metal straight-edge to guide the scribe tool - otherwise, I assure you that you will slip and have a mistake to repair - it's Murphy's Law!!

Gluing: Do a lot of test-fitting prior to gluing! DON'T USE TUBE GLUE - USE LIQUID STYRENE PLASTIC GLUE! Liquid styrene glue dissolves a thin layer of the plastic and "welds" the pieces together. Good brands include Testors (red & black square plastic bottle) and Tenax R7 - both brands are readily available at Walmart, most model shops and in our eBay Store & web-site - though most any brand will work fine. Don't dip your glue applicator into the bottle/container of liquid glue - this will put too much glue on the applicator and too much glue on the model part resulting in a mess! Place a very small amount of liquid styrene glue in a metal bottle lid or on a small metal disc (I use the top from a Minute Maid frozen orange juice container). The amount of glue on the metal lid should be about half the size of a dime or smaller - larger amounts are wasteful because the glue evaporates very quickly. Dip a small size flexible (not stiff) round pointed-tip paint brush in the liquid glue, then apply the glue to the part to be glued by stroking the brush from inside to the outside of the part. This keeps excess glue on the inside of the model part - glue on the outside makes for a mess - smears, fingerprints, etc - which must be sanded off!

CA (cyano-acrylic) glue (super-glue--instant glue--etc) uses moisture in the air (or your fingers) as a catalyst to set the glue almost instantly, so be careful not to stick your fingers together (NOTE: **Always** keep a bottle/spray can of CA glue de-bonder handy to use in such emergencies!) I use the "Zap" brand though most any brand will work fine. Keep your CA glue fresh and store it up-right to prevent it from leaking - (once opened CA glue has a short shelf life of 30-90 days depending on how well your bottle cap fits!). I also use a long applicator nozzle with a small hole to put out only a tiny amount of glue (a tiny drop is all that is needed - using more is wasteful & probably messy). For applying very small amounts of CA glue, use a small/medium sewing needle with the end of the needle eye filed off - stick the sharp end of the needle in a short length of small diameter wood dowel to make a handle - put a small drop of CA glue in a metal lid & dip the "eye-end" of the needle in the CA glue, then touch the glue-filled needle eye to the parts to be joined - capillary action will make the glue flow into the joint making a clean glue joint with no mess.

Putty: I use **Squadron White Putty** and often, some red-colored auto body putty I bought at the auto parts store. Putty must attack the plastic in order to stick to it - therefore, apply the putty in very thin layers, otherwise it will shrivel your plastic parts up like a prune! I use a putty applicator tool to apply the putty but an Exacto knife blade will also work well (Wipe the wet putty off of your applicator tool before it dries). Discard/remove any dried putty around the tube opening because it won't stick very well - use only

fresh moist putty for best results and let it dry very well before filing, sanding or adding another layer of putty. **Gap-filler CA glue** also works very well as a putty although it may take several applications to fill large areas such as wing/body fillets - if you use an accelerator (mine comes in a little spray can) to fix the CA glue instantly, the "build-up" process won't take very long. Gap-filler CA glue is especially useful in filling engraved panel lines that need to be covered up or re-drawn. To repair light/small scratches, I often use 1 or 2 coats of very **thick/heavy model paint** applied only in the area of the scratch - allow the paint to dry thoroughly before sanding (sanding sticks such as those from Squadron are very useful here!). Carefully file/sand the repaired area by finishing with 400-grit or finer grade of wet/dry sandpaper or a fine/super-fine grit sanding stick. Most putty can be "thinned" by mixing in a tiny amount of liquid styrene glue, but be extra careful using the "thinned" mixture because it really attacks plastic material and can cause the part to shrivel/wrinkle badly - just be careful and apply only thin layers of the mixture. Talcum powder mixed with slow setting CA or liquid styrene glue also makes a good putty for large cracks, fillers, etc.

Errors/Mistakes: **ALWAYS read & re-read the model's instruction sheet prior to starting building your model to avoid making dumb mistakes!!!** The vacuform process sometimes makes the thickness of the plastic for deep-cavity parts become very thin and **susceptible to being crushed** (prop spinners, crew seats, etc). If this has happened, carefully push out the crushed part from the back-side. Some modelers will spread a thin coating of putty or CA glue on the inside of "thin" parts to give more rigidity. If possible, fill the thin part with model putty to give it rigidity and fill/repair/sand any imperfections caused by the crushing. Apply model putty in thin layers - it "attacks" plastic in order to stick to it and a thick layer of putty takes a long time to dry and may make your part become distorted and wrinkled. Carefully cut out vacu-formed plastic detail parts, such as props, spinners, wheels, etc., and fill the cavities with model putty, white glue, or CA gap-filling glue. Allow the glue to dry completely before lightly re-sanding the mating edges and gluing them together with CA or liquid styrene plastic glue applied with a small sharp-pointed paint brush. It is helpful to make a simple jig to hold/align prop and spinner parts, landing gear parts, etc. during the "build-up" process.

Bi-planes: They are harder to build than monoplanes, but when properly built, are things of beauty. If possible, drill small holes or make tiny slits in the wings to locate mounting points for the wing struts. Make and use a jig to help in holding the struts in position while the glue dries. To model the wing brace wires, use very fine-gauge nylon fishing line or nylon sewing thread, black or dark gray in color. Drill tiny holes in the wing to attach the "wires". Use a small needle to pass the "wire" through the wing, then glue it in place on both sides of the wing with a tiny drop of glue and when the glue is very dry, clip the "wire" on the opposite (outside) side of the wing. Fill and sand any imperfections/errors resulting from the "wiring" process. **(If anyone has a better "wiring" technique than my rather crude system, please let me hear from you!)**

Metal/resin parts: Most cast metal/resin parts will have some flash on them. Carefully file away the flash and finish the part by sanding starting with a 200-grit sandpaper and ending with a 600-grit or finer sandpaper. A good set of needle files are most helpful here - an Exacto knife blade will also work but will get dull very quickly. Use Elmer's white glue or slow-setting CA or Epoxy glue to attach metal/resin parts to plastic - liquid plastic glue doesn't work well here!.

Photo-etched brass parts: If you have the knack, skill and patience to use these teensy-weensy tiny parts, they really add to a well-detailed model. **HOWEVER**, for most of us, they are nearly impossible to separate from the brass parts fret without about half of them zinging off into the wild blue yonder never to be seen again - or being bent out of any recognizable/useful shape. I pick and choose the photo-etched parts that I can handle and that I think will add good detail to my model - instrument panels, wheel well covers, etc. Little tiny fragile levers 1/64th of an inch wide and 3/16th of an inch long are super difficult to remove from the parts fret and even harder to properly install. Just buy some very small gauge pins at the yard-goods/crafts section at Walmart and use those instead - properly cut to length (fine-gauge brass wire also works well here!), they'll be a little over-sized but will be sturdy and will look great.

Cockpit detailing: A cockpit back and floor, a seat, a control stick, two short plastic strips glued to the floor to represent rudder petals, a couple of thicker plastic strips representing radio and switch/instrument boxes along the sides of the pilot's seat, and a front instrument panel will suitably detail just about any model. An instrument panel can be made from scrap plastic by carefully cutting and dry fitting the panel to match to shape of the fuselage where it will be attached. The panel should be at least .060 thick (if you have no .060 thick plastic, glue several thinner pieces together). Using a pencil, draw a couple of lines across the panel to aid in lining-up the various "instruments." Make the instruments by lightly drilling small holes part-way through the plastic. Use two or three different sizes of tiny modeler's drill bits to make the holes that will represent different sized instruments. Study a photo of the prototype cockpit/instrument panel, if possible. Paint the instrument panel flat black and use a round fine-tipped brush to place a tiny drop of white or silver paint in each hole to model the various instrument faces. Rows of switches can be modeled by lightly sticking the tip of a #11 Exacto blade into the plastic; they do indeed look like toggle switches unless examined under a magnifying glass. Throttle levers and other levers are easily modeled (most folks just ignore their existence!) by using short lengths of pins/wire inserted into small holes drilled using tiny modeler's drill bits. Very realistic **shoulder harness/seat belts** can be modeled using very thin strips of masking tape with the harness hardware drawn on with a black-inked pen or a silver-inked pen. Generally, cockpits need to be installed in one of the fuselage halves **before** the halves are joined, or at least install the cockpit floor and back before the fuselage halves are joined.

Canopies: If such is present, leave the "cast-in" canopy part of the fuselage intact until the fuselage is pretty well finished because it adds rigidity and strength to the fuselage during assembly. **Installing the clear canopy should be one of the last steps in completing your model.** Prototype canopies most often slide backward and forward to open and close - this means they can be simply glued in place and will look pretty good. Carefully cut away excess plastic from the canopy using a small pair of sharp scissors and small files. **DON'T** use a knife - the knife blade may twist in your hand and cut into the canopy - ruining it. After the canopy is properly trimmed, file/sand the inside bottom of the canopy to match the contour of the fuselage where it will be mounted. *Use white school glue/Elmer's glue* to attach the canopy to the fuselage - it will dry clear and will hold fine. **DO NOT** use CA or styrene glue because it will craze/fog the inside of the canopy and ruin it. When painting the metal strips of the canopy, I mask and paint the vertical strips first, then mask and paint the horizontal strips - it seems to make the masking go easier than when you try to do both directions at the same time. I paint the canopy before installing on the fuselage - to hold the canopy during painting, place a little blob of modeler's clay or play-dough inside the canopy, stick a small dowel/pencil in the clay and secure the dowel in a small modeler's vise/clamp or vise-grip pliers. A light coat of acrylic floor polish, such as Futura, brushed over the finished canopy makes the canopy seem clearer. For opened canopies, it works best if you have two copies of the canopy to work with - that way, you can have the vertical metal strips on both ends of the "opened" parts of the canopy. For modern canopies that raise upward to open, model the opening/closing cylinders by using pins/wire/paper clips of the proper diameter.

Engines: Unless a separate cowling front piece is provided, engines need to be installed in one fuselage half **prior** to gluing the two fuselage halves together. Often, an engine-mounting template is provided and the engine is glued to this and the whole assembly is then installed in the fuselage (if such a template is not provided, make one from scrap plastic by cutting and dry-fitting it until there is a snug fit in the fuselage halves). Make sure that the engine is positioned so the prop can be correctly installed - not too far forward and not too far back! Paint the front area of the engine-mounting template flat black before installing the engine assembly - leave a spot in the center unpainted so the glue will adhere better. Many of our Wings kits that use a radial engine have a front and back row of cylinders provided. Unless I am going to open up the engine cowling to show a highly detailed engine, I generally omit the back row of cylinders because they don't show anyhow! If a cowling or cowling front-piece is provided, you can assemble the fuselage, glue the engine parts to the cowling/cowling front-piece and attach the cowling/engine assembly to the fuselage. To open up a vac-form cowling front, drill a small hole in the center of the cowling front, using an Exacto knife, enlarge the hole and carefully cut to within 1/32 inch of the desired opening size - wrap 200-grit sandpaper around a dowel, Sharpie pen, bolt or ?? that is slightly smaller than the desired opening - carefully sand until the opening is perfectly round and of the desired size. Engine exhaust pipe stubs can be modeled using a short piece of plastic sprue/brass rod/copper wire of the proper diameter. In the 1st row of cylinders of **radial engines**, one cylinder **ALWAYS** points straight up in the 12 o'clock position - in the 2d cylinder row, one cylinder always points straight down in the 6 o'clock position. Keep in mind that the engine's front row of cylinders may have some visible accessories that must also be properly positioned.

Pitot tubes, antenna masts, antennas, control sticks, etc.: It is hard to cast these tiny pieces from resin/metal and make them realistic-looking and durable/strong. I normally discard such kit provided parts and make new ones from needles, paper-clips or fine-gauge wire - these can be bent as necessary without breaking and are durable/strong! If you need a handle for a model's control stick, use some insulation from very small gauge wire or glue/wrap a couple of turns of paper around the metal part of the control stick. For WW I control sticks with a loop handle and for radio loop antennas, use small-gauge copper wire with the loop being bent around a nail/drill bit of the appropriate size (a small dab of CA glue at the end of the loop can be carefully sanded to make the joint invisible. Machine gun mounting rings can be modeled this way also. Wire antennas can be modeled by using very fine gauge nylon fishing line or nylon sewing thread, black or dark gray in color. Drill a tiny hole at the point where the antenna wire will be attached, knot the end of the "wire", push the knot into the hole and add a small drop of glue to fix the antenna wire in place.

Landing gear and wheel wells: Wire/cast metal landing gear struts are stronger than resin/plastic landing gear struts. Landing gear struts can be modeled with wire/brass rod of a proper diameter bent to the shape/contours of the prototype. Flat areas should be filed before bending. Larger diameter areas such as hydraulic sleeve ends or strengthening areas can be modeled with insulation from electrical wire or by gluing/wrapping several turns of paper to make the enlarged diameter area. Hydraulic dampening scissors can be cut from brass shim stock or thin plastic sheet material, bent to an appropriate angle and glued to the landing gear strut. A short piece of pin/wire glued to the inside of the angle will model the scissors joint pin/bolt. To securely attach the landing gear struts to the wing, a thick block of plastic should be glued inside the wing/wheel well **after** the "wheel well" areas of the wing surface are cutout/opened and **after** the wheel wells are installed or **before** the wing halves are joined. Drill a mounting hole in the plastic block in which to glue the landing gear strut. If wheel wells are not provided, they can be easily modeled by gluing formed plastic strips and a wheel-well top to the bottom wing half before the wing halves are joined. Carefully remove the area of the bottom wing half that is represented by wheel/wheel well covers. Paint the inside of the wheel well zinc chromate green/interior green.

Decals: Use **ONLY** water-slide-off decals. **DO NOT** use stick-on decals - they will make your model look like a ridiculous toy! Carefully cut out the decal parts using a small pair of sharp scissors. Soak the decal part in warm water until the decal paper absorbs enough moisture to let the decal slide off of the paper. Leaving the decal in the water too long may cause the decal's glue to be washed off! Use tweezers and a pin to position the decal on the model, then use a paper towel to blot off any excess moisture. Next, apply a

coat of Walther's "Solvaset", Microscale's "MicroSol" or "MicroSet" or other decal setting solution to make the decal snuggle down around rivets, panel lines, etc. Use paper towel to help "snuggle down" the decal and blot off excess decal setting solution (leaving the decal setting solution on the decal for long periods of time may cause the decal to shrivel). If you're not sure of the quality of your decals, spray/brush on a coat of acrylic floor polish or even better, a coat of Microscale Liquid Decal Film before cutting the decal apart (this also repairs old/cracked decals). Apply decals **ONLY** on a **shiny glossy** paint job - matt/flat paint jobs will cause "silvering" of the decals. When the model is completely decorated, you should spray the model with a coat of Walther's "Dullcoat" or Microscale "Micro Coat" flat or satin coating - this will seal the paint, make decal edges disappear and will give the model a more natural look.

Painting: Test the compatibility of your model's plastic and the paint you are using to make sure it doesn't crack/craze/distort the plastic. Most water-based paints/enamels are OK; most solvent-based paints will attack plastic. Before painting, if your model doesn't have engraved panel lines, control surface lines, etc., carefully scribe these lines on the wings and fuselage surfaces or, after painting, draw them on the model by using a sharp pointed black-lead pencil (Wings Models already have these details expertly molded in place!). Spring-type wooden clothes pins make good holders for painting small pieces - cut a small v-notch in one side of lip to help keep the part properly located.

Metal parts: Since styrene cement has little effect on white metal or resin, such model parts should be attached using CA (cyanoacrylic) glue (e.g. Super glue), fast setting epoxy glue or white Elmer's glue. We recommend using slow-setting epoxy or a thicker slow-setting "gap filling" CA where parts need time to be positioned. Once in place you can use an accelerator to bond the parts instantly. These products can be found where ever hobby supplies are sold. Paint will adhere directly to white metal parts. However, using a very light coat of primer first will guarantee adhesion of the of the paint. A set of miniature files comes in handy for removing mold parting lines while fine gauge wet-or-dry sandpaper (Squadron's sanding sticks really work great here!) aids in further "clean up" and polishing areas that represent polished steel. A variable speed rotary tool can be useful for detailing certain areas. Just be careful not to grind on your fingers and ALWAYS wear eye protection. I knew a guy once that!

Other handy modeling tools: Several sizes of Modeler Knife handles plus an assortment of "Exacto" blades, Exacto scraper blades (round, square & pointed, etc.), a good set of sprue cutters, good small diagonal cutters, small modeler's needle-nose pliers, set of riffler files (has curved tips for filing concave surfaces), a set of miniature files (about 8-10 files of assorted shapes - about \$10), a set of small wood-handled assorted files (flat, round, triangular, square, etc - about \$15 at Lowe's), a small double-cut bastard file or two (mill cut files generally cut too slow for me! - files do become dull and useless, so replace worn-out files - a dull file is a problem - not a help!), a variable speed rotary tool and set of rotary tool tips of various shapes/sizes, a set of small gauge drill bits plus drill-bit holders for the drill bits, a scribe tool, a seam scraper tool, various tweezers and scissors, various grit sanding sticks (sorta like finger-nail emery boards), a set of modeler's scale rulers in what ever scales you are modeling, a good medium priced air spray gun/brush plus other helpful but not absolutely necessary doo-dads that your pocket book will allow - such as a small band saw (Delta-\$100 at Lowe's), a small sanding machine that has both a disc and a belt sander (Delta-\$100 at Lowe's), a small drill press (Delta-\$100 at Lowe's), a small shop vacuum (\$30 at Lowe's)!

As always, good photo references are necessary in order to achieve a model's detail accuracy. Close up photos of landing gear are essential when you're adding stuff like hydraulic and lines actuating cylinders - the same for cockpit details. Good detail photos can be found in our growing list of modeling books such as the Ginter book series, Schiffer book series, Squadron Signal In-Action & Walk Around series and the Detail & Scale series. You can find over 275 Aircraft/Armor books plus our line of modeler's supplies (tools, glues, & some paints) on our web-site <www.donsmodelworks.com> and in our eBay store. We can also special order most any model kit/item you need and we generally sell these special ordered items at 10-15% off from normal model shop retail prices (plus no sales taxes unless you live in Missouri!)

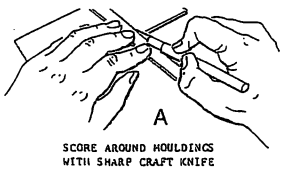
I hope all of this helps you get started - contact us by e-mail <wings@donsmodelworks.com> if you need further information or assistance.

Don Bennett, Wings Models, LLC

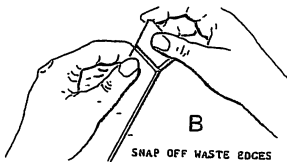
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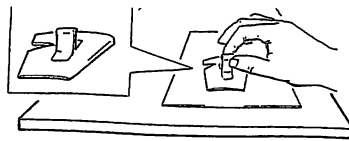
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SCORE AROUND MOLDINGS WITH SHARP CRAFT KNIFE

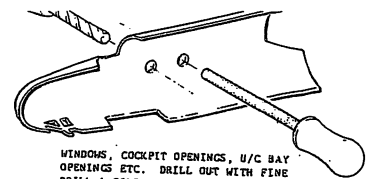


SNAP OFF WASTE EDGES

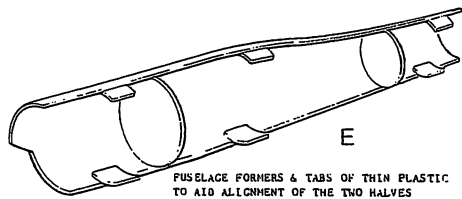


HOLDERS MADE FROM CARD

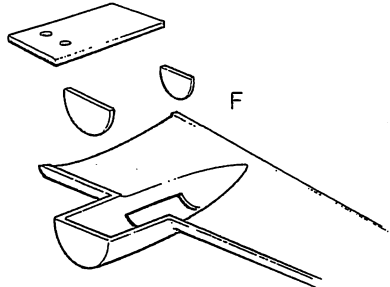
GLASS PAPER ON FLAT BOARD



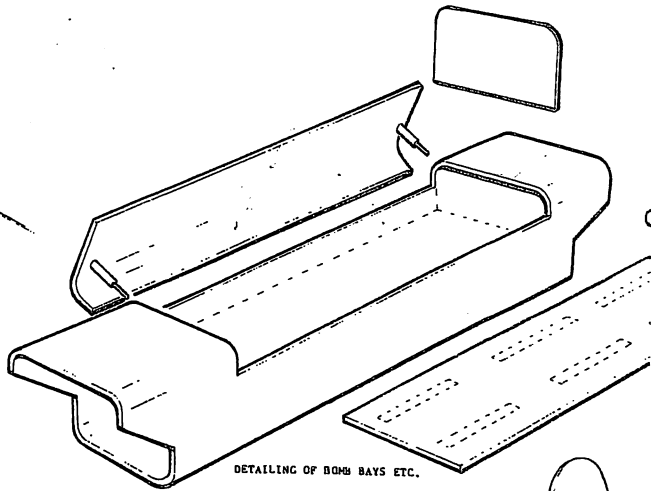
WINDOWS, COCKPIT OPENINGS, U/C BAY OPENINGS ETC. DRILL OUT WITH FINE DRILL & FILE TO SHAPE WITH NEEDLE FILES. SMALL WINDOWS BENEFIT FROM THE USE OF KRISTAL KLEER.



FUSELAGE FORMERS & TABS OF THIN PLASTIC TO AID ALIGNMENT OF THE TWO HALVES



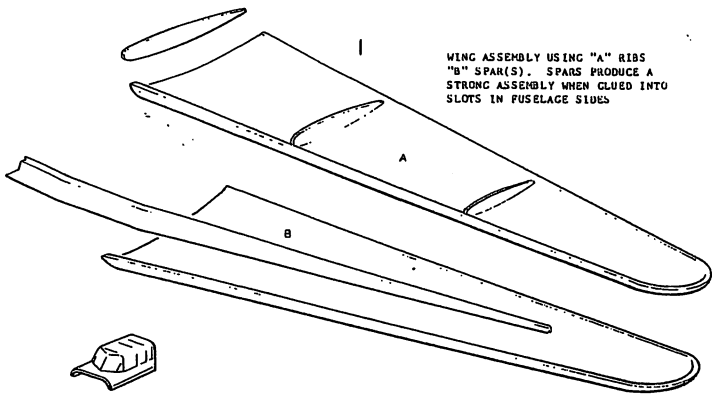
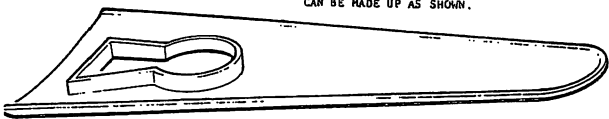
BOXING IN A NACELLE UNDERCARRIAGE BAY



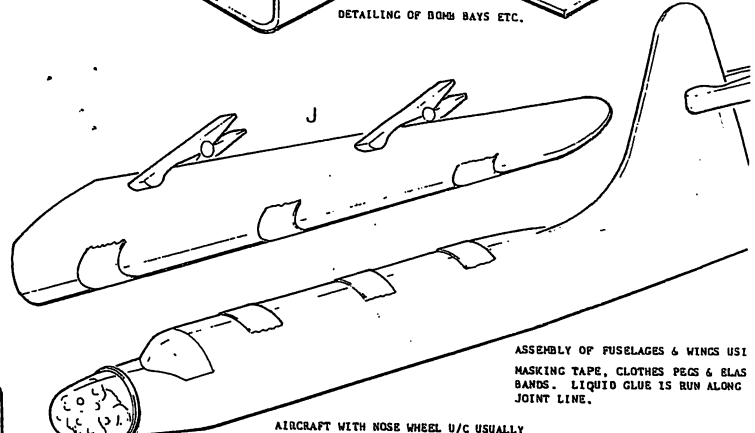
DETAILING OF BOMB BAYS ETC.



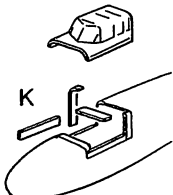
UNDERCARRIAGE WELLS MAY BE ALREADY MOLDDED INTO THE WING. IF NOT THEY CAN BE MADE UP AS SHOWN.



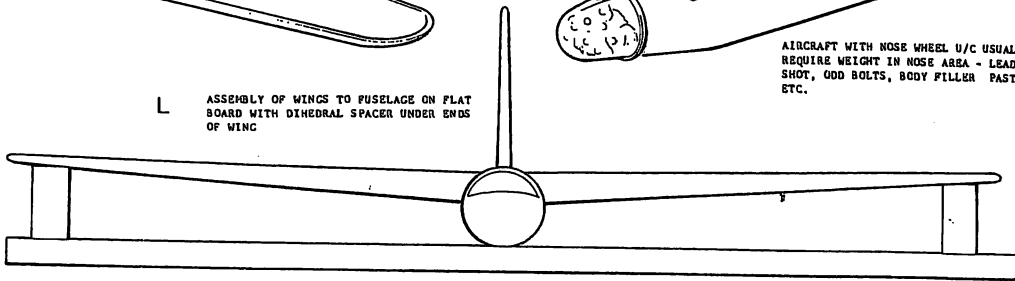
WING ASSEMBLY USING "A" RIBS "B" SPAR(S). SPARS PRODUCE A STRONG ASSEMBLY WHEN GLUED INTO SLOTS IN FUSELAGE SIDES



ASSEMBLY OF FUSELAGES & WINGS USE MASKING TAPE, CLOTHES PEGS & GLAS BANDS. LIQUID GLUE IS RUN ALONG JOINT LINE.

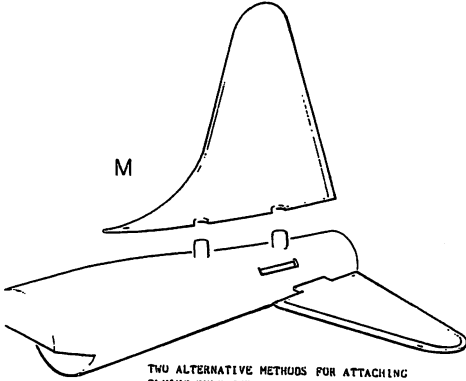


COCKPIT CANOPY SUPPORTS GLUED AROUND INSIDE FACES OF FUSELAGE

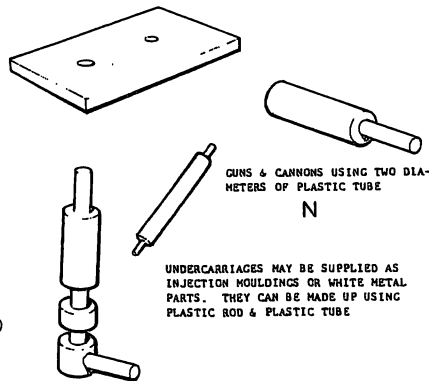


ASSEMBLY OF WINGS TO FUSELAGE ON FLAT BOARD WITH DIHEDRAL SPACER UNDER ENDS OF WING

AIRCRAFT WITH NOSE WHEEL U/C USUALLY REQUIRE WEIGHT IN NOSE AREA - LEAD SHOT, ODD BOLTS, BODY FILLER PASTE ETC.

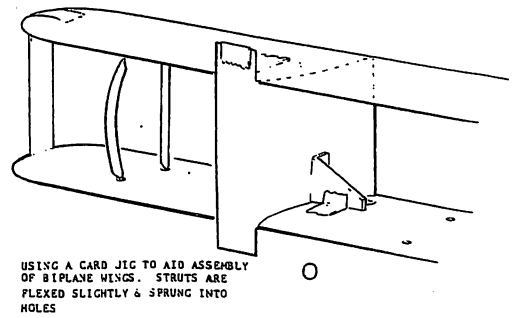


TWO ALTERNATIVE METHODS FOR ATTACHING FLYING SURFACES TO FUSELAGES.

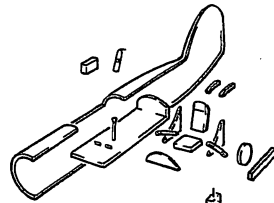


GUNS & CANNONS USING TWO DIAMETERS OF PLASTIC TUBE

UNDERCARRIAGES MAY BE SUPPLIED AS INJECTION MOLDINGS OR WHITE METAL PARTS. THEY CAN BE MADE UP USING PLASTIC ROD & PLASTIC TUBE



USING A CARD JIG TO AID ASSEMBLY OF BIPLANE WINGS. STRUTS ARE FLEXED SLIGHTLY & SPRUNG INTO HOLES



INTERIOR DETAILING. MAY BE SUPPLIED IN OR:-
1. CAN BE MADE FROM SCRAP PLASTIC
2. PARTS FROM SPARES BOX
3. SPECIALIST PARTS I.e. EJECTION SEATS, CONTROL COLUMNS ETC.



SOME GENERAL HINTS ON ASSEMBLY OF A VAC FORM MODEL