CONTROL LINE MODEL AEROPLANE

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TOOLS, MATERIALS, TIPS & TRICKS

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TOOLS

Cutting Blades

The one basic and indispensable tool for model-aeroplane construction is the single-edge razor blade. If you can not get them at the local supermarket, they should be available from most hobby shops.

Due to its pulpy nature, balsa wood requires sharp carving tools. An X-Acto® carving handle with interchangeable blades is ideal. These should be available from most hobby shops. Keep the blades sharp. A dull blade will crush the wood rather than cut it.

Saws

An inexpensive coping saw with changeable blades is good for roughing out balsa blocks and for cutting plywood, hardwood, and balsa sheets that are more than 6mm (1/4") thick. You may also use an electric jigsaw, but this is a luxury item and the coping saw will do the job perfectly well. Suitable saws are available from most hardware shops.

Clamps & Vices

Clamps are valuable during the assembly of most model aeroplanes. Spring-type cloths pegs are most useful. Small cabinet or C-clamps for holding two hardwood pieces together and holding items to be soldered.

A small bench vice is even more useful than the C-clamp, since it performs all the functions of the clamp, and also holds work firmly while it is drilled, filed, or sawn. A vice is also helpful in bending the heavier sizes of piano wire. C-clamps and vices are available from most hardware shops.

Pliers

Piano wire is normally too tough to be bent without pliers. Flat-nose pliers are the most useful for this purpose and can be supplemented with a pair of needle-nose pliers for small-diameter bends. Pliers are available from most hardware shops.

Screwdrivers

Three screwdrivers are essential. A slot-head screwdriver with a relatively thin edge is required so that it will fit the relatively small hardware used in making model aeroplanes. For work on engines, two Phillips-head screw drivers are often needed. One should be a No. 1 size and the other should be a No. 2 size. Screwdrivers are available from most hardware shops.

Rule

A measuring device is mandatory. A standards 300mm (12”) stainless steel rule is sufficient. Some modellers prefer a 600mm (24”) or 900mm (36”) steel rule. Steel rules are available from most hardware shops.

Scissors

Sharp scissors are used to cut paper or silk covering without tearing the material. They can also be used to trim 1mm (0.04”) sheet balsa to shape, and can cut thin sheet aluminium and brass, as well as sheet plastic for windows and windshields.

Drills

You will need an inexpensive small hand drill for making holes in the fitting out of your model aeroplane. A set of inexpensive twist drill bits is also required. Their sizes should range from 1.5mm (1/16”) to 6.5mm (1/4”) in 0.5mm (1/64”) increments. The hand drill and bits should be available from most hardware shops.

Hammer & Pins

You will also need a small, lightweight hammer to drive pins when assembling pieces of wood. The pins are helpful in holding pieces of wood together while the glue dries. The pins are later removed with pliers. At least 36 straight pins are very handy. The hammer should be available from most hardware shops.

Tweezers

Tweezers at least 125mm (5”) to 150mm (6”) long are very handy for reaching into confined spaces and to pick up small nuts, bolts and screws.

Sandpaper

The difference between being a beginner and an expert modeller is that the expert uses sandpaper. A cork sanding block of about 25mm (1”) x 50mm (2”) x 100mm (4”) helps when sanding large flat areas or straight edges.

All wood components should be lightly sanded with fine sandpaper before assembly. The entire model is then lightly sanded with fine sandpaper before the covering is applied. Extra-fine sandpaper is used between coats of sealer, and coats of paint. A sanding block and sandpaper should be available from most hardware shops.

Soldering

There are times in model making when the best way to join metal items is with solder. A small electric soldering pencil is good for all model work. Resin-core solder of 1.5mm (1/16”) diameter is recommended. A soldering pencil and solder should be available from most hardware shops.

Worktable

The worktable need not be elaborate; a straight, warp-free board about 25mm (1”) thick, 450mm (18”) wide, and 1.2m (4’) long can accommodate the construction of most model aeroplanes. The board should be used for cutting and assembly-over-plans work. A satisfactory board can be purchased at most timber yards as shelving material.

Apron

Since model aeroplane building involves gluing, sanding and painting, it is wise to wear a shop apron while working. A simple apron can be stitched together from any heavyweight material.

Basic Tools

These basic tools are required to complete the average model aeroplane:

- Single-edge razor blade
- X-Acto knives (optional but very handy, particularly blade No. 26)
- Coping saw (inexpensive non-rotating type)
- Small clamps or spring type cloths pegs
- Small bench vice (optional but very handy)
- Pliers (small needle nose type)
- Screw driver (medium size)
- Screwdriver (No. 1 Phillips-head)
- Screwdriver (No. 2 Phillips-head)
- Ruler (steel 300mm (12” or 450mm (18”))
- Pencil (soft 2B)
- Ballpoint pen
- Hand drill with set of small drill bits up to about 6mm (1/4”)
- Small hammer (tack hammer)
- Sandpaper (medium, fine and very fine)
- Camel’s hair paintbrush (flat, 10mm (3/8”) wide)
- Straight pins

MATERIALS

Balsa Wood

Balsa wood has been used for over a century in making model aeroplanes: It is still the preferred material.

The wood is white, extremely porous, and both lightweight and strong. Available in strips, sheets, and blocks, it comes in various degrees of hardness. Hardness is extremely important because items of extreme stress, such as longerons, spars, leading edges, and keels, require hard (stronger) balsa. Other structural members can be made from medium balsa. Soft balsa is used for non-structural fairings, etc. Large, carved items, can be made from soft balsa

The standard length for strip and sheet balsa is 900mm (36”). Strips range in size from 1.5mm (1/16”) square to about 25mm (1”) square. Sheets are normally 75mm (3”) or 100mm (4”) wide and come in thickness ranges from 0.75mm (1/32”) to 12mm (1/2”). Blocks are normally 300mm (12”) long and range is size up to about 100mm (4”) by 150mm (6”). Balsa wood is available from most hobby shops.

Hardwood

Balsa wood is unable to withstand concentrated stresses, so such items as engine mounts, wing-strut supports, and spar joiners must be made from more durable woods such as pine or cherry. Hardwood is available from most hobby shops.

Plywood

Where sheet material has to withstand concentrated stresses, birch plywood is used. Items made of plywood include firewall bulkheads, landing-gear foundations, and bell-crank supports. Suitable plywood is available at most hobby shops.

Piano Wire

Piano wire comes in lengths generally of 900mm (36”). The diameter rages in size from threadlike to 4mm (5/32”). Because of its high strength, piano wire is used for landing gear struts, control rods and control lead-out lines. The wire is cut and bent as required using pliers. Piano wire is available from most hobby shops.

Covering Materials

Model-aeroplane structures are covered with silkspan, silk, plastic film, or thin sheets of balsa.

Silkspan is a paper tissue that does not disintegrate in water. It is available in light and heavy weights and resembles the paper used for tea bags

Silk is light and strong and can be used on any model aeroplane which has a structure strong enough to withstand the high shrinkage ratio. Of silk.

Plastic film (usually Mylar) is generally used for larger models. Several brands are available, such as Coverite®, Monokote®, and Wing Skin®.

Sheet balsa covered structures are used where great strength is required. It is the heaviest of covering materials.

Covering materials are available from most hobby shops.

Glues

Adhesive technology is advancing all the time. Glues used in C/L aeroplanes need to be strong, light in weight, waterproof, fuel proof, quick setting, and easily sanded. Consider the advice given by your hobby supplier.

Cyano-acetate glue (called “CA cement”) is commonly used to glue together most wooden components of a model aeroplane. CA cement is clear, dries quickly, is waterproof, flexible, light in weight, and strong. Make sure the cement you are using is fuel proof. Normal CA cement gives off some annoying fumes that can be a health problem to some people but when used with the most ordinary of precautions are among the most appropriately designed adhesives for this hobby.

Slightly more expensive are some non-allergic CA cements that are almost as good as the regular stuff, they just do not release the fumes that can cause respiratory problems.

Another very useful glue in model aeroplane making is yellow aliphatic resin. This glue (often called 30 minute or 15 minute epoxy) is supplied in two parts which must be mixed before the glue is used. It works well in areas of high stress such as engine mounts, firewalls, and landing gear installations. Compared to CA cement, aliphatic resin is fairly heavy and should be used selectively on models. Normally use CA cement; only use epoxy where it is really needed. When dry, CA cement is not as hard as aliphatic resin glue, so when sanding balsa, it does not tend to leave a raised glue ridge.

Finishes

Model aeroplanes are painted with a cellulose liquid similar to lacquer, called dope. Fuel-proof dope must be used. Dope is available in bottles, cans, and spray cans, in sizes which range from 30ml (1floz) to 1 litre (2 pints) The advantages of dope over other types of finishes is it dries very quickly and, when dry, produces a tough, flexible, thin, waterproof, and lightweight film that will adhere to wood or metal. In addition, it has shrinking qualities that are necessary for models covered with silkspan or silk. Dope is available from most hobby shops.

Balsa wood is extremely porous. For this reason, it requires more than ordinary attention to obtain a really good finish. Sealers have been specially formulated for balsa wood and are available from most hobby shops. These liquids should be applied liberally and sandpapered to a fine finish before the dope is applied.

New finishes and sealers are entering the market. Most of these are heavier than the lightweight dope and must be used judiciously. Automotive primers and epoxy sealers perform their work very efficiently. Epoxy paints have also been developed which can be applied over doped finishes as a top coat. Epoxy paints have the advantage of strengthening the balsa wood and the covering material of the model. They are slower drying, and they lack the shrinking qualities of dope on silkspan or silk covering material.

Because of the constantly developing technology with finishes, it is best to discuss what is best for your model with a model expert at your hobby shop.

Engines

There are many types of internal combustion model engines. Make sure your engine is suitable for a control-line model aeroplane. Control-line model aeroplane engines come in many different sizes designated by their displacement. They range from 0.3cc (0.02cu.in) to the large 9.8cc (0.6cu.in) engines. They are available as either diesel (now less popular due to lower power to weight ratios or glow plug in either two-stroke or four-stroke configurations. Most control-line engines are now two-stroke glow-plug engines. The design of your model aeroplane will determine the most suitable engine size for the model.

Most model aeroplane engines are normally equipped for use in radio control aeroplanes with barrel type carburettors. These engines should be modified for control line use by removing the carburettor and replacing it with a fuel spray rail. The engine supplier can normally do this. Make sure that your engine supplier knows the engine is to be used in a control-line model.

It may be necessary to modify or reverse the needle-valve assembly so that the fuel line will have a direct path to the engine.

TIPS & TRICKS

Double Cementing

Double cementing is used where there are large areas to be glued that are subject to strain and vibration. It is achieved by applying balsa cement to both surfaces to be joined. The two surfaces are then rubbed together back and forth to evenly distribute the cement. The surfaces are then separated and left for the cement to dry. After the cement has dried, apply more cement to both surfaces. The surfaces are then mated together and held in position until the cement dries.

Edge Gluing

There will be times when you need to join planks of balsa edge to edge. An easy way to achieve a good join is to first make sure that the edges to be joined are straight and square to each other. Lay the two planks on a flat surface with the two edges to be joined pressed firmly together. Run a piece of plastic insulation tape along one side of the joint, pressing down firmly to ensure that it is well adhered. Pick up the two planks and open the joint using the insulation tape as a hinge. Apply the balsa cement to both surfaces to be joined. Lay the planks down on a flat surface with the insulation tape side of the joint down. This will close the edge joint. Apply strips of plastic insulation tape across this upper edge of the joint to hold the two planks in place while the cement dries. Allow a few hours for the cement to thoroughly dry before moving the balsa planks. Once the cement has dried, the plastic insulation tape can be removed.