BUILDING AND DETAILING
SCALE MODEL AIRCRAFT

BY
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THE COMPLETE GUIDE FOR BUILDING, DETAILING, PAINTING AND DECALING
SCALE MODEL AIRCRAFT
MIKE ASHEY PRODUCTIONS
PRESENTS
BUILDING AND DETAILING
SCALE MODEL AIRCRAFT

DEDICATION

To my wife Leah, to our children, Thomas, Erin, Gregory and Rachel and our pets Buddy, Jewel and Max.

ACKNOWLEDGEMENTS

A hearty thanks goes to Scott Weller of Tallahassee, Florida for allowing me to include some of his models in this book. Special thanks goes to my beautiful wife Leah for encouraging me to get back into writing about scale modeling.

All photos are by the author

ABOUT THE AUTHOR

Mike Ashey lives in Tallahassee, Florida. Mike has been building models since the early sixties and his interests span all types of scale modeling. He has an undergraduate degree in Ocean Engineering from Florida Atlantic University, class of 1983 and aside from building and writing about scale modeling he enjoys, swimming, jogging, weight lifting and most importantly being a Dad!

Mike spent four years in the U.S. Marines and was honorably discharged as a Sergeant in 1978. He worked for the Department of the Navy throughout the 1980’s and his last assignment was as the technical advisor for the U.S. Navy’s elite SEAL Special Forces from 1988 to 1990.

Mike has been involved in environmental protection since the early 1990’s and he is presently the Bureau Chief for Florida’s petroleum contamination cleanup and discharge prevention program.

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CHAPTER 1
GETTING ORGANIZED

HOW TO USE THIS BOOK

When I wrote my first aircraft book in 1990 I thought that the scale modeling hobby industry and the cottage industry which began producing resin and photoetch accessories had reached the peak of its golden age. As I started to review the text from my first aircraft book in preparation for this book I realized that aircraft scale modeling had matured so much that complete sections of the original text were no longer applicable. In fact the entire text had to be re-written to incorporate sixteen additional years of scale modeling advances. With new kits sporting higher levels of detail and accuracy and a multitude of parts, with resin detail sets for everything from cockpits to bombs and photoetch detail sets both painted and unpainted, comes new challenges on how to best use, build and incorporate all these wonderful accessories into the scale modeling experience.

As with all my books this one is also organized by topic. That is to say that if you want to learn or read up on painting, decaling or working with seams then you can quickly turn to that chapter of the book and find your specific topic. I recommend that you go through the entire book once to
get a feel for all the information and techniques that are presented. I have incorporated lots of pictures for each chapter because a picture is worth a thousand words. While in some cases the pictures associated with some sections of each chapter compliment one another, in other sections I have taken the liberty of incorporating techniques and ideas into the text while covering additional topics in the picture sections. By taking this approach I was able to incorporate a lot more information into the limited number of pages in this book.

There are three key skills for making your scale modeling experience more enjoyable and these have not changed in 50 years. They are assembly, painting and decaling techniques and these three topics form the triangle of success for scale model building in any subject area. Whether you are building out of the box or adding lots of detail to achieve a higher level of accuracy, your finished model should show no seams, have no surface flaws or glue marks. Additionally the model has a good paint job and sports decals that are straight and level which have not silvered and conform to the surface detail.

It takes practice to get good at the basics but that’s part of the fun of the hobby. With each kit that you build you should focus on the basics and once you get them down then graduate to adding details with cottage industry products, and start modifying the kits to add additional levels of realism. Scale modeling is a construction hobby with a sprinkling of artistic flair so be patient and don’t worry about making mistakes and having modeling disasters. Even those of us who have been building for years and years have disasters now and then. If you get frustrated set the model aside for a few days and then get back to it.

Remember that scale modeling is a hobby. It’s supposed to be relaxing and provide the human mind with an escape from reality. Scale modeling is whatever you want it to be for you. Just have fun and enjoy creating a good-looking three-dimensional object from a pile of parts!

**REQUIRED TOOLS AND EQUIPMENT**

Listed below are the tools and supplies that you will need in order to build and detail your models. All the items listed are mentioned throughout the book.

The super glues that I use are made by Zap-A-Gap and they are specifically designed for working with plastic. They come in different fluid viscosities from very thin to super thick. For white glue I use Elmers and MicroScale’s Kristal Klear. For putty I like to use Testors gray putty and I use their red tube plastic glue for attaching small parts where I need to position the part after gluing it into place. You will also need to purchase a super glue accelerator and I have found that a two-ounce bottle will last a very long time.

For all your cutting needs purchase both large and small handled X-Acto knives and at least one complete set of X-Acto blades. I use number 11 blades more than any other blade shape so I purchase these in packs of 100. X-Acto also makes a stencil knife with a tiny angled blade. Stencil blades come in handy when working with seams in tight locations. I also use lots of single edge razor blades for cutting and shaping photoetch and you can also get them in packs of 100. I also recommend that you purchase a Xuron plastic cutter for removing parts from trees and trimming plastic. Also get a petite sprue cutter called a “despruing tweezer cutter” for removing small
parts from trees or trimming tree stubs from parts.

You will need an X-Acto miter box for cutting thick plastic strip, and various size razor saws. For cutting small plastic strips and making angled cuts I recommend that you purchase a North-West Short Line Chopper. To get straight edges on cut plastic purchase a NorthWest Short Line True Sander.

All of your cutting should be done on a self-healing cutting board, which can be found in any hobby or arts and crafts store.

For all of my sanding needs I use the sandpaper marketed by K & S Engineering Company. The sandpaper comes on a waterproof backing, it can be used wet or dry, and it can be cleaned with soap, water and a toothbrush and used time and again. The grades range from 150 to 600 grit, come in 3 X 4 inch sheets and are color coded for easy identification. Another good source for sandpaper is to visit your local vehicle supply store. In the car body section you will find 9 x 11 sheets of sandpaper designed for body fillers. It is waterproof and comes in rough to super fine grades. Flex-I-Files work great to form and reshape curves and round stock. For sanding sticks, visit the nail care section of a drug store or supermarket. You can find lots of different grades of sanding sticks in large sizes.

For sanding blocks I use small lengths of Balsa wood of various sizes, plastic stock or even the handles of my files. Balsa wood is especially useful because it conforms to compound areas such as wing and fuselage connection points. I also use strips of balsa wood to attach small parts and sub-assemblies for painting.

Polishing is also necessary for a smooth finish on plastic, as the slightest scratches will show up. To smooth out plastic and remove most scratches I use 0000 steel wool. This grade of steel wool works great for most of your polishing and painting needs. If you plan to have a natural metal finish you will need plastic polish to really get a smooth and flawless surface. Use the 0000 steel wool first and then apply plastic polish with a soft cotton cloth.

For plastic scribing and for cutting out control surfaces I recommend the plastic scribes marketed by the Bare Metal Foil Company. You can also use a sewing needle in a pin vise (called a scribing needle), which works well around sharp corners. Scribing templates for circles and box shapes are also handy to have on hand to restore access panel outlines. These templates are made from thin sheet metal or photoetch metal. Labeling tape, which is used as a guide for plastic scribes when restoring panel lines, can be found in office supply stores. To clean out sanding dust from scribed lines use a toothbrush with soft bristles.

For all your drilling needs have a good supply of various size drill bits on hand. For most of your drilling needs purchase a set of micro drill bits, numbers 61 to 80. For drill bit holders I use both a pin vise for larger sizes and a brass micro twist drill for tiny drill bit sizes. I also have a collection of large size drill bits both in standard and metric sizes for all my drilling needs. You will also need a drill bit gauge and a pair of calipers for checking the diameters of drill bits. For electric drills purchase a variable speed motor tool, a motor tool drill press and a motor tool vise. I also recommend getting a miniature motor tool chuck for your motor tool.
Waldron Products markets a standard size punch set and you will find a thousand and one uses for it. It is a very valuable tool for scratchbuilding and it also simplifies many projects. Punches used for working with leather can also be used to get different size plastic disks.

I have found that scale modelers usually stick with the same type of airbrush once they find one they like. I like the Badger 200 series of airbrushes. They are single action, internal mix, bottom feed airbrushes which is great for scale modelers like myself who’s hands are not that steady. I also like the heavy feel of the brass and chrome construction. I keep a good supply of airbrush jars on hand as I usually end up with about a dozen jars of mixed paint by the time I am done with a model. I also keep a small supply of the Teflon bearings and washers as well as a spare head and needle for quick repairs.

For airbrushing you will need a reliable air source and many modelers use a hobby compressor. There are two drawbacks to compressors; noise and water vapor buildup inside the compressor. The water can sometimes find it way onto the surface of your model as you airbrush. I use a compressed air bottle filled with CO2, which is the same type of bottle used at soda fountains. The bottle is slightly smaller than a SCUBA tank. I also have a pressure regulator gauge and a tank pressure gauge so I can regulate the pressure. The air that comes out of the tank is very dry and it will last you up to two years. You can find these bottles and the pressure regulator and gauges at any store that supplies compressed air and air bottles.

For a spray booth you can use a large cardboard moving box with the top and front cut out. Moving boxes are sturdy, come in various sizes, and are readily available at a low price. If you have a vent hood above your stove you can set the box on top of the stove and use the vent to draw away the paint vapors.

For mixing thinner with paint invest in some eyedroppers. They can reduce the mess associated with mixing paint and save you some clean up time.

For all your masking needs I recommend Scotch 3M painters masking tape. This tape is the best product I have found for masking and painting. It has low tack qualities, but it does not allow paint to bleed under it, the tape has sharp clean edges when cut, it has stretch qualities and thin widths can be formed around curved locations. I always keep several rolls of various widths for all my masking needs.

To detect flaws and scratches on plastic surfaces, joints and seam lines use Testors silver paint applied with a soft paintbrush.

To clean plastic prior to applying a primer coat use Polly-S plastic prep. This stuff can also be used between coats of paint to remove dust and skin oils. Polly-S also makes an excellent decal and paint remover called “Easy Lift off”.

Warm paint will flow and adhere better than cold paint. I use a coffee cup warmer plugged into a timer so that I will not forget to turn off the warmer.
I recommend that you acquire a good supply of quality flat and round brushes, especially small detail brushes. Natural hairbrushes made from pure red sable are the best quality brushes that you can purchase. Pactra and Floquil brushes are excellent natural hairbrushes, although they are becoming increasingly hard to find. I have purchase IMEX brushes from my local hobby store and found them to be of excellent quality and I like the their large handles.

I prefer using enamel paints as they stick well to plastic surfaces and they do not peel up when they are masked over. Always use the manufacturers recommended thinner and never mix paint with different chemical compositions.

To mix paint I use copper bee bees as agitators in the paint bottle. I usually place 4 to 6 in the bottle to get the thicker paint, which always settles on the bottom of the bottle, mix with the rest of the paint. Using copper bee bees is especially important of you are using water based paints. Steel bee bees can change the paint color when they rust.

For proper decal application you will need to apply a clear gloss finish and I use enamel polyurethane made by Minwax, which can be found in hardware supply stores. To apply a flat finish to protect decals I use Testors Dullcoate, which Testors has relabeled as “clear flat lacquer finish”. This stuff can be airbrushed straight from the bottle and if you want to thin it use lacquer thinner. Testors Dullcoate also work great for hiding super glue that has over flowed onto painted surfaces.

For great looking decals you will need a decal setting solution, but be sure that the solution you purchase is compatible with your decals. I use the Microscale two-part system and it has never failed me. The liquid in the blue labeled bottle is called micro set and you apply it to the surface to be decaled just before placing the decal. The liquid in the red labeled bottle is called Micro Sol and it is applied to the decals surface to soften it and to get it to conform to any raised or engraved detail on the model surface.

If you are going to add weathering to your model than I recommend that you purchase paint colors that are specifically designed for weathering. They can be found in enamels and in water base colors, and you can get a wide range of weathering effects by mixing the colors. Another good source for weathering is pastel pencils, which can be found in any arts supply store.

You will need a good selection of drafting templates and at a minimum you should have circles, squares, rectangles and ellipses. These templates can be used to cut out large shapes for masking and painting. A set of small clear drafting triangles is also a must.

For working with photoetch parts I use a Plexiglas plate as a cutting surface and single edge razor blades and number 11 X-Acto blades for cutting the photoetch. The metal dulls the blade tips very quickly so you need a good supply of blades when working with photoetch parts. Stores that specialize in selling stuff to make jewelry are great places to find tools such as flat faced needle nosed pliers which are a must for achieving clean sharp edges when bending photoetch parts.

You should also plan on using several boxes of facial tissue per model for general cleanup and painting needs especially for cleaning paintbrushes. Tissue makes an excellent stuffer in areas that
are deep and need to be masked like cockpits and wheel wells. Q-Tips are also a must when working with white glue and for cleaning your airbrush. You will need various diameters of pipe cleaners for cleaning an airbrush.

A six-inch stainless steel sewing ruler is a great tool to have and they can be found in almost any sewing supply store. The graduations on the ruler are very precise and the ruler’s thickness is perfect for use as a straight edge for cutting masking tape.

You will need a good supply of various size tweezers and micro files. Tweezers are a must for working with small plastic and photoetch parts and micro files are a must when opening up plastic or squaring off edges.

Evergreen and Plastruct Scale Model Products produce a wide selection of plastic sheet stock, strips, rod sizes and various shapes. Their plastic is easy to use and it responds well to sanding and shaping. I keep a good supply of various thickness's of sheet stock, strips in widths ranging from .010 to .250 inches thick and rod diameters from .020 inches to .125 inches for all my modeling needs.

I like to apply glue with stiff, small diameter wire. You can find various diameters of stiff steel wire at your local hobby store in the radio control section. I also keep a supply of various diameters of brass beading wire, which can be found in jewelry supply and arts and crafts stores. Small diameter wire also comes in hand for adding plumbing details to the engine area and the cockpit. I also keep spools of clear and black nylon sewing thread for rigging small-scale biplanes and for adding antennas to propeller driven aircraft.

To mark plastic parts and to color clear nylon sewing thread and stiff wire for rigging biplanes and adding antennas purchase Sharpie indelible markers in various colors. The colors I use most are black, brown and silver.

Round toothpicks make good applicators for white glue and for picking up small photoetch parts and for helping to position decals. I also use the tips of round toothpicks to apply tiny quantities of paint.

I like to use plastic sewing and needle craft bin organizers and these can be found in sewing and arts and crafts stores. These organizers are great for storing small plastic and photoetch parts. They can be found in various colors, sizes and shapes.

For adding strength to control surfaces that have been removed and to add weight to parts such as engines you can use two-part resin. The one draw back to using two-part resin is that it is messy and once the bottles are opened they have a short shelf life. To extend the shelf life store the capped bottles in a refrigerator. You will also need lots of mixing cups and small wooden sticks for mixing the resin together.

Good lighting on your workbench and in your paint booth are a must. I have four large adjustable desk lamps on my workbench and several large construction “clip on lights” with large disk reflectors for my paint booth. These large lamps can be found in large hardware stores like Home
Depot. Invest in a dust mask or painters mask and a good pair of safety glasses.

Most of the tools and supplies that you will need can be found in your local hobby store. If they don’t have it in stock have them order the items. FineScale Modeler Magazine is also a great source for manufacturers and suppliers for hard to find tools and supplies.

REFERENCE AND RESOURCES FOR SCALE MODELING

Reference material is a must for scale modeling and there are a great variety of books that have lots of photos of specific aircraft. How the cockpit actually looks, the colors, the arrangement of all the interior hardware and the details inside the wheel wells will help you when you are adding these types of details to your model. What wiring and plumbing is exposed in the engine area, whether the air intakes are open or covered with screening, how the brake lines are set on the landing gear are all important details that reference photos will show you.

The costs of reference material can vary widely and for more expensive books get the ISBN number and have your local library order the book for you. This affords you the opportunity to see if the book is worth the money and that it has what you are looking for.

Reference books should contain lots of original aircraft photos and these are usually black and white unless it’s a modern aircraft. All the pictures should be clear and in focus and each photo should have a caption. Some books have walk around photos that were taken of aircraft at museums and these should all be in color. Keep in mind that restored aircraft may vary slightly in colors and the placement of some interior components when you compare them to original aircraft photos. There should also be pictures of the variants of the aircraft and a color section for the different paint schemes that the aircraft may have had.

In the last few years reference CD’s have also become available and they can contain hundreds of quality photos of aircraft. There are also many WEB sites that have scale modeler resources and links to other sites. I download the pictures from the WEB sites and save them on CD’s for later use. Another great source for reference material is to visit aircraft museums and take lots of pictures. If you are using a digital camera be sure that you have adequate lighting otherwise the pictures taken indoors will be dark. I use a Kodak P-712 digital camera and the one advantage to this camera is that it has a hot shoe for a standard external flash unit.

The WEB is a great place to research what types of detail sets are available for a specific model. Almost all of the cottage industry companies have WEB sites and you can get a first hand look at the actual detail set and all of the parts that are included. There are lots of WEB sites that also have kit and detail set reviews. Sometimes the reviews are just an “in-the-box” review and other times the reviewer actually built the kit or used the detail set.

The one caution here is that sometimes these reviewers get caught up in what I call the accuracy trap. They can find lots of things wrong with a kit or a detail set that most of us would not see or even care about. Some of these people spend so much time consumed by the accuracy trap that they never build anything or finish a model. You can also witness a lot of talk and some very mean spirited keyboard discussions on WEB chat boards about accuracy. Don’t get caught up in it. Scale modeling is a hobby not a competitive sport and it is not politics.
In closing out this section save the WEB site addresses so that you can build up a digital library of locations of Manufacturers, cottage industry products and general information WEB sites. I visit many of these WEB sites to see what the latest and greatest is and what new products may be available in the coming months.

**ORGANIZATION**

The key to having a successfully experience in any hobby is to be organized. I use stacked plastic draws with labels on the draw faces to organize and store tools and equipment. I usually keep the most used tools within reach on my workbench and those used less frequently in the plastic draws. I also keep a supply of expendables such as X-Acto blades, sandpaper and glues on hand so that I am not running out to the local hobby store all the time. I keep a small supply of basic paint colors on hand, but I do not let their shelf life extend more than a few months. I stock up on needed colors for each and every modeling project. Lacquer paints have a much longer shelf life than enamels or water base paints so I keep a small supply of Testors metalizer paints on hand.

I use small plastic draw organizers like the ones you find in hardware store for storing nuts and bolts to store and organize unused plastic parts. I use small to medium plastic shoe and shirt boxes to store detail sets, decals, plastic sheet, tubing and wire and sandpaper sheets. I have lots of shelving to store all the stacked draws, and storage boxes and everything is labeled and organized for ease of identification and access. I also keep an ample supply of small and medium zip lock bags on hand to temporarily store things and to seal up items like 0000 steel wool when not in use.

A little bit of planning can go a long way when you are building scale models. This is especially true when you are incorporating detail sets into the kits construction sequences. Study the instructions carefully and become familiar with the part trees and the locations of the parts. Kit manufacturers have gotten very good at keeping sub-assemblies located on the same trees, but this is not always the case. Typically the larger the kit the more parts you will have so having an ample supply of those sewing and needle craft bin organizers is a must have.

When I am working at my hobby bench everything I need to work with is positioned around the self-healing cutting board. I use the kits box top to store large sub-assemblies and my bin boxes for individual parts and small sub-assemblies. I also place a strip of masking tape on the top of each bin box to identify what the parts are. One box will have interior parts and another box will have engines parts. I also strive to keep my workspace clean so after a lot of sanding and scraping take a little time to do some house cleaning before proceeding to the next step.
These are the three types of glues I like to use. I made the glue tube holder for the Testors red tube glue because positioning the tube upright makes the glue last longer.

Here are the basic hand tools for snipping, cutting, trimming and scraping. The long thin black blades are stencil knives and the stainless steel sniper is called a despruing tweezer cutter.

Miter boxes and razor saws are necessary for cutting plastic stock. The miter boxes are specifically designed for use with the razor saws. The saws also come in various cutting grades.

Testors and K&S Engineering sell color coded waterproof sandpaper. The U shaped tool is a Flex-i-File and the sanding stick are from the nail care section of drug stores. Balsa wood makes great sanding blocks for contoured areas.

Here are the basic tools for restoring panel lines. Bare Metal Foil makes the best plastic scribe. The best templates for scribing are photoetch, which are very flexible. The pounce wheel and needle scriber work great for restoring rivet detail.

I keep a good supply of drill bits and I use a caliper to check diameters. A drill bit gauge is also a handy tool. The Waldron Punch has a thousand and one uses and twist drills make repetitive drilling easier.
A variable speed motor tool, a Dremel drill press stand and a Dremel vise are the perfect combination for precise drilling. To hold plastic parts in the vise, sandwich the part between strips of balsa wood.

The Northwest Shortline chopper and true sander are traditional model railroad scratchbuilding tools and they have a thousand uses in scale modeling. The chopper is especially hand when you need to make multiple parts.

These are the essential tools for airbrushing. I like the Badger 200 single action airbrush. Always keep an ample supply of thinner and spare airbrush jars. Copper bee bees are great for mixing paint in its original jar.

My airbrush source is a CO2 tank with a pressure regulator. The air is always dry and the tank makes no noise! The air supply will last you up to two years and refills are inexpensive.

The regulator on my air supply tank has two gauges. The one on the right indicates the tanks air supply and the gauge on the left indicates the pressure of the air being supplied to the airbrush which is controlled by the black knob.

A spray booth can be as simple as a large box, placed on top of the kitchen stove. This set up works great if the stove vent discharges the air outside. To protect the vent from paint I tape an air conditioner filter to it.
I have a good supply of quality brushes for detail work. Many of these brushes are over 20 years old. Always clean brushes after every use. This simple organizer stores the brushes and keeps them in easy reach.

I like to keep my airbrushing tools in easy reach. Everything I need for airbrushing is stored in these two organizers.

These are the essential tools for cutting out decals and applying them. Use sharp number 11 X-Acto blades for cutting out decals. Setting solution is also a must if you want your decals to look like they were painted onto the model.

For cutting, bending and shaping photoetch you will need dowels, flat faced needle nose pliers and single edge razor blades. I found the red handled pliers in a jewelry supply store and they work great.

If you are going to do any type of scratchbuilding or just improve kit parts you will need drafting triangles and templates. I made the small white triangles for checking corners on scratchbuilding projects.

Evergreen and Plastruct sell plastic sheets and various shapes and sizes of plastic strip and round stock. I keep a supply of plastic sheet and shapes for all my scale modeling needs. This stuff has a thousand uses.
I keep a good supply of various diameters of stiff brass wire. It has lots of uses such as cockpit and landing gear plumbing, engine wiring and landing gear brake lines.

I have various sizes of files with different shapes. Here again these tools have lots of uses in scale modeling. They are great for shaping and cleaning up cut outs such as access panels, hatches and doors and small openings.

A good size self healing cutting board is a must for scale modeling. I also keep a good supply of tissues and Q-Tips for painting and general cleanup. I use safety glasses whenever I am using my Dremel tool or cutting photoetch.

Indelible markers are great for coloring antenna wires, control cables and flying wires on Biplanes. Drafting inking pens can be used to detail small parts and pencils are a must for marking plastic during scratchbuilding.

I have about a dozen of these handy parts bins and use several for each modeling project to store parts, and to separate cleaned up parts and painted parts.

Aircraft reference material helps me detail my models, check for the locations of interior and exterior items and verify colors and markings. I also enjoy reading about the development history of the aircraft that I am building.
The second kind of reference material are the scale modeling books that have been written over the years. I have learned from every one of them and they are great sources for modeling tips and techniques.
CHAPTER 2

ASSEMBLY TECHNIQUES

REMOVING PARTS AND TEST FITTING

The assembly sequences layed out in the kits instructions are usually very good, but individual sequences and steps are not always in tune with the paint scheme that you have in mind. In addition these may be fit problems that require you to deviate from the instructions from time to time. Some good examples of odd kit instruction steps are; clear parts being added to the outside areas of the fuselage prior to the completion of construction, landing gear that are attached before painting the exterior and guns and bombs that are installed prior to the wings being attached to the fuselage.

After you have studied the kits assembly instructions and put some thought into how you want to build the kit, what modifications and details you may want to add, and what colors and paint scheme you want, the next step is to start removing parts and test fitting. I consider test fitting a very important step because this is where you will find out how well the kit fits together and it will get you thinking about how to deal with problem areas.
I use a fine point black sharpie to write the part numbers on the individual parts that I am going to remove. Never snap parts off their trees as this may leave an indentation in the part where it was connected to the tree. This indentation will almost always occur along a gluing surface. Always cut the tabs which connect the parts to the trees using a pair of plastic cutters and be sure to leave a small amount of the tab on the part. It is much easier to remove the excess tab from the part after the part has been removed from the tree than it is to try to remove the entire tab while the part is attached to the tree.

After all the necessary parts have been removed from the trees, you can finish removing the excess stubs from the parts. Sometimes the stub connection points are round and sometimes they are flat. Typically the actual point where the tree stub meets the part is very thin as compared to the rest of the stub. If the stub part is round, place the part on a wood block with the stub hanging over the edge so that the part will sit flat on the block. Using the tip of a number 11 X-Acto blades cut the stub off. If the stub is flat you can just lay the part on your cutting board and cut it off. Finish cleaning the surface where the stub was by wet sanding it smooth with a sanding stick. On really small or delicate parts you can sometimes cut the part clean from the tree stub right at the connection point with despruing tweezer cutters if the sub is small and thin.

After you have cleaned up the area where the stub was located, remove any excess flash from the part. Be careful not to mar the plastic parts or remove any raised detail when removing flash. If the part is complete such as a landing gear check the parts for a seam line that runs around the perimeter. Typically these seam lines are very tiny. Remove them by lightly scraping off the excess plastic with the tip of a number 11 X-Acto blade. On round or curved parts you need to be careful that you do not flatten out the area and ruin its shape. To smooth out curved areas use a Flex-I-File with 400 grit sandpaper and wet sand the plastic smooth.

As you finish with parts place them in plastic bin organizers so that you do not misplace them. The next step in parts preparation is to check the gluing surfaces of the parts. There are sometimes raised bumps, uneven surfaces or remnants of the tree stubs on these surfaces. Carefully and slowly scrape or sand them off so that the gluing surface is flat.

When all the parts are cleaned up, the next step is to assemble the kit with masking tape. I use small strips to assemble the cockpit area and the engine and larger strips for the fuselage, wings and tail area. When taping sub-assemblies that will fit inside the fuselage be sure to locate the tape in areas that will not interfere with the placement of the assembly inside the fuselage or cowling.

As you assemble the parts make notes on the kits instructions on fit, where there are gaps and voids or where parts need some work to get them to fit better. If you find parts that just do not fit go ahead and work with them to trim or cut as necessary. Its better to identify problems at the start of a project than to get to the point where its time to mate the fuselage halves together and then find that you have a major fit problem. If there is a misalignment problem caused by a locating pin, remove it and use the tape to properly align the part. Warps in the fuselage and the wings can sometimes be corrected by taping the parts together so if you have this problem see if large sections of masking tape will correct the warp. Sometimes small assemblies such as drop tanks and bombs have uneven gluing surfaces or locating pins that just do not line up with their respective
holes. In these cases run the part across a stationary piece of sandpaper to flatten out the surface and remove the aligning pins.

When you are done assembling the kit with masking tape you should pretty much have the entire kit put together. At this point I place the kit on my workbench and I start making assembly and painting notes on the kits instructions. I also note where I plan to deviate on the suggested construction sequence of the kit instructions. Typically the kit’s instructions do not take into account painting steps, modifications or detailing that you want to add.

The width of the gluing surface usually reflects the thickness of the plastic and on older kits the plastic was reasonable thick so that the resulting assembly such as a wing or fuselage was strong. On newer kits I have noted that the gluing surfaces are pretty narrow which means the plastic is thinner. This presents two problems. The first one is that without a wide gluing surface there is a good chance that the seam area may crack after you have glued it because the bonding surface is narrow. The second problem is that on large models, thin plastic can flex along the center points of the wings and fuselages causing the seams to fracture.

To fix this problem laminate strips of plastic to the inside areas of the wings and fuselage to add strength and prevent flexing. You can also carefully add plastic to the seam areas so that you will have a stronger bond. I usually use .020 or .030 inch thick plastic strips for laminating interior areas and I always use super glue. You do not need to butt them up against one another. If I am adding strength to wings I usually glue strips from the leading edge to the trailing edge although placing strips from the tip to the centerline will also work. For fuselages you can place them from top to bottom or from front to back. If you want to increase the width of the gluing surface position small sections of .020 or .030 inch thick strips along the underside of the parts gluing edge. Super glue the strips in place and trim and sand so that the strips are flush with the glue edge.

**SEAM WORK**

For all your gluing and for the majority of your seam work I recommend that you use super glue. The glue doubles as seam filler, it can be sanded and scraped like plastic and you cannot detect the difference between the glue and plastic once it has been painted. There is a specific technique that works best for using super glue that takes advantage of the glue’s capillary action. When you are ready to glue two part halves together tape the part using strips of masking tape. As you tape check specific contours and details that are formed when the parts are glued. Panel lines and hatches which cross seam lines need to be lined up correctly. Corners and edges also require extra care to ensure that they are aligned properly; otherwise, you will be doing a lot of scraping and sanding. Tape the halves securely and use as much tape as necessary to hold the parts just the way you want them.

For gluing parts together use a length of stiff wire as a glue applicator. The thinner the wire the smaller the quantity of glue that will be applied. Make a small puddle of super glue on a piece of paper. When you put the super glue on the paper for the first time, the paper will absorb the majority of the glue so let the first puddle dry and then place more glue on top of the first puddle. Dip the tip of the wire into the puddle and then run the tip along the seam line and between the masking tape locations. The super glue will seep into the seam area and along the seam line for a
short distance. Typically you will have to repeat the application process several times, as the capillary action of the glue will pull it down along the width of the gluing contact surface.

Start applying in the middle of masking tape locations so than you can see how far the glue moves along the seam line. Do not let the masking tape get glued to the plastic so keep the wire applicator about 1/8 of an inch away form the edges of the masking tape. Work in small areas at a time and check the positioning of the part as you work along the seam line. If you added extra plastic to the underside of the gluing surface the super glue will seep into these areas too.

If you have wide gaps along the fuselage or where the wings and fuselage meet I recommend that you fill the gaps or voids with sections of plastic strip. You could use gap filling super glue, which is very thick, but I have found that using strips of plastic works better, adds additional strength to the seam area and it is easier to sand and shape than a big glob of super glue. Cut strips and form fit them into place along the void. It’s okay for the strips to protrude above the surface of the plastic as they can be trimmed later. You may have to use different thickness along a gap, as the center areas tend to be wider. Do not force the plastic into the void, just use thinner widths. Run a bead of super glue along both sides of the plastic strips. When the glue is dried cut the excess plastic with plastic cutters or an X-Acto blade and scrape and sand smooth.

After the super glue has dried, which takes only a few minutes; you can remove the tape and glue those areas where the tape was located. After the entire part is glued along the seam line carefully check the seam to see if more glue is needed. What you want is to have the glue be level with the surrounding surface plastic. Sometimes this can be hard to judge so the rule of thumb is less is better as you do not want excess glue running along the surface of the model.

To remove excessive glue and to contour and smooth the glued surfaces, carefully scrape and wet sand the seam with a sanding stick. You can protect surrounding surface detail by applying masking tape along the edges of the seam. When you have completed your initial scraping and sanding, clean off the seam area and apply Testors silver paint to the seam line. The silver color will highlight any, cracks, scratches and flaws. Apply additional coats of super glue over the silver paint in needed areas. The glue will mix with the paint creating a dark silver color. As you scrape and sand the areas where additional super glue was added the silver color of the glue will help you determine when the excess glue has been removed. Repeat the process of checking the seam area with silver paint, applying super glue and scraping and wet sanding until the silver paint shows not flaws. Typically two to three iterations will do the trick.

To remove sanding marks, smooth and polish the plastic and the super glue and to remove any excess silver paint, rub the surface with 0000 steel wool. Use small quantities of steel wool, compress it into a tight wad when using it and use new wads frequently as the steel wool will get clogged quickly with plastic dust. The steel wool fibers will also get all over the place so do not use it around you workbench or your paint booth. The surface of the model will also have lots of tiny fibers of steel wool and these can be easily blown off with high pressure air run through your airbrush.
**DIMPLES AND INJECTION MARKS**

Injection marks can either be indented or raised, they are almost always round, and they are usually located in places that are very hard to get to and correct. The first step in dealing with injection marks is to determine if you need to do any work at all, so check to see if they will be noticeable when the part is positioned along with any other parts that may be attached to it. If the marks are not noticeable don’t waste your time correcting them.

You can fill indented injection marks using a Waldron's punch to make disks that are close to the diameter of the indentation. The thickness should be slightly higher than the indentation. Place a drop of super glue into the indentation, position the disk and press it down with a toothpick. When the glue is dried sand the area smooth, check for flaws with silver paint and add more glue where needed. If you are working in tight areas which have surrounding surface detail such as the inside areas of landing gear doors, wrap a small length of sandpaper around a piece of balsa wood and carefully sand the surface smooth.

If the injection marks have a small diameter and they are located in areas where a lot of sanding and scraping is difficult, pick a plastic rod diameter that is slightly larger that the injection mark diameter, drill a shallow hole through the injection mark and super glue the rod into the hole. Cut the rod and sand the surface smooth.

Raised injection marks are usually easier to deal with because you are removing plastic instead of filling in an area. The easiest way to deal with raised injection marks is to either scrape the plastic flat with a stencil knife or number 11 X-Acto blade, and then sand the surface smooth or just sand the injection mark which may take more time than scraping and then sanding.

Dimples are typically caused by the incomplete flow of hot plastic into the mold. Depending on where they are located will help determine how best to deal with them. If the dimples are on large flat surfaces punch out a disk size with your Waldron punch that will cover the dimple. Apply enough super glue to the dimple and a small area surrounding the dimple and press the disk over it. When the glue is dry, wet sand the surface smooth.

Another approach that causes less damage to the surround surface detail is to drill out the dimple and plug the hole with plastic rod. Cut the rod and sand it smooth. In both cases use masking tape to protect surrounding detail. Dimples on small parts can be fixed the same way.

**USING WHITE GLUE**

Sometimes there are voids between parts that you just cannot fill, sand and shape. While these situations are not common they do occur. In these instances you can use white glue as filler but be sure there is no flexing of the plastic at the seam location. The trick to getting white glue to stick properly is to prime the areas where the white glue will be applied so that the glue will have a good contact surface to stick too. I apply small amounts of the white glue at a time using my trusty thin wire applicator and then I wipe the excess glue with a damp Q-Tip.

You can apply as many coats of white glue as required to build up the area between the parts,
but be sure to let each coat dry and always swipe the glue to remove any excess. Usually three coats will do the trick. If the distance between the parts is tiny the white glue will fill the void without any noticeable contours in the surface of the glue. The wider the spacing that needs to be filled the more contoured the surface of the glue will appear. Give the dried glue a coat of primer to check for tiny air pockets and for places that you may have missed.

**USING PUTTY & TESTORS TUBE GLUE.**

I very rarely use putty for seam work, but if you do here are some tips. To apply putty first squeeze a small amount on to a piece of paper. Allow the putty to flow from the tube's opening while retaining its round shape, and squeeze out a line of about 1/4 to 1/2 inch in length. For most putty applications use either a number 18 flat ended X-Acto blade or a number 16 angled X-Acto blade, and slice off small amounts of putty with the edge of the blade. Doing this will give you greater control of both application and location of the putty.

Use very small quantities of putty for your work and try to use the minimum amount to accomplish what you are trying to achieve. Piles of putty greatly increase your sanding work, and also increase your chances of marring surrounding detail when you start sanding. When applying putty be sure that the plastic halves are well secured with glue. Any flexing of the halves during the curing process or during the sanding and scraping process will cause the putty to crack.

Mask the areas surrounding the location that will get the putty prior to applying it, so that when the tape is removed the only putty that remains is along the seam line. Using the masking tape guarantees that the only place the putty will touch the plastic is where you want it to touch. Tape along both sides of the seam and get the tape as close to the seam as possible. This will result in a very thin putty line, which will greatly reduce your workload and also reduce the amount of detail that will be removed during sanding.

When you apply the putty do not worry about getting it on the masking tape and work in sections that are no more than two inches long. Quickly apply the putty and after you have finished, remove the tape by pulling it back over itself and away from the putty. It is important to remove the tape while the putty is still moist. While this is a slow process, the resulting thin putty line is well worth the effort and time expended. Prior to any sanding, again mask those areas around the putty line so that any surrounding detail will be saved.

If you are using Testors tube glue be sure that you use the red colored tubs as the blue ones are a nontoxic glue that was designed for kids and it can not be sanded. When using Testors tube glue be sure that the glue is not stringy. If you use a tube frequently the top layers inside the tube can get somewhat stringy so squeeze out the glue until you get to glue that is fresh. I use Testors glue to attach small parts or where I need to position or adjust a part. I squeeze a small puddle onto a piece of paper and apply the glue with a toothpick. It only takes 30 seconds or so for the surface of the glue to start to gel so use new glue each time you glue a part. I also wipe the old glue off the paper before it dries to reduce the odor problem.
RESTORING SURFACE DETAIL

Every scale model builder is faced with the dilemma of what to do about panel lines and rivet detail that is lost during sanding. Typically this occurs along the two halves of the fuselage and at the connection points of the wings and elevators. The first step is always to minimize the damaged areas with masking tape.

If the surface has engraved panel lines you can easily replace them in the areas that you sanded by simply re-scribing them. Be sure to scribe the new line to the same depth and thickness as the indented panel lines that you are going to connect to. If the surface has raised panel lines you can play a trick on the human eye by scribing a line that connects the raised panel lines.

To scribe a line you will need to attach some sort of guide to keep the line straight. I use labeling tape because it has a sticky backing, it is very flexible and it is thick enough to act as an edge guide for the scribers tip. To get the tape to contour around curved areas cut the tape into thinner strips so that it will be more flexible.

If you are using a plastic scriber usually one or two passes will peel away enough plastic to form engraved panel lines. To connect raised panel lines one pass with the scriber should do it. If you are using a needle scriber how much pressure you apply will determine how deep the needle will penetrate the plastic. Light pressure works best and several passes may be necessary to get a good line. Sometimes the scriber or needle will jump away from the tape edge. In these instances you can repair the damaged area using super glue.

For rivet detail carefully mark the locations of the lost rivets and punch tiny indentations in the surface of the plastic. If you need to restore access panel’s outlines use a photoetch panel template guide and a needle scriber. Once you have restored all the panel lines and rivet detail you will need to polish the surface with 0000 steel wool. The steel wool will flatten out the surface of the plastic in areas where you scribed lines or indented the surface of the plastic for rivets. To remove any residue plastic dust from the scribed lines or rivets use a toothbrush that has soft bristles.

MASKING, PAINTING AND ATTACHING CLEAR PARTS

A discussion on clear parts in a chapter on assembly techniques may seem out of place, however the biggest challenge in dealing with clear parts is attaching them to the fuselage. Most manufacturers still provide a separate windscreen and here the challenge has always been is to get the part to fit snugly onto the fuselage and to fill any void areas between the windscreen and the fuselage without damaging the clear plastic. Traditionally, clear plastic has also been very brittle and it cracks and fractures easily.

To solve this problem some newer companies are making clear parts that are a section of the fuselage with the windscreen attached to it. In these instances a different approach is necessary to deal with the seam areas created by a small, clear separate fuselage part. Luckily the plastic is not as brittle as traditional clear plastic. However the draw back is that the parts are not as transparent.

For kits that have separate windscreens test fit the part into place with strips of masking tape. If
there are gaps between the base of the windscreen and the fuselage determine the size of the gap by sliding various sizes of plastic strips into the gap. Next remove the windscreen and cover the clear panels with masking tape. Cut the selected plastic strip to a manageable length and then super glue it into place. Form fit the windscreen into place by carefully scraping and sanding the plastic strip to its required shape.

For windows that are undersized for the opening I recommend that you determine the strip size that you will need and then glue the strip to the window opening. You can then scrape and sand the added plastic to it proper shape by form fitting the window into place.

Once you are satisfied with the fit of the clear parts you can mask it for painting. One of the best ways to mask clear parts is to use 3M painters masking tape to cover the clear panels between the framing and then airbrush the parts.

There are two basic techniques for using masking tape and the method you choose depends on the framing on the clear part. All framing on clear parts is raised, but some manufacturers design their clear parts so that there is a high relief between the clear panels and the framing. While this sometimes appears unrealistic, when this type of framing is painted it is hard to notice the high relief.

This type of framing detail offers a quick and easy approach to masking the clear part. Lay a section of masking tape over an area of the clear part so that the tape covers a clear panel and overlaps the framing. Next, take a sharp, soft lead pencil and follow the frameings edge with the tip. This does two things: first, it outlines the location where the framing meets the clear panel, and second, it provides a visual line for you to follow when you cut the tape. As the pencil tip pushes the tape up against the edge of the framing you will also notice that the tape stretches slightly.

After you have finished outlining a section take a number 11 X-Acto blade and run it along the edge of the framing by following the pencil line. Due to the high relief of the framing the edge of the knife will follow the framing very easily. Be sure that you cut through the entire section of the tape so that when you remove the excess tape you will not peel off the tape covering the clear panel. Once you have outlined the entire clear part run the pencil along the edges of the tape one last time to insure that all the edges are seated properly.

The second technique is used for clear parts that have low relief framing. In these instances you will need to cover the clear panels with very small pieces of precut masking tape. To do this lay two layers of masking tape, one on top of the other, and then cut various sizes of small lengths of masking tape using your trusty sewing ruler as a guide. Really small pieces of masking tape can be used to follow the curved surfaces of framing. You can then use the tip of a toothpick to shape the masking tape to the exact curve of the framing. For box shaped areas between framing start anywhere along the framing edge and work your way around the entire clear panel. As you work along a framing edge overlap the sections of tape and push and position the tape with a toothpick.

Once you have completed outlining a frame you can mask the center area of the clear panel with the larger strips of masking tape. When you are finished masking the entire part go back over the areas where the tape meets the framing and be sure that the tape is pressed down. When you have
finished masking the entire surface of the clear part, check to be sure that you have not overlooked any areas. Also be sure to mask the inside of the canopy to protect the plastic from over spray.

If you are masking a fighter aircraft windscreen you will also need to mask the interior of the clear part because you can see both sides of the windscreen when it is installed. Paint the outside framing first, remove the masking tape and use the painted framing as a guide to mask the inside area of the windscreen. When painting the canopies of fighter aircraft, at a minimum, also paint the interior framing on the outside edges of the canopy. If you want to paint the entire interior framing use the painted exterior framing as a guide for the masking tape placement.

Another method is to mask the exterior framing, paint the interior color first then prime over this color. The primer will restore the framing to a neutral color. Next apply the exterior colors to the framing. The interior color will show on the inside areas. The only drawback to this method is that the interior color of the framing will appear shiny due to the clear plastic. To reduce this effect mask the interior framing along the inner edge of the canopy and give it a coat of the interior color.

As a general rule you should attach clear parts with white glue because this glue will dry clear. Apply the glue with a toothpick. Position the clear part in its correct location and then wipe off any excess glue with a damp Q-Tip. For the installation of interior clear parts such as windows, apply the glue to the perimeter of the opening on the fuselage, install the window and then wipe off any excess glue. If you have masked the part before you installed it you should still wipe off the excess glue from the masking tape so that when you peel off the tape you will not remove any of the dried glue along with the masking tape. After the glue has dried you can apply more white glue to fill in any gaps between the clear part and the fuselage.

If the windscreen is attached to a fuselage part paint the windscreen first. After the paint has dried mask both sides of the windscreen to protect the clear panels. Position the part onto the fuselage and then glue it in place with super glue applied with a thin wire applicator. Fill in any voids with small pieces of strip plastic. The masking tape covering the clear parts will prevent super glue vapors from fogging up the windscreen. Carefully wet sand the seam area and follow the techniques described above on seam work except I recommend that you not scrape the clear plastic with an X-Acto blade. The clear plastic will respond well to the wet sanding with a sanding stick.

When you have completed your seam work carefully peel off the masking tape from the interior area of the windscreen. Peel the tape from the outside edge with the tip of a number 11 X-Acto blade and then grab the tape with tweezers and carefully peel it away from the windscreen. You may have to re-position the tweezers several times to work around the cockpit interior parts so go slow.
Snipers work great for removing parts from their trees. I prefer to cut the tree stubs and then trim off any excess. This lessens the chance of damaging fragile parts.

After the part is removed you can continue to trim off the excess tree stubs with a despruing tweezer cutter. These cutters work great for trimming off excess plastic that is not too thick.

To do fine trimming of any remaining excess plastic from the tree I like to elevate the part on a hard wood block and use a number 11 X-Acto blade to remove any excess plastic.

Some parts are very delicate and damaging them would be hard to repair. In these cases use the despruing tweezer cutter to remove the part from multiple tree location connection points.

For large sturdy parts like fuselage halves you can use your cutters to remove the excess plastic and then sand the surface smooth.

Be sure to check all the gluing surfaces to be sure that they are flat. Sometimes parts have bumps, tiny clumps of plastic or residual plastic from the tree connections.
Sometimes the best way to get parts to fit tightly together is to sand the surfaces flat. Light sanding works best and a few passes over the sandpaper will usually flatten out the gluing surfaces.

On large parts I recommend that you lightly scrape the gluing surfaces first to remove any excess plastic.

The second step for flattening out the gluing surfaces on large parts is to lightly sand them with a sanding stick.

The best way to remove seam lines on one piece parts is to carefully scrape the excess plastic off using a number 11 X-Acto blade.

One piece parts almost always have a tiny seam line of excess plastic that will need to be removed. Carefully check all parts for these types of seams.

The second step for flattening out the gluing surfaces on large parts is to lightly sand them with a sanding stick.

Resin detail sets almost always have some type of pour plug that needs to be removed. I like to mark the edge of the pour plug first and then cut off as much as possible with a razor saw.
The marked location on the remaining pour plug will act as a visual gauge for you when you sand the remaining excess resin off the part. Wet sand resin to cut down on the resin dust which can irritate your sinuses.

Different resin part shapes require different types of pour plugs. Sometimes you can use combinations of tools like cutters and number 11 X-Acto blades to remove the plug and clean up the part.

Round parts with a flat plug can be removed by carefully snipping around the perimeter of the part and then lightly sanding off any remaining excess.

The resin plugs on delicate parts can be removed with snipsers and then cleaned up with a sanding stick, if scraping the edge with a number 11 X-Acto blade will damage the part.

Small resin parts can be attached directly to a pour plug. In these cases place the parts on the edge of a hardwood block with the pour plug hanging over the edge and cut off the parts.

Sometimes small parts are attached to a pour block by a thin layer of resin. In these cases carefully cut off the parts and then trim and scrape off any excess resin.
Injection marks can be in very difficult places especially on older kits. These shallow injection marks were gently wet sanded with a fine grit strip of sandpaper wrapped around a piece of balsa wood.

To sand the disks smooth wrap sandpaper around lengths of balsa wood and wet sand. For raised injection marks carefully scrape of the excess plastic with a number 11 X-Acto blade and then sand smooth.

Once you have all the parts cleaned up, tape the model together to check the fit of all the major components. This step can be a bit time consuming but it is well worth the effort.

Injection marks can be both raised and indented. These parts have both raised and deep indentations. The indented marks were filled with disks punch out with a Waldron Punch tool and then super glued into place.

Indented injection marks can be tricky on small round surfaces. Drill out the indentation and then super glue round plastic stock into the hole. Trim of the excess and scrape and sand smooth with a Flex-I-File.

I also like to tape together all the cockpit parts to ensure that everything fits together correctly. This step also allows me to make notes on changes, detailing, painting and weathering.
I also tape up the engines to be sure all the parts fit together and that the assembled engine will fit inside the cowling. I make any adjustment note on the instructions.

Voids between parts are easily identified during the tape up step and careful checking of all the connection points will leave no surprises once you start gluing subassemblies together.

The tape ups on these complex engine and wheel well assemblies on this P-38 kit were well worth the effort as I was able to identify several fit challenges that were easy to fix during the assembly of the engines and the wheel wells.

I use the instructions to make note on all the things I find during the tap up process and I also note how I intend to fix them. I also save my instructions so that I have record I what needs to be done as well as details that I added.

On large scale kits I have found that sometimes the plastic is so thin that it can flex after the parts have been glued together. To strengthen parts laminate strips of plastic to the inside surfaces.

Even small parts can benefit from laminating a few strips of plastic to the inside areas for added strength. If the plastic does not flex it will put less stress on the glue seams and it also makes the parts easier to handle.
You can position plastic strips in different ways to add strength to an assembled part. Since these wings were very wide I decided to laminate the strips from front to back.

To glue parts together tape the halves together positioning the parts along the seam line as you tape. Use as much tape as necessary to ensure the part halves are snug and that there are no voids along the seam line.

Make a puddle of super glue on a piece of paper and using a thin wire dap the tip of the wire into the puddle and then apply the super glue along the seam line between the tape locations. I like to add at least two layers of super glue.

Capillary action will pull the glue down into the part half gluing surfaces resulting in a strong bond. Once the glue is dried between the taped locations, remove the tape and glue the remaining seam locations.

To fill voids along seam lines I use strips of Evergreen and Plastruct plastic. I apply super glue to both sides of the plastic for a strong bond. This technique works much better than trying to fill the void with thick gel super glue.

To fill in even the smallest voids I insert tiny pieces of plastic and then super glue them into place. I have found that if you use super glue as a filler, the glue will shrink over time (several years) creating a dip in the void area.
To position strips of plastic into void areas use long lengths so that you have the ability to easily adjust and position the plastic.

Trim them as close to the surface as possible to make it easier to sand and apply super glue to both sides of the inserted plastic for a strong bond.

Seam lines along fuselages and wing edges are best scraped first to remove as much of the excess super glue as possible before you wet sand the surfaces smooth. Number 11 X-Acto blades are perfect for this type of work.

Number 11 blades are also great for contouring and scraping parts that do not fit well into their locations. Sometimes you have to remove a lot of plastic to get the parts to fit correctly and make those pesky seams disappear.

For sanding flat or semi flat surfaces wrap strips of sandpaper around lengths of balsa wood to smooth out the plastic. Once this is done you can wet sand with finer grades of sandpaper. Polish the plastic with 0000 steel wool.

Sanding sticks work great along the seam lines of fuselages and the edges of wings to smooth out the plastic and the super glue. I like to smooth sand first, then wet sand, then check for flaws.
To smooth out the wing to fuselage seam connections use balsa wood strips of various thickness with sandpaper wrapped around it. I use combinations of balsa strips that have flat edges and rounded edges to shape the plastic.

Wet sanding helps reduce surface abrasion caused by sandpaper. Using balsa strips as sanding blocks also reduces the surface area that will need to have panel lines and rivet detail restored.

Another trick for reducing the impacted surface area around a seam is to use masking tape to protect surface detail.

Testors silver paint is a great flaw detector. Remove the paint with 0000 steel wool and then sand the super glue smooth. The silver color of the glue will act as a visual indicator that the glue is contoured and smooth.

I also use Testors silver paint as a final check for any locations where I have had done seams work, filled voids or fixed dimples or injection marks.

When you are satisfied that the silver paint shows no more flaws you can remove the paint and also polish the plastic with 0000 steel wool.
Some voids are in places that are impossible to fill without damaging the surrounding plastic and the surface detail. Step one is to apply some primer to the area where the void is. This will provide a surface for the glue to stick too.

For these types of voids I use Elmers white glue to fill the void. Make a puddle of the glue on a piece of paper and apply it with a wire or toothpick. You have to work quickly as the surface of the white glue dries quickly.

Before the surface of the white glue begins to set, contour the glue with a damp Q-Tip. Use a new Q-Tip for each pass that you make over the surface of the white glue.

Once the white glue is dry give it a light coat of primer. Check for flaws and repeat the application of the white glue to completely fill the void. Prime the dried glue between applications.

Sometimes there are injection marks in places that are impossible to scrape and sand. In these cases hide them with small strips of plastic cut from your Northwest Shortline chopper.

The first step in restoring surface detail is to draw the panel lines. I use a small length of labeling tape to set the lines and mark them with a soft lead pencil with a sharp tip.
Here is another example of drawing panel lines. On tight curves you can make the labeling tape more flexible by reducing the width of the tape.

Here you can see how the labeling tape has been cut down so that it will lay across the surface of the fuselage. The thickness of labeling tape is just high enough to provide a secure edge guide for the scribe.

Flat surfaces are much easier to work with because there is much less of a chance that the scriber will skip off the edge of the labeling tape. If it does fill the damaged area with super glue and sand it smooth.

Sometimes you can set several lengths of labeling tape at once to speed up the panel line restoration process. It is important that the labeling tape lines up with the existing panel lines.

You can restore rivet detail with punch tool, but it's important that you set the locations with a pencil first along straight lines. After you are done smooth the surface with 0000 steel wool.

For large scale aircraft (1/32 & 1/24) you can use your punch tool to set the locations and then use a number 80 drill bit (.0135) to make the indentations round and all the same shape. Just a few light drill twists will do the trick.
When you have to replace lots of surface rivet detail I recommend using the punch tool. Go slow and use light pressure to set the indentation.

Using the 0000 steel wool to remove surface burs and to polish the plastic also leaves a dark residue on the panel lines and rivets from the pencil marks. Use this pencil residue to check your work and removed it with a toothbrush.

When removing clear parts from their trees do not snip close to the part. Some clear plastic can be fragile and the stress induced into the plastic when sniping can result in stress cracks in the surface of the part.

Use a despruing tweezer cutter to remove the remaining tree from the part.

When cutting be sure that the flat surface of the tree is sitting up against the cutters blades. This cutter is not positioned correctly and there is a good chance it will cause an indentation at the attachment point or a crack in the part.

Trim any excess plastic off of the part using a number 11 X-Acto blade. Do all your cutting on a raised hardwood block.
Sometimes the best trimming efforts will still leave a slight bump at the attachment point of the tree. In these cases carefully peel off the excess plastic with the tip of a number 11 X-Acto blade.

To sand the plastic at the attachment point cover the clear surface with masking tape and use the tip of a sanding stick to carefully sand the plastic smooth.

If you have to add some extra plastic to a clear part so that it will fit snugly into its location first cover the plastic with masking tape and the super glue the plastic onto the part. Super glue can fog clear plastic so be sure to use the tape.

Another method of masking is to use thin strips of masking tape to outline the framing and then fill in the open area. Be sure to use a sharp blade when cutting masking tape. I use a pencil tip to help snug the tape up against the framing edge.

Masking clear parts depends a lot on the shape of the clear area and the height of the framing. On this part I used one piece of tape over the front which was traced along the framing with a pencil. I then cut along the trace line.

The interior area outlined by the masking tape is then filled in with additional strips. I set the tape in place with tweezers and the use a toothpick to push the masking tape down onto the clear plastic.
Once the outside area is masked I mask the inside. I use the outline of the exterior masking tape edges to guide me in the placement of the interior tape.

Here is another example of taping along the edges of the framing. In this case I used small lengths of tape. I always cut the tape using my trusting metal sewing ruler so that the tape edges are straight, clean and sharp.

Sometimes you have to use small lengths of tape to create curved length. I then use the tip of a toothpick to push the edges of the tape strips to make the line smooth.

I tape the clear parts to lengths of balsa wood and airbrush them. Once the paint is dry I peel off the tape using the tip of a number 11 X-Acto blade.

These canopy parts were well masked yet a little overspray got onto the clear areas. If the overspray is just a dusting you can carefully scrape off the paint using the tip of a toothpick.

Pay close attention this this technique! These canopy parts had their exterior framing completely masked and only the perimeter framing on the inside areas masked. The parts were then airbrushed on both sides with the interior color.
I then masked over the interior perimeter framing and then airbrushed the exterior framing with primer to restore the exterior framing to a neutral color.

The exterior framing was then airbrushed with light gray. This stepped process is a quicker way to paint both the interior and exterior framing without having to mask all of the interior framing.

The interior color around the perimeter is painted and the remaining interior framing also appears to be painted, although it is just the bottom coat on the exterior framing that you are actually seeing.

To paint formation lights and navigation lights carefully paint the undersides of these clear parts with a detail brush. Attaching them to masking tape makes it easy to paint these tiny parts.

The formation lights on this P-38 were glued in place with tiny drops of Elmers glue applied to the inside lip where the parts will sit. I then used the tip of a toothpick wrapped with a tiny strip of masking tape to position the parts in place.

These tiny formation lights can be challenging to set in place and I have found that the openings in the wing tips where the parts sit need to be slightly enlarged to get them to fit correctly.
Some newer kits have the forward canopy attached to a section of the fuselage. The first step is to make sure the part fits snugly into place. You can see some extra plastic was added to provide for additional strength to the glue joint.

The clear part is painted the interior color and then masked to prevent fogging. The part is super glued into place using a thin wire applicator to apply the glue. The plastic on these types of parts is not as fragile as normal clear plastic.

Several applications and sanding sessions later the seam line is getting its last coat of super glue. Aside from filling the seam, the edges of the part also needed to be flattened to match the sides of the fuselage.

The part is now complete. The seam line is filled and the part is contoured into its location. Panel lines and rivet detail have also been restored. The interior masking was also carefully removed.

This model also had combination windscreen/fuselage fit. The seam line is clearly visible because I used white glue to fill the seam (bad mistake). I experimented and developed the technique described in the previous P-38 pictures.

White glue works great to attach canopy parts and to fill any voids that exist. Be sure that both surfaces are painted as white glue makes a strong bond when applied to flat paints.
This canopy sat slightly forward of its intended locations. To fix the mismatched colors carefully mask around the area and then airbrush light coats of paint to blend in the fuselage and canopy frame.

The clear parts on this SBD Dauntless are what I call the traditional attachment type clear parts. The canopy parts are separate and distinct. White glue works great for these parts because it dries clear.

QUICK TIPS

STUDY THE PARTS AND THE KIT INSTRUCTIONS PRIOR TO ASSEMBLY

CAREFULLY SNIP PARTS OFF THEIR TREES, THEN CUT OFF EXCESS PLASTIC FROM THE ATTACHMENT POINT AND SAND SMOOTH.

CHECK GLUING SURFACES TO BE SURE THEY ARE SMOOTH

TAPE UP THE MODEL TO CHECK THE FIT AND USE THE KITS INSTRUCTIONS TO WRITE NOTES

CHECK ONE PIECE PARTS FOR SEAM LINES AND PEEL AWAY THE EXCESS PLASTIC

ALWAYS WET SAND TO HELP REDUCE SURFACE ABRASION AND USE MASKING TAPE TO PROTECT SURFACE DETAIL

USE SMALL STRIPS OF MASKING TAPE TO MASK CLEAR PARTS
CHAPTER 3

COCKPIT CONSTRUCTION AND DETAILING

WORKING WITH PHOTOETCH INTERIOR DETAIL SETS

You can purchase interior photoetch detail sets which will either dress up the existing kits interior parts or a detail set that could just about supply enough parts to completely rebuild the interior. These photoetch detail sets can be either painted or unpainted. Eduard has the largest selection of photoetch detail sets. They are well engineered, fit together well, they have lots of fine etched or raised detail and their painted sets are superb!

I cut off photoetch parts as I need them and I do all my cutting and assembly on a Plexiglas surface and I use a single edge razor blade for all my cutting needs. The fold lines on Eduard photoetch parts are usually very precise, but sometimes hard to see especially on pre-painted parts so look closely at them before you start bending. To fold the parts I use either flat faced needle nosed pliers and a single edge razor blade or two single edge razor blades or a combination of both. The choice depends on the situation. I also run the backside of each part that will be a gluing surface along a stationary piece of 400 grit sandpaper to clean the backing so that super glue will have a better bonding surface.
Parts that just fold over to a ninety-degree angle can easily be done with the flat nosed pliers and a single edge razor blade. Place the part into the pliers with the fold line along an outer edge and use the tip of the single edge razor blade to fold the part. Parts that have a bottom and four sides are usually shaped by slightly bending the sides along the fold lines. It is important to start with a clean bend so that the completed bend will be sharp and flat. If you try to work the initial bend by just folding it with your fingers the edge of the bend will be round instead of being sharp and flat.

Once the fold lines have their initial bend you can work them into their correct positions using tweezers and a toothpick. When the sides have been folded into their correct positions and the edges butt up against the other edges of the part apply a tiny bead of super glue along the interior corners. You want to add just enough glue to hold the part together. Photoetch shapes, especially boxes, can be pretty delicate and fragile so I reinforce their interiors to add strength. This is very helpful when painting these parts, as you will be handling them a lot.

I use small plastic strips to reinforce the corners of large box shapes and I also place these strips along the open edges of these photoetch shapes for a better gluing surface. I cut the strips longer than I need so that I can position them with tweezers. I dip the end of the plastic strip into a small puddle of super glue and then carefully position the strip at the interior corners. The super glue will bond the plastic to the photoetch almost instantly so you need to be precise in your positioning. Once all the strips are in place I trim them to length and then add a bead of super glue along their lengths to add additional strength to the corners. When the glue has dried I form fit small lengths along the open edges of the box shape and then glue them into place. This will provide a wider gluing surface for the part.

To add strength to small parts pick a strip size close to the interior void size, trim down the plastic so that it fits snugly inside the void and then glue it into place. If you get super glue on the outer surfaces of the photoetch, the glue can be scraped off with the tip of a number 11 X-Acet blades. If you are working with pre-painted parts and some glue has seeped onto the painted surface give the outer surface a coat of Testors Dullcote to hide the glue.

For small parts such as throttle and mixture handles you will need to check their fit before gluing. If you are using a photoetch assembled throttle quadrant, the actual throttle handles can sometimes slip too far down into the assembly so be careful when attaching them. If you are adding small photoetch levers to kit supplied parts be sure that you drill the opening large enough to accept the photoetch part. I like to paint these small parts on their photoetch trees first, remove them and attach them with tiny drops of white glue so that I have some working time to position them correctly. Once the white glue has dried I apply a ting drop of super glue to add strength to the attachment point and I then touch up the part with a detail brush.

To reproduce the ball handles on control levers apply a small drop of white glue to the tip of the lever with a toothpick. The glue will dry into the perfect shape of a ball. If there are circles on the photoetch electrical and radio boxes chances are there is an instrument or dial face that should be there. Use the outline as a guide to add flat white paint applied carefully with the tip of a toothpick or detail brush to color in the circle. Then punch out a decal or placard instrument using your Waldron punch with the closest diameter to the circle and attach the instrument face.
If the box has indicator lights apply tiny drops of white glue applied with the tip of a round toothpick to the locations. After the glue dries use a sharpened toothpick tip or a detail brush to paint the indicator lights which are usually red, green or yellow. If there are switch locations on the part drill out small holes and add stretched sprue or small diameter round stock attached with super glue. The lengths of plastic should be pre-painted so that once they are glued into place you can cut them to length, and then touch up the tips.

WORKING WITH RESIN DETAIL SETS

Resin detail sets can add a very high level of realism to open cockpits, but there can be a lot of cleanup work involved. Most resin detail sets have pour plugs, which need to be removed, and how it is attached to the part will determine how you will remove it. Before you do any cutting or sanding of resin parts I recommend that you take inventory of all the parts to be sure that they are all there and that none are damaged. Damaged or missing parts can be replaced by the manufacturer. Always wash resin parts before working with them to remove any mold release agents. You can soak them in warm water and Ivory soap for a few minutes and then scrub them with a soft toothbrush. Rinse the parts to remove the soap residue and let them dry.

Large resin plugs can be cut down using a razor saw and the remaining excess resin can be removed by running the part across a stationary piece of sandpaper. When cutting resin place some paper towel under the cutting area and wear a dust mask over your mouth and nose as you do not want to breathe in the residue resin dust. When sanding resin parts always wet sand them whether you are using stationary pieces of sandpaper or a sanding stick. The resin residue will glob up making it easy to clean up.

Be very careful when sanding resin as even 400 grit sandpaper will remove resin rapidly from a part so check your sanding work often and go slow. Good resin detail sets have resin parts with minimal pour plugs. The small parts are usually found on trees. You can easily remove them with a number 11 X-Acto blades. When cutting small parts off leave some of the thin pour sheet attached to the part. Once the part is removed you can then clean it up. Parts such as frames will have a thin layer of resin between the framing. Typically this resin is .010 inches thick or less and can easily be cut out with your trusty number 11 X-Acto blade.

All the major components that fit inside the fuselage should get a fit check. You may need to do some minor trim work to get everything to fit correctly so go slow when you sand, shave or cut and be sure too form fit the parts into place. Once you are satisfied that all the parts fit correctly you are ready to complete any subassemblies and prime the parts. Priming the parts is important as it affords you the opportunity to check for any flaws such as pinholes or voids where the resin did not fully fill the cavity of the mold. You can fill these with tiny strips of plastic by dipping the tip into a puddle of super glue and then sticking the tip into the pinhole or void. Once the glue has dried cut the strip and carefully scrape or sand it smooth. At this point, painting, assembly and gluing proceeds just as if it were plastic a kit. You should always scrape paint off gluing surfaces and use super glue to attach resin parts to one another or to plastic. Small parts can be attached with white glue if the parts are painted.
BUILDING THE INSTRUMENT CONSOLE

There are many kits on the market today where the instrument console has the instruments engraved onto the part. Fortunately these kits also supply console decals which can be used to enhance the plastic surface. To get a really good looking result from a kit console, first paint the console the appropriate color and then give it a gloss coat. Punch out the individual instruments from the decal sheet with a Waldron punch and apply each decal to its respective location on the painted console. This is a very slow and tedious process but if you are careful you can get a fairly good looking console. When you are finished give the console a coat of clear flat to seal the decals and restore its appearance.

Some newer kits come with a transparent console, a plastic backing and a clear acetate film or paper instrument panel that is sandwiched between the transparent console and the backing. Sometimes the transparent part has holes for the instruments and sometimes it’s just a solid piece of clear plastic. For a solid clear piece you have two options; one is to mask the instrument locations and the other is to drill them out. If you decide to drill out the instrument locations, I recommend that you thin out the clear plastic a little by running it across a stationary piece of sandpaper, as these parts tend to be rather thick.

To mask the instrument locations use a Waldron punch to make masking tape disks that can then be placed over the instrument outlines of the clear part. This is a slow process as you have to separate the Waldron punch, place a strip of masking tape over the appropriate punch hole, replace the top part of the punch, punch out the disk and then repeat the process for the next disk. You will also have to punch out a lot of masking tape disks to get a few good ones. Sometimes using two layers of masking tape works better than one.

The second approach, and the one I like best is to drill out the instrument locations. Since clear plastic is more fragile than colored plastic you will need to be careful when drilling. Gently center punch each location and then drill out a small hole. Select the drill bits you will be using and what you will need to do is use progressively larger bits to open up the instrument hole. If you try to cheat and use too large a drill bit you will crack or fracture the cleat plastic. I also place the clear instrument face on a wood base when drilling.

Once you are done masking or drilling you can paint the clear instrument face the appropriate color and be sure to paint both sides. If you are using a paper instrument placard use tiny drops of white glue to attach it to the back of the console. Line up the instruments carefully and be sure that the glue is pressed flat. If you use super glue on the paper you might stain the instruments ruining the part. If you have a clear acetate part paint the backing flat white so the instruments will stand out, position the acetate onto the back of the clear part and attach with tiny drops of super glue. Complete the assembly by super gluing the backing to the console. I like to run a bead of super glue around the perimeter of the completed assembly for a strong bond. You can then scrape and sand the edge smooth and touch up with the console paint color.

Another approach is to purchase a photoetch detail set. Eduard makes great cockpit detail sets for hundreds of different aircraft models in 1/72, 1/48 and 1/32 scale. Their consoles are very easy to assemble, and they are well engineered and have excellent fit. You get a console face, clear ace-
tate sheet with the instruments printed on it and a back piece. Most photoetch consoles need to be reinforced to add strength to them. Trace the outline of the console’s backing onto .020-inch white sheet stock and cut out the new backing. Paint the photoetch console and then carefully position the acetate part onto the back of the console so that the instruments are centered in their respective holes. A few drops of super glue will secure the acetate part into place. Glue the white plastic backing to the photoetch console and run a tiny bead of super glue around the perimeter. The white plastic will highlight the detail on the instrument faces, although you might also want to also paint the back of the acetate flat white.

Sometimes photoetch consoles have several layers and in these cases plan your assembly carefully and reinforce with plastic whenever possible to add strength to the assembly. If you are working with Eduard’s pre-painted photoetch sets, to help prevent damaging the pre-painted surfaces wrap small lengths of masking tape around the ends of your tweezers.

If the console has raised detail for indicator lights, these can be simulated by adding a drop of white glue to each location using a round toothpick as an applicator. These glues have a high surface tension and will form a perfect hemispherical shape. After the glue has dried paint it the appropriate color using the tip of a round toothpick as an applicator.

**SEATS AND SEAT BELTS**

Wherever possible I like to use the kit-supplied seat as a starting point. Most new kits supply seats with no belt detail molded onto it, but there are lots of older kits where the belt and seat are one part. If the kit seat is thick you can thin it by running the part across a stationary piece of sand paper. If the seat has molded on seat belts you can carefully scrape them off using a stencil knife and a number 11 X-Acto blade and then smooth out the surface using a small length of sandpaper wrapper around a length of balsa wood.

Prior to attaching seat belts paint the seat and dry brush the edges with silver paint to highlight the shape of the seat. To replace the seat belts I recommend purchasing Eduard’s per-painted seat belts. In 1/48 and 1/72 scale, the belts are one piece and all you have to do is some minor bending and then attach them to the seat with super glue. Carefully cut them from the photoetch sheet, bend them onto the seat and backing so that they take the shape of the edges and curves of the seat and then attach them with tiny drops of super glue. Be sure your tweezer tips are covered with masking tape to protect the painted surfaces.

If you are working in 1/32 scale, the Eduard pre-painted seat belts need to be assembled. The first step is to fold the belts at the locations where you want to put the adjustment buckles, which is usually about half way along the length of the belt. I use a set of flat nosed needle pliers, with the inside surfaces cover with masking tape, and a single edge razor blade to make the initial bend. I then exploit the bend by working the photoetch seatbelt into a tighter bend almost collapsing it onto itself. The bend needs to be tiny as the slots for the belt on the adjusting buckle are only 1/32 of an inch apart. Thread the bent seatbelt through both slots of the adjustment buckle and work it up to the fold. Once the buckle is positioned correctly expand the belt and then press it flat to set the buckles location. Once you have the center adjustment buckles in place, carefully fold the tabs at the end of the belts for the remaining belt hardware. Next you can add the remaining
photoetch details such as the adjusting straps.

Once I have the belts assembled I like to form the belts to the shape of the seat at their respective locations by carefully pressing the assemblies onto the seat. Go slow when shaping the seat belts, as you do not want to pop off any glued on details. Attach the belts with tiny drops of super glue. After the super glue has dried apply some Testors Dullcote where the super glue is exposed on the painted surfaces, which will appear to be shiny. The Dullcoate will make the super glue blend into the flat painted surface and it will disappear.

If you are working with a resin seat and the belts are molded onto the seat I do not recommend that you attempt to remove the belts, as it is too easy to damage the resin part. I recommend that you paint the seat, then mask off the belts and paint them and then carefully pick out the metal components with a detail brush. Another approach is to purchase a photoetch detail set that has a seat and use it. Photoetch seats can be very fragile so reinforce them by laminating .015-inch sheet stock to the sides and backing after you assemble it.

Jet aircraft ejection seats are very complex pieces of machinery and most jet aircraft kit seats do not do them justice. I recommend that if you really want to add a high level of detail to your jet cockpit purchase a resin ejection seat. Carefully painting, highlighting and dry brushing will bring out all the detail that was added by the manufacturer. The pour plugs are removed the same was as described in the section on working with resin parts.

**GUN SIGHTS**

Most manufacturers supply some type of gun sight part, which usually has the correct shape, but lacks detail. Most World War Two fighter aircraft were fitted with some type of reflective gun sight which was centered either at the top of the console or above it, while modern jets have heads up displays which combine computer aided gun and missile aiming along with instrument readings. The reflective glass for the gun sight is positioned so that the pilot’s eye could look through the reflective glass, on through the front of the windshield and out to the target.

To dress up the sides of the gun sight I usually add some small, thin plastic disks that I punch out with a Waldron punch tool. You can also add a switch or two with stretched sprue and to really add some realism attach a small instruction decal. Most gun sights are a light shade of flat black. Do not add the clear parts until you have finished all your painting. If the gun sight needs a reflective glass plate, but none was supplied in the kit, you can add this by cutting a small rectangular shape from clear sheet plastic. Glue it in place with white glue.

**ADDITIONAL DETAILING**

If you decide to install interior framing keep in mind that vertical framing is wider than horizontal framing. To draw the lines for the framing on a curved surface use a thin strip of sheet stock of about .020 inches thick. If you decide to install both types of framing, I recommend that you do the vertical ones first and then form fit the horizontal ones. Since the horizontal frames will be in sections and positioned between the vertical frames you will need to insure that they are all installed along a straight line. I install all the strips along one line, adjust them until they appear
straight and then place a drop of super glue with a thin wire applicator along the underside of each length. The capillary action will pull the glue under the plastic strip.

If you want to add some additional interior plumbing use small diameter round stock for straight lengths and moderate bends. You can secure the bend’s position by applying tiny drops of super glue at the bend point. If you need to run the piping along interior contours use small diameter solider or soft brass beading wire. These metals are easy to shape and contour around curves, corners and over framing. Be sure to paint these parts before you install them. An easy way to paint these small diameter lengths is with a sharpie indelible ink marker.

### QUICK TIPS

- **CUT OUT PHOTOETCH PARTS WITH A SHARP BLADE ON A PLEXIGLAS SURFACE**
- **CUT OFF PHOTOETCH PARTS AS YOU NEED THEM**
- **TO GET SHARP BENDS IN PHOTOETCH, SHAPE THEM WITH FLAT FACED NEEDLE NOSED PLIERS AND SINGLE EDGE RAZOR BLADES**
- **REINFORCE PHOTOETCH BOX SHAPES WITH SMALL STRIPS OF PLASTIC**
- **ALWAYS WET SAND RESIN TO REDUCE THE DUST AND USE CIRCULAR “8” MOTIONS TO ENSURE AN EVEN SURFACE**
- **ALWAYS WASH RESIN PARTS TO REMOVE THE MOLD RELEASE AGENTS**
- **USE TESTORS DULL COAT TO HIDE SUPER GLUE ON PAINTED PHOTOETCH ASSEMBLIES**
- **INSTRUMENT DECALS ARE BEST PUNCHED OUT WITH A WALDRON PUNCH TOOL**
- **WHEN DRILLING CLEAR PLASTIC, GRADUALLY INCREASE THE DIAMETER WITH MULTIPLE DRILL BITS**
Always cut photoetch on a Plexiglas plate with a sharp blade and only cut the parts off as you need them. You can clean off any excess stubs on the part with a sanding stick.

These photoetch parts are being cut off and glued into place one at a time. Working slowly in a stepped process will always yield better results with photoetch parts.

Photoetch box shapes are best partially bent along their fold lines. Once the metal is slightly worked along the fold line you can complete the shape by bending the sections with a set of tweezers and the tip of an X-Acto blade.

These box shapes photoetch parts had beads of super glue applied along the interior seam and fold lines. Small strips of .020 inch plastic strip were then added to strengthen the part and provide for a wider gluing surface.

Even these small box shapes were reinforced with small bits of plastic to strengthen them.

These small name plates were shaped by rolling a Waldron punch rod across the part. I use a slightly smaller diameter rod than the diameter that I need so that the photoetch part would fit snugly in place.
Photoetch parts can greatly enhance the appearance of the plastic kit parts. I place tiny drops of super glue at the photoetch part location and then position the part in place.

These parts will look much better once they are painted and the small added details are painted with a tiny detail brush.

The addition parts on the sides of the cockpit will greatly enhance its appearance resulting in a very busy looking interior once the parts are all painted and drybrushed.

I do not always use all of the photoetch parts. The upper face plate on the throttle quadrant would be very difficult to shape and place correctly. I decided to stick with the larger side plate.

To help place the additional parts that get attached to the side plate, I used by Waldron punch tool to make some different size disks.

The disks were super glued into place and they will help enhance the appearance of the parts by creating a wider three dimensional effect when the additional parts are attached.
Although cockpit photoetch detail sets include a seat, I like to use the kit's seat. I thin out the sides and the back and use the photoetch details to enhance the seat's appearance.

All of the kit parts for this 1/32 scale P-38J have received their photoetch details and they are now ready for priming and final painting, detailing and weathering.

Many new kits have different types of console assemblies that include an acetate sheet with instrument details on it. The sheet gets sandwiched between the front console and its backing.

The clear plastic console on this P-38J was thinned out by running it across a stationary piece of sandpaper. If the plastic is too thick, the instruments will appear to be set too deep into the console.

The console on this P-38J had some mold punch outs on its surface that I did not see until I primed the part. To fix the problem, I drilled out the punch marks, glued round plastic stock in place, trimmed and sanded them smooth.

All the interior parts on this 1/32 scale P-38J have been painted, drybrushed and weathered. Note that the backing for the console is painted white so that the acetate instrument details can be clearly seen once the console is assembled.
The p-38 J console has been assembled and I then placed drops of white glue onto the instrument surfaces to replicate the glass cover plates of the instruments.

White glue dries clear and this instrument console will look great once it is installed inside the cockpit.

The cockpit on this 1/32 scale P-38J is starting to really take shape. Note the top of the throttle quadrant and the details associated with the throttles and the engine fuel mixture lever locations.

This is the photoetch console that came with the Eduard detail set for the P-38J. I traced out a thicker backing on .020 inch sheet stock to add strength to the assembly.

This is the assembled photoetch console that I could have used for my 1/32 scale P-38J project. I decided to use the paper instrument detail sheet because it had some color to it.

Resin cockpit detail sets provide you with everything that you should need to enhance the cockpit of your aircraft model. This detail set is for the Revell 1/32 scale He-162 Salamander and it includes engine and wheel well details.
To remove the resin pour plugs on the cockpit side panels scribe along the base of the plug with a sharp number 11 X-Acto blade to remove it. Finish removing the excess with a sanding stick.

Small resin parts can be cut off in a variety of ways. Chapter two has several examples of different methods. The resin sheet between the framing can be scribed and removed with several passes of a number 11 X-Acto blade.

The molded on interior detail on the Revell Salamander’s fuselage sides was carefully sanded off so that the resin parts would sit correctly. Model by Scott Weller

Careful detail painting can really bring out all the added details on resin kits. With the addition of some wash along the framing, these parts will really enhance the cockpit interior. Model by Scott Weller

The instrument console for the Revell Salamander is a phototetch front with an acetate instrument sheet and a backing which was painted white to enhance the instrument detail. Model by Scott Weller

Now that all the cockpit parts and the seat belts have been added, this assembly is ready to be added to the kit. Note how all the different colors and shades enhance its appearance. Model by Scott Weller.
Eduard’s prepainted self adhesive photoetch parts should be cut out with some of the backing attached to the part. The long backing tab will make it easier to peel it off as you handle the part.

The first layer of the console has been positioned onto the kits part. You need to be farley precise when you lay down self adhesive photoetch parts as you will not be able to move it a lot once it starts sticking. Press firmly once in position.

Here again you need to be farley precise in positioning the parts. You can slide it a little and I used the ends of toothpicks to accomplish this. I noticed that the sliding became more difficult in a minute, so position it quickly.

Although these small red parts had some adhesive I also used tiny drops of super glue to attach them once the parts were positioned. I moistened the tip of the toothpick to pick up these tiny parts and place them in there respective locations.

I also found that you can attach parts to one another while one part is still attached to its tree. On smaller parts I found it easier to assemble them in this fashion, although next time I will also try assembling the console this way.

The console is now completely assembled and it looks very impressive. I was concerned about the color differences between the prepainted colored console and the flat black color I used for the backing, but it looks great!
For self adhesive photoetch parts that need to be shaped leave the backing on the part and bend it with flat faced needle nosed pliers.

The left side cockpit panel has received all of its kit and photoetch detail parts. Note how clean the panel looks. You can use Testors clear flat paint to hide super glue that overflows onto painted surfaces or photoetch parts.

This is the assembled 1/32 scale Hasegawa P-47D cockpit with a combination of kit parts and Eduard’s prepainted photoetch parts. Note the slightly different shades of interior green between the sides and the floor.

The only problem I discovered with the Eduard photoetch parts was that the canvas map case top should have been wider. The reflective lenses for the gun sight are kit parts.

Sometimes kits have such extensive interior detailing that the only thing you need to add are Eduard’s colored seat belts. Such is the case for the Trumpeter 1/32 scale SBD Dauntless.

The side detail parts were painted their base colors and then carefully masked. The next color to be added will be flat black with a little white added so that the resulting color will not be so black.
This masking took some time to get into place so that there would be sharp demarcation lines between the interior green framing and the black instrument boxes.

These parts were masked and then placed onto tape that is folded over onto itself. I like to use strips of balsa wood for mounting small parts for painting.

These parts were positioned onto the masking tape first and then small strips were applied to mask off the areas that were to be painted.

Multiple strips of tiny lengths of masking tape covered these areas. I used the tips of tweezers to help position the tape so that the edges wrapped around the parts completely.

Here I painted the canisters first, then masked the green areas and airbrushed the black straps. To get crisp, sharp lines always cut masking tape with a sharp number 11 X-Acto blade and a straight edge.

One last example of masking. The lower part was painted the base interior green, then masked for the black control boxes and then masked again for the leather case. I then removed all the tape at one time.
I added brass beading wire to the antenna reel to add an additional level of detail to the cockpit. This reel was turned by the copilot to pay out the antenna for better communications.

These interior parts have received their detail painting and drybrushing and they are ready for installation. See chapter 7 for tips on drybrushing.

The communications and navigation boxes need some dial faces which I made with an instrument decal sheet. The decals were punched out with a Waldron punch set and white glued into place.

The finished boxes look much better with the dial faces added. I picked out the surface details using the end of a round toothpick that I dipped into red and silver paint.

You can also use decal instruments to add detail to just about any kit console. This console is from Trumpeters 1/32 scale Mig 3.

Some large scale kits come with a solid clear console face which either needs to have the instrument locations masked or drilled out. I chose to drill them out. All of the drill bits were used to carefully increase the size of the holes.
I put a slight indentation in the center of each drill location and started with a small drill bit. I used progressively larger bit sizes until I achieved the desired opening. Go slow and peel away small amounts of plastic at a time with each bit.

To clean up the edges of each hole I used the tip of a number 11 X-Acto blade. Here again go slow and check your work frequently so you do not gouge the edges of the plastic.

I used the tip of a sanding stick to smooth out the surfaces of the plastic around the drill locations to remove any residual plastic and a drill burs.

The console backing was airbrushed flat white and the consoles face was primed, check for flaws and then airbrushed flat black.

I masked the flat white area of the backing so that the remaining surface area of the part could be airbrushed flat black.

The main console parts have been painted and they are ready for drybrushing and detail painting. I added some flat white to the flat black so that the resulting color would be a dark charcoal.
The clear acetate sheet was carefully cut using a sharp number 11 X-Acto blade and my trusty stainless ruler. The two acetate sheets were positioned onto the back of the console face and the edges were glued in place with tiny drops of super glue.

Next I sandwiched the front and back halves of the console together positioned them and then ran a bead of super glue around the perimeter. Next I carefully scraped the perimeter area flat to remove the excess glue.

I check the seam line with Testors silver paint, added more super glue where needed and then sanded the surface of the perimeter smooth with a sanding stick. I masked the face of the console and airbrushed the perimeter. The surface details were picked out with my trusty toothpick and a lot of patience. The one thing I should have done was to thin out the console face so the instruments would not be set so deep into the console.
The alternative to drilling out the instrument faces is to mask the instrument locations. You can use your Waldron punch tool to make small masking tape disks which you can carefully position onto the console face.

When attaching interior parts to the cockpit area don’t forget to carefully scrape off the paint at the glue locations. Otherwise the parts may fall off after you glue the fuselage halves together.

I did a final fit check on the communications and navigation part and found that it did not fit correctly between the fuselage halves so I scraped away some of the plastic and slightly shortened the width.

The right side of the fuselage has now been completely assembled and almost ready for the cross part and the center section. Note how a good paint job with sharp demarcation lines.

The center section of the cockpit assembly is also done and all the detail parts have been painted and added. Note how subtle drybrushing and different shades of the interior green color make the assembly stand out.

The left and right halves and the center section are done and all that remains is to attach several cross pieces and the cockpit will be closed up.
Note how the combination of the color shades, individual colors, drybrushing and careful assembly add that extra level of detail to a cockpit.

This 1/32 scale Dauntless cockpit was the most detailed out of the box assembly that I have ever constructed. The only aftermarket item that was added were the Eduard prepainted seat belts.

Eduard’s prepainted seat belts are easy to assemble once your get the hang of it. Do all your cutting on a plexiglas sheet and cut the tree stubs as close to the part as possible. Sanding off residual stubs on small parts can be challenging.

To position an adjusting buckle, fold the belt over onto itself, slide the buckle to the bend, then press it flat. On self adhesive belts, place a piece of the backing paper between the belt’s tips when folding to prevent them from sticking.

I like to assemble one belt at a time. The end folds for the belts buckle hardware can be small. You need just enough length to slip the hardware’s end loop through the bent portion of the belt so that you can fold it over.

To glue the hardware to the belt, tape one end of the assembly so that you can pull the belt tight to center the hardware. Place a tiny drop of super glue at each hardware location. Hide the super glue with Testor’s clear flat paint.
The shoulder belts assemble the same way as the waist belts. This time I attached the end buckle hardware first, then bent the belt to slide the adjusting buckle into place. Both methods work equally well.

I like to install the shoulder belts first. Glue the back attachment points first and then carefully press the belts length against the seat so that the belt drapes down the seat backing. Glue into place with tiny drops of super glue.

Scrape away some of the paint to get the buckle hardware to attach firmly to the seat. Press the belt over the edge of the seat first, then onto the seat’s bottom.

The belts have all been attached with Super glue and Testors clear flat applied to the glue spots to make them disappear. This 1/32 scale seat is going to greatly enhance the cockpit of my P-38J.

Some belts have lots of small adjusting straps. Position them, hold the in place with the tip of a toothpick and super glue them into place.

The waist belts on these seats are much wider than later World War II US seat belts. These wider belts were a lot stiffer so they didn’t conform to the seat as well as thinner ones did.
The gun sight on this P-38 J had a few tiny disks attached to it which I made with my Waldron punch tool. I painted them the same shade of black as the gun sight and they are hard to see. Use different shades to get tiny parts to stand out.

The addition of the clear base lens, plus some careful detail painting really enhances the appearance of the Hasegawa 1/32 scale P-47D gun sight. The reflective lenses on the gun sight are from the kit.

To smooth out the plastic I used a small ball of 0000 steel wool held with a pair of sturdy tweezers. To remove the tiny specs of the steel wool I used my airbrush to blow them out.

I carefully drilled out the top of this 1/32 scale P-47D gun sight so that I could install a clear lens punched out with my handy Waldron punch tool. I painted the inside silver and secured the clear part with white glue.

Sometimes cockpit interior seams can be a real challenge to remove. I placed a tiny drops of super glue along the seam line and then carefully scraped the surface smooth with the tip of a number 11 X-Acto blade.

I carefully masked the interior area and then primed the surface, checked for flaws and then gave it a finished coat.
Here is another example of “after the fact” seam work. The top cross member of this SBD had seam lines on both sides that needed to be fixed. I carefully scraped the areas smooth after applying a bead of super glue to the seams.

I then wet sanded the area smooth with sand paper wrapped around a section of balsa wood. I had to work carefully so that I would not damage the raised detail.

To smooth out the plastic and the remaining paint I polished the area with small balls of 0000 steel wool.

I careful masked the areas and the primed the exposed surface to check for flaws. I found a tiny area which I fixed by applying tiny drops of super glue which I smoothed out with a fresh ball of 0000 steel wool.

The area looks one hundred percent better now that the seam lines on both sides of the cross member have been fixed. The steel wool smoothed out the edges of the existing paint so that the new paint would blend in and be undetectable.

CHECK OUT THE AIRCRAFT PROJECTS SECTION OF MY WEB SITE FOR ADDITIONAL TIPS AND TECHNIQUES ON BUILDING, DETAILING, PAINTING AND WEATHERING COCKPITS
CHAPTER 4

ENGINES AND LANDING GEAR

DETAILING ENGINES

Aircraft with radial engines have big cowling and consequently large opening which show off most of the face of the engine. All radial engines have a wiring harness, which is located at the base of the crankcase in the shape of a ring. The individual spark plug wires emit from this ring and metal jackets protect both the ring and the wires. The wires for each cylinder are located next to one another on the ring with a wider space between sets of wires. One spark plug location was always centered on the front of the cylinder and the other was located either on the top or on the backside of the cylinder.

If the kits radial engine has a separate wiring harness or has one molded to the engine their are most likely stubs along the rings circumference where the wiring emits. Use a pin vise to set the drill hole locations and then use small drill bits to make indentations for wiring. If the ring has no stubs you can mark the wiring harness for the correct number of cylinder sets and then drill small holes in the ring with a pin vise and a small drill bit so that the wires you add will have a
positive seating.

You will also need to drill holes in the cylinders at the correct spark plug locations. Be sure that the drill bit size that you use matches the size of the wiring you plan to use. For 1/48 and 1/72 scale engines you can use strands of electronic wire, and for 1/32 scale kits use brass-beading wire. You can also purchase photoetch detail sets for engines and they always include a wiring harness and the correct number of spark plug wires. These detail sets are specifically designed for a particular model kit and the photoetch parts fit onto the kit parts very well.

After you have completed drilling the holes for the spark plug wires, prime the subassemblies and then give them a coat of Testors gloss gull gray. To accent the cylinders and highlight the cooling vans hand paint them Testors non-buffing gunmetal metalizer. Testor’s metalizer paints are thinned for airbrushing, but the non-buffing types can be applied with a brush to small areas. Due to the thinned consistency of the paint, and the fact that these paints do not adhere very well to gloss enamels, the paint will flow into the areas between the cylinders cooling rings while only slightly staining the tops of the them. This will result in a two-color appearance to the cylinders and highlight the detail.

The tops of the cylinders are usually a darker color than the cylinder's body, and to represent this paint the tops flat black or Testors non-buffing exhaust color metalizer. To accent the crank case bolts I paint them Testors silver, applied with a sharpened round toothpick. To add a final touch I add a small square or rectangular black decal onto the crankcase to represent the manufacturer's plate. Photoetch detail sets usually come with several manufacturer plates for different locations on the engine.

Push rods that are separate parts can sometimes be misaligned with the engine cylinder heads. In these cases I recommend that you cut the push rods off at their base and replace them with round plastic stock. You will need to form fit them one at a time and I recommend that you paint them prior to installation. The easiest way to do this is to paint a few lengths of round stock, cut approximate lengths, form fit each one into place and then attach them with super glue.

To weather the engine I dust it with a mixture of brown and black pastel dust applied with a soft brush and then I airbrush a coat of clear flat to seal the pastel. Remember that these stains need to be very subtle so do not over do it.

The last step is to add the wiring. You need to determine what color the metal covering that protects the actual engine wiring: usually this was a copper, black or a bright metal color. After you paint the wire strands glue the wires around the harness at the base of the crankcase and then form fit them, one cylinder location, at a time. I usually do the front wires first, and then locate the wires for the backs of the cylinders. If there is a second row of cylinders, I work on the front row first and then complete the back row.

If you decide you want to add wiring to an inline engine you will need to plan to remove one of the cowling covers so that you can see the detail that you worked so hard to add. This means additional work for cutting out the panel, thinning it and adding framing to the inside of the cowling area. If there is molded on wiring to represent the spark plug wires scrape the detail off using a
number 11 X-Acto blade and smooth it out with a sanding stick, mark the locations of the spark plug wires and then drill holes for their locations. The spark plug wires are usually wrapped together and distributed along the length of the block. To achieve this effect you will need to glue them individually in place and then bundle them together as you move toward the rear of the engine. As you bundle the wires apply tiny drops of super glue to hold everything in place.

You can highlight detail on in-line engines by painting different parts of the engine various shades and colors. The block is usually one color and the top of the engine and the rear components are usually different colors. The engine mounts and framing can be painted various shades of the same color. The overall effect of adding wires, painting the engine and mounts different colors and some weathering can turn even an average in-line engine into a masterpiece.

Another approach to detailing the engine is to purchase an after market resin engine which usually comes with all the parts in resin and photoetch that you need to make a real eye catching engine. Some of these kits are models in themselves. Some of these after market resin engines are well engineered and fit together well and also fit onto your model without much effort. If the aftermarket kit has fit problems chances are the engine will also need to be modified to fit correctly onto the fuselage and within the area of the cowling.

If you are going to add detail to a jet engine you will need to decide how to open up access panels to see the detail. For this reason most jet aircraft kits do not have engines although newer kits, especially those in 1/32 scale are now including them. Molded on piping and wiring is very difficult to remove without marring the engine so I recommend that you add additional piping and wiring to provide a perception of depth. Use various size plastic rods, especially if you are running several lengths together and always use super glue to attach them to the engine. Thin electronics solder also works well because it easily conforms to the shape of the engine. Junction boxes and other types of appendages can be added using various sizes and shapes of small square stock. Dry brushing to highlight detail is another technique you can use to bring out all the subtle surface detail molded onto the parts.

If there is no jet engine you can enhance the intake area by sanding off the backing of the jets engine fan. Run the part across a stationary piece of sandpaper in circle 8 motions so that the plastic is removed evenly around the part. As the plastic gets thin it will become almost transparent. At this juncture you can use the tip of a number 11 X-Acto blade to remove the remaining plastic and clean up the individual fan blades. Use the part to draw an identical circle on sheet stock, cut it out, paint both parts and then position the circular disk you cut out approximately 1/16 of an inch behind the intake part. This will add an increased perception of depth to the intake area and also add an element of realism because the individual turbine blades will stand out.

**PROPELLERS, ENGINE INTAKES AND EXHAUSTS**

After you remove the mold lines, give the propeller a coat of primer and then paint the tips the correct color, which is usually yellow. You can get a better shade of yellow if you first apply an undercoat of flat white. When the paint has dried mask the tips with 3M painters masking tape and then apply flat black. I like to add a few drops of flat white to my propeller color so that it is a dark charcoal.
If the propeller's hub is a different color than the blades you will need to mask the blades re-prime the hub and then paint it the required color. Once you are finished painting the propeller, give it a coat of clear gloss. I find that at least two coats are necessary to get a really good clear gloss finish on flat black. Apply the decals to the blades and then seal the decals and restore the flat appearance of the propeller with Testors Dullcote. If you want to weather the propeller dry brush the leading edges with Testors silver.

Exhaust ports can be hollowed out several different ways depending on the type of model you are building and the locations of the exhaust ports. Since these parts can become very fragile after drilling, especially in the smaller scales, all preparations such as cleaning, scraping and sanding should be completed prior to drilling. It is important that the surface that will be in contact with the drill bit be smooth and flat so that the drill bit will not skew off to one side so be sure the tip of the exhaust is flat.

When selecting drill bits start with the diameter that you want the finished hole to be and then select several other sizes that are smaller than the finished diameter. What you want to do is slowly work up to the finished diameter because if you try to remove too much plastic you can fracture the part. Another advantage of working up to the needed diameter is that you can achieve very thin walls if you are careful.

I first place an indentation in the center of the exhaust for a pilot hole and if it is not centered you can adjust it by angling the tip of the punch. Start drilling with the smallest bit and check the centering of the hole. If it looks good move on to the next diameter and so on until you achieve the diameter opening you want. If your drill bit becomes offset from the center you can correct this by removing the plastic from the off centered side using the tip of a number 11 blade. This is a very delicate process so be gentle and go slow. I then move up two drill bit sizes, which usually helps to self-correct the off centered hole.

If the exhaust has an oblong or elliptical shape you can still drill a round hole and then shape the opening to match the shape of the exhaust by using the tip of a number 11 X-Acto blade. Be careful, go slow and check your work frequently. When hollowing out exhausts it is only necessary to go deep enough so that the exhaust port appears to be hollow which is usually about 1/16th of an inch or so.

Cowling flaps, especially on a bomber, look much more realistic if the plastic between the cowlings flaps is removed. This can be done with a thin bladed razor saw. Engine vents can also be drilled out in a variety of ways, depending on the situation. The best way to hollow out these types of vents is to drill a series of very small holes, use a number 11 X-Acto blade to remove the plastic between the holes and then smooth out the sides with micro files. There is little room for error, and repairing gouges can be difficult due to the locations of some of these vents. Be sure that you protect the surrounding plastic with 3M painters masking tape so that if you slip with the drill bit or the files, the surrounding plastic will not be damaged.

Air intakes can be open or have screening covers, so check your documentation to be sure. Fighter planes usually have big air intakes on the front of the cowling or around the front area of
the fuselage, while two and four engine bombers can have intakes on the leading edges of the wings as well as on the engine cowlings. If the area is covered with molded on screening cut it out and add photoetched screening. Photoetched screening can be very hard to cut to an exact shape so I recommend that you attach the screening to the inside area of the part so that you can use an oversized section.

Piston engine exhaust ports generally take on an almost rust or mud color because the cast metal they are manufactured from tends to take on that color due to the combinations of temperature and exposure to the elements. To paint exhausts I use Testors burnt metal buffing metalizer, which I polish with a Q-Tip, and then seal with Testors Dullcote.

Jet engine exhausts nozzles are very complex pieces of equipment that can expand and contract depending on the jet's speed and whether it is accelerating or slowing down. The nozzles are designed along the same principles as a camera's diaphragm. The diaphragm is a series of metal plates, which slide past one another to form a specific size opening.

If you want a good representation of a jet exhaust purchase an aftermarket resin exhaust that has all the details you could ever want molded onto the resin piece or as add on details. In most cases all you need to do is remove the resin casting block do some sanding to flatten out the surface where the block was and then prime and paint the part.

When you paint the nozzle use Testors buffing metalizer colors and use a Q-Tip to polish the paint. The Q-Tip will only touch the top areas of the strip resulting in a two-tone effect. I like to use combinations of Testors metalizer buffing and non-buffing paints to help highlight details.

**DETAILING LANDING GEAR STRUTS AND WHEELS**

The first step in detailing landing gear struts is to remove the seam lines and then fill in any injection marks and dimples. The vast majority of kits today have finely detailed landing gear with separate parts for the scissor type framing, which extends outward around the oleo and connects the upper strut and the lower strut, as well as having brake lines. If you are satisfied with the landing gear detail you can proceed to painting them the appropriate colors. I usually airbrush the metal sections of the landing gear first, and then I paint the brake lines flat black with a detail paintbrush. To bring the subtle details of a landing gear you can dry brush it with Testors silver. The brake line clamps are usually a natural metal color so use your detail brush to paint these small details. The last step is to paint the oleo. The oleo is the airplane's shock absorber and it pushes up into the strut and it is usually a very shiny metal, which can be represented with Testors chrome paint.

If your landing gear does not have any brake lines you can make them with stretched black plastic sprue for flexible lines, and stiff brass wire for metal hydraulic lines such as the ones that are found on a B-25 bomber. The brake lines usually terminate near the axle or somewhere on the backside of the wheel hub. I locate the termination point, drill a small hole, place a small drop of super glue in the hole and then insert the brake line into the hole. If the brake line is flexible I bend the end towards the strut after the glue has dried so that the line follows the length of the strut. The majority of brake lines are attached to the landing gear struts with thin flexible clamps.
like the ones used to secure the cooling hoses for your car's radiator. These can be simulated using a thin strip of masking tape that is layered over itself one time. There are usually two or three of these clamps on each strut. I always work from the brake line termination point up towards the top of the strut so that any excessive slack in the line can be worked out. To secure the tape I apply a small drop of super glue at the point where the tape ends and then I paint the masking tape with Testors aluminum colored paint.

You can also purchase a specific photoetch detail set for the landing gear areas and they are sometimes included in general detail sets for a particular model. Eduard provides the most comprehensive details sets available for specific models and general sets which can be used for all types of detailing.

The last step is to add some weathering. I dry brush the entire landing gear with a dark pastel dust and then I airbrush a coat of Testors Dullcote to seal the pastel dust. Be careful not to get the flat finish onto the oleo because it will dull the shiny appearance of the paint.

As a final note on landing gear I recommend that you stick with the plastic ones provided in the kit. Although white metal may appear to have better detail, the metal is very soft and if your model has any weight to it at all the white metal landing gear will not be able to support the weight.

Most main landing gear wheels do not have solid wheel hubs, but model manufacturers are forever molding solid wheels hubs with indented round or oblong spoke detail. To enhance the appearance of spoked wheels remove the plastic between the spokes so that you will have an accurate representation of a spoked wheel.

For hubs that have round indentations use a drill bit that is the same size diameter as the indentation and drill out the plastic. Oblong shaped holes are a little more challenging especially if you are working in the smaller scales, but with some patience and small drill bits and micro files you can make just about any shape.

Once you have completed removing the plastic, sand the gluing surfaces smooth by sliding the part along a stationary piece of sandpaper and then glue the wheels together. When you glue the halves be sure that the spokes or holes on both wheel halves line up so that you can see through the hub.

After the glue has dried scrape the seam with a number 11 X-Acto blade and then sand it smooth. Check your work by painting the seam area with silver paint. If you find any cracks apply some super glue to the area and sand it smooth. Unfortunately, doing this also removes any tread detail that the manufacturer may have provided along the seam line, but this can be replaced. Place the wheel in a vise between two pieces of balsa wood to protect the plastic and then take a thin bladed razor saw and cut the tread back into the wheel. When you are done replacing the tread remove the wheel and then sand the wheel with 400 grit sandpaper. This will remove the plastic burs located along the rim of the areas you cut.

You can also purchase aftermarket resin wheels but there is still some work to do on them. True
Details makes a wide range of resin wheels in just about any scale. You have to remove the pour blocks and drill the correct size holes in the hubs for the landing gear axle. Also some after market tires have a flattened appearance to simulate the weight of the aircraft. While the tires may be slightly bulged some resin tires make the tire appear almost flat. You can reduce this flattened appearance somewhat by carefully wet sanding the sides of the tires with a sanding stick.

To paint the wheel apply a coat of primer to the entire part. Rubber is more of a dark charcoal and to achieve this you can mix a few drops of flat white to flat black. Airbrush the entire tire with this mixed color and after it dries place a strip of masking tape over the face of each side of the tire. Next, take a round toothpick or a pencil and run the tip around the edge of the rim where it meets the tire. The tape will stretch and stick to the rim and define the location where the tire meets the rim. To cut the excess tape from around the rim carefully run the tip of a number 11 X-Acto blade along the base of the rim using the rim as a guide. Remove the tape from the rim and then run the toothpick around the base of the rim again to insure that the tape is sticking to the edge where the tire meets the rim. Airbrush primer on the rim to restore a neutral color and then airbrush it the appropriate color. As a final note on this technique, masking tape will not stick as well to gloss paint as it will to flat paint.

If your kit has flexible tires made from rubber or some type of flexible material there may be a slight molding seam along the centerline of the tire. Trying to sand off this seam can mar the appearance of the tire and I have found that putting these parts in the freezer over night helps the material respond to sanding. Another problem with these flexible tires is that they are dust magnets. Every tiny particle on your work bench will stick to them and the way to fix this problem is to give them a coat of Testors Dullcote, but first you need to get ride of all the stuff that is clinging to them. I clean the tire by using masking tape to remove all the stuff stuck to these parts and then I immediately give them a coat of the Dullcote.

**DETAILING LANDING GEAR BAYS AND DOORS**

Most kits offered today have a lot of detail in the landing gear bays and on the doors but you can still enhance them with photoetch detail sets and careful painting.

If your documentation shows framing and piping and hydraulic lines that are not present on the kit you can add these using different size rod and strips. There is no set size for each scale, but I recommend that you install rod and strip sizes that look “in scale”. To represent framing glue strips along the sides using long lengths so that you can position them correctly and use a thin wire applicator to apply super glue to the contact surface. The super glue will seep along the underside of the bottom securing it in place. Once you have completed the framing and attached any photoetch details you are ready to paint the landing gear bays.

I like to paint the wing area first, then mask around the landing gear bay opening and paint it. I prime the landing gear bay and then paint it the required color. I almost always give landing gear bays a dusting of various colors of pastels dust using my trusty pastel pencils and a brush. I then seal the pastel dust with Testors Dullcoat.

The last step is to add any interior piping. You can use plastic rod, stiff wire or thin solder and if
you run several lengths close together make them different sizes. Whether you are running piping from front to back or left to right, I recommend that you pre-drill holes through the sides of the landing gear bay before assembling the wings. This gives a much more accurate representation of the piping and it also means that you do not have to be accurate in the lengths that you cut. Also be sure that you paint the lengths before you install them and if they are all the same color use different shades.

If the landing gear doors have no detail you can enhance their appearance by purchasing a photoetch detail set specifically designed for landing gear doors. Eduard markets hundreds of exterior detail sets for all types and scales and they typically include enhancements for the interior areas of the landing gear door such as framing.

If there are no detail sets available you can add some detail with strip stock. To add framing you will need to draw the locations of the strips onto the door and be sure that the outer framing that follows the perimeter of the door is slightly offset from the door’s lip. Check your documentation for the approximate design of the framing and then duplicate it. Remember that it does not have to be exact; you just need to approximate the frame’s appearance. After you have completed placing all the strips, paint the inner doors the correct interior color and then lightly weather them using pencil pastels.
More and more kit manufacturers are including radial engines in their 1/32 scale kits which are models in themselves. Lay out the parts and clean them up. Don’t forget to check the small parts for those pesky mold seams.

I carefully positioned and taped this engine bracket onto the firewall and added tiny drops of super glue. I removed the assembled part, added more glue and then painted it. Note the Eduard photoetch wiring harness clips.

After I primed this part I found injection marks on its Underside. Since I planned to display the area behind the engine I had to remove them.

To insert the small Eduard photoetch screening inside the oil cooler housing I cut off the end of a round toothpick and placed a small strip of masking tape on the tip. This makes it easy to pick up the part and position it inside the housing.

These photoetch brackets were shaped with wooden dowels. I used the larger one first to get the round shapes and then used the smaller dowel to tighten the curves so that they would fit snuggly around the part.

The parts that fit onto the backside of the engine were painted different shades of black so that they would stand out better.
I drybrushed Testors silver paint onto the individual parts so that the corners and edges would standout.

The subassemblies have their photoetch details added, the parts have been painted, drybrushed and assembled. Its now time to start adding some wiring and plumbing.

I predrilled the holes for the plumbing for the oil tank, the cooler and the engines control case.

I used brass beading wires for the wiring details and I colored the wires using Sharpie markers. The individual wires were stretched out with flat nosed pliers.

The engine control box and the engine brackets have been installed and I am now adding wiring.

The oil plumbing was made from small diameter electronics solder painted with a black sharpie. Be sure to use solder that does not have flux. You don’t want the flux leaking out from the solder onto the parts.
The firewall assembly is now complete including the throttle and engine mixture links. Note how clean the assembly looks.

The assembly was then carefully positioned and glued to the fuselage. This model is now starting to look like an airplane!

To wire the engine I indented the tabs on the wiring harness so that the tip of my drill bit would not skip off to the edge. There is little room for error on these small parts.

I used a number 79 (.0145 Inch) drill bit to drill tiny holes in the tabs so that the individual wiring for the spark plugs would have positive seating on the harness.

I painted the engine Testors steel buffing metalizer. I wrapped tiny strips of tape around the base of each cylinder and then used small square shapes to finish covering the cylinders. The base of the engine was painted gray.

I used strips of balsa wood taped together to elevate the engine parts for drying. The wood stems allowed me to handle the parts and paint them in one airbrush session.
All the engine subassemblies have been painted. Note the clean demarcation lines between the black and silver colors on the push rods. This was achieved with careful masking.

The engine is now assembled and the last step is to add the spark plug wiring. Note how all the different colors add depth to the assembly.

Brass beading wire was used for the spark plug wires. Each length was stretched straight and then form fitted into place. The wires were attached to the wiring harness with drops of super glue.

This engine sure looks good enclosed inside the bright red cowling. Since so much of the surface of a radial engine can be seen, careful painting and adding details such as wiring can really make them stand out.

In line piston engines can’t be seen unless you plan to remove access panels. I assembled this 1/32 scale P-38 engine to check the fit inside its tight fuselage location.

The engine air scoop vents for the P-38 needed a little work to properly close the seam lines. I used strips of plastic to accomplish this.
To get a P-38 to sit correctly you need to add weight wherever you can. I added brass bee bees to the inside of the engines and glued them in place with white glue.

Now that all the sub-assemblies are complete it's time to start painting.

The engine blocks on the P-38 were painted gray, then masked so that the upper halves could be painted flat black. Note the fine demarcation lines between the gray and the black. Always cut masking tape with a sharp blade to get fine paint edges.

All the P-38 engine sub-assemblies have been painted and drybrushed and now it's time to assemble them. Be sure to scrape off the paint at the glue locations so that you get a strong bond.

The engines have been assembled and attached to their firewalls. They are now getting a final fit check. Note the strips of white plastic laminated to the inside areas of the fuselage to add strength to the assembled parts.
P-38’s in any scale have lots of seams to work on. I taped the parts together as tightly as possible and there was still slight voids between the fuselage halves.

I used micro files and the tip of my trusty number 11 blade to clean up and shape the openings on the sides of the boom fuselages on this P-38 project. Files remove a lot of plastic very quickly so go slow and check your work frequently.

The air intakes on the fuselage booms were multiple piece assemblies and they had lots of seams to fix.

The inside air intake assemblies had seams that were impossible to get to so I used small half diameter lengths of plastic strip to hide them.

The air intakes required a lot of super glue to fill the seams. I then carefully scraped the glue flat and then sand the surfaces.

I polished the plastic with 0000 steel wool and the restored the rivet detail.
Note how the small diameter half rounds hide the interior seam. Once the part is painted you will not notice the added length of plastic.

After I finished the seam work on the P-38 air intake assemblies I added the photoetch screening.

The air intakes were then super glued to the boom fuselages and the seam lines were filled with super glue applied with a thin wire applicator.

The seams were carefully scraped to remove the excess glue, and the surfaces were sanded smooth. I had to repeat this process several times before the seam lines disappeared.

The assembly on this SBD cowling required some sanding and scraping to get the parts to fit correctly.

To get to the seam in the indented area of this SBD cowling, I reduced the width of the Flex-I-File sandpaper strip.
Layers of super glue were added with a thin wire applicator to fill the seam line. I then carefully scraped the seam smooth, lightly sand the surface and then polished the plastic with 0000 steel wool.

Although the P-38 superchargers were several parts and well detailed one additional touch was needed.

The air cooling inlets needed to be drilled out. I started with a pilot hole and carefully enlarged it. Note how thin the plastic walls are around the hole.

The supercharger was painted with Testors metalizer buffing exhaust and burnt metal colors and then polished with a Q-Tip.

The exhaust pipes for this Mig -3 kit were well shaped but they had prominent mold lines that needed to be removed.

The exhaust ports on this Mustang engine manifold were drilled out by hand.
Note how thin the walls are on the Mig-3 engine exhausts. If I had scraped the mold lines off after I drilled out the exhausts I might have collapsed a wall. Do all the scrapping, sanding and shaping before you drill.

Another good example of drilled out exhausts. By using lots of drill bits with tiny changes in bit diameter you can achieve very thin plastic walls on exhausts.

The engine breather holes on the fuselage of this P-51 Mustang were carefully drilled out. The molded on indentations for the holes were perfect for guiding the tip of the drill bit.

The engine intakes on these Mig-3 parts had molded on screening. I drilled out the plastic and replaced it with photoetch screening.

The air intakes look much better with actual screening. Small touches like adding screening and drilling out the exhausts add higher levels of visual realism to a scale model.

These Revell P-38 props had dimples that were easily filled by super gluing tiny strips of plastic over the dimples. I used the Revell props instead of the Trumpeter kit props because the Revell parts had a more accurate shape.
The first step in achieving good looking propellers is to carefully snip off the tree attachment points, and then sanding the area smooth with a sanding stick.

The edges of the blades sometimes have mold lines that need to be scraped off. Finish the props by wet sanding the surfaces with a sanding stick.

Prime the props and then airbrush the tips flat white.

Next airbrush the color for the propeller tips. Usually it was a bright color so the ground crews knew were the edges of the props were when the engine was running.

Carefully mask the tips using small strips of masking tape cut with a straight edge and a sharp blade.

The remaining areas of the props were painted flat black and then given a coat of clear gloss for the decals.
The clear gloss surface will prevent silvering of the clear decal backing and also make it easy to slide the decals around a little to get them positioned correctly. Be sure the decals are positioned on the blades in the same locations.

The props are then given a coat of Testors clear flat. Note how the Black color is now a lighter shade.

The combination of part preparation, color undercoating, careful masking and proper decal application technique will give you great looking propellers.

When I test fitted these props on the P-38, I noticed that they sat slightly below their correct locations. The props needed to be positioned a tad bit higher.

To fix this problem I glued a tiny strip of plastic on the engine shaft to raise the propellers. I test fitted the props and carefully sanded down the plastic until the props sat correctly.

The propeller assemblies look much better now that they have been positioned correctly!
While some kits come with jet engines, resin castings are usually better detailed. This detail set is for Revell’s 1/32 scale He-162 salamander.

The pour plugs are best removed with a razor saw. The remaining plug can be wet sanded. Wear a dust mask when working with dry resin to prevent inhaling the dust.

Small parts can be removed from their pour plugs using the tip of a number 11 X-Acto blade. Carefully scrape and sand the parts smooth at the pour plug connection points.

I like to wet sand resin on a stationary piece of sandpaper. To remove the excess resin evenly, use a figure eight motion and don’t press too hard as resin responds quickly to sandpaper.

The kit engine looks good, but the three part resin engine has a lot more surface detail. Model by Scott Weller

Extra surface details were added using fine electronics wire and small diameter solder. You can also use Rub & Buff to highlight details. Model by Scott Weller.
Note how the clean paint job and multiple colors add to the busy look of the engine. Model by Scott Weller.

Dry brushing and Rub & Buff are excellent paints for bringing out small details by highlighting the edges of these small parts. Model by Scott Weller.

To enhance jet engine intakes sand off the backing and then carefully remove the thin plastic from between the blades. Form fit a piece of plastic behind the part and paint it black to add some depth to the intake.

Wheels can be enhanced by removing the plastic from between the spokes.

Flatten out the gluing surfaces for a tight fit. Just a few passes across the sandpaper will do the trick.

Tape the parts together tightly and then run a bead of super glue around the seam. Be sure to line up the spokes prior to taping and gluing.
Lightly scrape the excess super glue off the seam line. Holding the blade at an approximate 45 degree angle will prevent the blade from digging into the surface of the plastic as you scrape.

Use a sanding stick to smooth out the surface of the plastic. To get a finer surface finish wet sand the plastic.

The final plastic surface preparation for plastic tires is to polish the plastic with 0000 steel wool.

To mask the hubs place masking tape over them and press down along the rim with a soft pencil. Use the tip of your trusty number 11 X-Acto blade to cut along the pencil line using the rim as a guide for the blades tip.

On small wheels I sometimes use indelible markers to paint the tire and thin tipped markers to paint around the tire/rim contact area.

Kit manufacturers are providing separate tires and rims in either plastic or some type of flexible material. The flexible material has a tendency to be a dust magnet. Assemble the wheels and use masking tape to remove the dust.
I immediately airbrush the wheels with Testors cleat flat which seals the flexible material and prevents dust from clinging to it.

Landing gear doors sometimes have either raised or indented circular injection marks. Raised ones can be scrapped off and indented ones can be filled by making disks from your Waldron Punch tool.

Super glue the disks in place and then smooth them out with sandpaper strips wrapped around sections of balsa wood.

To enhance the inner doors on these Mig-3 parts I used Eduard photoetch details. I positioned each part and then ran beads of super glue around the edges.

To remove the excess super glue I carefully scraped off the glue with a sharp number 11 X-Acto blade.

Once these parts are painted the raised framing and rivet details will really stand out, helping to enhance the overall effect of realism on the landing gear.
To fix the injection indentations on these Hasegawa Hellcat landing gear, I drilled the indentation deeper and the super glued plastic rod. The rods were then cut and carefully sanded smooth with a Flex-I-File.

Even new kits suffer from these pesky injection marks. These Trumpeter P-38 landing gear had small indentations that were filled in the same way as the older Hasegawa kit parts were.

I always polish the surfaces of the plastic with 0000 steel wool to remove any scratches from the scraping and sanding process. Don’t forget to remove the mold lines on these parts!

Priming these small parts is essential. The primer will enhance any flaws that you may have missed.

Many newer kits come with the brake lines molded onto the landing gear or as separate parts. Carefully paint the brake lines with a detail brush. I use Testors chrome color to paint the oleo’s.

These Mig-3 landing gear parts have been painted and details and they are now ready for assembly. Note how clean all the parts look. There are no glue or paint smears.
These SBD landing gear have been fully assembled and they are ready for installation. The attachment points for the landing gear were pre-fitted so that once assembled they would slide into place.

This tail wheel was enhanced by removing the mold lines, drilling out the dimple and filling it with round stock and then drilling out the framing.

The tail skid on this old Bi-Plane kit needed an additional attachment point to make the part more secure. I drilled out a tiny hole, added some round stock and then drilled a corresponding hole in the fuselage.

These tail wheel parts were carefully painted and weathered using pencil pastels. Note the fine demarcation line between the gray metal color and black color of the oleo dust boot.

Sometimes landing gear parts should be assembled to check for fit problems. This is definitely the case for any kit where the landing gear has to be assembled at the same time as the landing gear bay.

I prepainted all the parts and then scraped off the paint from the glue attachment points so that I would have a strong assembly when completed.
These P-38 boom landing gear bays are now ready for gluing into the booms. Note the plastic sheeting laminated to the outside areas to reinforce the sides.

Now that the doors have been installed these landing gear bays look very busy.

The edges of the landing gear bays had super glue added to fill the tiny voids between them and the edges of the opening on the fuselage. I then carefully touched up the dried super glue with a detail brush.

The landing gear bays on this Mig-3 could use a little weathering to enhance their appearance.

Just a little black pastel dust sealed with Testors clear flat was all that was needed to make these landing gear bays look more realistic.

This one piece resin landing gear bay got the detail painting, black wash and drybrushing treatment. Note how the combination of these techniques makes all the added detail stand out. Model by Scott Weller.
CHAPTER 5

GUNS, FLYING WIRES, CONTROL CABLES AND ANTENNAS

GUNS

There are several things that you can do to improve the appearance of guns such as adding gun sight rings, ammo belts and a good paint job, but the single most important thing that you could do is to hollow out the barrels. Since these parts can become very fragile after drilling, especially in the smaller scales, so all preparations such as scraping and sanding should be completed prior to drilling. It is important that the surface that will be in contact with the drill bit be smooth and flat so that the drill bit will not skew off to one side so be sure the tip of the barrel is flat. I like to use a number 11 blade to remove the mold lines using very light strokes and then use a Flex –I – File to restore the round appearance of the barrel. Once the plastic has been cleaned, sanded and the tip of the barrel flattened, the part is ready for drilling.

There are two basic ways to bore out gun barrels. The first method is by hand and the second is to use a Dremel drill press and a Dremel vice. When selecting drill bits start with the diameter that
you want the finished hole to be and then select several other sizes that are smaller than the finished diameter. What you want to do is slowly work up to the finished diameter because if you try to remove too much plastic you can collapse the plastic walls or fracture the plastic. I usually try to use every other size diameter drill bit until I get to the finished diameter.

Before we get into the drilling you need to decide whether you will use the kits guns or make new barrels from round stock. If you are not going to see anything except a small portion of the length of the barrel or just the tip you may want to replace the gun with round stock and save the kit part for another project. I like to use Plastruct rod for my gun barrels as their rod is always perfectly round. I cut the lengths that I need, I flatten the ends with a Northwest Short Line true sander and I always cut extra lengths because I never get it right every time. I then place an indentation in the center of the rod for a pilot hole. If the indentation is not centered you can adjust it by angling the tip of the punch.

Start drilling with the smallest bit and check the centering of the hole. If it looks good move on to the next diameter and so on until you achieve the diameter opening you want and be sure to hold the pin vise straight. Practice builds confidence and do not be disappointed if you destroy a few lengths of plastic or end up with some rejects. If your drill bit becomes offset from the center sometimes you can correct this by removing the plastic from the off centered side using the tip of a number 11 X-Acto blade. I then move up two drill bit sizes, which usually helps to self-correct the off centered hole. Here again this does not always work and that why I recommend that you cut spare lengths.

The second method is to use a Dremel Drill press to bore out the tip and if your hands are not steady using the press will yield good results for you. The technique for boring out plastic using a Dremel drill is the same as doing it manually with respect to using multiple drill bits and working up to the required diameter. The big difference with the Drill press is that you have to set up the part in a vice so that it is parallel and in line with the drill bit.

Set up the drill press and install the first drill bit into the motor tool. Place the barrel between two strips of balsa wood so that about 1/2 inch of the barrel is protruding from between the balsa strips. Press the balsa strips together, and then position the sandwiched part into the Dremel vise and tighten it just enough to prevent any slippage. By pressing the balsa strips together, you will effectively push the part into the balsa, which will prevent the part from moving. Also be sure the barrel is straight. To ensure that the drill bit and part are truly centered, turn on the motor tool at its lowest speed and very carefully drill a slight indentation into the part just deep enough to see. If the indentation appears to be off center adjust the position of the vise accordingly and repeat the procedure. Also, do not forget to wear safety glasses.

Once you are confident that the bit is centered, you are ready to begin drilling. Keep the motor tool set at its lowest speed and do not let the bit come in contact with the plastic for more than a few seconds at a time. If you push too hard and try to finish the job all at once you will melt the plastic and ruin the part. You may also find that during drilling a thin layer of melted plastic has covered the drill bit tip. It can be easily removed with the tip of a number 11 X-Acto blades, but it is also an indication that you are drilling too fast.
For guns on bombers I recommend that you add gun sight rings and front sight aiming posts to the guns. Several photoetch manufacturers make excellent gun sight rings that can be easily installed with a small drop of super glue. To help secure the part in place drill a small pilot hole at the location of the ring so that the rings post has a firm attachment point. Front sight aiming posts can be made from tiny lengths of plastic strip. Ammo belts can be added using Eduard’s pre-painted photoetch gun belts.

Another added detail is to attach lengths of clear nylon sewing thread painted black with a sharpie to the back of each single gun and then attach both ends of the thread to the interior walls of the bomber. This will represent the bungee cord, which held the guns in a stationary position and helped support some of the gun's weight.

When you are ready to paint the guns I recommend that you use Testors buffing metalizer gun-metal. Spray on two coats and polish the part with a Q-Tip. You will find that the cotton tip will only polish the larger raised surface areas resulting in a two-tone appearance highlighting the gun's detail.

Another detail that you can add is to hollow out the shell ejection ports on fighter planes. Most fighter plane kits have very pronounced indentations in the lower wings for the shell ejection ports, but they are not hollow. To remove the plastic, drill a starter hole through the plastic and then enlarge the hole with a number 11 X-Acto blade. The outlines of the ejection ports will help provide a guide for the knife blade, but be careful not to damage these areas. Once the holes are enlarged you can use your micro files to remove the remaining plastic.

**FLYING WIRES**

The are two challenges to building aircraft that have multiple wings, struts and flying wires. The first challenge is to insure that the wings and struts are aligned correctly and the second one is adding flying wires and control cables. For 1/72 scale and 1/48 scale aircraft I like to use clear nylon sewing thread painted with a black or silver sharpie and I literally sew the flying wires onto the model. On 1/32 scale aircraft I like to use stiff wire painted with a silver sharpie.

Building biplanes requires some special construction techniques because you are dealing with multiple wing levels and wing struts that must be properly aligned. Just about every biplane I have built has had some type of minor fit problem with the struts and the upper wing, and the best way to detect these is to assemble the wings and the struts with masking tape to check the fit and to see how the wings are positioned. I usually build the fuselage and attach the lower wings first, build the upper wing and then set the struts and the upper wing with masking tape. In most instances you can solve a positioning problem by making slight adjustments to the upper wing and struts.

Another good reason to attach the struts and the upper wing with masking tape is that it will allow you to check and set the flying wire locations. Once the wings and struts are glued, there is not a lot of room to work between the wings so do the prep work before assembly. In order to do this you need to coordinate the lower and upper wing termination points for the flying wires, and this can only be done with the wings set up in their correct locations. Most 1/32-scale kits have the
flying wire locations either marked or there are holes in the wings and the fuselage. Even with these marked locations it is a good idea to check your documentation to insure that the manufacturer did not miss anything.

To sew the flying wires on a model, drill the location holes all the way through the wing. If you are using wire just drill a hole deep enough to accept the wire. If the manufacturer did not provide at least pilot hole location for the flying wires, I recommend that you consult your documentation, mark the locations and then drill the holes. Also, be sure that you angle the holes in the direction of the flying wires so that the wires will sit correctly.

Once you have finished locating the flying wires and you are ready to assemble the struts and the upper wing you will need to first paint the fuselage and lower wing. The struts and the upper wing will need to be painted separately and then attached. Keeping the upper wing and the struts separate will allow you to achieve a quality paint finish since airbrushing the underside of the wing and the interior struts after they are attached would be very difficult.

When you are ready to assemble the struts and the upper wing position all the parts using masking tape. Be sure that you remove the paint from the gluing surfaces of the strut attachment points on the wings and the tips of the struts so that the glue will make a strong bond. When you are satisfied that the wings and struts are positioned properly, apply a drop of super glue to the lower strut locations. When applying the super glue be very careful not to let the glue bleed onto the wing surfaces and remember that you only need a small amount at each location. To fill the voids where the struts attach to the wings use white glue as filler, apply the glue with a thin wire applicator or a toothpick and then contour the glue with a damp Q-Tip. Apply touch up paint if necessary.

Now you are ready to add the flying wires so let's start with the sewing technique. When you remove a length of this thread from the spool it will have a tendency to coil up because it has been sitting tightly wound around a small diameter. Simply stretch the thread using slight pressure and it will almost lay straight. I always start with a length much longer than I need so that I have a lot of thread to work with. On 1/72 scale kits use black nylon sewing thread straight from the spool and for 1/48 scale kits paint the thread using a sharpie. Slice the center of the felt tip of the marker, tape one end of the thread to your work bench, stretch out the thread and then run the tip of the pen across the thread by imbedding it into the slice in the felt tip. Make a few passes, let the ink dry and then add a few more coats.

Now you are ready to sew the rigging onto the model. Using this technique is especially helpful if you have multiple struts across the span of the wing and the flying wires are crisscrossed from left to right across the length of the wing and from front to back across the width of the wing.

The first rigging to add is from the front to back across the width of the wing between the struts. Cut lengths at least twice as long as you need and thread it through the appropriate holes. Secure one end with masking tape and then gently pull the other end tight and set it with masking tape. After I complete the entire front to back rigging, I check my work to insure that everything is set correctly and the thread is taught. I then applied a drop of super glue on the outer sur-
faces of the wings where the masking tape is holding the thread. The glue will bond the thread to the plastic almost instantly. The capillary action of the super glue will pull it into the hole making a very strong bond between the nylon thread and the plastic.

Remove the masking tape and repeated the process for the opposite side of the wing. After the glue has dried carefully cut the nylon thread flush with the surface of the wing using the tip of a new number 11 X-Acto blade and then add enough super glue to each location to fill and seal the holes in the upper and lower surfaces of the wings where the thread was cut.

Next, literally sew the rigging on the wings starting from the outer end of the wings working towards the fuselage. The starting point will need to be attached with masking tape and as you carefully loop the thread through the holes be sure to leave excess thread between them as you come up through the outer wing surface and then sew down into the area between the wings. A one inch loop should be just about right to work with once you have completed sewing a length of the thread. Again secure the finished end with masking tape. When you have completed all the sewing along the length of both wings carefully check your work. Correct any mistakes and be sure the thread locations and positions on both sides of the wings match. Gluing these long lengths of thread is a stepped process and here is where the loops on the outer surfaces of the wings are needed.

Secure one end of the thread with super glue, carefully pull the tread tight along the first length using the loop, secure the thread with masking tape and then place a drop of super glue into the hole. Now that the first length of thread is taught, remove the masking tape, apply a drop of super glue to the hole where the looped thread goes into and then repeat the process for the next length of thread. This stepped approach takes a little time to complete but when you are done all the lengths of thread will be taught. Next trim off all the excess thread and fill the holes with super glue.

After all the glue dries carefully scraped the super glue flush with the wing using the tip of a number 11 X-Acto blade and then lightly sanded each location using a small strip of 400 – 600 grit sand paper wrapped around a length of balsa wood so that the sanding would be confined to a small area around each hole. If the holes are located close to a wing tip you can also use a sanding stick. Check your work with silver paint, and add more super glue if necessary and sand again. Once you are satisfied with the surface, wet sand the areas and then polish the surface with small balls 0000 steel wool secured between the tips of your tweezers. The steel wool will also blend in the surrounding paint. As you sand you will notice that the completed assembly is very strong and that’s because the rigging is secured with super glue and the nylon thread adds strength to the finished assembly making sanding and scraping easier.

If your wing surface has canvas surface detail you can simulate this by roughing up the sanded areas with courser steel wool. Use your airbrush to remove any residue plastic dust and steel wool and then spot prime the bare areas overlapping slightly onto the painted surfaces. Next spray the finished coats onto the surface and again overlap. Light, thin coats will blend into the surface rendering the areas your worked on invisible.

The second technique is to use real wire for the rigging. For 1/32 scale kits I recommend that
you use wire close to .019 inches in diameter. This stiff wire can be found in hobby stores that carry radio controlled airplane hardware.

To measure the approximate length of a flying wire section, use a ruler or a length of plastic strip to measure the distance between the end points of the flying wire. Be sure to add approximately an inch to the measurement so that you will never cut a length too short. The next step is to form fit the wire into its location and the only way to do this is to install the wire in its location to check the fit. If it is too big, cut a small length off the end of the wire, test fit it and cut another small length if necessary. The wire should be straight and not bowed.

I recommend that you install the wires as you cut them to their proper lengths. In most instances, once you cut a wire to its correct length and install it in its corresponding holes it will not fall out if you have a tight fit. Once you are satisfied with the fit, color the wire with a silver sharpie. If you are working with pairs of wires, installing both wires before you glue them helps insure that you do not mix up the corresponding holes, which is easy to do if the wires are situated very close to one another. Give each end of the flying wire a tiny drop of super glue. Use Elmers white glue to fill in voids where the flying wires attach to the wing of the fuselage.

CONTROL CABLES

Control cables were exposed to some degree on many biplanes, but as aircraft designs improved, aileron and elevator control cables were incorporated into the wings and the fuselage. As in the case of flying wires, sometimes kit manufacturers locate the holes and provide control horns where the control cables emit and attach to on the control surfaces and sometimes they do not.

If there are no holes in the fuselage for the tail surface control cables, mark these locations by checking your documentation and then drill these holes into the fuselage. After you start the hole I recommend that you angle the hole in the direction of its attachment location on the rudder or the elevator. This way the cable will appear as though it is angled correctly as it protrudes from the fuselage. Also be sure that the holes that you drill on both sides of the fuselage are symmetric.

For most biplanes the control cable material I recommend that you use is stiff wire or nylon sewing thread. The appearance of how the control cable emits from the area of the fuselage or the wing is important as it should be straight and not appear to be curved or bent. Nylon sewing thread can sometimes give you this effect and I have found that the nylon thread works best when both ends can be glued, one at a time, so that you can make the thread taught.

When I am ready to install the control cables I like to do the fuselage ones first as these can be done quicker. If you are building a 1/72-scale kit you can glue the control cable to the tip of the control horn and for larger scales use a number 11 X-Acto blade to notch out the surface and then use a triangle shaped micro file to make the notch deeper. I like to drill a hole into the control horn or at least notch out the tip. Insert the control cable into the fuselage and then glue it to the control horn. For control cables that protrude from the wing you will need to form fit these into place using the same technique that I described for form fitting flying wires.
If the model has no control horns you can add these using tiny lengths of plastic strips. Be sure that you locate the control horns on both sides of the rudder and on the ailerons so that they are at the same locations. The edges and the tops of the control horns should be tapered and on 1/48 scale and 1/72 scale you can use small plastic rod to simulate the control horns. After you have installed all the control cables be sure to add a touch of paint to the tops of the control horns.

**ANTENNA WIRES**

Many types of propeller driven aircraft had some type of wire antenna that extended from a vertical antenna to the tail. World War I planes did not have radios or any type of communications gear so do not add any antennas for these types of aircraft. On the other hand, jet aircraft have no antenna cables, but they do have small metal protrusions, which can receive and send all kinds of electronic signals, can be found on the surfaces of jet aircraft.

For wire antennas I have found that the easiest type of material to work with is clear nylon sewing thread. I recommend using this exclusively for antenna wires. I always start with a length much longer than I need so that I have a lot of thread to work with. For 1/72 scale aircraft use the clear or black thread right off the roll and for 1/48 and 1/32 scale add color to the thread to slightly thicken its appearance with a black or silver sharpie.

If one end of the antenna wire attaches to the tail and most do, drill a small pilot hole. In most cases the other end will attach to a vertical antenna protruding from the upper area of the fuselage. I like to drill a small hole all the way through the vertical antenna so that I can push the thread all the way through it.

I usually glue the end that attaches to the rudder first by dipping the tip of the thread in a puddle of super glue and then pushing the thread into the hole. It’s important to keep the thread as straight as possible until the glue dries which should take less than a minute. I then run the other end of the thread through the hole in the vertical antenna, tension the thread and then tape it to the fuselage. If you need to adjust the tension in the thread simply move the tape. Once I am satisfied with the appearance of the thread I add a small drop of super glue to both sides of the antenna where the thread is, let the glue dry and then cut the thread with the tip of a single edge razor blade. I lightly sand the end where the thread was cut with a sanding stick to contour the glue and then add some touch up paint to the antenna and to the attachment point on the tail. To simulate antenna insulators just add a small drop of white glue, let the glue dry and then color it with a sharpie.

On modern jet aircraft antenna usually take the shape of small, thin squares or rectangles on the fuselage. Square or rectangle shapes can be made from Evergreen or Plastruct plastic strip. Choose a thickness and width that appears to provide a scale appearance and then cut the necessary lengths using your trusty chopper. I like to use my chopper for these types of details because you can easily duplicate lengths when you need a lot of pieces the same size. When you attach these parts the trick is to be sure they are straight. If you have steady hands you can attach them with super glue but I like to use tiny quantities of Testors tube glue so that I have some working time to get the small part positioned correctly.
The first step in hollowing out kit supplied guns is to set an indentation in the center with a needle scriber. This will prevent the drill bit from skewing off to the side.

Start drilling with a small diameter bit and work up to the size opening that you want using progressively larger drill bits. By taking this stepped approach you can achieve very thin walls without collapsing the plastic.

This machine gun assembly is from the kit. Notice how the gun metal color has a shiny appearance on the raised surfaces which gives the gun a two tone look. The gun was painted and then polished with a Q-Tip.

The first step in making gun barrels is to cut several lengths using your Northwest Shortline Chopper. I always cut more lengths than I need so that I will have some spares.

Next you will need to flatten the surfaces that will be drilled out. I use a Northwest Shortline True Sander for these small jobs. I like to use Plastruct round stock for making gun barrels.

Here again you will need to indent the ends in the center so that the first drill bit will set correctly. If the hole is off center you can usually correct it by going to the next high bit size and drilling at an angle.
I like to use a twist drill for all my hand drilling. Holding the round stock firmly will help ensure that the drill bits will set correctly as you turn the twist drill.

Another method for correcting an off centered hole is to carefully peel away the excess plastic using the tip of a number 11 X-Acto blade.

Here are the stages for hollowing out the tips of the plastic. You can clearly see how the holes get bigger with progressively larger bits.

I glued a backing into the inside of the P-38 fuselage tip so that the gun barrels would sit straight and level. I used my trusty Dremel drill press to set the holes in the backing to ensure that they would be positioned correctly.

The backing was two layers with some space in between each layer so that when I inserted the new barrels into place they would have a positive seating.

The new barrels for my P-38 are ready to go. They have been airbrushed with Testors gun metal and lightly polished with a Q-Tip.
Here you can see a good example of how thin you can get the plastic walls to be. The 20mm gun as well as the 50 caliber machine guns look pretty convincing.

It is always a good idea to check the fit of scratchbuilt gun barrels. I had to sand down the diameters of these barrels until I could get them to slide in and out of their locations.

If you decide to open up the gun bays on your model be sure to carefully paint all the details. This gun bay belongs to a 1/32 scale He-162 Salamander. Model by Scott Weller.

When setting the tail surface rigging on biplanes I like to set the locations and detail the direction of the rigging on the model. I then make notes on the instructions so that I can refer to them when I am ready to rig the model.

Setting the rigging on the wings can be very challenging especially when the manufacturer did not provide any locations to work from. I measured the locations using my trusty 6 inch ruler and then drilled the holes through the wings.

After you paint the wings you will need to clear out paint from the tiny rigging holes. Also be sure that when you drill the holes that they are angled in the same direction as the rigging.
All these parts have been re-drilled to make sure the rigging holes are clear of paint. This can be very tedious so go slow and be very careful not to scrape the paint.

For 1/48 scale bi-plane rigging I use clear nylon sewing thread paint with an indelible marker. I let each coat dry and give each length of thread several passes to be sure that the thread is completely painted.

Even after I checked and rechecked the individual rigging holes I still found a few that needed to be cleared more than once. The holes are so small that even loose paint particles can clog a hole up.

The secret to clean looking rigging is to plan your work and go slow. Check each installation to be sure that it is symmetric and that there is no sag in the lines.

The rigging on the tail section is progressing nicely. Where possible I like to use masking tape to set the tension on the rigging, glue them in place and then trim off the excess.

The tail rigging is now complete. The tips of the control horns for the elevator and the rudder were carefully notched out so the rigging would sit correctly.
To set the individual struts on this model I set the center and outer ones first and then carefully taped the wings together with thin strips of masking tape. This allows me to adjust the positioning of the upper wing and the struts.

I use tiny drops of super glue to set the struts on the lower wing and I add more struts and progress from the outside towards the fuselage. I set the struts, re-taped the wings and then glued the struts in place.

Now that all the struts are glued in place and I am satisfied with the positioning of the struts and the upper wing, I glue the struts to the upper wing. I add tiny drops of white glue to the strut/ wing attachment points to fill any voids.

I like to do the front to back rigging between the struts first. Each length is threaded through its respective hole. One end is taped, the line pulled taught and then the other end taped. I check my work and then start gluing.

Each length is carefully glued with a tiny drop of glue at each hole location. I remove the tape from one side, pull the line taught and glue it in place. Once the glue has set I repeat the process for the other end. I then trim the excess line.

Next I sew the rigging from the outer edges of the wing towards the fuselage leaving large loops. I check my work and then begin gluing. The loops are for pulling the lines taught as you glue.
Once all the rigging is glued I trim off the excess line and then add more super glue to each hole location in the upper lower wing.

I carefully sanded each hole location and add more glue if necessary. Once I am satisfied that the holes are filled and sanded smooth I polish the areas with 0000 steel wool.

I carefully mask the wing areas and the fuselage to prevent any overspray. To prevent the tape from sticking to the rigging, I double layered the tape leaving a 1/8 inch gap on the sticky side to attach to the wing.

The blue masking tape did not stick well so I used my trusty cream colored tape. The areas I sanded and polished were given a light coat of primer to cover the bare plastic and to blend the areas into the surround paint color.

The upper and lower wings were then given their finished coats of paint. Polishing the areas that were sanded with 000 steel wool blends in the painted and unpainted areas resulting in a smooth surface appearance.

The rigging on this model looks really good. All the lines are tight and they are symmetric. Even though this kit is over 50 years old, with a little bit of work and a good paint job you can turn this model into a real eye catcher.
The rigging on this 1/48 scale Bristol Boxkite is a bit more elaborate but here again the effect is well worth the effort.

The control horn rigging is all connected to the control stick. For rigging reference I watched the movie “Those Magnificent Men in their Flying Machines”

To rig the framing I drilled tiny holes in the plastic at the connection points with a number 80 (.0135 inch) drill bit. Once the rigging was glued into place it actually made the framing stronger and easier to handle.

Large scale kits like this Hasegawa 1/32 scale biplane are easier to rig but you still have to do some planning to ensure that everything will look symmetric and straight.

While the kit had some of the rigging locations indented I drilled them deeper and made sure that the angles of the holes matched the direction of the rigging.

I used a length is plastic to get the approximate length of each length of rigging. For large scale kits I use stiff wire for rigging and I always cut longer lengths that are needed.
I carefully form fit each length of wire into place by trimming off small lengths at a time until the wire fits correctly. The stiff wire will bow easily and this provides a visual check on getting a snug fit.

The last length of wire has been trimmed and form fitted into place. Note how even and straight the wires look.

The two aft sets of wires actually cross one another, yet they do not distort each other's shape by pushing against one another. By form fitting each length in place you can ensure that the wires do not impact one another.

The individual lengths of wire should be sanded to make them smooth and to remove any dirt or surface rust that may have formed on them.

The individual lengths of wire should be sanded to make them smooth and to remove any dirt or surface rust that may have formed on them.

I like to use a silver colored sharpie to paint stiff wire for rigging. It's much easier to just roll the wire and color it than to try to airbrush it.

I use nylon sewing thread for antennas and color it the same way as flying wires. I set the antenna wires in place, stretch them taught, tape them, then I add tiny drops of super glue.
I drilled tiny holes through the rudders on this P-38 using a number 80 (.0135 inch) bit. After the glue dried I trimmed the thread, filed the hole with a tiny drop of white glue and then touched up the dried glue.

On this SBD I drilled a hole through the antenna post on the tail for the antenna wire. This made it easy to stretch the thread, secure it with tape and glue it in place.

To attach thread lengths, I glue them together on the workbench and then trim the excess off. I use long lengths for these types of antennas. I then thread the lengths into their respective locations and glued them in place.

Sometimes small parts like bombs can have uneven gluing surfaces. Check these areas carefully.

To flatten out the gluing surfaces run the parts across sandpaper. Since the front half of the bomb has molded on parts for the other half I ran the part across the edge of the sandpaper to flatten out the gluing surfaces.

For parts that have flat surfaces use circular or figure eight motions to flatten out the gluing surfaces. One or two passes over the sandpaper should be sufficient.
Bomb fin parts usually have some flash that needs to be removed. I use a number 11 blade along with micro files to remove the flash and reshape the plastic.

Once the fins are glued together I scraped the glue seam smooth and polish it with 0000 steel wool.

Tape the bombs together with thin strips of masking tape to get the seams tight. Run a bead of super glue along the seam lines.

Carefully scrape the seams smooth. Check the seam lines with silver paint and apply more glue where needed. Repeat your seam work with the number 11 X-Acto blade.

To restore the round shape of the bombs along the seam lines use a Flex-I-File.

Polish the seam lines with 0000 steel wool to remove any scratches in the plastic.
To restore scribed lines, cut thin lengths of labeling tape so that the tape will conform to the curved surface. Carefully scribe the plastic with your plastic scribe.

To ensure that the fins will sit correctly on the bomb, run the attachment area across sandpaper to flatten it out.

I painted the area that will have the yellow strip, with flat white paint then flat yellow paint. I then masked the area with a thin strip of masking tape.

The bomb is then painted the overall color and then glossed so that the decals will not silver.

The assembled bomb has been given a coat of Testors clear flat paint to restore its appearance. Careful assembly and painting can really enhance the appearance of these parts.

These bombs were painted flat black, but I could have better enhanced their appearance by painting the forward areas a bright color like white or red.
There are several different types of paints that are available for scale modeling. The chemical compositions of these paints are very different and they cannot be mixed. There is the trusty Testors line of enamel paints that have been the mainstay of scale modeling since the 1950’s, there are lacquer paints, water base paints and hybrid paints which are made by Floquil. I refer to Floquil paints as a hybrid because their paints act like enamels but they have more of a lacquer odor.

As a rule I use the paint manufacturer's thinner or the thinner they recommend. For example, I use Testors Model Masters airbrush thinner for their Model Master paints. The same holds true for water base paints. If you cannot find the manufacturer's water base thinner I recommend that you use Polly-S thinner. Testor’s Metalizer paints are lacquer based and if you need to thin them be sure to use a lacquer thinner. If you are using enamels or lacquers you can paint water base paints over them or you can paint enamels over lacquers, but not lacquers over enamels. However you can not paint either enamels or lacquers over water base paints. These petroleum based paints can
damage the water base paint and destroy your paint finish.

Since paint pigments tend to settle onto the bottom of the original bottle over a period of time, it is important to mix the paint thoroughly before each use. This is true of all paints no matter what their chemical properties are. An easy solution is to drop a few copper bee bees into the paint and shake it for a few minutes. The reason that I recommend copper bee bees is that steel ones will rust in water base paints, and this will change the paint color. Another very good practice is to get into the habit of cleaning the neck and top of the paint bottle and the inside of the cap cover with tissue every time you open it. This is always the first thing I do after I shake paint and then open it. This practice will insure that you will have a good cap seal so the paint won’t dry out before your project is completed. I also go through this cleaning process every time I use an airbrush paint bottle.

**AIRBRUSHES**

To really achieve a quality paint finish on your aircraft models you need to invest in an airbrush and a reliable source of compressed air. Acquiring an airbrush and learning how to use it properly will allow you to produce the types of artistic effects necessary to achieve realism and a perception of depth, which are discussed later in this chapter. With an airbrush you can create very thin coats of paint that will not hide or cover up minute detail. You can mix paint colors, produce different shades of the same color and you can achieve superb weathering and streaking that is impossible to accomplish with spray cans or a paintbrush.

Most modelers use a compressor for the air source for airbrushing but moisture trapped in the tank is always a problem. If your compressor is pulling in even slightly humid air, water droplets will form inside the tank and lines and ultimately spitting out onto the surface of your painted model. To avoid this problem and to get rid of the noise factor associated with a compressor I recommend investing in a CO2 air tank and a pressure regulator. The air is very dry and I have never had a problem with water droplets. A tank of air will last you several years and with a pressure regulator you can control the output air pressure from 1 to 100 psi.

Once modelers find an airbrush they like they will usually stick with that airbrush and I prefer to use the Badger 200 series single action, internal mix, bottom feed airbrushes. This airbrush series is made from brass and they are chrome plated and since I have a tendency to rotate the airbrush during painting I like using a bottom feed so that paint doesn’t spill out of a paint cup. I also don’t trust my finger to stay in the same position on a double action airbrush button as I sweep the airbrush back and forth across the surface to be painted or rotate the airbrush to get into tight corners. So I stick with single action airbrushes.

Airbrushing creates paint vapors, which need to be pulled away from the model so that the particles in the vapors don’t settle on the painted surface ruining the paint job. I have a simple paint booth set up in my shop with a standard stove vent above the table to draw away the vapors. The top of the vent has tubing, which runs to the window so that the vapors are discharged through the windows screen. The sides of my paint booth have foam board to act as a barrier against dust and to help the vent draw away the vapors. You can also set up a simple paint booth on top of your stove if you have a stove vent, which deposits the air outside. For a spray booth use a large card-
board box that has the top and front removed and to reinforce the sides, tape the edges with mask-
ing tape. This setup works great and, best of all, it is very inexpensive. Also, you should always wear a paint mask whenever you airbrush so that you do not breath in the paint vapors. I use a res-
pirator paint mask with charcoal filters, which fits over my nose and mouth.

PAINT MIXING

The easiest method for mixing proportions of thinner and paint for airbrushing is to start off with two separate, empty airbrush jars of the same size. I use the airbrush jars for my Badger 200 for all my paint mixing. Most paints should be thinned by 25 percent (1/4) to 33 percent (1/3) by vol-
ume of paint. To achieve this ratio remove the bee bees from the paint bottle using a pair of tweezers and pour the paint into one of the airbrush jars. Add a few drops of thinner to the paint bottle and shake it vigorously to capture some of the remaining paint pigments that usually collect at the bottom of the paint bottle, and pour the remaining contents into the airbrush jar which is filled with paint.

Set the airbrush jar filled with paint next to the empty one that will contain the thinner. Using an eye dropped, fill the second airbrush jar so that the amount of thinner is about 25 percent to 33 percent of the height of the paint in the first jar. Once you have this set mixture ratio, pour the thinner into the paint jar and shake well. This technique is an easy way to get a thinner to paint mixture ratio of 25 to 33 percent by volume.

At this point test the paint with the airbrush and then add additional thinner if necessary a few drops at a time. If you are using enamel paint I recommend that you warm the paint before you use it. Warm paint will flow, spray and adhere to a surface much better than cold paint. To warm the paint, use a coffee cup warmer plate which can be found in a grocery or discount store. It warms the paint in a few minutes and is easy and safe to use. When you place the paint jar on the warmer plate be sure to loosen the jar’s cap so that as the paint warms up and expands it will not pressurize the air in the jar. After warming the paint shake it again to insure that the warmer paint that is at the bottom of the jar will mix with the cooler paint at the top.

When I am finished with the paint, I leave the paint in the airbrush jar and label it with the manu-
factures name, the paints color name and the date I mixed the paint. I usually end up with a dozen or so airbrush jars of thinned paint when I am finished with a model. Since these thinned paints do not have a long shelf life I usually pour them into a large container, and then clean the jars and caps when I am done with a modeling project. When this container is full I take it to the local re-
cycle center for proper disposal.

SURFACE PREPARATION

Surface preparation is very important because it will result in proper adhesion between the paint's bonding agents and the plastic surface as well as helping to insure a good paint finish. Prior to the application of any paint, including primers, the surface should be free of the manufacturer's mold release lubricants, dirt, polishing residue and the oil from your fingers.

I recommend that you use POLLY-S Plastic Prep for all your surface preparation needs. This liq-
uid cleans plastic, leaves no residue and it also makes the plastic static free so that dust will not be attracted to it. If you follow the manufacturer’s directions you will get excellent results. All plastic surfaces should receive a primer coat of paint prior to any finish coats (except metalizer paints which may or may not require a specific primer). The primer will also act as a final detector for cracks, imperfections and scratches and although you should have corrected any of these problems prior to the painting stage, this will be your last chance to do so.

If you are using a primer or some other color for checking the plastic for defects it is important to give the plastic an even coat of that color prior to the application of the finish paints. Without a uniform surface color the paint finish may have a slightly different color on areas that have no undercoat. Another very important point in surface preparation is to insure that the plastic itself is the proper temperature. If the plastic is cold, the paint, including any primers, may not adhere properly.

Use a hair drier to warm the plastic and to get rid of any remaining dust that attached itself to the plastic while the model was sitting in the spray booth. Hair dryers can also be used to accelerate the drying of water base paints. I have had great success with this technique on water base paints, but it does not work very well on oil/petroleum base paints. Do not, however, let the hair dryer get too close to the plastic as it may warp or melt it if the air exhausted by the drier gets too hot.

**MASKING**

As I stated in the section on tools and equipment I use 3M painters masking tape for all my masking needs. I lay one layer on my cutting board and then lay another layer over the first one. I then use a new number 11 X-Acto blade for my tape cutting and I change the blade frequently so that every cut tape edge is sharp. I peel the top layer of tape off with the tip of the cutting blade and then use tweezers, the tip of a toothpick or the tip of the cutting blade to help position the tape properly onto the surface to be masked. To cut straight lines I use stainless steel rulers of various lengths as a guide, but the one I use the most is my 6-inch stainless steel sewing ruler, which has measurements in 32nds, 64ths, 10ths and 100ths. It is one of the handiest tools I have and I use it all the time for measuring precise widths of tape and for measuring and cutting plastic for my scratchbuilding projects.

I also use 3M tape for attaching small parts to pieces of cardboard or lengths of balsa wood so that they can be easily painted. Simply take a length of tape and double it over, attach it to the cardboard or balsa wood and then press it flat with your fingers.

You can also use drafting templates for cutting shapes into the masking tape. Here again a new number 11 blade is important so that you get a very sharp edge. Place the template on the double-layered tape and secure the template with masking tape around its edges so it will not move. Run the tip of the number 11 blade around the perimeter using the edge of the template shape as a guide. Fear not as you may have to repeat the process several times before you get a perfect shape – so be patient! To make the white round circles on the 1/32 scale P-38J featured in this chapter, I had to cut almost a dozen circles until I got two perfect ones.

If you are finishing your model in a multicolor paint scheme and plan to have fine demarcation
lines between colors I recommend that you pencil in the outlines on cardboard first. It is much easier to sketch patterns on cardboard first until you get the shapes you want than to try to achieve this directly on masking tape. Once you are satisfied with the patterns cut them out and then transfer the shapes to the masking tape. This process allows you to duplicate your work and keep a record of the patterns you made.

**USING YOUR AIRBRUSH**

Good airbrushing technique evolves as you gain experience using it. You will find that your finger and wrist control are important in achieving good results with an airbrush. The distance between the tip of the airbrush and the surface to be painted is also very important. If the tip gets too close to the surface, too much paint will be applied resulting in paint runs. If the tip is too far away, the paint will dry as it hits the surface of the model resulting in what is commonly called the orange peel effect as the painted surface will appear rough, almost as though fine sand particles were deposited onto the painted surface. The orange peel effect can also be caused by bad thinner, or the wrong thinner, old paint, painting in a high humidity environment (above 55-60 percent) or airbrushing with high pressure air. I usually set the pressure regulator on my air tank to 15psi –20psi for general airbrushing and for corners and around protrusions I reduce it to 10 psi.

Flat surfaces are the easiest to paint as you can simply sweep back and forth across the surface to get light coats. Push the air button before the paint hits the surface, continue across the surface and then after the airbrush tip leaves the surface release the air button. Do not try to achieve complete coverage in one airbrushing session. Usually two or three light, thin coats are better than one thick coat. For surfaces that have corners, protrusions or elevated surfaces, lower the air pressure and carefully apply light coats rotating the airbrush so that the paint emitting from the airbrush tip will hit the intended area head on. If the paint hits the surface at an angle you may get the orange peel effect in some tight areas due to overspray so be careful how you position the tip of the airbrush as you apply the paint.

If you are going to use more than one color during an airbrushing session you can clean out the airbrush and paint bottle connection point with a Q–Tip soaked with thinner and by running thinner through the airbrush to remove the paint from the inside areas. I can usually do this three or four times during an airbrushing session before I need to actually take the airbrush apart to clean it and remove the dried paint which is clogging the tiny tip. After each airbrushing session take the time to disassemble your airbrush and clean all the parts by soaking them in thinner. Every few months I also soak the parts in lacquer just to be sure all the tiny paint residue is removed. If you take care of your airbrush it will last for years. Also if your airbrush has seals, bearings and washers, which are usually Teflon, buy spares and replace them every few months.

**PAINT BRUSHES**

For detail painting and tiny touchups invest in top quality paint brushes. I prefer brushes made with natural hair such as red sable, however I have also had great success with good quality brushes made from synthetic hairs. Companies such as Pactra and Floquil make great brushes, but they are increasingly hard to find these days. I have also used the recently introduced line of
IMEX brushes and I have been very pleased with them. The IMEX brushes have thick plastic handles that have a triangular shape. Although they do not look like the traditional round handled brushes that you would find in an artist paint store, I like the grip of these large handles.

Always clean your brushes after each use by dipping them in thinner and then cleaning off the excess paint with a soft tissue using a gentle twisting motion as the brush runs through the tissue paper. Never let your paint brushes rest on their bristles, as that is the surest way to deform the bristle’s shape. Good quality brushes will have a clear tube over the tip to protect the bristles which you should always keep on the tip of the brush when you are not using it. To store my brushes I have a 1-foot length of 2 X 4 with holes drilled into it in rows for my brushes. I have brushes that are over 20 years old and they are still good because I take care of them. So take the time to clean and store them properly and they will last a long time.

Paint will respond better and flow from your brushes if you add a few drops of the manufacturers recommended thinner to the paint bottle. Typically, paint fresh from the bottle tends to be thick and clingy and a few drops of thinner will help fix this problem. Here again be sure to shake the bottle well before use so the thinner is mixed with the paint. Also, you should also get into the habit of cleaning your brushes before you use them. Sometimes dust and lint will attach itself to the brush hairs and cleaning the brush in thinner prior to use will remove these unwanted pests. Allow the brush to air dry for a minute or so before using it again so that residual thinner will evaporate off.

**DRY BRUSHING & HIGHLIGHTING**

Dry brushing is another master modelers technique that simply uses another paint color or a lighter or darker shade of the same color to highlight detail and edges so that the modeling subject appears more appeasing to the human eye allowing it to pick out details. The technique is very simple however it is often way over done by even experienced modelers.

For all my dry brushing needs I use various widths of flat, stiff paint brushes. I dip the paint brush into the paint or the paint cap and then use a clean colored piece of paper to wipe off almost all of the paint by brushing the paint onto the paper. Even strokes back and forth across the paper are required here. Do not mash the brush onto the paper as this will deform the shape of the bristles and make it very difficult to apply the paint. When almost no paint appears on the paper you are ready to apply the residual paint to surfaces you want to highlight. Essentially you are brushing “almost dried paint” onto the surface to be painted hence the name dry brushing.

The most common color used in dry brushing is silver as it easily represents the shiny metal that gets exposed as the painted surfaces wear off due to a variety of reasons. Silver paint is also used to highlight the edges of box shapes, the edges of seats, console faces, the leading edges of wings and tail surfaces, the front edges of engine cowlings, areas on the upper surfaces of the wings where crew and maintenance personal walk frequently and so one. You can also tone down the silver by mixing it with some flat black so that it will not appear to be so shiny. You can also mix lighter or darker shades of the same color you use on parts and dry brush the edges of the raised surface detail such as wiring, bolt heads or interior framing. Here again what you are doing is providing the human eye with various shades of the same color on different surfaces and at different
angles so that the eye can discern all the details you want to focus attention on. Dry brushing is very easy to over due almost to the point of ruining the appearance of the model so whenever you are dry brushing remember this one simple rule – less is better.

**SPRAY CANS**

If you are using spray cans here are some tips to help get a better finish. Always shake the spray can well prior to use and if there is no agitating ball inside that you can hear when you shake the can don’t use it. Always test the spray can prior to use and when you are finished turn the can upside down, push the nozzle and allow the excess paint to spray out, then clean the tip to remove any excess paint. To achieve a better paint job with spray cans I recommend that you warm the paint before use. Simply immerse the spray can in a pan of hot tap water from your kitchen sink for a few minutes and shake well prior to use.

**PERCEPTION OF DEPTH**

I want to close out this chapter with a discussion about perception of depth, as this is a very important topic for scale modeling and a secret of master modelers. This technique is especially useful for painting enclosed or partially enclosed areas like cockpits. To illustrate the concept of perception of depth I will use aircraft cockpits as an example.

Regardless of how much detail you add to a cockpit or how well you paint the interior area, it will all be a waste of time if your eyes cannot see the detail. One of the tricks that master modelers use to highlight detail and create a perception of depth is by using different shades of the same color. Artists use this technique when painting a picture that appears to have depth to it even though it is on a flat canvas.

If the cockpit interior is flat black or say interior green, and you use this color throughout the interior, you will end up with a black or green hole. The human eye can detect many things, but when presented with an enclosed or partially enclosed three dimensional object that is all the same color, it will appear to be one dimensional and it will prevent the human eye from picking out apparent details. Mastering the technique of creating the perception of depth is easy to do, but will add extra steps to your modeling approach. The end results, however, are well worth the effort.

As an example for mixing colors, if you are using flat black for your console, mix a few drops of flat white with it so that the resulting color appears to be a dark, dark gray. If the radio boxes, switch banks and flight control and engine control quadrant boxes, which are located on the sides of the cockpit are also flat black, paint a few the same color as the console and others a slightly lighter color by adding additional drops of flat white. If the cockpit walls, floor and the seat are interior green, make the walls a slightly darker shade of green than the floor. The sides of the seat could be one shade of darker green and the seat bottom and back as well as the frame should be lighter. When you are mixing shades keep in mind that these color differences should be very subtle. All these different shades of flat black and green will be picked up by the human eye and it will also allow the viewer to focus on all the detail you have added and painted.
Your decision as to which parts or areas of the cockpit should be lighter shades should be based upon which ones are exposed to direct sunlight, because the sun's rays can bleach paint to the point where it appears to be almost a different color. In 1985, while I was working for the Department of the Navy, I spent two months at China Lake Naval Air Station, which is located in California’s Mojave Desert. There was an aircraft boneyard at this air station that had several B-29 bombers, which had been parked there since the early 1950's. I crawled through every one of them taking lots of pictures and among the many things that I noted was that the interior green that was exposed to direct sunlight was faded to an almost light gray. In other areas of the airplane where direct sunlight never touched the paint, the interior green color looked almost as good as the day it was painted. With this example in mind, do not be afraid to apply different shades of the same paint color. The floor, the rear cockpit wall and the seat backing and bottom get direct exposure to the sun so these areas would be lighter while the cockpit sides and the area around the console would be slightly darker.

In closing out this chapter let me say that you should label and number the bottles that contain the shade mixtures and make a list of which shades you use on what parts or identify them on the instruction sheet. This way you will know which shade to use on a particular part if you need to do some touch up work with a paintbrush. I always use flat white to lighten colors, flat black to darken colors and never mix flat paint with gloss paint.
For airbrushing my aircraft models I use a large box with the front cut out. I tape a filter over the oven exhaust to capture any paint particles. This simple airbrush booth works great so long as the oven vent exhausts the air outside.

I use a CO2 tank for my airbrush air supply. This tank will last me up to two years, it makes no noise and the air is dry.

The tank has an air regulator which sets the air pressure. The gauge on the left tells me how much air is in the tank and the gauge on the right tells me what air pressure I am using. The black knob adjusts the air pressure.

To be sure all the paint is mixed I drop a few copper bee bees into the manufacturers paint jar to act as agitating balls. This mixes the thicker paint pigment which settles onto the bottom of the jar.

Always clean off the inside area of the paint bottle cap after shaking it up. This will ensure that the cap seals properly with the jars lid.

I also clean off the lid of the paint jar to remove any excess paint. This helps seal the paint and prevents the cap from sticking to the jar due to dried paint.
To mix paint for airbrushing, pour the paint contents into one jar. Then fill a second jar with the paint manufacturer's thinner between 25 percent (1/4) to 33 percent (1/3) full. Use the paint height to gauge the amount of thinner.

I use masking tape to label my airbrush bottles. I also like to add the dates and I also sometimes add notes on what paint was mixed together and what parts were painted with a particular shade of paint.

To keep my airbrush equipment organized I have a length of 2 X 4 with holes drilled into it to hold the airbrush bottles and the various diameters of pipe cleaners that I need for cleaning the airbrush.

This is the proper way to hold an airbrush. The index finger controls the paint flow and the pinky is positioned under the airbrush jar. This finger positioning allows for the maximum movement of the wrist. Airbrushing is all in the wrist.

Sometimes paint can build up inside the airbrush tip and this excess paint can end up being spit onto the painted surface. To prevent this, check the tip frequently and clean out excess paint with a Q-Tip.

The stem of the airbrush where the paint bottle attaches to can be cleaned with a Q-Tip. Remove as much paint as possible with the Q-tip, then clean out the residue paint with a Q-Tip soaked with thinner.
I have a long thin stiff brass wire that I use to clear out paint clogs in the airbrush tip. Sometimes the paint will clog the tip during use and this is an easy and quick way to fix the problem.

I use small diameter pipe cleaners dipped in thinner to clean paint out the tip.

I use larger diameter pipe cleaners dipped in thinner to clean out the airbrush paint bottle cap and the siphoning tube.

All the airbrush parts should be soaked in thinner after each airbrush session to give the airbrush a really good cleaning.

My badger 200 has a Teflon needle bearing which sites inside the airbrush throat and a Teflon washer which sites between the airbrush body and the tip. I replace both these items about every six months.

If you take care of your paint brushes they will last a very long time. To protect the brushes keep the plastic covers on them and always store them upside down.
To clean paint brushes I dip them in paint thinner to dissolve the paint. I also swish the brush around inside the jar, but I never let the paint brush sit on its bristles.

To clean the brush of thinner and paint fold the tissue over onto itself with the brush inside and then pull the brush clear of the tissue. Several applications of thinner and wiping on the tissue may be necessary to get rid of all the paint.

To airbrush small parts I attach them to masking tape that has been folded over onto itself. I like to use large wood planks to store all the parts while they are being painted and drying.

I also use lengths of balsa wood for painting and drying parts. These Mig 3 parts have received their final coat of finished paint. They will be removed, the tape replaced and the parts flipped to paint the other side.

These P-38 cockpit interior parts have received their final interior color and now it's time to begin the detail painting process.

I like to mask and airbrush as much as possible so that I get clean, sharp demarcation lines between color. The P-38 parts have been carefully masked with small strips of masking tape.
The exposed detail on these P-38 parts were painted flat black with a few drops of flat white added so the black was not so dark.

I then drybrushed the edges with Testors silver paint and then detail painted the surfaces with a tiny brush and a toothpick.

These parts have several layers of masking tape. As I added more colors I simply mask the areas to be painted over the already masked areas. Once all the painting is done the layers of masking will be peeled away.

I sometimes use wood dowels to hold parts so that I can paint the entire surface at one time.

Most cockpit masking is easy to do. I like to fill the interior area with small balls of tissue and then cover the painted area of the cockpit with strips of masking tape.

When preparing the fuselage for painting don’t forget to mask the tail wheel assembly.
Priming all parts is essential to a good paint job. The primer will detect any flaws that you may have missed and it provides an excellent adhesion layer for the finished paint.

On this Mig 3 I noticed that there were slight indentations on the wings that the primer highlighted. I lightly sanded the surfaces and the polished the plastic and surrounding primer with 0000 steel wool.

Always paint from the lighter colors to the darker colors. The bottom paint color on this Mig-3 is a greenish blue.

I then airbrushed the upper surface being very careful not to get the green color onto the bottom areas. By rotating the model while airbrushing I was able to attain soft demarcation lines between the colors.

To do surface detail painting I placed the model on a towel on an elevated surface so that the paint would not get scratched. This allowed me to rotate the model while I touched up the paint line between the upper & lower colors.

Next I masked off the wheel wells and airbrushed them the interior color. This technique is easier than painting the wheel wells first, then masking them so that you can paint the underside.
Wheel wells that have open areas are easily painted after the underside is painted. Note the sharp demarcation lines between the colors.

Next I painted the interior flap areas using the same technique. Notice that I have covered almost the entire underside of the model to prevent any overspray.

The final step in detail painting was to color the exposed inside areas of the forward wing flaps. Here again I used lots of making tape to prevent any overspray.

Now that all the detail painting is complete the model received two coats of cleat gloss polyurethane. This step is essential for great looking decals that will not silver. The gloss finish allows decals to be slid around to position them.

This SBD needed more masking due to the engine firewall details. I did not want to damage the plumbing detail so I used the edges of the firewall area to attach the first layer of tape and then built the tape out towards the center.

I like to paint on strips wherever possible. Careful masking, cut with a sharp blade and a straight edge will yield great results. I re-primed the surface and then painted the model light gray.
To paint the upper wings yellow I masked the entire surface except for the wings. I also added balsa wood pedestals to elevate the model so the masking along the wings edges would not be damaged.

I painted the wings flat white first as an undercoat and then gave the surface a few light coats of yellow.

The wings had red strips. I cut lengths of tape the correct width of the strips and layed the tape on the wing at the correct angle. I then cut smaller strips of tape and butted the edges against one another, then removed the wider tape.

Now that the wing stripes are set, I covered the entire wing surface to protect the yellow color from overspray.

At this point the model has several layers of masking tape for the different colors that I added. It looks pretty ugly at this point, but all the careful masking will result in a great looking model.

The yellow wings and the red strips look great now that all the masking tape has been removed.
The SBD cowling also had a red strip. Note how I use the cut sections of masking tape. Long thin sections were used to set the demarcation line for the red color. Then I filled in the area to be masked with small square strips of masking tape.

To achieve this nice cowling I painted the interior green color and then masked over it. I then re-primed the outer surface and painted the light gray color. Lastly, I masked the light gray color for the red strip.

I painted one side of the SBD flaps the correct color. I masked over the surface with a large strips of tape making sure that it was attached to the entire surface of the part so no overspray seeped through all the holes.

The rudder was also masked and painted. The overall effect of careful masking, surface and paint preparation and good airbrushing technique will give you great results.

This P-38 project required a lot of careful masking around the wheel wells.

Since I had opened up some of the engine access panels these areas needed to also be masked. I added layers of small cut sections of tissue paper over the engine and then I masked over the tissue paper.
Only the front landing gear is installed so I had to make very high pedestals for the model to rest on. Note how the masking was done on the engines.

To mask the opening on the P-38 cockpit I attached small strips of masking tape to the inside areas of the canopy. This made the tape sit sticky side out.

I then added masking tape to the center area. I had to be very careful when adding the masking tape as I did not want to disturb the tape that was attached to the inside area of the canopy.

Now that everything has been masked I gave the surface a final, cleaning with Polly-S surface prep.

It took several days to prime the model. I painted the topside first and let the paint dry for several days. I then reattached the pedestals to the topside and then primed the bottom area.

Always paint from the lighter colors to the darker colors, the underside of the P-38 got two coats of light gray.
The P-38 had wavy lines for the olive drab color on the fuselage and booms. I measured the lengths on the fuselage and booms, made patterns on thin cardboard and then transferred the shapes to masking tape.

I used a drafting template to cut out circles. I had to do this several times to get two good shapes.

To achieve the large white circles on the outer tails I masked off the areas around the tail to protect the underside color and then painted the area flat white.

The circles and the wavy patterns have now been installed. To achieve a mirror image of the wavy patterns for the opposite side I flipped the cardboard patterns. I also marked them left and right so I would not mix them up.

Here you can see how the wavy patterns have been installed. The masking is almost complete.

The wing areas have been masked and now its time to airbrush the olive drab color.
I added a few drops of flat white to the olive drab color to lighten it up just a little bit.

The area between the elevator and the rudder looks somewhat grainy. This is a good example of the orange peel effect caused by high air pressure. Dried paint dust settled onto the surface.

I let the paint dry for several days and then I lightly rubbed the effected area with 0000 steel wool. I then used my airbrush and high pressure air to remove any tiny steel wool fibers from the model. The area was primed and painted.

Note how crisp the circle and wavy pattern edges look. Using a sharp blade to cut the masking tape makes all the difference.

To fix over spray, I carefully masked the effected areas and used low pressure air (15 psi) to airbrush small quantities of paint onto the surface.

To protect the paint finish I placed the model onto a towel. This made it easy to rotate the model to get at all the overspray areas that needed to be touched up.
The masking never seems to end! I found more tiny overspray areas after I checked the model's surface carefully. I masked around the flap openings and using low pressure air (15psi), I carefully airbrushed these areas.

The flap openings were easier to airbrush by masking the surrounding area rather than painting the inside areas and masking the opening before painting the underside color.

To paint the nose red, I cut a long thin length of masking mask so that the tape would conform to the shape of the fuselage. I then added square strips to hold the thin length in place and to increase the masked area.

I then added large sections of tape to protect the surrounding areas from overspray.

I primed the nose area so that I would have a neutral base color for the red overcoat.
I airbrushed two coats of flat red. If I had not protected the surrounding areas from overspray the port engine area would have red dusting all over it.

Finally the color painting is done and its time to start decaling! I like to use polyurethane which you can airbrush without having to thin it. I let each coat dry for a few days. Note how the clear gloss changes the appearance of the paint.

QUICK TIPS

USE COPPER BEE BEEES TO MIX THE PAINT AND LOOSEN UP THE PIGMENTS WHICH SETTLE ONTO THE BOTTOM OF THE PAINT JAR

 ALWAYS USE THE PAINT MANUFACTURES RECOMMENDED THINNER

 ALWAYS CLEAN OFF PAINT FROM THE PAINT JAR CAP AND LID TO ENSURE AN AIRTIGHT SEAL

 ALWAYS CUT MASKING TAPE WITH A STRAIGHT EDGE AND A SHARP BLADE

 PAINT SHOULD BE THINNED FOR AIRBRUSHING BY 25 PERCENT (1/4) TO 33 PERCENT (1/3) BY VOLUME

 ALWAYS LABEL YOUR AIRBRUSH PAINT JARS FOR EASY REFERENCE

 WRIST MOTION IS VERY IMPORTANT WHEN AIRBRUSHING

 CLEAN YOUR AIRBRUSH AFTER EACH SESSION

 NEVER ALLOW PAINT BRUSHES TO SIT ON THEIR BRISTLES

 ALWAYS CLEAN PAINT BRUSHES AFTER YOU USE THEM
CHAPTER 7

WEATHERING AND DECALING

INTERIOR WEATHERING

Before we discuss weathering I want to acknowledge that it is not necessary to weather your model. Some scale modelers like to build models that appear factory fresh while others really get into making their model look like a battle weary airplane. Most of us fall into either the almost factory fresh or slightly weathered category. Some scale modelers weathering techniques boarder on artistic expression and can get very involved and exotic in terms of the materials used. A note of caution on weathering – it can easily be over done on a model and the more materials that you use increases your chances of ruining the models appearance. Weathering takes a lot of practice so I recommend that you try different techniques on different models and then try combining techniques as your weathering skills evolve and improve.

In Chapter 6 we discussed creating the perception of depth with different shades of paint and dry brushing different color paints for highlighting. Since we already identified the need to use lighter shades on interior areas that are exposed to the sun, we have already addressed the interior weathering
effects of sunlight, but what about wear and tear, dirt and fluid leaks? Wear and tear on the cock-
pit area consists mostly of paint which has been worn off due to rubbing, chipping or constant
contact. Seat bottoms and backs should have areas which show metal, because these areas get
constant contact with the pilot's back and parachute. Places where his arms would rest, like the
horizontal surfaces close to the sides of the seat, and the area of the cockpit floor directly in front
of the rudder pedals, are also places where constant rubbing takes place.

To represent areas where the paint has worn off, use Testors silver or silver mixed with a tiny
amount of flat black so that the resulting color is not so shiny. Dry brush the paint with a small
flat brush along the edges of the seat sides, and along the edges of panels and boxes. Use a wider
flat brush to dry brush the paint onto larger areas such as the sides of the cockpit and the seat bot-
tom and back. To represent paint that has worn off wood, dry brush the areas with a lighter shade
of the paint color and then lightly rub the areas with 0000 steel wool.

Dust, dirt and fluid stains are also found inside a cockpit, and adding them must be done subtly-
another words less is better than over doing it! Paint manufacturers make paints that simulate
dust, mud, dirt and oily black. Dirt is usually tracked in by the pilot or blown in when the canopy
is open and the aircraft is operating from a dirt field. Dirt can be found accumulating behind the
pilot's seat, around the headrest, on the rudder pedals and on the floor area, particularly in the cor-
ners. Mud, which is also tracked in by the pilot is found on the floor and around the rudder ped-
als. Fluid stains are found on the floor area, particular near the control stick, the flap actuator
and under the rudder pedals. These types of stains are best applied with a small detail brush and
here again the application of these types of paints should be very subtle.

You can also use Pencil pastel colors to simulate dust, and dirt on the inside areas. Rub the pastel
color onto a piece of 200 grit sand paper and then apply the pastel dust with a soft paint
brush by dipping the tip of the brush into the pile of dust and then applying it to the desired areas.
The rough surface of the flat paint will trap tiny amounts of the pastel dust. Blow away the resi-
due dust and then seal it with a coat of Testors dullcote. The inside of the wheel wells often ap-
peared grimy and sooty. This can easily be simulated using black or dark gray pastel pencil dust
applied with a flat brush and then sealed with Testors dullcote. Apply the dust to the interior cor-
ners, nooks and to raised detail such and hydraulic plumbing and electrical wiring.

As you gain experience with weathering you will learn how to achieve a subtle effect. To prevent
yourself from overdoing it, and this is very easy to do, start with applying the silver paint to the
worn areas of one model, then try adding some dust and dirt on another one. Propeller driven air-
craft, especially WWII planes, suffered a lot of wear and tear both inside and out. Jet aircraft op-
erated from more suitable locations and although their surfaces and exteriors can get faded and
dirty, they do not suffer from the same wear and tear as their piston engine ancestors did.

APPLYING DECALS

As we discussed in the beginning of this book, the third basic technique to master in scale model-
ing is applying decals. While Ships and armor scale models do not have many decals, aircraft
models have lots of them and if you do a poor job of applying them you will ruin the appearance
of your masterpiece. Decal application is not difficult and if you follow a few simple steps you
will have success every time you work with them. It is also important to realize that from time to
time you are going to tear or ruin a decal. Fortunately you can always purchase replacements if
you are using aftermarket decals or contact the manufacturer for replacements if you are using the
kit supplied decals.

Decals are made by ink printing the required designs and colors onto a clear carrier film that has a
paper backing. The layer between the carrier film and the paper backing has a water soluble ad-
hesive. The surface of the decals are sprayed with a special coating to protect the inks and seal
them. There is also a clear portion of the decal and it is this clear area that can cause decal disas-
ters by what is known as the silvering effect. Most aircraft colors are flat and this paint has a very
rough surface which scatters the light which reflects on it hence the flat appearance of the paint.
Gloss paint has a very smooth surface and reflects light uniformly hence its shiny appearance.

When you lay a decal onto a painted surface that has a flat color, the decal traps air in the tiny
pockets of the rough surface of the paint and as the decal dries and light reflects off the clear areas
it will appear silvery. There are several easy steps to follow that will prevent this silvering effect
while at the same time giving you a decal that almost appears as if it were painted onto the model.

The secret to preventing decals from getting a silver appearance on the clear sections is to apply
them to a gloss finish. To minimize the chances of small air bubbles under the decal even if you
have a superb gloss finish – and yes this does occasionally happen, remove as much of the clear
film associated with a decal as possible.

If you have a flat finish, airbrush several coats of clear gloss paint making sure that the surface of
the model has a high gloss finish when the paint dries. Once you are satisfied that the surface is
glossy, apply the decals. When you have completed applying the decals and removed any decal
Glue residue with a damp Q-Tip, airbrush a coat of clear flat to restore the flat appearance of
the paint, dull the appearance of the decal and protect it. Sometimes clear flat coats will pull up if you
mask over them. The results will be a splotchy pattern of gloss and flat paint. To prevent this do
all your painting that requires masking prior to the application of a clear flat finish. If you do
mask and the flat finish peels up, airbrush just the areas that were damaged. Let the paint dry and
then give the entire area another coat to blend in the clear flat finish. This same problem occurred
with the pre-war colored SBD featured in this book.

When you apply the clear coats be sure that you apply them to the entire model, not just in the ar-
Eas where the decals go. If you do not you will be able to detect the differences under certain light
conditions. Just about every paint manufacturer markets clear gloss finishes and all of them work
well. I like to use Minwax enamel based gloss polyurethane which I can airbrush without having
to thin it. Another advantage to having a gloss finish is that the decals will slide very easily
across the surface of the model and this is very helpful when you are positioning a decal or if a
decal folds over.

To cut out decals I recommend that you rough cut out the individual decal off the decal sheet with
a new number 11 X-Acto blade. Some modelers use scissors, but sometimes you will have to
bend the decal sheet to fully cut around a decal and I strongly recommend that you never bend a
decal sheet. You stand a good chance of cracking the inks on the decal’s surface if you bend it.
Using a number 11 X-Acto blade is especially helpful if the decals are close together and you have cut close to another decal. I do all my decal cutting on either a glass or Plexiglas plate. The advantage of using glass is that the blade will not cut into the surface while after using a piece of Plexiglas for several decal projects you may have to replace it due to a rough surface as the blade will cut into the Plexiglas. On the other hand a glass plate will dull the knife blade sooner requiring more frequent blade changing.

I usually rough cut a 1/8th inch border around a particular decal and I cut them out as I apply them. In other words, cut one decal, trim the excess clear film, apply the decal and then repeat the process for the next one. Nothing is more frustrating than cutting out several decals and then losing or misplacing one. This can easily happen when applying decals because the process is a bit messy, and as you cut out decals and trim them your workbench will be littered with bits and pieces of the decal sheet.

After you have rough cut a decal you are ready to trim the excess clear film from it. In almost all cases I recommend that you remove as much clear film along the outer edges or perimeter of a decal as possible. If the decal is a series such as "115B6" and it is a small decal remove the clear film from along the outer perimeter of the decal. If the decal is large and the numbers or letters are spaced far enough apart you may want to consider cutting them out separately, trimming around each number or letter and then applying them to the model.

National insignia are the easiest to remove the clear film from and I also take the time to remove as much carrier film from nose art as I can. If the decal has clear film that is surrounded by a colored portion of the decal such as the upper portion of the letter "A" or the number "9", I recommend that you also remove the carrier film from these areas to reduce the risk of air bubbles getting trapped there.

If you do decide to remove all the excess carrier film from the perimeter of a number or letter there are several challenges, which you should be aware of. First, cutting out all the film is very time consuming because the individual numbers and letters being cut out need to be trimmed very carefully. Second, when they are applied to the models surface they need to be lined up and evenly spaced. Although this is not difficult to do, you need a good eye and you need to be able to judge the spacing between the decals.

Here again a new number 11 X-Acto blade works best for trimming the individual decals to remove the clear carrier film from the inked areas. Always cut the decal with clean cuts and if the knife-edge does not cut all the way through give it a second pass. Never tear partially cut areas away from the inked portions especially in tight corners as you stand a good chance of tearing the decal. The cut portion of the decal should fall free from the inked area. I use my trusty stainless steel sewing ruler to guide the tip of the number 11 blade for cutting straight lines. For odd shaped decals like nose art I free hand the cuts, but I work very slowly and check my work as I go so that I will not cut into inked areas. For curved edges I use a single edge razor blade and make tangential cuts along the curve, removing ever-smaller pieces of clear film.

The decals that I find the most difficult to work with are the label type decals that you find on aircraft surfaces to identify what is behind a panel or to give instructions to maintenance crews or
the pilot. These decals are usually very small, and in these cases the excess clear film can actually facilitate the placement of the decal. Because it gives you a little extra contact surface to work with, I recommend that on tiny decals you leave the carrier film on. To help apply these tiny decals leave a small length of the backing so that you can easily grab the backing with tweezers and slide the decal off the opposite end. Small round decals with clear carrier film in the center are also a problem, especially the red circle types that are applied to fuel caps. For some reason they do not respond to setting solutions very well and this may be because their round surfaces areas are so small. I have discovered that if I punch out the clear carrier film from the center of the decal with my trusty Waldron Punch Set, the decal will lie down on the gas caps surface very well and mold itself onto the raised detail.

To apply decals first fill a clear glass container that you will be using to soak the decals with lukewarm water. Keep your decal sheet away from the glass jar so that the wet decals will not drip onto the sheet. The next step is to dip the decal into the water. Most new types of decals only need to be submerged for about 10 seconds or so while older decals may require more time to get the glue to dissolve. When you dip the decal make sure that the entire decal is submerged. Do not let the decal float in the water because there is a possibility that the glue which holds the decal to the backing paper may dissolve very quickly, resulting in the decal lifting off the paper or, worse yet, the decal sinking to the bottom of the glass.

After you have removed the decal from the water let it sit until the decal slides freely across its backing. While you are waiting, apply your decal setting solution to the model's surface. To apply any setting solution I recommend that you use Q-Tips, because they absorb just enough solution and they will not damage decals. If you use a two-step process like the Micro Scale system, separate the bottles by putting them on either side of the workbench. This way you will not mix up the Q-Tips that you are using as applicators.

When the decal is ready to be applied, slide the decal very slightly off the backing so that you can grab the exposed backing with tweezers. Once you have moved the decal and you are holding the backing with the tweezers tips, place the decal onto the location on the models surface holding the backing with the tweezers in one hand and a damp Q-Tip dipped with the setting solution in the other hand. Lay the decal on the surface of the model, place the Q-Tip onto the decal and then ever so slowly, pull the backing away from the Q-Tip. You will have a small amount of working time with the decal before the glue starts to set onto the surface so you can then slide the decal around with your Q-Tip to position it. Be very careful not to put too much pressure on the Q-Tip as you may rip the decal. Once the decal is positioned correctly do a last minute check for location and position and then press down on the decal using either a damp tissue or a Q-Tip. It is important to keep the decal wet while you are working with it, so if it gets dry apply some more setting solution.

If the decal is a large one and it is a number or letter such as a "7" or and "F" you will need to be very careful how you slide the backing off the decal. This is because these types of decals have a tendency to fold over or, worse yet, they can rip. With these types of decals I try to move the backing away from the actual decal along the least likely surface that can be damaged. In the case of the letter "F," I would move the backing towards the left and in the case of the number "7" I would move the backing towards the right and upward. It also helps a great deal if the decal's
glue is very fluid and the decal is kept wet. If the decal does fold under itself, slide the decal around as this sometimes will move the folded portion just enough for you to correct the problem.

When you position a decal, check to insure that it is straight, not upside down and not reversed. I know you are smiling to yourself and saying that you would never do that, but if you are applying individual letters such as the letter "D" it can easily be reversed. Another decal that you need to be careful when applying is insignia, which contains a star. On fuselages the center point of the star is always pointing up and on wings it is always pointing towards the leading edge of the wing.

After you have applied a decal and you are satisfied with its appearance and position you need to soak up any excess water and setting solution before it dries. If you let the water dry on the model it will usually leave a stain which can be removed by washing the affected surface with a damp Q-Tip dipped in water.

In order to get the decal to really snuggle down around detail you will need to apply several coats of setting solution. If the decal is lying against a surface that has no surface detail I recommend that you not waste your time applying setting solution because there is nothing for the decal to conform to. I usually apply at least three or four coats of setting solution and I let each coat dry completely. Apply the setting solution with a Q-Tip and only wet the surface of the decal. As the solution dries it will soften the decal and pull it down around surface detail. If tiny air bubbles appear pop them with a pin, apply some more setting solution to the decal's surface with a Q-Tip and then press down on the area where the bubbles were located. Each successive coat of setting solution will pull the decal down around surface detail until the decal actually appears to be painted on the surface. Even small rivet and locking screw detail will show, so take your time and do not skimp on applying coats of setting solution.

As a final note on decaling I have purchased a lot of decal sheets over the years especially at conventions. I store all my decals in rectangular Tupperware containers to keep out moisture. Some of my decal sheets are no longer available so I keep them in a safe place and when I need to use them I scan them into my computer at 1000 dots per square inch (DPI), and store the scanned images on a CD or DVD. If I ever need to use them again I can always use decal paper and my trusty color ink printer to make a new set.

EXTERIOR WEATHERING

If you decide you want to weather the exterior of your model it needs to be done in stages. The first stage is to slightly lighten the paint that will be applied to the upper surfaces of the aircraft that are exposed to direct sunlight such as the upper wings and the top surface of the fuselage. Add a few drops of flat white to the paint and airbrush this lighter color onto these surfaces. The underside of the aircraft usually has an almost factory fresh appearance to the paint because there is no direct sunlight to fade it. So once you have completed applying the lighter colors onto the upper surfaces you can apply all the decals. Keep in mind that although the lower painted surfaces may not get faded, military aircraft that operated from dirt or grass fields, and many of them did, would have dirty undersides.
When you have finished applying all the decals and the water and setting solution stains have been removed, and the clear flat finish applied to the entire surface of the model, the next step is to fade the decals slightly. Fade the decals you say! Well consider this. If you painted the model as a factory fresh or almost factory fresh aircraft you can apply the decals, seal them and move on. If you decided to fade the colors on the upper surfaces of the aircraft and the decals look new there will be a visual disparity between the faded paint and the new looking decals.

To fix this problem you can give the upper surfaces a light, highly diluted coat of flat white or a light, light flat gray paint so that the decals will have a slightly faded appearance. This is especially true for decals like national insignia, nose art and large fuselage numbers and letters.

Since you will be using a highly dilute color which will be mostly thinner I recommend that you use water base paints so that the thinner will evaporate off the model. The reason I recommend water base paints is that you will be applying a large volume of thinner to the model's surface because of the paint to thinner ratio. A mixture of 75 percent thinner to 25 percent paint should give you a subtle dusting on the upper surfaces to slightly fade the decals.

Always test your mixture prior to airbrushing to be sure that the paint is just a dusting and that the paint has mixed correctly. If the paint is still too thick just add more thinner until you get the effect you are looking for. I have also had the bad experience of having the airbrush spit globs of water base paint onto the surface of the model. This was either due to bad thinner or bad paint, which does happen from time to time. So always test you paint especially highly diluted mixtures. As a final note to this disaster I quickly streaked the paint from front to back with tissue, which salvaged the models appearance. The pictures in this chapter of the Mig-3 are the result of that painting disaster!

For making the bottom of the aircraft dirty use the same ratio of paint and thinner. If the aircraft operated from an airfield use flat brown lightened up with some flat white or a light tan color. In addition to applying the dirt color to the lower surfaces of the aircraft, dirt also gets splashed into the wheel wells onto the landing gear, the tires and tire hubs. Here again less is better so hints of the dirt color are better than making it appear as though the airplane has had a mud bath! The result you want is a very subtle, light dusting of paint particles on the surface of the model, especially on the decals. If you decide to dust the bottom of the aircraft with dirt and mud add the leading edge weathering first.

LEADING EDGE & FOOT TRAFFIC WEATHERING

The next step in making your finished masterpiece look realistic is to add the subtle effects of worn off paint on the leading edges of the airplane and on surfaces where there is foot traffic.

For simulating worn paint on the leading edges of wings, which includes the tail and rudder leading edges, on the front of the fuselage and on the engine cowlings, I use the dry brushing method to add very subtle amounts of silver paint. I use a flat brush for leading edge paint application and I make sure almost all the paint is gone before I touch the brush to the surface. I would rather have to do multiple applications of silver paint to get a nice subtle effect than to suffer the disappointment of adding to much paint. It is also very important to be sure that your
brush strokes on the leading edges of wings simulate the actual flow of air, which would be from the leading edge and then across the upper and lower surfaces just beyond the leading edge.

On the leading edge of the aircraft fuselage the worn paint would be around the circumference area of the nose, but here again very subtly and not uniform as paint peels and is worn off at non-uniform rates. On engine cowlings I dry brush starting at the inner edges with brush strokes straight back across the cowlings surface such that the strokes simulate the airflow pattern. I also dry brush the tips of the engine cooling flaps on the aft section of the cowling.

Foot traffic is usually on the upper surfaces of the wings of fighter aircraft close to cockpit and some very subtle worn paint where the fuel caps are located. There may also be worn paint along the sides of the fuselage around the cockpit where the pilot and crew chief spend time getting into and out of the aircraft. I use a soft round brush with a blunt end to dry brush on the silver paint by using a stippling effect to simulate the worn paint from foot traffic. Here again the effect is very subtle and there should be hints of silver where the paint has worn off.

**EXHAUST AND GUNPOWDER STREAKS**

The last step in basic weathering are to add exhaust and gunpowder streaks. The best way to apply these streaks is to use your trusty airbrush and to apply light subtle amounts of paint. For enamel surfaces I like to use Testors Metalizer exhaust paint color and for gunpowder stains I use the flat black that has some flat white added to it so it is a dark, dark gray. If you don’t like using metalizer paint just use the same mixture for the gunpowder streaks that you used for the exhaust streaks.

The exhaust streaks should emit from just behind the exhaust pipes and streak back across the surface starting out heaver and then getting lighter in appearance as the streak moves away from the exhaust ports. This touch takes a lot of practice. Gunpowder streaks are pretty much the same except their streaks can be narrow or wide depending on where the guns are located. For wing-mounted guns, the streaks are often times narrow and extend across the upper and lower surfaces of the wing. For nose mounted guns the streaks can be narrow, but most times they are wider and less distinct due to the rounded and blunter shape of the fuselage. In all cases examine pictures of real aircraft to see what the exhaust and gunpowder streak shapes look like.

In closing out this chapter and this book, remember that less weathering is always better than more weathering. What you are trying to achieve is a hint of faded and worn paint, streaks of gunpowder and exhaust stains and decals that don’t look brand new.

Happy scale modeling!

Mike Ashey
To added weathering to the interior of aircraft I used pencil pastels. They are easy to use, they are not oil based and the dust sticks well to flat paint. I rub the pencil onto sandpaper and use various size flat brushes to apply the dust.

These interior cockpit parts for a Mig-3 have been painted and detailed and they are now ready for some pastel dust.

The pastel dust should be applied from top to bottom. Light dusting work best and you can add various shades to break up the interior colors. Do not touch the dust once applied. Simply blow away the excess dust.

Once the parts are dusted apply a coat of Testors clear flat paint to seal the dust so that you can handle the parts. Note how a good paint job, detail painting, dry brushing and adding pastel dust enhances the interior parts.

Here is a close up of the left and right cockpit sides of the Mig-3. Things that the pilot would use a lot like the trim wheel has lots of worn paint on its surface.

Enhancing the corners and edges of small boxes by Dry brushing them with Testors silver paint can really bring out the individual shapes of these parts.
I also dusted the interior sides of the Mig-3 fuselage and here I made a mistake. The streaks are from front to back instead of top to bottom. Luckily most of the interior will be hidden with the cockpit assembly.

Here the Mig-3 interior is being assembled. Adding subtle weathering on each part works best because as you assembly the cockpit the subtle effects start to add up.

I also use pastel dust to add grime and dirt to landing gear parts.

These SBD parts are getting dry brushed with Testors silver paint. Wipe off almost all the paint from the brush until only a hint of silver is left, then run the brush across raised surfaces and on edges and corners.

I use dry brushing to also enhance canvas. Here white paint is being dry brushed onto the black canvas covers on the bases of the control sticks of these SBD part.

The red canvas covers for the flare gun rounds on this SBD part also got a subtle dry brushing of flat white to enhance the appearance of the detail. I drybrushed before I removed the masking.
This canvas covered part looks much better now that the surface detail has been enhanced with flat white. The tiny paint enhancements that you had to each part will really make the cockpit stand out once its assembled.

These SBD interior parts have all been enhanced with Dry brushing of silver and flat white paint.

The console is a very prominent part in any interior so I pay particular attention to dry brushing the edges and any raised detail.

Here is a good example of very subtle dry brushing on the interior raised detail of this SBD cockpit side.

By running a flat brush across the raised surface detail tiny silver pigments flaked off onto the surface. Instead of your eye seeing an all green floor once the fuselage is closed up your eye will be able to see the floor detail.

The control column and the seat cushion on these P-38 parts have been dry brushed. Note the difference between these parts and the head rest which has not been dry brushed.
The P-38 control wheel has some Eduard photoetch enhancements. The grips were carefully painted and dry brushed with white and the metal was dry brushed with silver. The red buttons were painted with a toothpick tip.

These P-38 cockpit sides could have used a slight dusting of pastel but I wanted to display the cockpit as used but not so used that the interior was grimy.

The first step in decal application is to have a high gloss surface on your model. I like to use gloss polyurethane. The gloss will allow you to slide decals around and it will help prevent the silvering of the clear carrier film of the decal.

To lessen the chances of silvering, I remove as much of the clear film around decals as possible.

On small label decals cut around the wording to remove the excess clear film.

Removing the clear film on nose art can be challenging, but necessary.
For some strange reason small round decals seem to have a higher chance of silvering even with a gloss surface. To prevent this I even remove the clear film from the center sections using my Waldon punch tool.

I also remove the carrier film from around the edges of large numbers and letters and apply them individually.

For simple circles and squares I use a drafting template and masking tape to make these shapes and use paint instead of decals.

I dip decals in warm water lightly holding them with tweezers. The warm water will loosen the glue between the decal and the backing faster and it helps the decals adhesive stick.

Check to see if the decal will slide than carefully move it slightly off its backing so you can grab the backing with tweezers. Sometimes I lay it down to achieve this and sometimes I do it right out of the warm water jar.

For tiny decals do not cut the clear film as it will help the placement and adhesion of the decal. Also, cut out some extra paper backing so that you have a handle for your tweezers.
I apply Micro Set to the surface and then slide the decal off its backing with a Q-tip. Be sure the decal is wet so it will not tear. Position the decal with the Q-Tip and as it dries carefully press down with the Q-tip to remove air bubbles.

As the decal is drying I apply coats of Micro Sol to soften the decal. Note how the decal conforms to the surface detail. When I am finished applying all the decals I airbrush Testors clear flat to seal the decals and restore the flat color.

The SBD kit came with a colored rudder decal, but I painted it. I cut of the “SBD” from the kit decal. These is a lot of carrier film on the door hatch decal, but a good coat of clear gloss prevented silvering.

The red strips were also painted although decals were supplied. The combination of careful masking and painting in combination with good decal application can really enhance the appearance of a model.

This SBD kit also had a large red strip but here again I painted the red strip and then applied the decals. I gave the surface several coats of clear gloss to ensure that it had a high gloss sheen.

Applying decals on top of decals can be a bit tricky. Complete the bottom decal first including the applications of Micro Sol, then apply the second one. Decals don’t slide well over other decals so be precise in your positioning.
After several more applications of Micro Sol to get the ring decal to snuggle down onto the surface I sealed the decals with Testors clear flat finish.

This Mig-3 has all its decals added and it is ready for a layer of clear flat.

This is a good example of the difference in the shade of the finished color with a clear gloss finish and the final clear flat finish. Note how much darker the green looks when it has a gloss finish.

These decals look like they have been painted onto the model. This is a good example of good decal application technique.

The nose art of this A-20 Havoc has a lot of clear carrier film and I was extra careful to apply several coats of clear gloss finish on this area so that there would be no chance of silvering.

The kill tally and label decals on this P-47 silvered because I did not have an even surface of gloss paint. Unfortunately I did not notice this until after I applied the flat finish. Always check each decal carefully.
This Mig-3 has been given its clear flat coat and the lighter green color has been restored. Now its time to lighten the surface using water based paint.

The upper surface received a light dusting of highly thinned water based flat white to fade the paint and to also fade the decals. This approach makes the fading between the paint and the decals uniform.

This close up give you a better feel for the fading. Areas of the upper wings are faded while other areas are not.

To simulate the worn paint appearance from foot traffic I use the dry brush technique, but I use an up and down stippling motion by holding the brush at 90 degrees to the surface.

There is also foot traffic and worn paint around the fuel tank fill ports. These little details all add to the overall effect of the finished model.

I also stipple over decals when necessary and in this case the outer wing fuel tank fill ports need a little bit of silver to simulate worn paint.
The leading edges of the main wings, the tail and the rudder are all exposed to high air pressure air flow. These areas always have exposed metal where the paint has been worn off.

Always dry brush from front to back to simulate air flow. When adding silver paint to simulate exposed metal on the leading edges of an aircraft less paint is better.

These exhaust stains along the top area of this P-38 Fuselage boom were applied before the exhaust and super charger assembly were added.

The exhaust stains should emit from the area behind the piping not in front of it or around it.

Powder stains and staining from the gasses and the lubricants associated with the machine guns should streak behind the gun openings.

Now that the guns along with the rest of the remaining parts have been attached, the business end of this P-38 looks pretty realistic. As a final note, less weathering is always better than applying too much weathering.