



Royal Products

CORPORATION

790 WEST TENNESSEE AVENUE • DENVER, COLORADO 80223

PHONE (303) 778-7711 • P. O. BOX 9706 SOUTH DENVER STATION, DENVER, COLO., 80209 • CABLE ADDRESS: "ROYAL" DENVER, COLO., U.S.A

F-4

Phantom II

CONGRATULATIONS ON HAVING JUST PURCHASED ONE OF THE FINEST SCALE MODEL KITS AVAILABLE TODAY.

THERE IS A GREAT DEAL OF INDIVIDUAL DETAIL TO BE TAKEN CARE OF PRIOR TO GLUING A TO B SO SIT BACK, RELAX AND CONSIDER THE FOLLOWING PRELIMINARIES.

YOUR CHOICE OF THIS KIT WAS INITIALLY MOTIVATED BY SOME PRIOR EXPERIENCE OR PREFERENCE FOR THIS PARTICULAR MODEL. PERHAPS IT IS A REAL PLANE OF THE SAME DESIGN YOU HAVE FLOWN OR MAYBE OWN NOW. THE POINT IS, RIGHT NOW, ONLY YOU ARE FAMILIAR WITH THAT FEELING. HAVEN'T YOU NOTICED THAT WHEN YOU SPEAK OF THIS BEAUTIFUL SCALE JOB THERE IS THE CASUAL INDIFFERENT LOOK ON YOUR COMPANION'S FACE? WOULD YOU BELIEVE THE SAME INDIFFERENT FEELING COULD BE IN THE JUDGE'S MIND AS HE INSPECTS THIS BEAUTY YOU WILL CREATE? 'TIS POSSIBLE, ISN'T IT?

THE ABSOLUTE FIRST THING YOU MUST DO AT THIS VERY TIME IS DETERMINE WHETHER THIS IS TO BE THE "ULTIMATE SCALE JOB" OR AN "EYEBALL SCALE". IF YOU CHOOSE "EYEBALL SCALE", WHICH IS JUDGED FROM 25 FEET AWAY, THEN YOU MAY AS WELL TURN TO CONSTRUCTION TECHNIQUES AND START BUILDING! HOWEVER, IF YOUR CHOICE IS "ULTIMATE SCALE", THEN YOUR PROJECT HAS NOT YET BEGUN.

THE NEXT DECISION YOU MUST MAKE IS WHICH PARTICULAR TYPE, MODEL AND SERIES YOU INTEND TO DUPLICATE TO THE NTH DEGREE. THE TYPE (THAT IS BOMBER, FIGHTER, ETC.) HAS ALREADY BEEN DECIDED AS YOU BOUGHT THE KIT. THE MODEL (THAT IS 24-25-26 ETC) MAY NEED TO BE YOUR CHOICE AS FOR INSTANCE, THERE IS NO EASILY RECOGNIZABLE DIFFERENCE BETWEEN A B-44 AND A B-50. THE SERIES VARY WIDELY AND YOU WILL NEED TO MAKE THIS DECISION YOURSELF. FOR INSTANCE THERE IS VERY LITTLE DIFFERENCE BETWEEN A B-52B, B-52C, B-52D AND B-52E TO THE CASUAL OBSERVER, BUT TO THE TRAINED EYE OF A COMPETITION SCALE JUDGE THIS MAKES THE FIRST GREAT DIFFERENCE.

ONCE YOUR CHOICE HAS BEEN MADE AS TO EXACTLY WHICH TYPE, MODEL AND SERIES YOU WILL BUILD, YOUR NEXT TASK WILL BE TO COMPLY WITH THE "SCALE PRESENTATION". BY THIS I MEAN YOU MUST ASSEMBLE AND ARRANGE THE "PROOF" YOU INTEND TO USE, TO THOROUGHLY CONVINCE THE JUDGE THAT YOURS IS THE BEST OF THE BUNCH! KEEP IN MIND THAT YOU CAN'T "TALK" HIM INTO IT SO EXTRA EFFORT SPENT AT THIS STAGE REAPS GREAT BENEFITS LATER.

START WITH AN ACCURATE, AUTHENTIC 3-VIEW DRAWING PREFERABLY FROM THE MANUFACTURER, AND WHICH GIVES DIMENSIONS OF THE REAL PLANE. IF NOT AVAILABLE,, THEN SUCH GREAT WORKS AS THE COMMERCIAL SCALE 3-VIEWS BY NIETO, NYE, WYLAH, SUPERSCALE, ETC. ARE ACCEPTABLE. I KNOW THIS BECAUSE I JUST READ IT IN THE CURRENT AMA MODEL AIRCRAFT REGULATIONS BOOK WHICH INCIDENTALLY IS THE BOOK BY WHICH YOUR EFFORT WILL BE RATED. NEEDLESS TO SAY, BEFORE YOU GO ANY FURTHER, GET REAL FAMILIAR WITH THE RULES FOR SCALE.

ONE MORE WORD OF ADVICE ABOUT THE "SCALE PRESENTATION". THE BETTER IT LOOKS, THE BETTER YOUR SCORE WILL BE SO DON'T CUT CORNERS OR GO SECOND CLASS! 'NUFF SAID?

NOW THAT YOU'VE ASSEMBLED THE 3-VIEW, TECH DATA, PICTURES AND REFERENCES AND CONSTRUCTED A WELL ORGANIZED, WELL PLANNED, EYE APPEALING PRESENTATION, YOU MUST STUDY, COMPARE, MEASURE AND CAREFULLY PLAN THE MODEL YOU WILL BUILD.

FIRST, SELECT THE SCALE RATIO YOU WILL USE. THIS HAS BEEN APPROXIMATED IN OUR KITS BECAUSE THERE ARE SO MANY VARIANTS BETWEEN EACH DIFFERENT SERIES OF THE BASIC AIR PLANE. YOU MAY CHOOSE THE SERIES WHICH IS CLOSEST TO OUR KIT - STILL YOU WILL HAVE TO MAKE ADJUSTMENTS, PERHAPS AN INCH IN WINGSPAN, 1/2 INCH IN LENGTH OR SO ON. THE POINT IS--THIS IS THE TIME TO PLAN FOR THESE ADJUSTMENTS AND THEY MUST ALL BE THE SAME RATIO FOR MAXIMUM POINTS.

THE EASIEST WAY TO DO THIS IS TO OBTAIN A PAIR OF "PROPORTIONAL" DIVIDERS. THIS IS A TOOL WITH A MOVEABLE PIVOT IN THE MIDDLE AND WHEN OPEN LOOKS LIKE AN "X" WITH NEEDLE POINTS AT EACH TIP. WITH THESE YOU MAY SET THE "RATIO" SO THAT MEASURING WITH ONE END OFF THE 3-VIEW WILL GIVE THE DESIRED MEASUREMENT AT THE OTHER END. CAREFULLY ADJUST THE DRAWINGS WE'VE PROVIDED TO EXACTLY MATCH THE 3-VIEW YOU WILL USE.

NEXT, CAREFULLY STUDY THE MATERIAL YOU'VE GATHERED AND MAKE NOTE OF EXACTLY WHICH DETAILS YOU WILL INCLUDE ON YOUR MODEL AND WHERE AND HOW THEY WILL BE INCORPORATED. FOR INSTANCE, DO YOU PLAN ON FLAPS? RETRACTABLE GEAR? LIGHTS? THOUSANDS OF TECHNIQUES ARE INCLUDED IN MAGAZINES AND COLUMNS WHICH ARE DEVOTED TO SCALE CONSTRUCTION TECHNIQUES SO I'LL LEAVE YOU TO HUNT UP ALL THAT FOR YOURSELF.

WE WILL NOW CONSIDER THE BASIC AIRPLANE AND THEN IT'S CONSTRUCTION.

THE McDONNELL PHANTOM II

COMMONLY KNOWN AS THE F-4 THIS PLANE IS CALLED PHANTOM II BECAUSE THERE REALLY WAS A PHANTOM I. THE PHANTOM I WAS TESTED, THEN ACCEPTED BY THE NAVY IN 1946 AND WAS THE FIRST NAVY JET FIGHTER. BECAUSE THERE REALLY WAS A PHANTOM I, IT IS CORRECT TO REFER TO THIS CRAFT AS THE PHANTOM II, OR FOR SIMPLICITY, (AND LIKE THE MILITARY DOES) JUST THE F-4.

YOUR CHOICE OF THIS PARTICULAR KIT WAS AN EXCELLENT ONE FOR NUMEROUS REASONS. IT IS A BEAUTIFUL PROJECT AND AS A "JET JOB" WILL REALLY STAND OUT IN TODAY'S RUN OF THE MILL RC GROUP. ANOTHER REALLY GREAT BENEFIT FOR YOUR CHOICE IS THE WEALTH OF CURRENT INFORMATION REGARDING THE F-4. IT IS REALLY ABUNDANT.

THE FIRST THING YOU MIGHT DO IS LOCATE A COPY OF THE MAY 1970 AMERICAN AIRCRAFT MODELER MAGAZINE BECAUSE DON BERLINER WROTE A VERY COMPREHENSIVE ARTICLE ON THE F-4 AND ACCOMPANIED IT WITH FOUR BEAUTIFUL PHOTOS AS WELL. AS A PRICELESS ADDITIONAL BONUS THE CENTERFOLD OF THIS SAME MAGAZINE IS A PERFECTLY DETAILED SET OF DRAWINGS BY BJORN KARLSTROM COMPLETE WITH MANY DETAILS OF THE VARIANTS SUCH AS EXTENDED NOSES ON RF-4C AND F-4D MODELS.

THE NEXT EASIEST STEP YOU MIGHT TAKE IS TO YOUR LOCAL LIBRARY WHERE THE GRAND BOOK OF AVIATION ENTITLED "JANE'S ALL THE WORLD'S AIRCRAFT" WILL REVEAL ALL THE SPECIFICATIONS AND A THREE VIEW DRAWING. FINALLY YOU CAN WRITE THE McDONNELL-DOUGLAS CORPORATION DIRECTLY AND OBTAIN THE INFORMATION YOU NEED.

THE F-4 HAS BEEN MADE IN OVER TWENTY DIFFERENT VERSIONS, SO FOR SERIOUS SCALE PRESENTATION YOU MUST CAREFULLY SELECT YOUR SUPPORTING DATA ALL ON THE SAME PARTICULAR MODEL. IT WOULD DO NO GOOD TO HAVE 3 VIEWS OF THE F-4C AND A PICTURE OF THE F-4D AND SO FORTH. CONSIDER ALSO THAT THE F-4 APPEARS IN US NAVY, US MARINE, US AIR FORCE, ROYAL BRITISH NAVY AND ISRAELI COLORS JUST TO NAME A FEW. TO QUOTE FROM "JANE'S ALL THE WORLD'S AIRCRAFT" 1965-1966--

"THE PHANTOM II WAS DEVELOPED INITIALLY AS A TWIN-ENGINE, TWO-SEAT, LONG-RANGE, ALL WEATHER INTERCEPTOR AND ATTACK BOMBER TO SUCCEED THE F-3 DEMON IN SERVICE WITH THE US NAVY. IT WAS DESIGNED FOR MACH 2 SPEEDS AND IN FACT, ACHIEVED MACH 2.6 DURING ITS FLIGHT TRIALS. THE FOLLOWING VERSIONS HAVE BEEN ANNOUNCED: XF4H-1, F-4B, RF-4B, F-4C, RF-4C, F-4J, F-4K AND F-4M.....THE PHANTOM II HAS SET UP MANY OFFICIAL RECORDS SINCE DECEMBER 1959 INCLUDING WORLD SPEED AND HEIGHT RECORDS OF 1,606.48 MPH (2,585.425 KMH) AND 98,556 FT. (30,040 M) RESPECTIVELY.....

WINGS:

CANTILEVER LOW-WING MONOPLANE. AVERAGE THICKNESS CHORD RATIO 5:1%. SWEEP BACK 45° . OUTER PANELS HAVE EXTENDED CHORD, GIVING "DOG TOOTH" LEADING EDGE, AND DIHEDRAL OF 12°INSETAILERONS LIMITED TO DOWN MOVEMENT ONLY, THE "UP" FUNCTION BEING SUPPLIED BY HYDRAULICALLY-OPERATED SPOILERS ON UPPER SURFACE OF EACH WING.HYDRAULICALLY-OPERATED TRAILING-EDGE FLAPS AND LEADING-EDGE FLAP ON OUTBOARD HALF OF EACH INNER WING PANEL ARE "BLOWN". HYDRAULICALLY-OPERATED AIR-BRAKE UNDER EACH WING AFT OF WHEEL WELL. OUTER WING PANELS FOLD UPWARD FOR STORAGE.....

TAIL UNIT: CANTILEVER ALL-METAL STRUCTURE, WITH 23° OF ANHEDRAL ON ONE
PIECE ALL-MOVING HORIZONTAL SURFACES (ANHEDRAL ON RAF AND RN
VERSIONS WILL BE 15° AND LEADING EDGE WILL INCORPORATE A FIXED
SLOT)....RUDDER INTERCONNECTED WITHAILERONS AT LOW SPEEDS.

LANDING GEAR: HYDRAULICALLY-RETRACTABLE TRICYCLE TYPE, MAIN WHEELS RETRACTING
INWARD INTO WINGS, NOSE UNIT REARWARD. SINGLE WHEEL ON EACH
MAIN UNIT, TWIN WHEELS ON NOSE UNIT WHICH IS STEERABLE AND
SELF CENTERING.....

DIMENSIONS,
(EXTERNAL:)

WING SPAN	38 FT. 5 IN. (11.70M)
WIDTH, WINGS FOLDED	27 FT. 6½ IN. (8.39M)
LENGTH, OVERALL	58 FT. 3 IN. (17.76M)
HEIGHT, OVERALL	16 FT. 3 IN. (4.96M)
WHEEL TRACK	17 FT. 10½ IN. (5.30M)

AREA:

WINGS, GROSS	530 SQ. FT. (49.2M ²)
--------------	-----------------------------------

WEIGHTS:

T-O WEIGHT (CLEAN)	46,000 LB. (20,865 KG)
MAX T-O WEIGHT	54,600 LB. (24,765 KG)

PERFORMANCE:

MAX LEVEL SPEED WITH EXTERNAL STORES	OVER MACH 2
APPROACH SPEED	150 MPH (240KM/H)....."

THE ABOVE WAS EXTRACTED, SO REMEMBER THIS IS NOT THE LIMIT OF INFORMATION AVAILABLE
ON THIS EXCELLENT SUBJECT. ALSO, NOTE THE BOOK SAYS THE ABOVE EXTRACTED DETAILS APPLY
SPECIFICALLY TO THE F-4B BUT ARE GENERALLY APPLICABLE TO THE OTHER VERSIONS OF THE
PHANTOM II.

CONSTRUCTING THE F-4 PHANTOM II

BEFORE YOU GLUE A SINGLE PART ON THIS FABULOUS SUBJECT, CAREFULLY CONSIDER HOW
NICE RETRACTABLE LANDING GEAR WOULD LOOK ON THIS BIRD. WHEN IT WAS DRAWN ONLY A FEW
TYPES WERE AVAILABLE BUT NOW....WOW! IF YOU DO DECIDE ON RETRACTS TAKE THE TIME TO
DESIGN AND ENGINEER THEIR INSTALLATION BEFORE YOU BUILD AS IT WILL BE A FAR EASIER TASK.

CONSTRUCTING THE F-4 PHANTOM II

BEFORE YOU GLUE A SINGLE PART ON THIS FABULOUS SUBJECT, CAREFULLY CONSIDER HOW NICE RETRACTABLE LANDING GEARS WOULD LOOK ON THIS BIRD. WHEN IT WAS DRAWN ONLY A FEW TYPES WERE AVAILABLE BUT NOW...WOW! IF YOU DO DECIDE ON RETRACTS, TAKE THE TIME TO DESIGN AND ENGINEER THEIR INSTALLATION BEFORE YOU BUILD AS IT WILL BE A FAR EASIER TASK.

LET'S BEGIN CONSTRUCTION BY GLUING THE S-1 TO S-2 AND SPOT GLUING THE ELEVATORS IN PLACE. WHEN DRY, SAND IN THE AIRFOIL, GLUE THE STAB TOGETHER (FORMING ANHEDRAL) AND BRACE IT WITH S-3, S-4 AND S-5. ONCE SANDED, THE ELEVATORS MAY BE CUT LOOSE AND PREPARED FOR HINGING.

GATHER UP THE RUDDER PARTS R-1 THROUGH R-6 AND GLUE ALL TOGETHER AS SHOWN ON THE SIDE VIEW (ONLY SPOT GLUE R-5 IN PLACE BECAUSE WHEN DRY WE WILL SAND THE WHOLE THING TO SHAPE AND THEN CUT R-5 LOOSE AND HINGE IT SEPARATELY).

START THE FUSELAGE BY GLUING F-1, F-2, F-3 AND F-4 TOGETHER AS SHOWN IN ISOMETRIC DRAWINGS JUST ABOVE AND BEHIND THE FUSELAGE SIDEVIEW. BE SURE TO MAKE A RIGHT AND LEFT SIDE. ADD F-5A (PLYWOOD) AND F-5B (BALSA). GLUE A 1/8" X 3/8" BALSA STRIP ALONG THE TOP OF EACH SIDE SUCH THAT 3/16" OF IT WILL OVER HANG. THIS WILL GIVE A SOLID JOINT WHEN YOU ADD THE TOP PLANKING LATER. GLUE A 1/8" X 3/8" BALSA STRIP FLUSH WITH TOP AT THE STAB SADDLE AND THEN ADD THE 1/8" X 3/16" BALSA STRIPS ALONG THE BOTTOM OF THE FUSELAGE SIDE F-2 (MAKE SURE THE STRIPS ARE FLUSH WITH THE FUSELAGE CURVATURE).

STUDY THE SIDE AND TOP VIEW CAREFULLY AND THEN CONSTRUCT THE FUSELAGE "BOX" BY INSTALLING FORMERS F-7, F-8, F-9, F-10, F-11, F-13, AND F-18. USE TAPE TO SECURE AND HOLD THIS STRUCTURE IN ALIGNMENT. ALLOW IT TO DRY COMPLETELY BEFORE PROCEEDING FURTHER. GLUE THE FOUR F-14s IN PLACE AND ADD THE 3/16" SQUARE BALSA BACKBONE. WET ONE SIDE ONLY OF THE 1/8" BALSA SHEET TOP PLANKING AND CAREFULLY FORM IT TO THE CONTOUR DESIRED, TRIM IT TO SHAPE AND GLUE, IN PLACE, SECURING IT WITH TAPE.

NEXT, REFER TO THE DRAWINGS AROUND THE NOSE OF THE FUSELAGE AND INSERT EM-1 AND 2 AS SHOWN ON THE PLANS. ADD EM-3, 4 AND 5, INSURE ALIGNMENT AND ADD FUSELAGE NOSE BLOCKS F-28, F-29, F-30A, F-30B, F-31s AND F-32, IN THAT ORDER. WHEN DRY, DRESS OFF THE NOSE AND ADD F-6, F-24, F-25, F-26 AND THE COCKPIT PLANKING. ALSO, INSTALL THE F-23 BOTTOM BLOCKS AS SHOWN.

REFER TO THE DRAWINGS AROUND THE SIDE VIEW OF THE FUSELAGE FOR THE NEXT STEPS. INSTALL THE F-12 (ENGINE EXHAUST RINGS), F-15 AND F-16 AS SHOWN. GLUE THE F-20 KEEL PIECE INTO ITS SLOTS (FROM F-15 TO F-13) AND THEN WET ONE SIDE OF THE 3/32" SHEET BALSA AND FORM IT TO THE CURVATURE AS SHOWN. SECURE IT WITH PINS AND TAPE. WHEN DRY, INSTALL THE CROSSBLOCK AND F-33 PLANKING AS SHOWN IN THE DRAWING. F-17 AND F-19 CAN BE INSTALLED WITH SCRAP BALSA. SPOT GLUE THEM IN PLACE WHERE THE ELEVATORS GO, THUS ALLOWING FOR SHAPING AND SANDING OF THE FUSELAGE TAIL. WHEN DONE,

CAREFULLY REMOVE F-19 TO ALLOW FOR INSTALLATION OF THE RUDDER AND ELEVATORS

ALL THAT REMAINS OF THE FUSELAGE CONSTRUCTION IS THE JET BOXES. SHAPE THE FUSELAGE AS YOU WANT IT PRIOR TO THIS STEP. IT WILL HELP TO REFER TO A PLASTIC MODEL IF YOU CAN'T LOOK AT THE "REAL MCCOY" TO SEE THE CURVES WE INTEND TO DUPLICATE. CAREFULLY COMPARE THE CROSS-SECTIONS ALONG THE RIGHT EDGE OF THE PLANS. EXAMINE THE TOP AND SIDE VIEWS TO DETERMINE WHAT THE FINISHED PRODUCT SHOULD LOOK LIKE. INSTALL J-7 BETWEEN THE "EARS" OF F-8 AND F-10. ATTACH F-35 AND CAREFULLY INSTALL J-1 & J-2. J-4 AND J-5 ARE ADDED NEXT, THEN INSTALL THE 3/4" X 45° STOCK ABOVE J-4. THESE PIECES ADD STRENGTH AND ALLOW CARVING TO THE PROPER CONTOUR. (SEE F-F CROSS SECTION FOR DETAIL) WHEN DRY ADD THE 1/8" SHEET BALSA PLANKING ALONG THE SIDE AND FINALLY CARVE IT TO THE PROPER SHAPE.

LAY OUT OR TRACE ANOTHER WING PLAN FOR THE LEFT WING CONSTRUCTION (OR TURN PLANS OVER, COAT WITH A LIGHT LAYER OF OIL AND ADD WAX PAPER TO GET PLANS FOR LEFT HALF) AND BEGIN BY BUILDING THE WINGTIPS FROM W-7 OUT TO THE TIP. NOTICE THE MAIN SPAR IS A 90° CUT AT THE W-6, W-7 LOCATION. TRIM SPAR LENGTH FROM THERE TO TIP. DRAW CENTERLINES ON ALL WING RIBS AND THEN GLUE W-10, W-9 AND W-8 IN PLACE ON BOTTOM SPAR. BLOCK UP SO CENTERLINE IS PARALLEL TO TABLE TOP. ADD W-29 (AILERON SPAR) AND LEADING EDGE.

GLUE A W-26 TO THE INSIDE OF THE BOTTOM MAIN SPAR (LIKEWISE TOP SPAR) AND THEN ADD RIB W-7 AND FINALLY THE TOP SPAR. WHEN THIS ASSEMBLY IS DRY, REMOVE IT FROM THE PLAN AND PROP IT UP SUCH THAT THE TIP RIB IS 1 1/2" ABOVE THE TABLE (OR 12° IF TRUE SCALE IS DESIRED) AND SECURE IT WITH CENTER LINES PARALLEL TO THE TABLE TOP. CONTINUE BY GLUING BOTTOM MAIN SPAR IN PLACE AND THEN REMAINING RIBS AND FINALLY THE TOP SPAR. WHEN DRY, ADD W-25 AND W-26 TO SECURE THE DIHEDRAL.

INSTALL THE BELLCRANK ON W-24 AND GLUE W-24 IN PLACE WITH 3/16" SQUARE RAILS TO HOLD IT IN PLACE. RUN THE CONTROL WIRE AT THIS TIME. ADD THE LEADING EDGE, W-19 AND W-11 IN THAT ORDER. W-14 FITS BETWEEN THE MAIN SPARS AT THE CENTER SECTION. CONTINUE BUILDING THE OTHER PANEL IN A LIKE MANNER AND ADD W-16 AS YOU GO. INSTALL THE LANDING GEAR TRUNION W-20 AND W-21 (IF YOU DON'T INTEND TO USE RETRACTS) AND THEN THE W-23 DOUBLERS. WHEN THE WING IS DRY, PLANK IT WITH BALSA AND BEGIN WITH W-20 WHICH IS PRE-CUT TO FIT CENTER SECTION TRAILING EDGE. WORK FROM THERE UNTIL IT IS COVERED AND THEN CUT OUT AILERON PUSHROD ACCESS AND FINALLY ADD THE WING TIP BLOCKS (W-22). SAND TO SHAPE AND TAILOR W-12 AND W-13 TO FIT THE FUSELAGE. NEXT, DRILL THE WING HOLD DOWN HOLES. INSTALL THE DOWELS AND ATTACH THE WING TO THE FUSELAGE. FINALLY, ADD W-17 AND W-18, FAIRING IT INTO FUSELAGE. STAND BACK AND ADMIRE IT FOR ALL THAT IS LEFT TO DO IS TO CARVE, SAND AND THEN GO ON TO THE FINISH WORK.

REVISED EDITION

WRITTEN FOR ROYAL PRODUCTS CORP.

BY: JAMES SIMPSON



THE FINISH WORK

The construction phase concluded with the remaining parts being stuck one to another and/or "shape" sanded. This pile of parts, which may resemble an airplane, depending on arrangement, must now be finished to satisfy the goal.

One of the keys to a good finish is sand, sand, sand, dust it off, and sand once more! Remember that, as it's important. The first sanding is done with rougher open coat sand paper. (I prefer aluminum oxide or garnet paper) 280-320 range. I glue mine to 1"x4"x12" blocks with spray contact adhesive or "sticky back" by Scotch. It's best to sand all components prior to final assembly and is also much easier. The next sand is done with 320-400 grit paper. After this step, take a good rest. Then come back and sand until tired again. Now wipe the plane down with a clean, soft rag and check it for seams, low spots, and symmetry. Then sand once more with the 400 grit.

If you plan to "Monokote" your eyeball scale, it is done at this stage on bare wood and in accordance with the directions furnished with the "Monokote." After it's all Monokoted, go to the final assembly step.

If you plan an ultimate scale job finish, you must paint it, because no real airplanes are Monokoted. (Too bad, though!) You must decide what type hinges you will use now, because it makes a difference. If you are going to use hinges with removable hinge pins, then install all hinges and control rods, linkage, radio gear (according to manufacturers instructions) etc., at this time. Then dismantle it and cover it individually. If you are to use "hidden" hinges (like the no-glue molded nylon ones), then cover all the separate pieces and then assemble them.

To prepare the model for covering, you dope the balsa with at least a 50/50 dope-thinner mixture. After each coat, sand lightly and continue until no "fuzz" occurs after doping (usually 3 or 4 coats). Now cover with the material of your choice (for instance, silk, silron, nylon, etc.). Check the grain (look at a corner of the material to ensure that the grain is parallel to the heaviest or most dense threads, whichever the case). The grain must go lengthwise on each piece.

To apply the covering, cut it oversize, hold in place and spray with a fine, fine mist water sprayer, carefully working out all the wrinkles and dope it while still wet with the brush nearly parallel to the surface and lightly, lightly stroking it. If done while wet, the dope will "float" on the damp surface and dry "white or cloudy," but will require far fewer coats, and the cloudy look will disappear after the 2nd or 3rd coat.

Carefully trim (with a double edge razor blade) and sand the "rough" areas, but be careful not to "cut" or "sand" out the fibers over a "high" place like a rib.

When surface remains smooth after a coat of dope (3rd or 4th coat), it's time to thin the mixture and add talc or cornstarch for filler "body." Sand after each coat until desired smoothness is achieved. Then assemble the parts and spray paint the final colors to suit. Just remember, a lot of planes modeled are glossy when the prototype was not. This mistake costs points. As I mentioned earlier, I won't presume to advise on achieving the "ultimate scale" finish, but if in doubt, there are volumes written on the subject. There may even be a "scale nut" in your area who can help. Don't forget the plastic modeler who knows finishes. Remember also, the plastic model is an excellent source of scale detail as well.



AIRCRAFT ALIGNMENT

This sheet is included as an addition to the normal instructions in hopes that you may benefit from the information it contains. The time it takes to accurately align an airplane is repaid many, many times by the superior performance of the aircraft.

All alignment information is included on the plans. Note that wing and stab angles, thrust angles, etc., appear near their component locations. Generally, the angles are referenced to a fuselage centerline which is also drawn on the plans.

Most angles are expressed in degrees of angular offset. Don't let this stop you from using them! The least expensive conversion method is to borrow an algebra book which has trigonometry sections. Use the formulas to convert the degrees to fractions of an inch of offset. The easiest method is to use a Robart incidence meter. This device is calibrated in degrees and allows direct readings of the incidence angles.

The first step in aligning the aircraft is to transfer the centerline to the fuse sides. Usually the centerline runs parallel to a major piece of the fuse such as the top edge of the side. Use a felt tip pen and draw a line parallel to the centerline above the wing saddle and below the stab saddle.

Next, mark the centerlines of the leading and trailing edges on the stab and wing. Make a template from the plans to transfer this location.

Place the fuse on the workbench and block up so that the centerline is parallel to the table top. Now place the stab in its saddle and trim and skim it until the leading and trailing edges are at the required different angles. Let's say the plans call for 1/16" positive incidence. That means the center of the leading edge is 1/16" higher (referenced to the top) than the center of the trailing edge. It makes no difference how far up the trailing edge is from the work surface--just make the leading edge 1/16" higher. The stab may have positive, negative, or no incidence, depending on the design.

Align the wing the same way. A method to use, where dowels are employed on the leading edge, is to drill the dowel holes in the bulkhead higher than necessary (toward the top of the fuse in a low wing design). Now, when the wing is put in place, the trailing edge will stick up off the wing saddle. Using a rat tail file, elongate the holes downward until the wing is at the correct incidence. If there is a gap along the wing saddle, use balsa, ply, or filler to close. If you want to use wing seating tape, be sure to make all your measurements with the tape in place.

The wing and stab must also be checked to be sure they have the same length extending out from the fuselage. Use a balsa stick or yardstick and be sure that if the total wingspan is 70" that 35" minus 1/2 the fuse width extends on each side of the fuselage.

Next, be sure the wing and stab are not skewed on the fuselage or to each other. Use a piece of non-stretchable string and tie a loop in one end. Pin through the loop attaching the string in the exact center of the fuselage. For the wing, attach near the tail. (Near nose for stab). Measure out to one tip and then go to the other tip. It must be the same distance. Do this for the wing and stab.

The last thing to check is that the wing and stab are not tilted. Carefully sight from the front and be sure that one tip of the stab does not droop lower than the other.

As you can see, these 5 parameters must be completed taking into account the other 4 as one is being worked upon. Usually, we establish the stab incidence, equal extension, skewness first, and then glue the stab in position while sighting from the front with a straight rod resting on the wing saddle.

The last difficult area is the fin and rudder. Be sure the fin is perpendicular to the stab. A large right triangle is necessary for this step. Also, sight carefully from the front to be sure that the fin is in line with the top centerline. Sight from the front and make sure you see the same amount of each side of the fin.

Motor offset is difficult to measure. If the Robart gauge is used, it is easy. In case you don't use the gauge, about the best method is to draw the thrust line on the nose or nacelle and then extend this line with a stick. Measure from the crankshaft to the stick and compare with what the plans call for. Remember that thrust angles may be altered with skims or oversize motor mount holes. When you verify that the thrust is correct, fill the unneeded part of the hole with epoxy to maintain strength.

We are sure that if you take the time to complete the above steps, you will have much more satisfaction from your new model.



BALANCE AND FLIGHT

There before you is the result of these many efforts. All of the work is done, you say. Nay, say I. All of what is done, anyone could do. What lies ahead is important, for it makes an almighty difference.

This phase begins with the model ready for flight and ends with a successful landing. Begin with the airplane assembled as if to fly. Set it on a smooth surface with a plain, unbroken background, and go around behind the craft and "eyeball" it. Very carefully check to see that the rudder and vertical fin are perfectly aligned. In the case of twin rudders, measure them accurately. Is the horizontal stabilizer parallel to the wing? Are there any warps in any of the flying surfaces? Is the fuselage straight? If the answer is yes to all these questions, you are in great shape. If not, adjust it so it is. You know what must be done to align surfaces, but wait awhile to do that while we consider warps.

Warps are crooked or "bent" surfaces. They cause most accidents. it isn't necessary, as they can be fixed. On any wood airplane which has been doped or painted with any of several different paints, the problem is to soften the paint and twist the surface opposite the warp, then let it harden again.

The paint can generally be softened two ways. It can be heated or dissolved. To heat it, use steam. If a small surface is the problem, a teakettle over a stove does nicely. If a large surface is warped, the outlet behind a steam cleaning plant will do the job. You apply both sides of the warped surface to the steam until good and hot, then hold opposite warp, remove from steam and allow to cool well. Wait awhile, then check again. Do this until the warp is gone.

To dissolve the paint, use more coats of paint over both sides of the warp. This doesn't work on all paint, but has been done successfully with dope and lacquer. I have also seen guys fasten the surface down in proper position and paint and paint until it will stay. That's the hard way.

Now that all the warps are gone, reassemble the plane, put it on a true flat surface and measure the distance from that surface to leading edge of wing, then from the surface to trailing edge of wing at same station (chord point) and verify that it agrees with the incidence shown on the plans. Do the same for the tail. If it doesn't agree, do whatever is necessary to make it agree.

Next check the thrust. Fasten a string to the centerline of the plan back near the tail and compare the distance to each prop tip with the prop horizontal, ensuring that the offset agrees with that shown on the plans. Then vertical for downthrust.

Now, check the balance point to be sure it is exactly as shown on the plan. If not, add weight or relocate the radio in such a manner that it agrees with that shown.

Lastly, turn the radio on and operate all the surfaces one at a time to ensure that they move in the proper direction, do not bind, do not interact with other controls and do run smoothly. When you have satisfied all these requirements, put the outfit on charge all night before you go fly.

When you get to the field, don't be afraid to ask an expert to fly your plane for you if you are a novice or if you haven't flown in awhile.

If you decide to fly it yourself, plan your flight from takeoff, through climb, turns, pattern, approach and landing with careful consideration given to wind direction, runway orientation, other traffic and relative position of the sun.

I have seen everything mentioned in this chapter cause a scale job to crash when not done properly, so if you will carefully tend to each one of these points, your odds will be much better. Don't you agree?

GOOD LUCK AND HAPPY LANDINGS!