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C47/DC3

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:

The absolute first thing you must do at this time is to 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 type of aircraft of course was chosen as you purchased the kit, but for the exact scale job you will have to choose the specific model, and series which you intend to duplicate to the Nth degree. There is no easily recognizable difference between a B-44 and a B-50 for instance, so you will need to choose one model. Likewise the series may or may not vary greatly (for instance B-52B, B-52C, B-52D, and B-52E). To the casual observer, there may be very little difference in the various series of the B-52 (as an example), however to the trained eye of a competition judge this does make the first great difference.

Once your choice has been made as to exactly which 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, Wylam, 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: Don't cut corners or go second class!

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 airplane. You may choose the series which is closest to our kit - still you might 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 of 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 that for yourself.

DOUGLAS C-47D SKYTRAIN

INTRODUCTION

THE DOUGLAS C-47 "SKYTRAIN" OR "DAKOTA" WAS A MILITARY VERSION OF THE DOUGLAS DC-3 COMMERCIAL AIRLINER. THE DOUGLAS PROTOTYPE KNOWN AS THE D.S.T. WAS FIRST FLOWN ON DECEMBER 17, 1935.

THE DC-3 WAS AN ENLARGED VERSION OF THE DC-1 / DC-2 DESIGN. IT FILLED A PRESSING NEED OF THE EARLY AIRLINES TO PROVIDE MORE ECONOMICAL AND COMFORTABLE PASSENGER SERVICE. AS A MEASURE OF THE SUCCESS OF THE DESIGN, THERE ARE NEARLY 2,000 DC-3/C-47'S STILL IN ACTIVE SERVICE AFTER 40 YEARS.

THE DIFFERENCES BETWEEN THE DC-3 AND C-47 MAINLY REVOLVE AROUND WINDOW SHAPES, DOOR LOCATIONS, AND POWER PLANT INSTALLATION. GENERALLY, THE C-47 VERSION UTILIZED MORE POWERFUL ENGINES AND CONSEQUENTLY, HAD A HIGHER TOP, CLIMB, AND CRUISE SPEED. AS LATE AS THE 1960'S C-47'S WERE USED BY THE U.S.A.F. IN VIETNAM AS GUNSHIPS. THESE AIRCRAFT WERE KNOWN AS "DRAGON SHIPS" OR "SPOOKIES."

THE OFFICIAL U.S.A.F. TYPE DESIGNATIONS OF THE C-47 ARE NUMEROUS, UNDOUBTABLY DUE TO THE LONG AND VARIED SERVICE OF THIS AIRCRAFT. THE C-47 IS ALSO KNOWN AS THE C-47A, HC-47A, RC-47A, VC-47A, VC-47B, C-47D, EC-47D, HC-47D, TC-47D, VC-47D, & C-47E. IT IS KNOWN BY THE U.S. NAVY AND MARINE CORPS AS THE C-47H, EC-47H, LC-47H, SC-47H, TC-47J, EC-47J, LC-47J, SC-47J, TC-47J, VC-47J, AND TC-47K. AIRCRAFT WERE BUILT UNDER LICENSE IN RUSSIA AND BEAR THE DESIGNATION LI-2.

THE DC-3 HAS ALSO UNDERGONE SEVERAL TYPE MODIFICATIONS AND IS VARIOUSLY DESIGNATED AS THE DC-3, DC-3A, DC-3B, AND DC-3L.

THE ABOVE AIRCRAFT ARE NEARLY IDENTICAL EXTERNALLY BUT MAY HAVE DIFFERENT ENGINE TYPES. IN CHOOSING A SPECIFIC TYPE TO MODEL WE SUGGEST THAT YOU LOCATE A FULL SIZE AIRCRAFT. THUS, ANY SMALL DETAILS MAY BE VERIFIED DIRECTLY.

THE SPECIFICATIONS OF THE C-47/DC-3 ARE:

SPAN:	95'
LENGTH:	64' 6"
HEIGHT:	16' 11½"
WING AREA:	987 SQ. '

PERFORMANCE FIGURES OF THE C-47 ARE:

MAX. SPEED:	229 MPH AT 7,500 FT.
CRUISING SPEED:	185 MPH AT 10,000 FT.
INITIAL CLIMB:	1,130 FT./MIN.
SERVICE CEILING:	24,000 FT.
RANGE:	1,500 MI.

REFERENCES:

1. JANE'S ALL THE WORLD'S AIRCRAFT; 1935, 1936
2. THE AIRCRAFT OF THE WORLD; WILLIAM GREEN DOUBLEDAY AND COMPANY INC.
3. THE LORE OF FLIGHT; TRE TRYCKARE; CAGNER AND COMPANY
4. AIRLINES BETWEEN THE WARS 1919-39; LENNETH MUNSON; MACMILLIAN COMPANY
5. PROFILE PUBLICATIONS - NUMBER 96; ARTHUR PEARCY; HILLS & LACY LTD., LONDON.

FUSELAGE

1. PRIOR TO STARTING CONSTRUCTION THOROUGHLY FAMILIARIZE YOURSELF WITH ALL THE PARTS AND CHECK THEIR LOCATION ON THE PLANS.
2. NOTE THE PLY SIDE DOUBLER AND ITS INTERLOCKING FORMERS F-5, F-7, F-8, F-9 AND CHECK THAT THE TABS ON THE FORMERS FIT SNUGLY IN THE SLOTS OF THE PLY SIDE. RELIEVE IF NECESSARY FOR A GOOD FIT.
3. BEGIN CONSTRUCTION BY BUTT GLUING THE Balsa OUTER SIDE PIECES TOGETHER. USING CONTACT CEMENT, GLUE THE PLY DOUBLER TO THE FUSE SIDE. BE SURE TO MAKE ONE RIGHT AND ONE LEFT SIDE! THE PLY DOUBLER IS LOCATED ON THE INNER SIDE OF THE Balsa FUSE SIDE.
4. ADD THE $1/8 \times 3/16$ PIECES IN 5 PLACES ON EACH SIDE ASSEMBLY. ADD F-35 TO BOTH SIDE ASSEMBLY'S. ADD THE $1/8 \times 3/16$ PIECE BEHIND F-9 ON THE RIGHT SIDE ONLY. LAMINATE AN F-6 DOUBLER TO F-5 AND F-9. ADD F-30 TO F-5.
5. IT IS MOST CONVENIENT TO CUT THE WINDOWS OUT AT THIS TIME. IF YOU DO NOT WANT TO CUT THEM OUT AT LEAST MARK THEM FOR THE FUTURE WHEN ACCESS TO THE INSIDE OF THE FUSE IS DIFFICULT.
6. VERY ACCURATELY MARK THE FORMER LOCATIONS ON BOTH FUSE SIDES. DRAW A CENTERLINE ON EVERY FORMER. DRAW A 4' STRAIGHT LINE ON THE WORK SURFACE.
7. USING 5 MIN. EPOXY, GLUE F-7 AND F-8 TO THE FUSE SIDES. BE SURE THE SIDES ARE SQUARE TO THE FORMERS AND THE LENGTH FROM EACH FORMER IS THE SAME TO THE NOSE AND THE TAIL. GENTLY PULL THE SIDES TOGETHER AT EACH END AND BE SURE THEY MEET IN THE CENTER. PERFORM THIS STEP WHILE WORKING OVER THE CENTERLINE ON THE WORKBENCH. LINE UP THE FORMER CENTERLINES ON THE WORKBENCH LINE. BE SURE THE FUSE IS SQUARE BEFORE THE EPOXY SETS.
8. WHEN SET, ADD THE REMAINING FORMERS (F-1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 14) CHECKING AFTER THE ADDITION OF EACH, THAT THE FUSE IS STILL SQUARE. WORK SLOWLY AND ACCURATELY. ADD F-15 USING THE WING TO POSITION. MOUNT TAIL WHEEL TO F-38 AND GLUE F-37/F-38 TO F-12.
9. GLUE ALL THE FUSELAGE $3/16" \times 3/16"$ LONGERONS IN PLACE. BE SURE TO ADD THE SHORT SCRAP PIECES WHERE INDICATED ON THE PLANS.
10. ADD THE $3/16" \times 3/16"$ PIECES THAT EXTEND FROM F-2 TO F-3. ALSO GLUE THE $3/16" \times 3/8"$ PIECE FROM F-1 TO F-3. GLUE F-26 INTO THE NOTCH IN F-3. ADD THE F-29 COCKPIT FLOOR.
11. PLANK THE FUSELAGE. USE STRIPS IN ALL AREAS EXCEPT FROM F-5 TO F-9. SHEET MAY BE USED IN THIS AREA. TRY TO MINIMIZE JOINT LINES AND USE PLENTY OF PINS AND TAPE TO HOLD THE PLANKING IN PLACE. BE SURE YOU DO NOT EXERT SUFFICIENT FORCE TO WARP THE FUSELAGE.
12. WHEN COMPLETE, ADD THE WING FAIRING BLOCKS BEGINNING WITH F-16. ADD F-31 AND A SMALL TRIANGULAR BRACE BEHIND F-15. GLUE F-17 TO THE FUSELAGE SIDES AND F-16 AND F-31. ADD F-19 ABOVE F-17. GLUE F-21 AND F-20 IN PLACE. GLUE F-22 IN PLACE. ADD F-18 TO F-17.
13. SAND THE NOSE SQUARE AND GLUE THE F-23 NOSE BLOCKS IN PLACE. ADD F-24 AND F-25'S. GLUE F-28'S IN PLACE. ADD F-27 PIECES AT THIS TIME.
14. GLUE THE F-36 PLY PIECES TO THE FUSE INNER SIDES. ADD THE HARDWOOD WING HOLD DOWN BLOCKS AND TRIANGLE STOCK GUSSETS.

15. SAND FUSELAGE TO SHAPE. FABRICATE AND INSTALL PUSHRODS.
16. WHEN FIN AND STAB ARE COMPLETE, ADD TO THE FUSELAGE USING F-32 AND F-33's. FOLLOW ALIGNMENT INSTRUCTIONS CAREFULLY. ADD F-34 BLOCKS AND E-6.
17. CARVE AND SAND THE TAIL FAIRING BLOCKS TO SHAPE.
18. RELIEVE TAILWHEEL AREA.
19. SAND ANTENNA, PITOT TUBES, ETC., TO SHAPE BUT DO NOT ADD UNTIL MODEL IS FINISHED.
20. MOUNT WING AND CHECK OVERALL ALIGNMENT. SAND MODEL FOR FINISHING.

DOUGLAS C-47D SKYTRAIN

WING CONSTRUCTION

1. OBTAIN THE MOTORS AND THROTTLE CABLES YOU INTEND TO USE. WE RECOMMEND THE USE OF A FUEL PUMP FOR THE MOTORS. PERRY UNITS ARE AVAILABLE FOR MOST MOTORS AND THE ROBERT IN-LINE UNITS ARE IDEAL. THE FUEL LINE WHICH TRAVELS FROM THE MOTOR TO THE FUSELAGE AREA SHOULD BE MADE FROM SOFT 1/8" BRASS TUBING. TERMINATE AT BOTH ENDS SO A SHORT COUPLING MAY BE MADE FROM STANDARD SILICONE FUEL LINE. REMEMBER, WHEN YOU SET UP THE THROTTLE CABLE/SERVO SYSTEM, BOTH ENGINES MUST GO TO IDLE AND FULL THROTTLE SIMULTANEOUSLY. ALSO, MAKE PROVISION TO ADJUST BOTH CABLES SO THE MOTORS MAY BE SYNCHRONIZED PROPERLY. BENCH RUN BOTH MOTORS AND BE SURE OF ITS PROPER PUMP SET-UP.
2. SEPARATE OUT THE WING PARTS FROM THE REST OF THE KIT. SUB-DIVIDE THOSE INTO WING CENTER-SECTION, WING TIP, AND NACELLE GROUPS.
3. DRAW CENTERLINES ON ALL WING RIBS.
4. BEGIN CONSTRUCTION ON THE WING CENTERSECTION. PLACE A 3/8" SQ. BALSA SPAR OVER THE PLANS (COVER WITH CLEAR PLASTIC SHEET) AND PIN IN PLACE. GLUE 4 W-1 RIBS AND 4 W-2 RIBS IN POSITION. SHIM THE RIBS SO THE CENTERLINES ARE PARALLEL TO THE WORK SURFACE. ADD THE TOP 3/8" SQ. SPAR, THE TOP 3/16" SQ. SPAR AND THE 3/16" X 3/8" TOP SUB-SPAR. GLUE THE 3/8" X 1" LEADING EDGE IN PLACE.
5. WHEN SET, TURN THE WING OVER AND ADD THE BOTTOM 3/8" X 3/16" SUB-SPAR AND THE BOTTOM 3/16" SQ. SPAR. FLIP-OVER AND RE-PIN IN POSITION TO DRY.
6. ADD 4 W-17 PLY RIB DOUBLERS WITH EPOXY GLUE. AT THE SAME TIME GLUE 2 W-20 RIBS BETWEEN EACH PAIR OF W-2 RIBS.
7. DRILL HOLES FOR THE THROTTLE CABLES, FUEL LINES AND AILERON PUSH RODS.
8. GLUE 2 W-16'S IN PLACE AS WELL AS W-14.
9. GLUE 2 W-19 BLOCKS INTO NOTCHES IN W-20.
10. GLUE 2 W-19 BLOCKS INTO PLACE A-TOP W-18. GLUE W-18'S INTO PLACE BETWEEN THE W-2 RIBS. BE SURE THE NOTCHES FACE DOWN.
11. WHEN DRY, PLACE CENTERSECTION ASIDE.
12. BEGIN TIP ASSEMBLY BY PINNING THE SPAR IN PLACE ON THE PLANS. GLUE THE RIBS W-3 THRU W-11 TO THE SPAR SHIMMING AS NECESSARY TO KEEP THE CENTERLINES PARALLEL TO THE WORK SURFACE.
13. ADD THE TOP 3/16" X 3/8" SPAR AND THE 3/16" SQ. REAR SPAR.
14. GLUE W-2A IN PLACE ANGLING WITH W-23 FOR THE DIHEDRAL ANGLE. ADD THE TOP 3/8" X 3/16" SUB-SPAR. BE SURE TO TRIM CAREFULLY FOR A TIGHT FIT WHERE IT INTERSECTS THE MAIN SPAR. ADD W-23 AND CLAMP TIGHTLY TO THE SUB-SPAR.
15. GLUE THE LEADING EDGE IN PLACE. ADD W-22.
16. WHEN ASSEMBLY IS DRY, TURN OVER AND ADD THE BOTTOM 3/16" SQ. SPAR AND THE BOTTOM 3/8" X 3/16" SUB-SPAR.

17. TURN ASSEMBLY OVER AND RE-PIN TO PLANS UNTIL DRY COMPLETELY.
18. ADD W-26 BETWEEN W-2A AND W-3.
19. DRILL HOLES FOR AILERON PUSH ROD.
20. MOUNT AILERON BELLCRANK TO W-27 AND GLUE INTO PLACE WITH SCRAP 3/16" SQ. SUPPORTS. INSTALL AILERON PUSHROD AND LET THE CENTERSECTION LENGTH OVERHANG THE INBOARD END.
21. REPEAT STEPS 12 THRU 20 FOR LEFT PANEL.
22. WITH BOTH TIP SKELETONS COMPLETE, PIN THE CENTER PANEL IN PLACE ON THE PLANS. SKIM SO THE CENTERLINES ON THE RIBS ARE PARALLEL TO THE WORK-SURFACE. CAREFULLY SAW W-2 APART OFF OF THE SUB-SPAR AND AHEAD OF THE 3/16" SQ. REAR SPARS. DO THIS ON BOTH ENDS OF THE CENTERSECTION. LIKEWISE, SAW W-2A APART ON BOTH TIP PANELS.
23. PLACE ONE TIP PANEL IN PLACE AND BLOCK UP THE TIP RIB 2-9/16". BE SURE THE TIP RIB IS PARALLEL TO THE WORK SURFACE. WHEN SATISFIED, GLUE W-24 AND W-25 IN PLACE. CLAMP TIGHTLY TO SPARS. BE SURE TO GLUE W-2 AND W-2A TOGETHER IN THIS STEP. ADD W-2 AND W-2A REMOVED PORTIONS BETWEEN W-24 AND W-25.
24. REPEAT #23 FOR OPPOSITE TIP.
25. WHEN DRY, ADD TRAILING EDGE SHEETING, W-36, TO TOP OF CENTERSECTION. USE CONTACT CEMENT FOR RAPID ASSEMBLY.
26. TRIM THE W-33 TIP T.E. SHEETING TO THE TIP CURVE.
27. CONTACT CEMENT A W-33 SHEET TO EACH TOP TIP PANEL AFTER PINNING THE PANEL FLAT TO THE WORK SURFACE AND BEING SURE THE RIB CENTERLINES ARE PARALLEL TO THE WORK SURFACE. BLOCK THE CENTERSECTION UP DURING THIS PROCEDURE TO REMOVE THE STRAIN OF THE REST OF THE WING ON THE PINNED TIP PANEL. BE SURE YOU HAVE A TIGHT SMOOTH JOINT AT THE DIHEDERAL BREAK.
28. BEVEL THE LOWER TIP T.E. SHEET, W-33, AS PER THE RIB END VIEWS. CONTACT CEMENT THE SHEET IN PLACE BEING SURE NOT TO WARP THE TIP PANELS.
29. ADD W-37 TO BOTTOM OF CENTERSECTION.
30. RELIEVE THE AFT CENTERSECTION RIBS FOR THE FLAP W-35. SAND FLAP TO SHAPE AS PER END VIEW. GLUE 3 W-21 HINGE SUPPORTS IN PLACE.
31. GLUE FLAP BAY CAP W-34 IN PLACE IN CENTERSECTION AFTER ADDING 3 W-21 HINGE SUPPORTS.
32. CUT A SLOT IN W-36 TO CLEAR THE FLAP HORN.
33. GLUE C-17 IN PLACE BETWEEN EACH PAIR OF W-2 RIBS.
34. CUT OUT AILERONS FROM W-33 SHEETING.
35. ADD 3 W-28 HINGE SUPPORTS AND THE W-29 CAP.
36. RELIEVE THE AILERON FOR THE THICKNESS OF W-29 AND W-30 AND THEN GLUE W-30 IN PLACE ON THE AILERON. BE SURE THE AILERON IS NOT WARPED AS YOU GLUE W-30 IN PLACE AFTER GLUING W-31 IN PLACE.

37. ADD THE SCRAP 3/32" CAPS TO THE ENDS OF THE AILERON CUTOUTS. ADD 2 W-32'S TO THE INNER ENDS OF THE AILERONS AND A SCRAP PIECE TO THE OUTER ENDS OF THE AILERONS.
38. BEVEL LEADING EDGE OF AILERONS AND SAND TO SHAPE.
39. SHEET REMAINDER OF WING BEING CAREFUL NOT TO BUILD IN WARPS.
40. SAND ANY OVERHANG ON W-11'S AND ADD THE TIP BLOCKS W-12.
41. SAND AND SHAPE I, E, AND CUT A FLAT RELIEF AREA FOR W-13. GLUE W-13 IN PLACE AND ADD THE W-15 BLOCKS. SAND TO SHAPE.
42. BUILD FUEL TANK BOXES FROM W-41 FLOOR, W-40 SIDES AND W-38 AND W-39 ENDS.

NACELLE CONSTRUCTION

1. NOTE THE TWO NACELLES ARE CONSTRUCTED THE SAME WITH THE EXCEPTION THAT C-3 AND C-4 ARE IN THE RIGHT NACELLE AND C-5 AND C-6 ARE IN THE LEFT NACELLE.
2. MAKE A DRY ASSEMBLY OF THE NACELLE. CHECK FIT OF PARTS.
3. START WITH THE RIGHT NACELLE. GLUE C-3 AND C-4 TO TWO C-7 PIECES. BE SURE THAT C-3 AND C-4 AND THE MOTOR MOUNT RAIL CUTOUTS ARE ORIENTED PROPERLY. WORK OVER THE RIGHT NACELLE DRAWING. CHECK THAT C-3, C-4 ARE 90° TO THE C-7 SIDE PIECES. ALSO BE SURE THAT THE C-7 PIECES ARE ORIENTED SUCH THAT THE AIRFOIL CUTOUT IS THE SAME AS THE WING TOP AND BOTTOM. TRIAL FIT THE ASSEMBLY TO THE WING BEFORE THE GLUE SETS. SLOW EPOXY IS RECOMMENDED FOR THIS STEP.
4. REPEAT FOR LEFT NACELLE BUT USE FORMERS C-5 AND C-6.
5. THE FOLLOWING STEPS REFER TO BOTH NACELLES.
6. GLUE THE MOTOR MOUNT RAILS IN PLACE.
7. GLUE C-1 IN PLACE. BE SURE CUT-OUT IS ORIENTED CORRECTLY.
8. MARK NACELLES ON BACK OF C-1 AS TO RIGHT AND LEFT ASSEMBLY.
9. GLUE C-2 IN PLACE ON FACE OF C-7'S.
10. MOUNT MOTORS AND INSTALL BLIND NUTS.
11. TRIAL FIT ON WING AND CHECK THAT THROTTLE AND FUEL LINES ARE PROPER. MAKE ANY NECESSARY CHANGES.
12. GLUE NACELLES IN PLACE ON WING. BE SURE THEY ARE NOT GLUED ON WITH DOWN OR SIDE THRUST. THE MOTOR MOUNTS HAVE THE THRUST OFFSET BUILT INTO THEM. MEASURE CAREFULLY!
13. ADD C-14'S AND C-15'S.
14. GLUE BLOCKS C-9, C-10, AND C-11 IN PLACE.
15. GLUE C-12 AND C-13 IN PLACE AFTER HOLLOWING C-13

16. Add C-8 AND C-16.
17. SHAPE AND FAIR THE NACELLES.
18. SAND ENTIRE WING UNTIL READY FOR FINISHING.

STABILIZER AND ELEVATOR

1. DRAW CENTERLINES ON ALL STAB RIBS.
2. DRAW A CENTERLINE ON S-2 ON THE FACE WHERE THE RIBS ATTACH.
3. MARK LOCATION OF RIBS ON S-2.
4. PIN S-2 TO WORK SURFACE WITH CENTERLINE UP.
5. USING CYANOACRYLATE ADHESIVE AND A SMALL RIGHT TRIANGLE, GLUE ALL RIBS IN PLACE. THEY ARE ALL POINTING UP FROM THE WORK SURFACE. BE SURE THE RIBS CENTERLINES ARE CENTERED ON THE CENTERLINE OF S-2.
6. GLUE S-1'S IN PLACE ON TOP OF THE RIB ENDS. BE SURE S-1 IS CENTERED ON THE RIB ENDS.
7. Add S-3
8. SHEET STABILIZER, TOP AND BOTTOM, WITH CONTACT CEMENT AFTER SANDING RIB CONTOUR INTO S-1'S BE SURE NOT TO WARP THE STRUCTURE.
9. ADD TIP BLOCKS S-9
10. PIN E-1 TO WORK SURFACE. GLUE E-2, 3, 4, 5 AND 1'8" X 3'16" RIBS IN PLACE. ADD 3'16" SQ. SCRAP PIECE.
11. FLIP OVER AND REPEAT ON OTHER SIDE.
12. COMPLETE STEPS 10 - 11 FOR OTHER ELEVATOR.
13. SAND BOTH ELEVATORS TO STREAMLINE SHAPE.
14. GLUE TIE BAR IN PLACE BEING SURE ELEVATOR BLADES ARE EXACTLY IN LINE.

FIN AND RUDDER

1. MARK CENTERLINES ON R-3, 4, 5, 6, AND 7.
2. PIN R-4 TO WORK SURFACE WITH CENTERLINE FACING UP. USING CYANOACRYLATE ADHESIVE (HOT STUFF, ZAP, JET) AND A SMALL RIGHT TRIANGLE GLUE R-7, 6, AND 5 TO R-4. ALIGN CENTERLINES AND BE SURE RIBS ARE SQUARE TO R-4. ADD R-8.
3. UNPIN AND ADD R-3 TO THE FACE OF THE RIBS. BE SURE THE CENTERLINE ON R-3 INTERSECTS THE RIB CENTERLINES.
4. CAREFULLY SHEET THE FIN STRUCTURE.

5. Add R-2, R-10, R-9, AND R-1.
6. PIN R-11 TO WORK SURFACE. GLUE R-12 TO REAR EDGE.
7. GLUE R-14, 15, 16, 17, 18, AND 19 TO SURFACE OF R-11/R-12.
8. ADD THE ' 8" X 3 8" Balsa RIBS.
9. WHEN DRY, FLIP OVER AND REPEAT STEP 7 AND 8.
10. RELIEVE THE TWO R-13 PIECES FOR R-20 AND 21 HINGE PIECES. DRILL A 3/32" HOLE IN R-20 AND R-21. MAKE UP HINGE PIN AND DRILL R-13 ACCORDINGLY. ASSEMBLE R-20, R-21, AND HINGE PINS TO THE R-13 PIECES. GLUE R-13'S IN PLACE IN RUDDER ASSEMBLY.
11. SAND RUDDER AND FIN TO SHAPE BUT DO NOT GLUE R-13'S INTO R-10 UNTIL MODEL IS FINISHED.

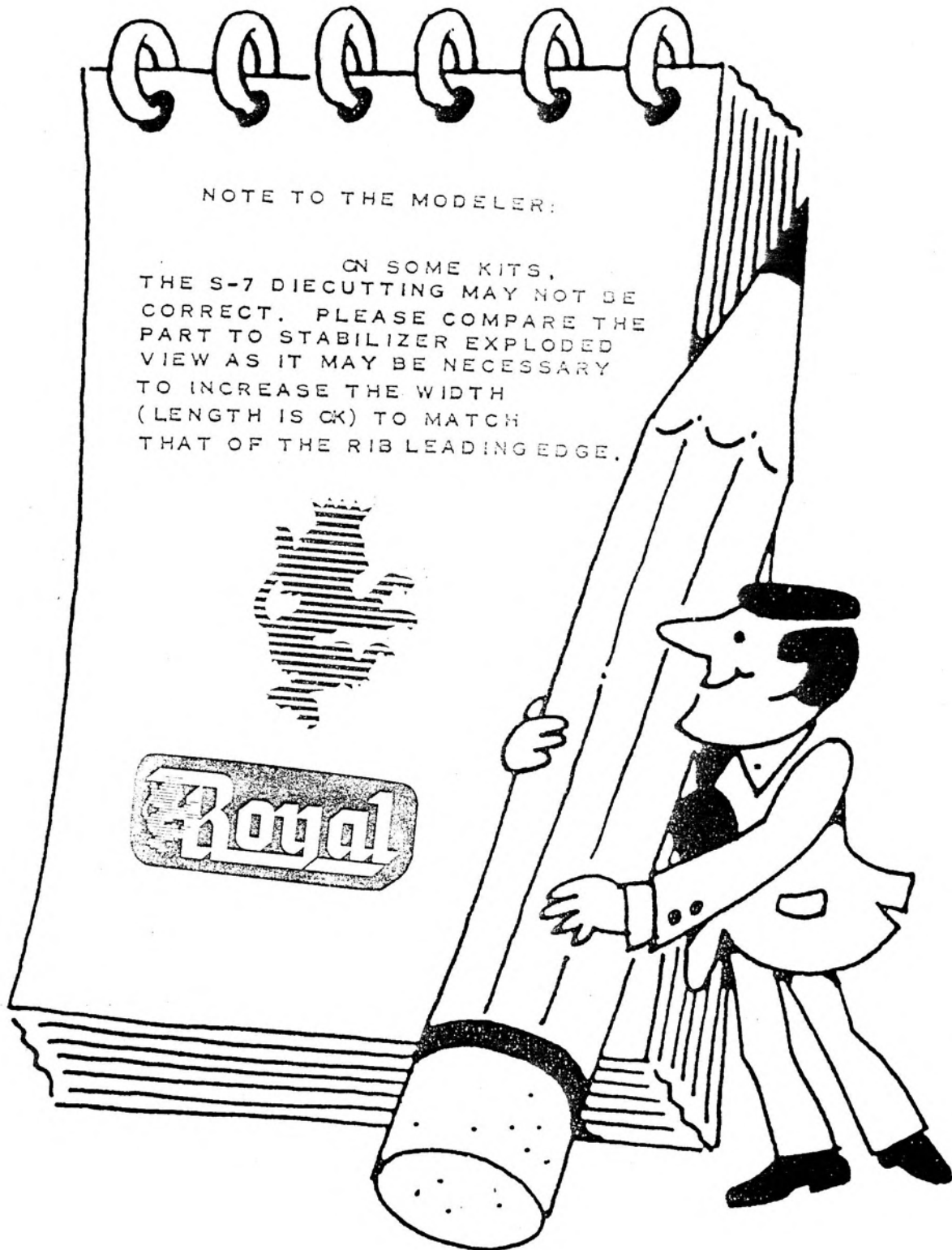


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SERVICE OUR ONLY PRODUCT

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 manufactures 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, 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, siron, 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 on 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 that the plastic model is an excellent source of scale detail as well.



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WATER TRANSFER DECAL INSTRUCTION ADDENDUM

When putting water transfer decals in water, it is important first of all that you start with a large flat pan that is big enough to accommodate the decal you are going to apply.

Further, you must have at least three inches of water in the pan so that the decal can remain completely submerged. When you push the decal into the water, it is important to push it in rapidly and at an angle. Once in the water, the decal must be allowed to roll up like a cigarette or cigar immediately and still remain completely submerged. What happens, of course, if you think about it, is that the paper takes on water and expands immediately, whereas the ink layer resting on the paper does not take on water nor does it expand.

By allowing the paper to roll, this compensates for the expansion and eliminates any chance of cracking the decal surface. As it stays in the water for awhile, the decal paper takes on enough water to allow the decal itself to begin to slip, and thus allows the paper to begin to flatten out.

Once the decal goes through the stage of rolling up and then becoming flat again, it is ready to apply. If you try to push the decal into the water and hold it flat, it is quite possible that the ink surface will crack in several places just from the strength of the paper expansion. This is especially true on the larger decals.

Following this simple rule will eliminate many problems in the application of your Royal decals.



Royal Products

CORPORATION

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PHONE (303) 778-7711 • P.O. BOX 5026 TERMINAL ANNEX, DENVER, COLO. 80217 • CABLE ADDRESS: "ROYAL" DENVER, COLO., U.S.A.

Water Transfer Decal Instructions

Your Royal decal sheet uses a special catalytic ink which is more durable than traditional solvent-based inks. This feature is especially advantageous to the modeler because the end product is stronger, thinner, and is not bothered by raw model fuel or any model airplane dope. Despite a superior chemical resistance, we still recommend that you paint the entire finished model (decals and all) with a gloss or matte clear. This will keep the fuel from working under and lifting the decals, as well as giving a consistent sheen between decals and model finish. Due to the wide variety of paints available, we recommend that you test for paint compatibility, using some non-essential lettering on the decal sheet. Let the paint set for about four minutes to see if it curls or wrinkles the decal. If it doesn't, the paint is compatible.

When putting water transfer decals in water, it is important first of all that you start with a large flat pan which is big enough to accomodate the decal you are going to apply. Water depth should be at least three inches, so that the decal can remain completely submerged. When you push the decal into the water, it is important to push it in rapidly and at an angle. Once in the water, the decal must be allowed to roll up like a cigarette or cigar immediately and still remain completely submerged. What happens, is that the paper takes on water and expands immediately, whereas the ink layer resting on the paper does not take on water nor does it expand. By allowing the paper to roll, this compensates for the expansion and eliminates any chance of cracking the decal surface. As it stays in the water for awhile, the decal paper takes on enough water to allow the decal itself to begin to slip, and thus allows the paper to begin to flatten out.

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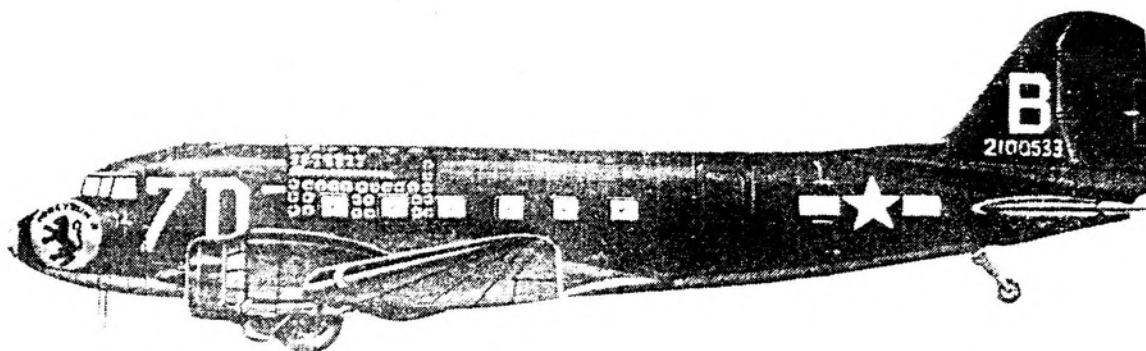
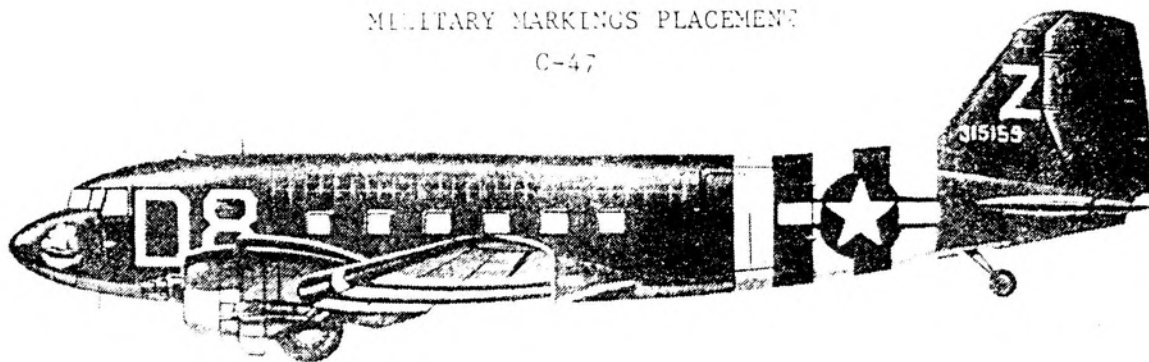
When applying the decals to the model, use the same spacing that is now on the decal sheet. Handle the numbers gently to avoid tearing. The numbers have not been joined for you because the clear backing that is used to do this is still visible after application and tends to detract from the finished job. Extra work and care in application is required, but the end result is far more professional and appealing to the eye. Refer to the markings placement sheet for positioning the decals on your model.

Application Instructions

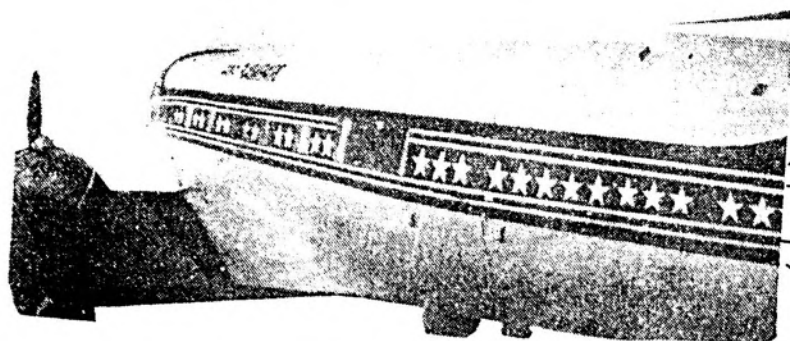
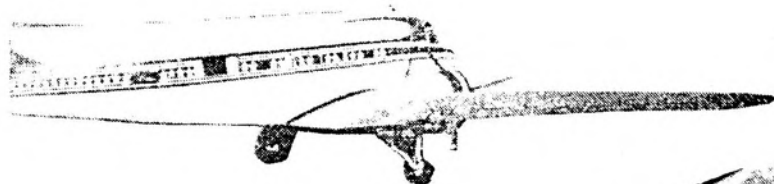
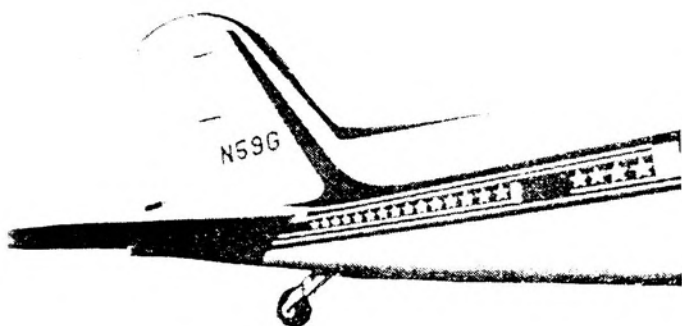
1. Plan the layout of decals on model.
2. If laying out numbers, masking tape makes a helpful reference border for obtaining a straight bottom line. Mark position of the numbers on the tape before lifting the decal in water. Remove the tape, once you have reached the squeegee portion of the instructions.
3. Cut sheet into convenient application-oriented sections.
4. Make sure surface of model is clean and free of dirt or grease.
5. If using flat paint, it is necessary to overspray with a gloss clear (polyurethane works well); then, after dry, apply decals and respray with flat clear. This step is necessary, as the clear decal bases (where it shows around the colors) will frost when applied on flat surface. This happens because air is trapped beneath and cannot be removed with squeegee because of the irregular surface that comes with a flat finish. The gloss clear stops this frosting and renders the clear borders invisible. Flat clear can then be applied to achieve a consistent flat finish with professional-looking decals. You cannot cover a frosted clear decal base with flat clear, as it will not cover up problems, but only make it look worse.
6. Dip decal section you intend to apply into lukewarm water. Hold it there until decal begins to loosen from paper backing (usually 20-30 seconds). Remove from water when decal can be slid freely back and forth on its paper backing.
7. After removing from water, allow to stand momentarily. Meanwhile, moisten area of model which is to receive decal with lukewarm water. Make sure surface to receive decal is near room temperature and not exceedingly cold.
8. Place soaked paper backing with decal still in place in approximate position on model and then slide decal, face up, from backing into position on model. Be careful not to tear numbers, and do not touch the side of decal which will adhere to the model.
9. Once in desired position, gently smooth out wrinkles or bubbles with a credit card, or better yet, a piece of 1/16" balsa sheet with straight edge. Decal should rest flush with surface, and all air bubbles, etc., squeegeed out from beneath. Use a very light touch with squeegee and apply very, very little pressure. Try to work from middle of decal out, with one light stroke in each direction. Repeated squeegee action is not necessary and can cause the clear border on some of the decals to frost, as air is trapped beneath surface. The water will be pulled out from beneath decal naturally with capillary action as the water evaporates from decal's edge.
10. Allow applied decals to dry overnight before painting model with clear overcoat. Polyurethane flat or gloss works well here. Decals furnished with military models have a special flat finish. Although impervious to clear model airplane dope, it will tend to "bead-up" and not adhere properly to the decal surface. For this reason, we recommend the use of a flat polyurethane clear coat to entire model (decals and all) to produce a consistent matte finish. Gloss decals may be sprayed with clear dope or gloss polyurethane.

MILITARY MARKINGS PLACEMENT

C-47



AERO RAMPART CIVILIAN MARKING PLACEMENT.
PAINT AIRCRAFT WHITE AND BLUE. SMALLER
INSIDE STRIPES ON SIDE ARE RED. USE DECAL
RED AND BLUE FOR COLOR MATCH.

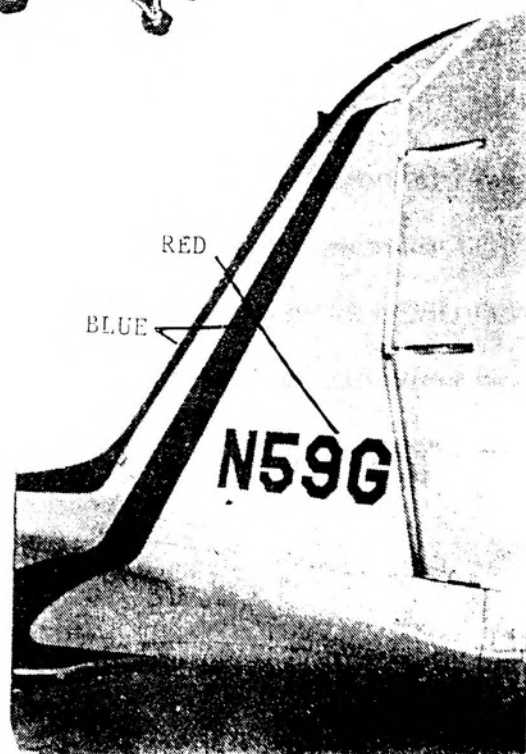


BLUE

RED

RED

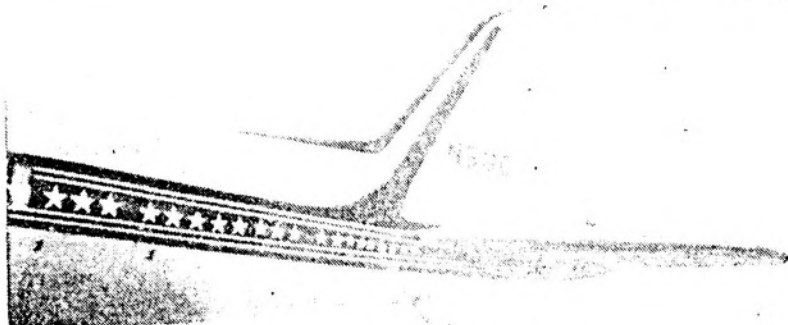
BLUE



RED

BLUE

N59G



C-47 STENCIL KEY AND PLACEMENT SHEET

USE FILLER
NECK TYPE
OIL HEATER
750W 115V

AA

GG

AILERON
TURNBUCKLE

AILERON
TURNBUCKLE

DWG NO. 89303 18
SER. NO. 2001 14
ANGLE HIGH 577
ANGLE LOW 227

II

CONTROL CABLE

CONTROL CABLE

PP

CONTROL CABLE

AILERON TAB DRUM

QQ

USE FILLER
NECK TYPE
OIL HEATER
750W 115V

BB

U.S. ARMY C-47A-25-DN
AAF-42-100558
CREW WT. 800 LBS.
SERVICE THIS PLANE WITH
100 OCTANE FUEL
SUITABLE FOR AROMATICS

ENGINE CONTROLS

ENGINE CONTROLS

ENGINE CONTROLS

ENGINE CONTROLS

HH

ELEVATOR TAB DRUM

JJ

FILL OIL
HERE

RR

FILL OIL
HERE

FUEL LINES

CC

DWG NO. 89303 18
SER. NO. 2001 14
ANGLE HIGH 577
ANGLE LOW 227

FUEL LINES

EMPENNAGE HOIST

DD

DWG NO. 89303 18
SER. NO. 2001 14
ANGLE HIGH 577
ANGLE LOW 227

OUTER AILERON
BELL CRANK

KK

OUTER AILERON
BELL CRANK

AILERON INNER
BELL CRANK

LL

AILERON INNER
BELL CRANK

FUEL AND
INSTRUMENT LINES

SS

FUEL AND
INSTRUMENT LINES

FUSELAGE TUNNEL

TT

FUSELAGE TUNNEL

SELECTOR VALVE

MM

STARTER RELEASE

REMOTE COMPASS
TRANSMITTER

UU

STARTER RELEASE

NN

LANDING LIGHT

WW

LANDING LIGHT

OIL COOLER DRAIN

XX

OIL COOLER DRAIN

OIL TANK
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OO

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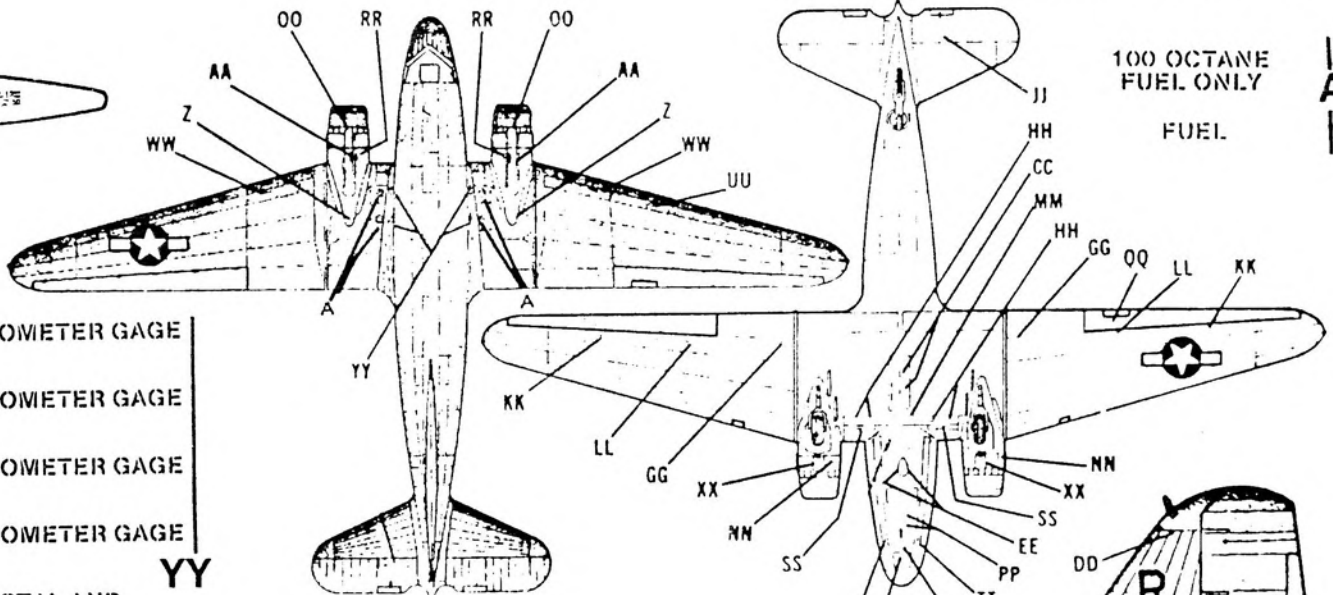
CORRECTED
10-2-44
DATA LINE 7B

EE

CORRECTED
10-2-44
DATA LINE 7B

DWG NO. 89303 18
SER. NO. 2001 14
ANGLE HIGH 577
ANGLE LOW 227

DWG NO. 89303 18
SER. NO. 2001 14
ANGLE HIGH 577
ANGLE LOW 227



FUEL LIQUIDOMETER GAGE

FUEL LIQUIDOMETER GAGE

FUEL LIQUIDOMETER GAGE

FUEL LIQUIDOMETER GAGE

ZZ PEDESTAL AND
CONTROL COLUMN

YY

BB

BUNGEE INSPECTION

ZZ

BUNGEE INSPECTION

ZZ

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 repayed 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 it's 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" 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, extend 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 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 inline 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 shims 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 what is done, however, 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 the Flying surfaces warp free? 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 wooden 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 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 plane 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 much better.

Good Luck and Happy Landing!