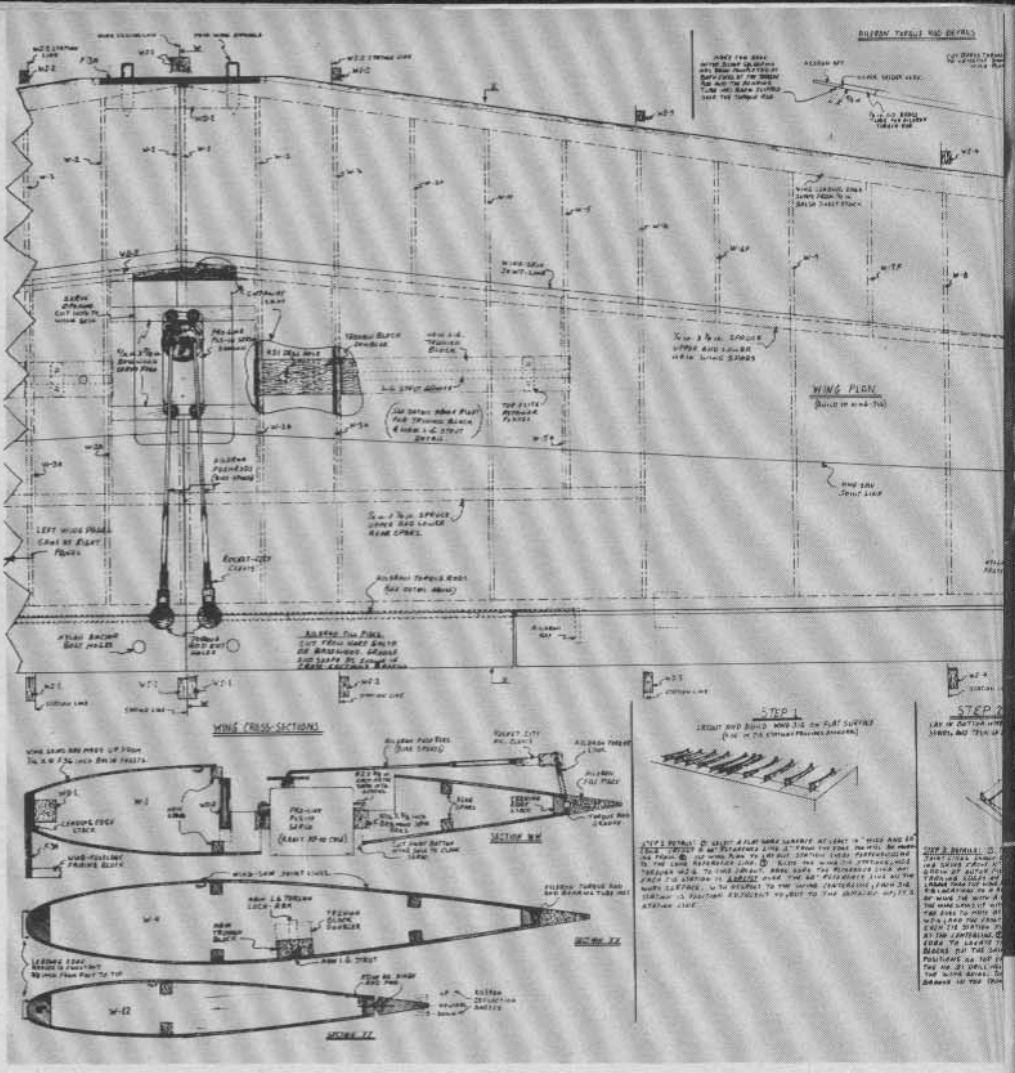
BY JIM KIRKLAND

Old Smily himself showing off the bottom of the bird against the Florida sky. In this shot you can see the retract gear and wells.



A-6 Intruder!

● *Final Assembly* – The performance of the finished product is very much dependent upon the accuracy achieved in the final assembly process. Therefore, painstaking care must be used, and constantly pursued in setting the wing, the stabilizer, and the fin to the fuselage. You simply cannot *overcheck* each step in the final assembly process!

Use two short pieces of one-quarter inch dowels to pin F-3A to F-3, placing wax paper between these two pieces. Notch the leading edge of the wing to fit over F-3A. Shim, or trim the wing seat in the fuselage to achieve a zero incidence setting on the wing. (Top of fuselage sides are parallel to the engine thrust line and should be used as a reference for setting the wing). Measure from the rear of fuselage to the wing tips for lateral alignment of the wing. Now epoxy wing to F-3A and pin, tape, or tie wing to fuselage when it has been aligned properly and allow the epoxy to set.

Before removing wing from fuselage, drill through rear of wing and into wing-bolt anchor-blocks with a #8 drill at the location shown on the wing plan. Glue the wedge-shaped basswood screw head leveler blocks to the bottom of the wing and center over these bolt holes. Leave enough clearance behind these leveler blocks at the wing trailing edge for F-5B. Remove wing from fuselage and twist dowel stubs from F-3A. Drill into wing leading edge, through holes in F-3A, and glue in regular wing hold-down dowels with white glue. Use a ¼-20 tap and tap the drill holes in the wing anchor-bolt block. Use a one-quarter inch drill and, using the smaller size holes as guides, drill through the trailing edge and the leveler blocks.

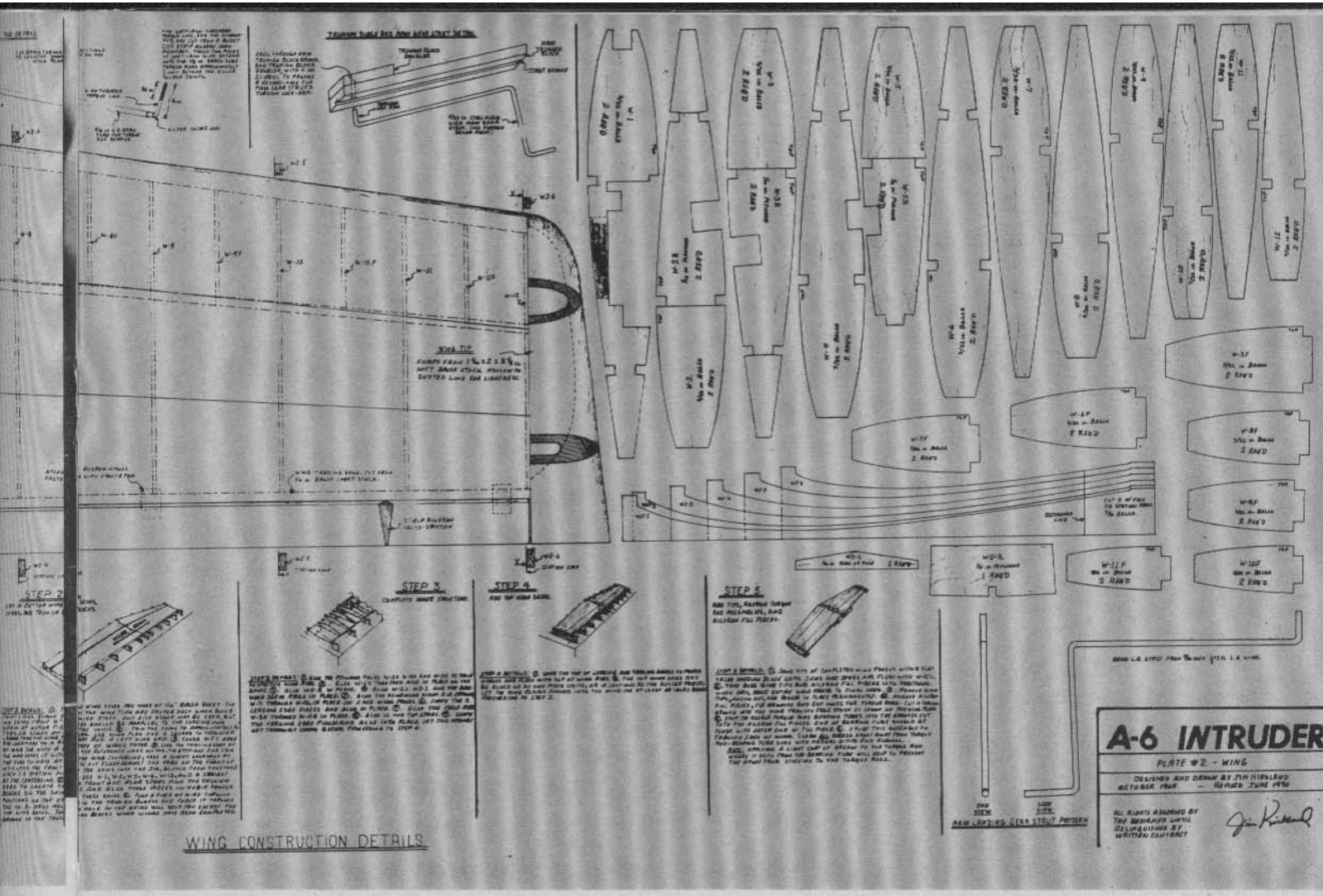
Cut some one-quarter inch washers from manila folder stock to be used as shims to the wing-bolt anchor-block. Glue these shims to the anchor-block until the wing can be firmly bolted to the fuselage and retain a perfect alignment with the fuselage.

Sand one-eighth inch from the front of the wing-fuselage fairing block so that the block will fit between F-3A and F-5A. Trim the sides to fit the lower contour of wing. Bolt wing to the fuselage and glue the fairing block to the bottom of the wing. Cut small holes in the fairing block over the anchor-bolt heads and enlarge them to slightly over one-half inch diameter, and center over the anchor-bolt heads. Enlarge as necessary to receive access tubes made of poster board, masking tape, and epoxy. Epoxy these access tubes into place, fastening to the leveler blocks and to the fairing. Be careful not to foul the anchor-bolt heads with epoxy. When epoxy has cured, use a sanding block, and sand the protruding ends of the access tubes flush with the fairing block.

Use slow setting epoxy to fasten the horizontal stabilizer in place. Notch the bottom of the stab to just clear the top of F-6. Measure from the front-center of the fuselage to the stab tips for lateral alignment. The mean chord line of the stab should be in line with the top of fuselage sides. Align the stab horizontally by using the wing as a reference while standing seven or eight feet behind the model, and sighting down the centerline of the fuselage.

The fin must be perfectly in line with the fuselage center line and absolutely perpendicular to the horizontal stabilizer. The trailing edge should line up with the rear of the fuselage consisting of the V-shaped tail block, fuselage sides and ventral fairing. If, when the lower tab of R-2 is pushed into recess in the top of stab, this line-up does not occur, then R-2 must be trimmed until a proper line-up can be achieved. Epoxy the fin in place. Shape the dorsal fin and epoxy in place.

After the epoxy has set up, build up the fuselage-stab-fin fillet from Epoxy-Lite. A wet finger can form this material into a final fillet shape that will require little sanding. In fact, if you use the wet finger technique, be *sure* to finish shaping the fillet so that it will require little,



1970 NATS-MULTI WINNER

PART TWO

Thank you for your patience but because Jim felt it important enough to take the time to tell the full story we should at least do the same and thus the two parts – we are sure that you will agree that it was worth it.

or no, sanding. Epoxy-Lite finished in this manner has a tougher, and a somewhat more flexible surface film, and is harder to sand.

To build the wing fillet, first pin a piece of wax paper covered balsa to the rear of F-5B with approximately one inch overhang on either side, and along the wing trailing edge. This overhand should be trimmed to the concave shape of the lower wing fillet, and will act as a backstop for the build-up of the fillet.

Using the wet finger technique build-up this lower wing fillet to the lines shown on side and top view of plans. Let this Epoxy-Lite fillet cure until hard. Bolt the wing to the fuselage with wax paper between them and extending about two inches from each wing panel past the fuselage sides. While holding FF-2 pieces to conform to wing shape, and against the fuselage sides, run a bead of five minute epoxy along the FF-2-fuselage seam. Hold in place until the epoxy sets. Epoxy FF-1's to fuselage sides and in line with trailing edge of wing. Lay a bead of five minute epoxy over the near butt-joint between FF-1's and FF-2's. Be sure the wax paper between the wing and fuselage extends from the dowels at F-3A to a point past the lower fillet line on F-5B. Apply Epoxy-Lite material to upper and rear areas of wing-fuselage joint to complete the wing fillet. Let Epoxy-Lite cure thoroughly.

One tail-low spot landing coming up. Spot in this case a yellow X denoting that field is closed.

At this point I use various sizes of dowels and small blocks to sand all fillets and the entire model to the shape that I want the finished model to have. I then go over the entire model with 120 or 150 grit garnet paper to make certain that it is smooth and ready to receive

Continued on page 78)

wonderful hobby/sport. ■

Intruder A-6

(Continued from page 43)

the finish.

Covering and Finishing – There must be as many ways, and combinations of materials, to finish a model as there are modelers! A few people have reached what they consider to be a Utopian level in-so-far as their personal preferences are concerned. Others are still searching and having their problems with pealing, cracking, bubbling, warping, and other phenomena too numerous and varied to categorize! I went this route, and while I do not consider my present method Utopian, I do feel it is the most consistent and predictable. It should be, as it has been around longer than any of the newer methods. Primarily, I use silk and dope! I suppose personal experience accounts most for the consistency and predictability, but this method is hard to beat for a true workbench modeler. It requires sandpaper and some patience, but the results are good looking, durable, fuel-proof, non-cracking, easy to clean, and easy to repair if the need arises!

I do not claim results for myself that the true perfectionists can get with silk and dope, but the following is a relatively fast way to complete a model using this method.

First, the bare wood is given three coats of clear dope. (Stick with the same brand of dope from start to finish.) Use 120 garnet paper lightly after each coat is dry to the touch. The wood should have a sheen and be slick to the touch at this point.

I cover the fuselage with one piece of silk.

Fold the silk lengthwise, slit and notch the fold at one end to clear the fin and stabilizer. Lay the silk along the top of the fuselage with the front of the slit against the front of the dorsal fin. Wet a kitchen sponge, wring it partially, and wipe the silk smooth along the top centerline of the fuselage. Use a one-half inch wide brush and brush dope through the silk along this centerline from front to rear of fuselage. Now use the wet sponge to wipe the silk down and around one side of the fuselage, doping only in the concave fillet areas. Slit if necessary around the rear of the wing fillet, and cover the resulting bare area with a scrap later. Continue wiping silk around the fuselage until it overlaps the bottom centerline. Dope along this line, cutting off excess silk with a sharp razor blade before the dope dries. Cut away excess at wing opening, leaving approximately one to three-quarters of an inch for lapping underneath. Repeat for other side of fuselage. Make slits in overhang areas at wing opening, engine opening, and at front of fuselage. Dope these tabs down.

Cover the stabilizer, fin, rudder, elevators, and ailerons with Japanese tissue. Use thinner to stick the tissue to the wood, rubbing the wrinkles out as you go. It helps to iron the tissue first if it has many wrinkles. This tissue will not follow a compound curve, so slitting is necessary about the tips and in the fillet areas.

I prefer to use Skyloft, a nylon fiber material marketed by Southern RC Products, Pecan Street, Citronelle, Alabama, to cover the wing. It resembles Jap tissue, or lightweight silkspan, and is light in weight, super tough, and fills very easily during the clear doping process (provided you do not sand up the nylon fibers!) It follows a compound curve easily when wet, and it must be applied *wet*! Use four pieces to cover the wing and keep all lap joints on the bottom surface of the wing. If you use silk, apply it with a wet sponge as described in covering the fuselage.

When covering has been completed, clear doping time has arrived! Apply two coats to the entire model and when dry to the touch, sand with 120 grit garnet paper. Get as rough as necessary to get the surface 'bump' free. If it is necessary to cut any fibers, do it during this first sanding! Now apply two more coats of clear dope to the fuselage and wing. Apply one coat of clear and one coat of your primary color to all areas covered in Japanese tissue. Use 120 grit garnet paper and sand again, but try not to cut any more fibers this time around. The final two coats of brushed fill-coats should be of your primary color, and only *one* coat is applied to the areas covered in Jap tissue. Now use 320 wet or dry sandpaper, (use it dry) and go over the entire model. It should now be slick to the touch in all areas. If not, work these individual areas out until they are slick and appear so when held up to the light.

Cut slits for the nylon hinges and cut hinges for all surfaces. Epoxy all hinges into the main surfaces using five minute epoxy. Push pins in until they touch nylon, clip off with diagonal wire cutters, push in until flush with finish, and use the butt end of a small drill bit to push the ends below the finish surface. Careful, don't let the point penetrate the finish on the opposite side! Fill holes over pins with spots of white glue. Now push control surfaces onto hinges, first filling the slit in the surface, and coating the tip end of the hinge, with *slow* setting epoxy. Push surface up against the other surfaces's flat-faced trailing edge and pin as described above. Use medical Q-tips, dampened with alcohol, and toothpicks, to remove all excess epoxy in the V-shaped groove between the control surface and the main surface. When hinging the ailerons use a piece of PVC bag (almost all model parts are packaged in this type of bag) between the protruding end of the torque rod and the trailing edge of the wing. Push aileron into place and pull, and tape the PVC strip tightly around the V-shaped leading edge of the aileron. Be sure to clear all excess epoxy away from the torque rod where it enters the bearing tube next to the end of the aileron.

Now cut and fit the Debolt CL-4 canopy to fit into place on top of the fuselage. With the canopy held in place, mark around it with a felt-tip pen. Remove the canopy and mask one-quarter inch below and outside this line. Brush on four *thin* coats of whatever color you wish to use under the canopy, and add whatever you wish in the way of cockpit details. Remove masking tape from around the canopy paint area and glue the canopy in place with Aero-Gloss C-77 cement. To keep peace in the family, *ask* the wife for about twenty-inches of narrow (three-eights wide) hemming tape. Now apply masking tape around the upper section of the canopy so that the lower edge of the tape is *below* the point where your final paint line will be. Use C-77 cement and glue the hemming tape around the base of the canopy, half or less on the canopy, the remainder on the fuselage. Rub two coats of C-77 into the hemming tape fabric and sand when dry. Repeat this procedure until the tape, and resulting canopy fillet, is smooth to the touch. Remove masking tape from the canopy, remask to your final paint line. Sand away the ridge left when original masking tape was removed.

Now for the final finish, spray on two coats of your primary color, mask as required; seal tape edges with clear dope, and spray on two or three coats of your trim color. Remove masking tape.

If a spray gun is not available, thin the dope to approximately 65-35 proportions (65% dope, 35% thinner) and use a soft bristle brush to apply three coats of the primary color, and three or four coats of trim color. Unmask, add decals, wax, and you are ready to install the radio and perform the pre-flight checkout.

If a spray gun was used to apply the final finish, apply decals after removing the trim masking. Test decal material's compatibility with clear dope on a test board. If clear dope caused decals to wrinkle, brush one coat of a decal protector, or fuel proofer, over them. When dry, test again with clear dope. When all decals and markings are compatible with clear dope, spray one coat of clear over entire model. When dry, wet sand model with 400 wet or dry sandpaper. Cut ridges at trim edges down smooth to the touch, lightly sanding the remainder of model. (Sand *very* lightly over the decals.) Now mix retarding thinner and clear dope to fifty-fifty proportions and spray a light wet-coat to the entire model. This will bring the colors out, bright and glossy. When dry, wax the model.

This type of finishing and covering adds approximately eight to nine ounces to the total weight of the model. Not very much, yet a good durable finish, with a minimum of sanding and *no* rubbing. I think you will find the finished product worth the little extra effort required.

Pre-Flight Checkout – Install fuel tank, engine, prop, spinner, landing gear and the radio. First, check ground angle. The wing mean chord line should be parallel to the

ground when the model is at rest. Check the center of gravity location as shown on the plans and adjust until it falls *exactly* on this point. (Fuel tank empty.) Now balance the model along the fuselage centerline, adding weight to the lighter left wing tip until a perfect lateral balance is achieved.

Turn on the radio and set the transmitter controls and trims, at neutral. Adjust the clevis at the control surfaces until each surface is in line with its reference surface (R-4 for rudder, stab tip and aileron fill-pieces for the elevators and ailerons respectively). Now check the deflection angles for each control surface. Adjust for each control surface until the deflection angle matches that shown on the plan for that particular surface. Adjust the throttle linkage so that full servo throw moves the throttle from full open to the idle position *without* hitting a stop at *either* end.

I have used every kind of brake system that has appeared on the model scene over the past ten years. All have their particular advantages and peculiar traits of operation and maintenance. I have found that a simple nose wheel drag brake, that operates in conjunction with full down elevator control, is the most positive and trouble-free. Under existing rules it is totally adequate for competitive purposes on most flying sites.

Flight Trim – This can be a rather frustrating experience for the novice, and is a necessary chore if any flyer is to realize the full potential of any model design. Probably more erroneous conclusions have been reached about a particular model because of inconsistent and improper flight trimming than for any other reason. Until a flyer can properly flight trim a model for competition flying it would have to be considered an impossibility for that person to properly analyze the performance characteristics of any given model or design.

To begin with, the model must be constructed as accurately as possible. Any deviations from such basics as thrust and decalage settings during construction will have to be corrected during the flight trimming process. Results from such practices are usually at least unsightly, or else require considerable effort to camouflage. So initial efforts to get these basics correct will be most beneficial during the flight trimming process.

Warps that result from hasty building practices are much worse than those that may result from covering and doping. Built-in warps, twists, and misalignments are practically impossible to correct. Slight warps (usually to control surfaces in a model of this type) caused from covering and doping can usually be corrected by steaming the surface and twisting the warp out. Needless to say, any warp will only serve to aggravate the flight trimming process, and may even make it impossible to properly trim the model if severe enough.

It is possible to flight trim a model of excellent design, built to absolute accuracy, to fly like a real dog. Only a model with superior design features, plus proper flight trimming, can result in a model with superior *flight* characteristics.

Do not dismay. While all of the above has a direct bearing on trimming a model for flight, not many models have ever been built to such standards. In fact, not very many have ever been trimmed out to perfection, not even by the experts! A combination of model design, flight trim, flying skill, and equipment reliability and accuracy, all combine with a bit of lady luck, to produce a winner. So proper flight trim is only part of the expert's bag of tricks, and this can be mastered to the degree necessary to materially increase the enjoyment of flying by any RCer. Only experience can lead to a satisfactory degree of perfection, but experience can best be gained while working with a pattern of basic techniques. I have found the following step by step procedure to work well with any type of model, using every step in trimming a model such as the Intruder, and only those applicable for the less complicated models.

1. Trim for hands-off upright level flight while using full engine power. Normally, only elevator and aileron trim is required.

2. Trim for inverted straight flying, using only down elevator to maintain altitude. If the model has a persistent turning tendency in a given direction, trim rudder in the same direction as the turn until no turning tendency is present while flying inverted. If rudder trim was required, retrim ailerons for hands-off upright level flight. Repeat inverted straight flight trim, etc., until model flys straight, level, and true both upright and inverted. (Hands-off upright and only a slight down elevator required when inverted.) If a lot of down elevator is required to maintain altitude when inverted, check center of gravity location, decalage, and thrust settings. Correct if necessary, and repeat Steps One and Two.

3. Trim for glide condition. Fly by upright and level with full power. Cut power to full idle. Model should continue on a straight line, with no tendency to suddenly balloon or dive. As speed decreases the nose should gradually drop, but only a slight amount of up elevator should be required to maintain a constant speed and rate of decent in the glide. If ballooning or diving occurs when power is abruptly cut to idle, then a vertical (up or down) thrust angle change is required. If a lot of up elevator is required to maintain the glide, then center of gravity, or incidence settings should be checked and corrected. If changes are needed, retrim as outlined in Steps One and Two.

These three steps constitute the basic flight trim and must be achieved before proceeding further. Most major changes have now been completed with respect to center of gravity, decalage, and vertical thrust settings. If any changes are made to these three basics in later trimming processes, then Steps One, Two, and Three should be repeated and verified as remaining correct.

If the model is to be used in competition, or if the flyer has any interest in aerobatics, the flight trimming process must be continued if full potential is to be reached. So the next requirement in the flight trimming process is to set the deflection angles for the elevator, ailerons and rudder. Two factors are used to govern our efforts in setting up these deflection angles.

First is the need to achieve maximum benefit from the human reflex system, wherein the reflex action requirements are as even as possible on all axis of control. I choose to call this a 'balanced-feel' of control where model response is the same in either direction about a given axis. In other words no control has a more sensitive response in one direction than the other. This 'balanced-feel' should also apply to the response sensitivity between controls for all three axis, particularly between elevator and ailerons. In other words, we do not want a soft feel on the elevator and supersensitive ailerons, or vice versus.

The second factor in determining deflection angle limits is maneuvering requirements about each axis of control. This is determined by either individual preference for the sport flyer, or the current rule book for competition flyers. Each control must have sufficient deflection available to perform the most demanding maneuver which uses that particular control as the primary means of achieving the desired flight reaction.

The Elevator: The requirements of the spin maneuvers are the primary factor in setting up the elevator deflection limits. The elevator must be able to put the model into a stalled condition and *hold* it in a stalled condition for the duration of a spin. This is true for both upright and inverted spins, and reversals, if such maneuvers are required. Incidentally, you do *not* release the elevator command in a reverse spin maneuver until the spinning

MODEL AIRPLANE NEWS • April, 1971

action has been completed in *both* directions!

The elevator deflection angle for most designs is approximately fifteen degrees, but may be as little as ten degrees, or as much as twenty degrees. Since limited elevator sensitivity is important for smooth execution of most all maneuvers, the deflection angles should be set as low as possible, but with an equal amount to either side of neutral.

When split type elevators, such as on the A-6 Intruder, are used it is most important that the trailing edges of the two elevator halves be in perfect alignment. Any attempt to flight trim a competition RC model by *misaligning* the elevator halves could best be compared to trying to correct an automobile's steering discrepancy by misaligning the rear wheels! The results would probably be similar also!

The Rudder: Any rudder deflection beyond about thrity-five degrees does not do much more than apply air-brakes! If the rudder will not do what it is supposed to do with thirty-five degrees of deflection, it needs more area! The amount of deflection is determined by how much is needed to do a dead straight hammer-head stall, to either right or left, with no wind present. Any more than this will turn the spin into a real tail twister!

The Ailerons: Both the double immelmann and the three rolls are used to determine the amount of aileron deflection. For me, this works out to be about four seconds required for the three rolls. At this point I try to achieve a 'balanced-feel' between the ailerons and the elevator by either slightly increasing, or slightly decreasing.

It is now necessary to adjust for proper aileron differential. I have found it easiest to determine if the differential is correct by doing a split S from a long, straight-away climb-out. If, following a left 180 degree roll, the heading has veered to the left, there was too much differential. If the veer was to the right, there was not enough.

Loop Tracking: This is probably the biggest bugaboo of all! No wind and stable air are both a must if experience is lacking, and a definite help in any case. Inexperience could also use a helper to verify what happens and jot down this information for analysis during the relaxing periods between flights!

To trim for loop tracking requires that both inside and outside loops be flown with the model heading straight away from the pilot. Try inside loops first and use *no* command other than elevator to complete one loop on any given pass. Note which direction the model turned, right or left, and if a turn did occur, which wing went toward the *outer* perimeter of the loop. Now do an outside loop, using only elevator command, and note turn direction and wing deflection. At this point, you are interested only in whether a wing *did* deflect in both inside and outside loops, and if it did, was it the same wing panel in both type loops. If the same wing panel moved outward in *both* inside and outside loops, then that panel is heavier, and weight must be added to the lighter panel's tip.

If the same heading change occurs at the *beginning* of both insides and outsides, the rudder should be trimmed to correct this heading swerve. If a change in rudder trim is necessary, the ailerons will probably need re-trimming also. If the same heading change occurs primarily as you approach the *top* of the insides and outsides, the problem is more likely engine thrust setting than rudder trim. In this case, right or left thrust must be added by shimming the engine mount.

If, after following the above steps, the model will track while doing insides, but will not track as well while doing outsides, raise both ailerons two turns at the control clevis. Depending on the degree of improvement, or aggravation, of the outside tracking tendency, either raise the ailerons more, or less, or change to lowered ailerons, as the results dictate. Continue this process until the model will track properly during only *one* inside loop and only *one* outside loop. If it will track through one loop, it will track through three, unless the flyer, the slipstream from the preceding loop, or wind conditions causes the model to veer. For these reasons, it is only rarely that three perfect loops can be done using only elevator commands.

There you have the basic techniques that I have used successfully for fifteen years to flight trim my RC models. The loop-tracking procedures may seem over-simplified as there are usually two or three different adjustments to make. Trying to analyze those first loops may be frustrating! Just remember to first learn to recognize a heavy wing and correct for this. Then recognize turning tendencies, whether caused by rudder or thrust, and correct the causing factor. Finally, after correcting the wing balance and the turning tendencies as much as possible, play around with raising and lowering the ailerons to find the best setting for loop-tracking. Only experience will teach you to recognize the primary culprit early in the trimming process. I still find an advantage in having someone around to help if a model turns out to be particularly difficult to trim!

Flight trim can either make or break a model for you. Proper flight trim can give anyone a winning edge in competition, or just plain satisfaction in fun flying. It is as much a part of this hobby as any other part and, while some things can be bought, flight trimming must be learned! See you in the winner's circle. ■

R/C News

(Continued from page 29)

fine points, but perhaps you can see an organized approach as something you haven't been doing; using it may get you on the track toward much better flying. The more accuracy you can trim in to eliminate in flight corrections, the less you'll have to work to get those 10's. Balance, measure and trim are the secret of Champions!

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A TALE OF TWO CITIES – CONTINUED...

December's trip to warmer climes was to the Remote Control Association of Central Florida's third edition of its Tangerine Internationals in Winter Park, Florida. As last month's Winter Nats was at Thanksgiving, this meet is held during a holiday period that tends to draw contestants from relatively long distances – Chicago's Hiller family, Ohio's Don Lowe and Norm Page, Joe D'Amico from New York, Illinois' Harold Vandiver, Bud Nosen from Michigan, Bob Violett from Virginia and California's Mike Barna to name a few.

Weather was not as ideal as at some past Tangerines, but was still sufficiently warm and sunny to melt the ice crust from most northern snow birds. Contest structure gave more time to racing events based on a growing pylon interest in the Sunshine State. A sizable entry in open pylon and Formula I proved the wisdom of this but a sizable pattern entry and an excellent scale entry also proved the potential appeal of this meet for all phases of R/C. It is hoped that the sponsor's racing interest does not overpower other flying events; a general R/C meet at this time of the year is ideal.

Formula I was decided first with Norm Page topping a large field; Miami's Charlie Gray was second, followed by American Modeler's Don Lowe. Open Pylon winner Mike Barna won with a U/C combat style, 40 powered machine that made last year's performance by Walt Schoonard's X-1 seem almost slow. Lou Penrod turned the fastest qualifying time at 1:40. Pylon still holds potential for accidents and when held at a field as tight as this one the hazard seems very high. One ship was put into the parking area, barely missing a car and spectators nearby. Most spectacular incident occured when a Form I ship was put through the control tower spilling an official watching the action from that vantage point; no serious