

BAZDI

"DOC" MATHEW'S NEW .25-.40 SPORT FLIER



ou've no doubt already looked at the pictures accompanying this article and (hopefully) have found the Bandito to have eye appeal. It's a whimsical take-off on the pursuit planes of the 1930's; the sort of thing we "doodled" on the borders of church programs or in our Big Chief tablets when we were kids. Whatever you see in the Bandito, you have to admit it's sort of cute.

That "cuteness" is likely the reason we have built no less than seven of them over the last 12 years. Why would anyone do that? Simply put: because they are appealing esthetically, fly

wonderfully, are not at all difficult to build from plans, and we couldn't make up our mind on a final configuration.

A lightweight variant was the first built as a proposal to kit manufacturer and, in many ways, was the most satisfactory. However, the kitter felt it was not structurally suitable for commercial use, so we built many other versions in attempting to meet their parameter.

Some featured locking lite ply fuselage boxes, some all sheet empennage, some sheet balsa fuselages, one had a "D" tube wing, and so forth. Some of them also gained so much weight, they required .60 size engines and cruise speeds twice that of the prototype, just to stay in the air. A very ordinary run of the mill design in that form. A bastardization of a delightful concept.

One of the consistent design concerns has been the location of the main gear. Some of the prototypes had the mains in the wing, some a cut-out in the wing center section to fit over a gear mount farther aft than shown. All these variations added considerable additional construction complexity. with the only benefit being less bouncy landings if the model were three pointed. We eventually decided to keep the mains simple to mount and learn to land wheels on. A little bounce on landing is more than compensated for by vastly simpler construction.

The lightweight version shown was flown at an Ace float fly in 1989 and appeared as part of a commercial video and in the modeling press. That exposure led to numerous inquiries over the years as to when a construction article for the Bandito would be published.

While we frequently recalled what fun it was to build and fly that lightweight version, only recently did the urge to build another become irresistible. The Bandito is just too good a model design to remain in my "never published" file, so we decided to build still another and share the Bandito with you.

In this low wing loading and low powered form, the Bandito is just delightful. It's nimble, well behaved, and just a joy to look at in the air or on the ground. Some of its appearance has been influenced by the Peerless "Panther" free-flight design of 1940 and a modernized version we designed for Model Aviation (12-79). In an odd way, the Bandito is sort of an old-timer in drag.

General Construction

Whether you can't resist the charm of this model, or choose not to build one, reading these construction notes might be worth your time, as we will share some of a lifetime's collection of building hints.

The curved parts of this model can be easily cut out if one makes copies of them in a top load copy machine at Kinkos, etc., cuts the copy paper to rough outline with scissors, adheres the pattern to the appropriate wood size with a glue stick, then cuts them out on a jig saw. Cut outside the lines, then use a sanding block to final shape.

Peel off the paper pattern, assemble the outlines over the drawing, and glue. Remove and sand the outside edges with a sandpaper block and the inside curve with a piece of sandpaper wrapped around a cylinder such as a "Pringles" can.

Wing ribs can be constructed by using the copier technique to create a plywood master rib, then pinning it to the top of a stack of rib blanks to create a sandwich. Again, rough-cut with a jig saw, then final-sand down to the marks. Spar slots should be cut to a firm fit and to the proper depth. The technique we will describe later for the turtledeck stringers is also applicable for spar slots.

We have not included a bill of materials simply because if the builder has a good balsa stripper (such as Master Airscrew), many of the shorter strips can be made from scrap sheet created in building the fuselage and outline parts. If the builder prefers purchasing precut strip, obviously a different set of requirements will exist.

Primary adhesive is medium CA with 20-minute epoxy used in the high stress areas such as the landing gear and engine attachments. Use is also made of thin CA and aliphatic resin (Titebond, etc.), Balsawood should be chosen to match its intended use on the model: lite "C" grain for the formers, wing ribs, trailing edges, and the tail group. Use lite "A" grain for the planked areas.

Plywood should be 1/8" poplar (lite) ply for the doublers, and aircraft grade birch for the firewall and landing gear mount. Hardwood wing spars should ideally be long grained Sitka spruce, if not obtainable, basswood can be substituted.

We strongly advise against covering the wing structure with a heat-shrink fabric or low heat mylar, the design depends on its covering and is much more rigid if MonoKote, Ultracote, or Oracote is used.

All hinges can be of the laminated thin CA adhered variety. All hardware is stock off the shelf, available either from your local hobby shop or the manufacturer.

Fuselage Construction

Using the copier technique, fabricate all the formers and firewall, drill needed holes, and sand smooth. The turtledeck formers should have all the spar notches cut into F-3 and F-7, but only the top notches in the others.

LGM and the firewall should be drilled and the blind nuts installed at

BANDITO Designed by: D.B. "Doc" Mathews TYPE AIRCRAFT Sport WINGSPAN 64.5 Inches WING CHORD 12 Inches **TOTAL WING AREA** 725 Sq. In. WING LOCATION Fuselage Bottom AIRFOIL Modified Semi-Symmetrical WING PLANFORM Constant Chord DIHEDRAL, EACH TIP 3/4 Inches **OVERALL FUSELAGE LENGTH** 46 Inches RADIO COMPARTMENT SIZE (L) 12.25" (W) 3.25" (H) 3" STABILIZER SPAN 21 Inches STABILIZER CHORD (inc. efev.) 7 Inches STABILIZER AREA 140 Sq. In. STAB AIRFOIL SECTION Flat STABILIZER LOCATION Top Of Fuselage **VERTICAL FIN HEIGHT** 11.25 Inches VERTICAL FIN WIDTH (inc. rud.) 7.5 Inches (Avg.) **REC. ENGINE SIZE** .25 to .40 2-Stroke **FUEL TANK SIZE** 8 Oz. LANDING GEAR Conventional Taildragger REC. NO. OF CHANNELS **CONTROL FUNCTIONS** Rud., Elev., Throt., Ail. C.G. (from L.E.) 3 Inches **ELEVATOR THROWS** Low 1/2" Up & Down, High 1" Up & Down **AILERON THROWS** Low 1/4" Up & Down High 3/8" Up & 1/4" Down. **RUDDER THROWS** Low 1" R & L, High 1-3/4" R & L SIDETHRUST To Suit Power DOWNTHRUST/UPTHRUST 2° BASIC MATERIALS USED IN CONSTRUCTION

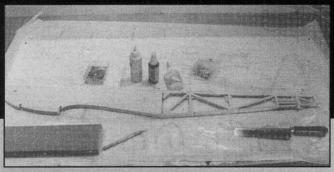
Fuselage Balsa, Ply & Basswood

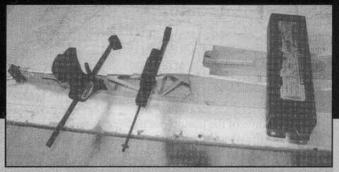
Wing Balsa, Spruce & Basswood

Empennage Balsa

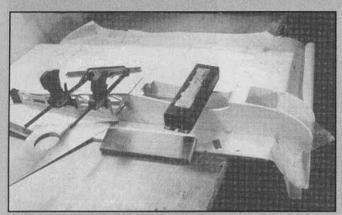
Wt. Ready To Fly 80 Oz. (5 Lbs.)

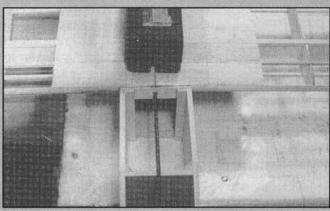
Wing Loading 16 Oz./Sq. Ft.



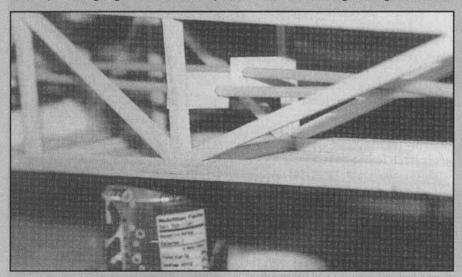


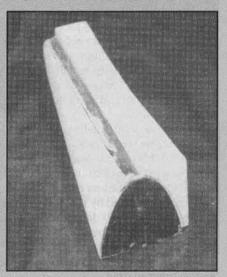
LEFT: Fuselage sides are assembled one on top of the other, then separated. Small sections of masking tape used to prevent sticking sides together. RIGHT: Fuselage assembles upside down over top view. Notice use of clamps and weights to hold everything in place.



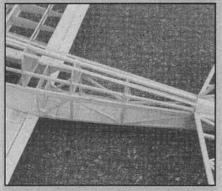


LEFT: In order to clear top of firewall, the nose is allowed to hang over edge of table. RIGHT: Wing has been seated in saddle, midlines marked, and wing aligned relative to tail post. Dowel hole into wing is being drilled with a 12" bit, but a shorter one can be used.

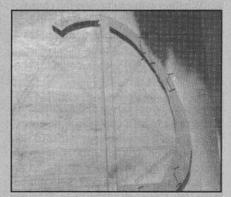




LEFT: Anti flex braces are positioned, then adhered to sides. RIGHT: Shaping fixture for tail filler blocks. Uncarved block right, finished left. Most carving is done with sandpaper. Fixture darkened for photo purposes.







LEFT: General view showing shaped aileron, very straight top deck stringers, and an extra piece of ply mounted behind former for strut when mounting floats. MIDDLE: Copy paper outlines glued to wood with glue stick, then cut out on saw and final sanded to shape. RIGHT: Rudder outline with paper removed and edges glued. This will be finish-sanded inside and out before proceeding.



A series of framework shots illustrating light but strong construction.

this time. A drop of medium CA is used to safety them.

Create one of the lite ply doublers using the copier technique. This then becomes the pattern for the other doubler, as well as the two fuselage sheet sides. Nail all four pieces into a sandwich, keeping as many edges true as possible, then block-sand all four to the same identical outline. Spread 20-minute epoxy on the mating surfaces, weight down, and allow to cure. Make sure you're creating a left and right side!

Lay down one fuselage side over the drawings. It is always helpful to cut the longest pieces first; in that way, if the cut is short, the piece can be used for the next longest one, etc. A good sharp razor saw and #100 sandpaper on a flat block helps create accurate cuts.

When one side is completed, place sections of masking tape over any area that would be touched by adhesives when building the second side over the first. Again, make a left and right fuselage side! We prefer to use aliphatic resin (TiteBond, Sig-Bond, etc.) for these joints.

After the glue has cured, remove the sides from the plan, sand the outer edges to exactly match each other, then separate them using a common table knife. Notice the gussets at station #3 do not attach to anything on their forward edge at this point.

Since the fuselage top is totally flat, at this point, it can be assembled upside down over the top view using the formers and pairs of identical cross members. Bevel the inside faces of the tail post with a sanding block, Pull the rear of the fuselage to match the center of the top view and clamp with clothes pins, etc.

Trial-assemble everything with masking tape and clamps, making sure everything is square with the building board in all plains. When satisfied, run medium CA along all the joints.

Add the ply tail wheel bracket and the cross-grained bottom sheeting. This sheeting should be cut into appropriate sections, hinged with masking tape, and assembled flat on the board, then placed in one piece onto the fuselage bottom.

LGM will require some relieving of the bottom portion of F-2 in order to allow the blind nuts to clear the ends. Once flush and level, adhere it with epoxy. LGM and the cross-grained lite ply in the tank area are not installed until the wing hold-down dowel hole has been drilled into the wing. This provided access for straight-on alignment with a 12" bit in a drill.

At this point, you will need to have the wing ready to assemble to the fuselage. Skip to the wing construction section step for drilling the dowel hole. Remove the box from the drawing, sand out any roughness, then complete the fuselage top by adding turtledeck formers. Install the top stringer only, make sure the formers are straight and vertical. Adhere the top stringer, then, using a straightedge, mark stringer locations in pairs using the precut slots in F-3 and F-5 as guides.

Construct a tool of #100 sandpaper adhered to one edge of a six-inch section of 1/4" x 1/4" balsa. Cut the paper flush; then use this tool to file in the required spar slots. In this way, the angle relief to the former can be controlled as well as its depth. And the notches actually match each other! Trial-fit the stringers and adjust the slots for a smooth flow from front to back. Repeat for the other stringers.

The sheet covered forward deck is easily fabricated by adhering the bottom edge of one side to the fuselage box, spraying it with diluted ammonia water, then gently pulling the sheet down onto the formers and center strip. Adhere with thick CA. True the center edge with the center of the strip and cut using a straightedge and sharp knife. Repeat for the other half and carefully

trim it to fit tightly against the center section of the first half.

The sheeting will need to be notched where it sets against F-3 to avoid cracking it. Once the water has evaporated, sand the cowl to smoothness, then cut out the cockpit hole using the pattern. Cut-outs in this sheeting should be made to fit around the engine used and the balsa toughened with thin CA, or just cut it flush with the firewall.

The tail wheel bracket is not flush with the bottom sheeting. It is simple to install and one need only paint it, rather than attempting to cover it with heat shrink.

Fine-sand all the fuselage and prepare the canopy now. Although the molded canopy is a stock Sig catalog item and can be obtained either from your dealer or direct, it has to be trimmed to fit the Bandito. It is not necessary to actually cut clear through the plastic, one can carefully score with a sharp knife, then flex and crack along it.

Obviously, the rear portion is cut off along a vertical line to extend about 1/4" behind former F-3. There is no way a cutting pattern can be drawn flat on the plans; therefore, the cut-out, to fit snugly down onto the front sheeting, requires careful fitting a little at a time until satisfied. For this reason, consider purchasing two canopies: one to work with until satisfied, and a spare just in case too much plastic is removed or the unit gets too badly beaten up in the trimming process.



Wing Construction

Again, make copies of the ribs and adhere them to the appropriate sheet stock with a glue stick. Stack-cut the ribs. Be very accurate when cutting the spar slots or rough-cut them, then finish them out using a "tool" as described in the turtledeck stringer step.

The center ribs are tilted using the jig, this creates the proper dihedral angle for a butt joint. The ribs that will have the basswood dihedral brace run through them should be scored by pushing a modeling knife through spots while leaving enough uncut material to

hold them together until the wing panels are ready to join.

The wing builds flat on the work surface from the front bottom spar to the trailing edge. Start by pinning the lower trailing edge sheet and aileron hinge spar. Use two ribs to position the bottom spars and straddle pin them to the work surface. Use the sheer webs to position the ribs and hit each joint with a spot of medium CA.

Install the leading edge stock, making sure it is adhered well to the cut-outs. Add the lower center section sheeting aft of the front spar, then position and adhere the center section ribs. Notice the bottom rear sheet has the aileron hinge spar on top of it, while the upper one butts against it. This greatly simplifies sanding in the proper bevel at that joint.

Wingtips should have been previously assembled over the drawing and sanded as earlier described. They and WT4 and WT5 are attached to the last rib in a unit. Adjust and trim, if necessary, for a flush fit at all joints. Adhere using the center line of the rib as a positioning guide.

Install the upper spar and center section sheeting. Scrap balsa filler is used to fill level with the ribs, then sanded to final contour when the leading edge and aileron ends are shaped.

Repeat this sequence for the opposite wing panel.

Dihedraling The Wing

Using the flat edge of your work table, block up the wingtip 3/4" at the point marked on the drawing. Using a flat sanding block with #100 paper, sand the center rib so it is flush with the edge of the table. Repeat for the opposite panel, then remove the scored portions of the first two W-2 ribs. This can be easily done with only a bit of further cutting (an X-Acto #226 blade is perfect for reaching the inside ribs).

Trial-fit the dihedral brace and adjust for a snug fit. Join the two wing panels, returning to the table edge, if needed, to create a well-matched joint. Place one panel flat on the building surface and block up the other 1-1/2" while joining them with 20-minute epoxy. Be sure the brace, rib slots, and rib faces are all coated with epoxy. Allow for overnight curing, then remove the joined wing and sand everything.

The aileron horns are installed into unshaped sections of the 1/4" balsa. The slots can be rough outlined using a knife, then filed to final depth and width using the threaded portion of the wire. A little Vaseline gently heated

with the covering heat gun will flow into the tubing to prevent any chance of getting adhesive into it. Wipe the outside clean with denatured alcohol. Once properly aligned relative to the wing panel, the blocks can safely be adhered with medium CA. Now blocksand this assembly to match the wing. Any voids in the wing joint should be filled with epoxy just before the glass cloth is applied. Hobby Poxy Smooth and Easy finishing resin is great for applying the cloth. Sonic-tronics fiberglass tape (ST-247) has woven edges and does not unravel.

We prefer to attach one end of the tape to the middle of the top sheeting with thin CA, then coat all areas of the wing to be taped with the surfacing epoxy. By pulling against the CA'd end and troweling the epoxy up through the weave with a scrap of balsa, the glass will go on smoothly with no major wrinkles. Use enough epoxy to coat the exterior of the tape, but not so much as to cover it.

Place the wing into the fuselage saddle using weights to hold it steady (we have used burned out and discarded fluorescent fixture ballasts for this for many years). Measure and mark the exact centerline of both the wing and fuselage. Align the wing relative to the tail post, then drill through the predrilled hole in F-1 into the wing center section.

A twelve-inch bit is very handy here, but a shorter one can be used to mark the entry into the wing, then remove it from the wing saddle and complete drilling into the dihedral brace. Epoxy the dowel into the hole using a short section of coat hanger wire to work it onto all surfaces. Sharpen the dowel on one end with a pencil sharpener and use this end to lead the push into the wing. Wipe away any excess epoxy that comes out the hole.

Once the epoxy has cured, return the wing to the fuselage with the dowel into F-1. Hold it in place with the weights, adjust for equal distance from wingtip to tail post. Drill down through the aileron block into WM with the appropriate size bit for your 1/4-20 tap. Remove the wing, tap WM and the underlying triangular stock. Toughen the threads with thin CA and retap.

Remove the wing and carefully sand out all the lumps and bumps preparatory to covering it.

Empennage

We always hate the phrase "construction is simple and straightforward, requiring little

explanation" in construction notes, but in this instance that's pretty much the way it is.

Fabricate the sheet outline pieces using the copier technique, sand them inside and out as explained previously. Pin them to the drawing (covered with wax paper of course) and adhere the joints. Again, cut the longest sections first, the angles are not critical, just create a joint that mates well. Aliphatic resin is the preferred adhesive for this step. Note the sheet in the center of the stabilizer is cross grained with pieces of 1/8" x 1/4" strip adhered to its sides to prevent any warping. The fin base is treated in the same way.

Remove from the work surface, do not separate the elevator halves just yet. Tape the units together with masking tape, flat-sand everything smooth, then sand the exterior edges to a half round and the elevator hinge line to a 45° angle.

Bend a section of scrap metal pushrod to the shape shown. Be certain it lies flat, if not, adjust until it does. Mark and drill holes into the elevator halves, route out a slot to allow for the wire's thickness (the aileron horn trick again), and epoxy the wire connector into the elevator. When the epoxy has set, remove the center section wood and sand smooth.

Equipment Installation

This is a topic with more answers than questions. Most anyone who has built an R/C model or two has developed pet techniques. Therefore, we'll detail how we do things and leave the final decision to the individual.

We no longer cut into the center rib or ribs when installing aileron servos. In our opinion, this time honored technique weakens the wing unnecessarily. It well may be that way back when strip ailerons were first developed; the servos were so large, the only way to have enough room for it was to mount it in the center. With smaller servos, this is no longer necessary.

We draw the servo outline left or right of the center ribs, cut it out, then mark and cut for 3/8" x 3/8" basswood strips. The inside portion of the servo rails are set into a cut-out in the center ribs and the outside fits under the sheeting. Medium CA is then flowed along the seams to secure the rails. The servo is mounted very securely using this approach.

Presumably, there should be some sort of geometry contraindication for this off center mounting technique, but we cannot detect any difference in flight characteristics. We mount the fuselage servos on the same rail material cut to fit snugly against the sides with a secondary rail to reinforce the joint if space permits. In our technique, the servos are temporarily mounted, the pushrods installed, then the control horns. In this way, the horns can be positioned to match the pushrods for improved accuracy.

We use Du-Bro Du-173 30" threaded rods running inside the outer portion of Sullivan Su-505 Gold-N-Rods. The threaded (clevis) end is used on the horn end and solder links on the servo. This produces very rigid, free running rods, and actually is easier to install than conventional nylon tube-intube systems.

Before the servo end solder links are installed, we slide drilled sections of lite ply stiffeners down the nylon. Finish the soldering and adjust them as needed to get smooth lines from servo to horn. Once positioned, they are CA'd to the fuselage sides then trimmed flush.

Throttle hook ups are easily done with braided cable inside nylon tubing. We prefer to use a solder link on the throttle end and an EZ connector on the servo. This can be done the other way around, but usually it is difficult to get to the EZ connector after the engine is mounted.

When using laminated CA type hinges, we find it much easier and more accurate to cut the hinge slots after covering. This avoids fishing around trying to find the previously cut slots through the covering. About 1/32" of covering should be removed from around the slots to avoid any possible damming of the thin CA when it is flowed onto the hinges.

The tank for the Bandito is not accessible through a hatch; however, in a pinch, it could be removed without cutting up the model. It is installed on a slide-out tank floor which is, in turn, held with horizontal strips across the firewall and F-1. The floor is not adhered, it is held with the pressure of the foam rubber placed around the tank.

Most often, the need to access a tank is some failure of the fuel tubing: it either tears or slides off the brass tubing.

Avoid abrupt bends in the fuel line and be sure the cut ends of the brass tubing are filed smooth. The exit holes in the firewall should be filed smooth after they are drilled.

To prevent unwanted slippage, the brass tube can be wrapped with several turns of soft copper wire and solder flowed over it to create a knob. This too must be filed smooth.

We have had some bad experiences over the years with tail wheel tiller bars buried in the base of the rudder. These don't seem to tear out on landing so much as they do when the model rolls backward in the van on the way to the field or is moved around in the pits. When they do tear, they take out a big chunk of rudder. This is difficult to repair and avoidable.

For years, we've bent the tiller to fit just below the rudder and articulated it with a scrap section of nylon servo arm with the hole enlarged. This is adhered with CA into a slot in the wood. If this does tear out, a very simple repair can be effected.

Covering And Finish

The Bandito wing needs the torsional strength of a high heat covering such as MonoKote, Ultracote, or Oracover. It will be too flexible in torsion if low heat mylars or fabrics are used.

When covering the fuselage, start with the turtledeck. We like to adhere one edge, then pull the covering tightly around the stringers to the other side and adhere it. One can adjust the covering section to avoid wrinkles if it is cut well oversize. The tank area should also be covered before proceeding.

The sides can be covered in one piece from nose to tail by cutting a straight line with a large steel straightedge, then carefully position the straightedge against the previously applied top covering.

The wing is covered in four sections, bottom first. The tips are not difficult to cover smoothly if one heats and stretches the covering as it is pulled down over the tips. In other words, heat, pull, stretch, adhere.

Tail blocks are fabricated and covered separately. They are installed after the horizontal and vertical surfaces have been epoxied to the fuselage. Obviously, always remove covering where the parts will be installed.

One of the most commonly omitted steps in covering with heat shrink is running a cloth just behind the covering iron, pressing the material down onto the wood. This step prevents much of the blistering and wrinkling often caused by exposure to bright sunlight and heat. When using MonoKote, punch small pin holes in the bottom of each open bay to allow expanded air to escape. Ultracote is more porous and the air can escape through it.

The interior of the tank and engine compartments should have epoxy thinned with denatured alcohol brushed and flowed onto all exposed wood. Two coats may be necessary to completely fuelproof the wood.

The landing gear and pants can be painted with spray can Rustoleum. The pants are held to Goldberg axles with Sig wheel pant mounts on the inside with screws running through the pant into the mount. This set-up will rotate during really rough landings rather than breaking.

Some versions of the Bandito have been piloted by two 5/8" Williams Brothers Sportsman busts, but the newest has an ACE 1/4 scale prepainted Cap'n Eddy. He is a bit wide in the shoulders for the cockpit, so we cut about 3/8" out of his jacket back and reglued the incision.

The canopy can be adhered to the coaming with RC-56 or equivalent. We like to mark the canopy's outline on the covering with a grease pen, then punch a series of pin holes through the covering and into the wood. We're talking a whole bunch of pin holes here. These provide a "nail hole" into which the canopy adhesive can lock.

The RC-56 is then beaded along the holes, the canopy seated and held in place with a few pins and some masking tape. Excess adhesive and smears can be removed with a rag and water before it sets. Hide the ugly glue seam with strips of trim tape or Ultracote plus.

Flying

Some of our prototypes have been nose heavy, conversely, none have ever been tail heavy. Some of the balance can be controlled by how far out the engine is placed on the motor mounts and by the location of the receiver battery pack. The Bandito will tolerate some nose heaviness at the expense of more sluggish aerobatics and a hot landing. It absolutely should not be flown tail heavy!

Take-offs are great fun, since the mains are set a bit forward of the balance point, the Bandito comes up off its tail wheel after a few feet of run and will run along tail high until just a tiny bit of up is applied. Due to the light weight of the model, climb-outs are very stable and can be rather steep.

The lightweight Bandito is actually overpowered with strong forties and are flown at 1/2 throttle most of the time. They are quite capable of

consecutive inside loops in 1/2 throttle. Rolls can be slow and lazy or rather rapid, dependent on throttle and aileron rates. The models will snap roll with rapid recovery and usually well on heading.

Since the Bandito has a lot of builtin stability, spins require some forcing. That is: full vertical stall, then full up and full rudder, with a tap of aileron needed to initiate the turns. Recovery is nearly instantaneous when the surfaces are returned to neutral.

We would describe the Bandito's flight characteristics as light and nimble, as opposed to blasting around with incredible vertical performance. She's a ballerina, not a fullback. The model flies on its wing, not raw power.

Landing the Bandito is a breeze: it can be held off for a very long time because it is a floater; that is, chopping power is not followed by a rapid rate of descent. Touchdown is admittedly going to be bouncy if a full stall three pointer is attempted. Better to ease the model down to the surface with a little power on, then chop and touch down on the mains.

With the over width landing gear, the model handles on the ground beautifully. It taxies well even on rough surfaces, but the large vertical fin does cause some weather vaning in strong crosswinds.

In summary: the Bandito is not your ordinary sport model. It does not look like one, build like one, or fly like one. It is a delightful change of pace, retaining many of the more desirable features of R/C conversion of prewar free-flight designs while possessing a very attractive cuteness.

That the Bandito has been a joy for the designer is an understatement, why else would we have built so many?

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From RCModeler Apr.2000