ZIPITY-DO-DA

A "Wing" for all the right reasons! If you haven't tried a "Simitar Series" Flying Wing yet, now is the time!

By Bill Evans

performance?

Though Simitars operate on the concept of a flying wing, they really don't look like a flying wing. Neither do they appear to be conventional in nature. So, what are they? They are 21st Century Aircraft of the Simitar Series.

Flying the Do-Da is pure pleasure. Some call it the K-12. That's Kindergarten through 12th grade. If you give low throttle and make slow, easy control input, it will respond as a glider. If you signal full power and give control input to the max, it's a screaming demon.

On one occasion I had landed the original one wheel version, dead stick and one of the Sierra Simitar Squadron members walked out to pick it up. The wind was blowing about 20 mph; as he approached the ship I gave some right to level the wing and, just for the fun of it, some down to lift the tail. Result was the wind pushed the ship backwards, in a reverse taxi mode, causing my retriever to run after it.

Another time, while flying the 85" span, ST3000 version of the Do-Da, upon landing and taxiing in at low throttle the engine loaded up a bit. When given more throttle it backfired and reversed direction. We then proceeded to taxi toward the pit, tail first.

Now, add flying in winds up to 60 mph, hovering inverted, and backing up mid-air in the same wind, to vertical landings, and vertical take-offs (recorded on VHS). To explain what the Do-Da can do in its entirety would take too long; to say what it cannot do is most simply put by saying, "The Do-Da violates all limits of what some hold true."

Construction is super simple: foam core wing; fuselage sides, top and bottom of sheet balsa. It takes about six hours of work time for construction, complete, ready to cover. It then takes me at least six hours to cover; about four hours to install radio,

NAME OF AIRCRAFT
ZIPITY-DO-DA
Designed by:
Bill Evans
TYPE AIRCRAFT
21st Century Simitar Series
(Sport Flying Wing)
WINGSPAN
64 Inches
WING CHORD
14 Inches
TOTAL WING AREA
890 Sq. In. (Approx.)
WING LOCATION
Top of Fuselage
AIRFOIL
ESA (Evans Simitar Airfoil)
Semi-Symmetrical Reflexed
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1/2" under each tip
OVERALL FUSELAGE LENGTH
47 Inches
RADIO COMPARTMENT SIZE
(L) 10" x (W) 2-1/2" x (H) 2-1/2"
VERTICAL FIN HEIGHT
10 Inches
VERTICAL FIN WIDTH
9 Inches (Avg.)
REC. ENGINE SIZE
.25-.60 2-stroke
FUEL TANK SIZE
4-11 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
3-4
CONTROL FUNCTIONS
Elevons, Throt., Nose Wheel
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Foam
Empennage ..... Balsa (Fin)
Wt. Ready To Fly ... 72 Oz. (4-1/2 Lbs.)
Wing Loading ..... 13-1/2 Oz./Sq. Ft.

Phillip Cardwell (with brother) of Morgantown, Kentucky. Their message is, "This is the best airplane we have flown."

ter how much power you put to a ship of the Simitar Series it just goes faster with no "Dutch Roll." It also slows down to a crawl (effect of no stall) and sets down like a hang glider. Finally, a Simitar is directional in flight as it will remain in any attitude it is set in. Blip a little left aileron, let go, and it will hold in a left turn (no trim set); barring severe winds it will do 360's, one after the other.

Also, for the record, the fastest aircraft in the world, the SR-71 "Blackbird" is a flying wing; it has no conventional aft mounted horizontal stabilizer. Neither does the fastest people mover the "Concord," nor does the world distance record holder (goes into space and returns) the "Shuttle." Ever wonder why? Could it possibly be **performance**?

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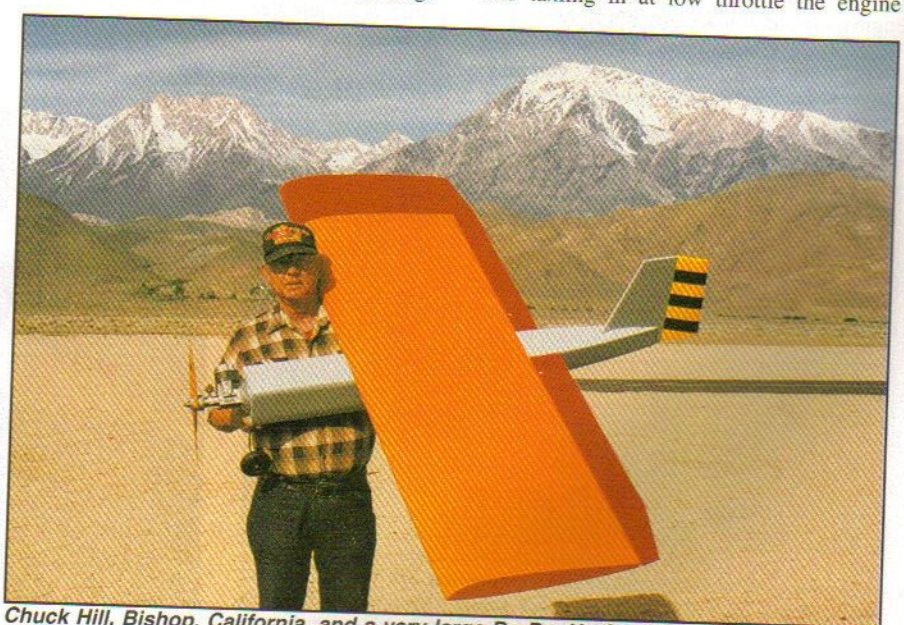
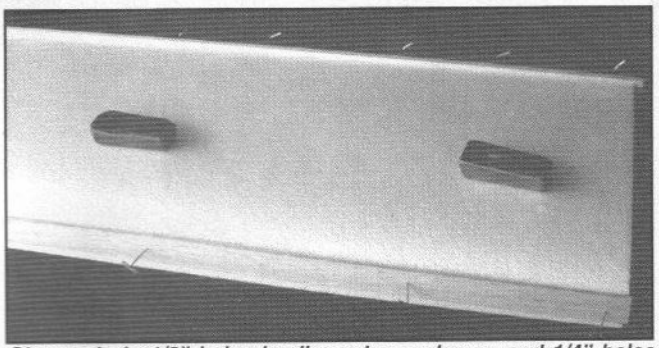
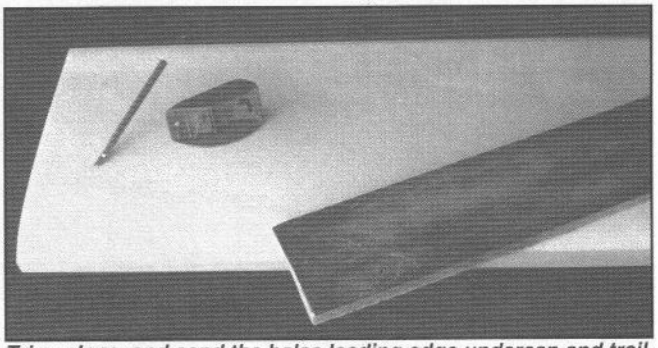


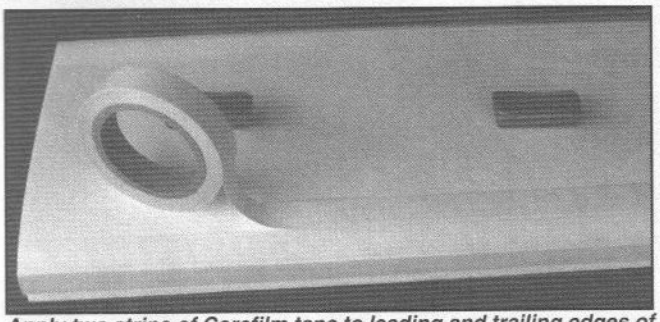
Chuck Hill, Bishop, California, and a very large Do-Da. Up front is a Super Tigre 3000. This one recorded a 28-minute glide on dead stick.



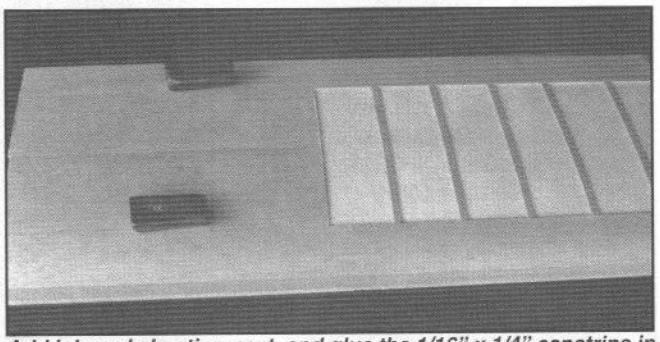
Glue and pin 1/8" balsa leading edge undercap and 1/4" balsa trailing edge to cores.



Trim, plane, and sand the balsa leading edge undercap and trailing edge to match the airfoil contour.



Apply two strips of Corefilm tape to leading and trailing edges of cores. Remove backing and place 1/16" x 2" balsa sheeting in place on foam and smooth down.



Add inboard sheeting next, and glue the 1/16" x 1/4" capstrips in place (on 2" centers).

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Construction is super simple: foam core wing; fuselage sides, top and bottom of sheet balsa. It takes about six hours of work time for construction, complete, ready to cover. It then takes me at least six hours to cover; about four hours to install radio, engine, etc., and make sure it's right.

CONSTRUCTION

For those who do not cut foam, you may order cores for the Zipity-Do-Da from Soaring Research, 454 Wildrose Lane, Bishop, California 93514. Cores @ $18.00 and shipping is $7.00.

Wing:

Make sure the wing panels are flat and straight; use weights with the core on a flat surface if necessary. Cement the 1/8" balsa leading edge undercap and the 1/4" balsa trailing edge in place. Use CA-UFO or carpenters glue when gluing to foam (do not use regular CA on foam). Set these aside to dry.

Fuselage:

Cut out the fuselage pieces. Place fuselage front and rear top pieces on flat work surface and separate them by the width of the wing cut-out. Use the fuselage sides to line them up, then pin the front and rear top to the work surface.

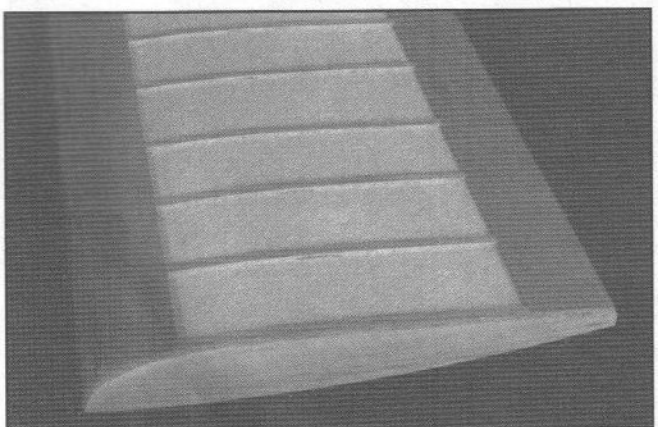
Mark the locations of the fire wall and former on the fuselage sides and front top. Cut two pieces of 1/4" sq. to fit between the back of the fire wall and the front of the former, then cut two more pieces of 1/4" sq. to the length of the rear top.

Pin the 1/4" sq. longeron onto front fuselage top, 1/4" in from outer edge (to allow fuselage side to fit flush on outside), and 1/4" back from front edge of fuselage front top (thickness of fire wall). Apply CA to inside edge only.

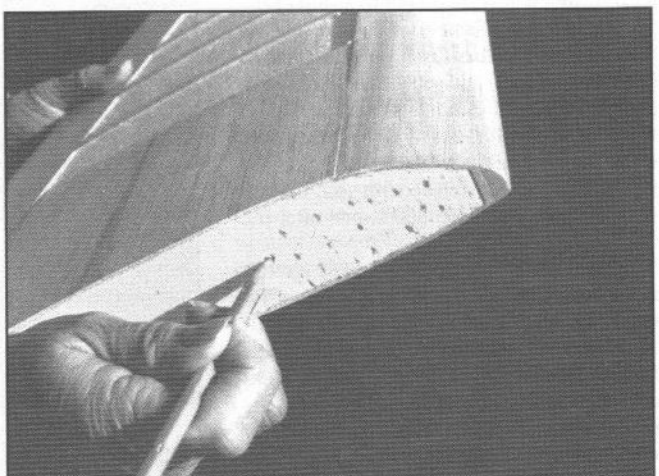
Pin the 1/4" sq. rear longeron to fuselage top rear. Locate longeron 1/4" in from outside edge at front end and curve it to centerline at rear end. Pin the second front top longeron on front top to match the first. Also, pin second top longeron in place on rear top and curve to match the first. Apply CA to inside edge between longerons and top front and top rear.

Drill fire wall to fit type of engine mount to be used and for fuel lines/throttle cable. Install blind nuts for engine mount.

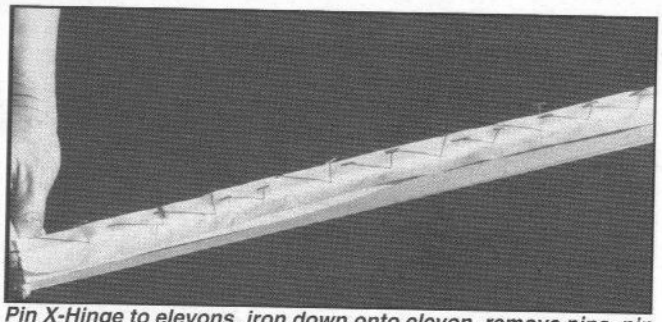
Pin fuselage side to front and rear tops;



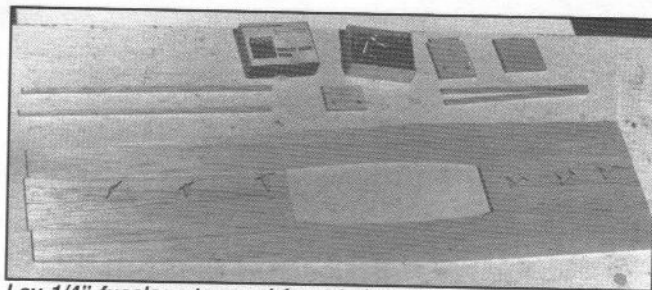
After sheeting bottom of wing panel, sand leading edge undercap flush with sheeting. Cement and trim the 3/8" leading edge cap to shape shown on plans. Note steep top on leading edge and fairly flat bottom. Glue the 1/4" balsa tips in place and sand to shape.



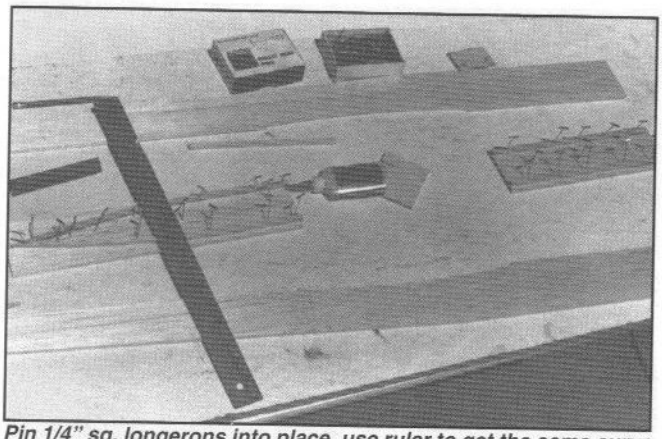
Prior to joining wing panels, puncture root of cores with pencil to give epoxy more grasp.



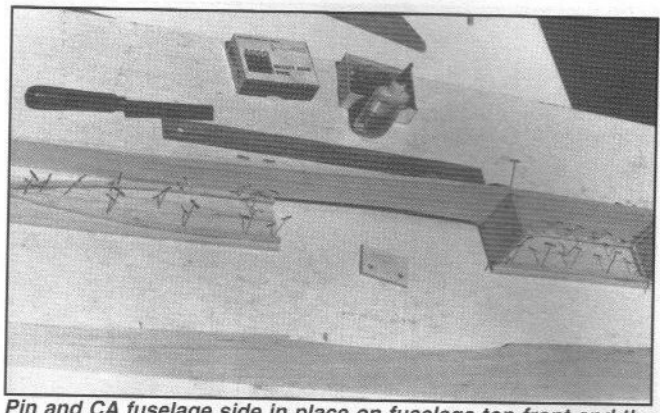
Pin X-Hinge to elevons, iron down onto elevon, remove pins, pin elevon into place on wing then iron down hinge onto wing.



Lay 1/4" fuselage top and front balsa pieces down on building surface, line them up using fuselage sides, mark pencil line on center of the top front and rear pieces, pin them in place.



Pin 1/4" sq. longerons into place, use ruler to get the same curve at rear. CA inside edges only.



Pin and CA fuselage side in place on fuselage top front and the first 2" of fuselage rear top. Do the same for other side, then join at rear.

pin fire wall and former in place against top and side; CA side to top, fire wall and former. Be sure to curve side to center at rear end.

Pin second side into place and CA. Pin and CA 1/4" sq. bottom longerons into place against fuselage sides. Pin and CA 1/4" sq. strips around back side of fire wall.

Sand bottom edges of fuselage side flush with bottom longerons. Pin and CA front fuselage bottom into place. Next, add the plywood gear plate and the 1/4" balsa behind gear plate. Finally, pin and CA 1/8" balsa fuselage bottom rear into place. Drill and tap the plywood landing gear plate for the 10-32 nylon retaining bolts.

The fuselage construction is complete. Apply sandpaper as needed.

Back to the Wing:

Carve, plane, and sand the 1/8" leading edge undercaps and 1/4" trailing edge spars so sheeting will fit over the cores and these spars. Be careful not to sand any of the core away.

Sheet the wings. We used Corefilm (available from Soaring Research) to apply the 1/16" x 2" leading and trailing edge sheeting, and the 1/16" center section sheeting. Capstrips are 1/16" x 1/4" on 2" centers, and are glued in place.

Sand the leading edge and trailing edge sheeting flush with spars. Pin and CA the 3/8" x 1" leading edge cap to leading edge. Pin and CA 1/4" tip plates to outboard ends of wing halves. Shape and sand leading edge, wing, and tip plates. Note leading edge bottom is nearly flat and leading edge top curve is fairly steep. Join wing halves with 5-minute epoxy. Glass center section with 6 oz. glass cloth and epoxy.

Fit elevons to wing. We used X-Hinge to attach the elevons to the wing. (Note: If you use mechanical elevon mixing, form and install elevon control rods before you attach elevons.) Cut and cement end grain balsa into wing at bolt location to help prevent crushing the wing when bolting to the fuselage. Cover wing and ailerons.

Glue the plywood wing hold-down plate into place on leading edge of wing using 5-minute epoxy. Now, sand and cover the wing. (Note: If you use electronic elevon mixing, install servo plates flush with bottom surface of wing and dig out foam for servo pocket prior to covering wing bottom.)

Complete, sand, and cover vertical fin. Cover fuselage, then epoxy vertical fin to fuselage.

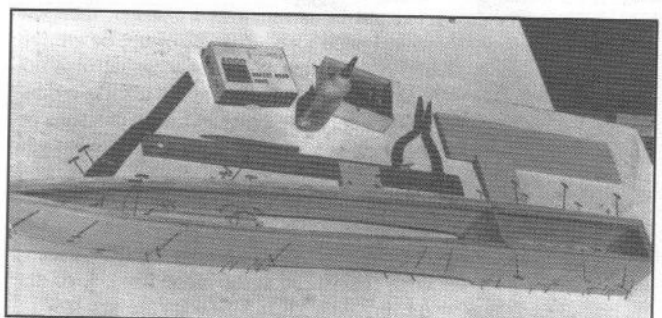
Control Systems:

For those new to the concept of the Simitar Series, an explanation of the control surface function and component installation will be helpful.

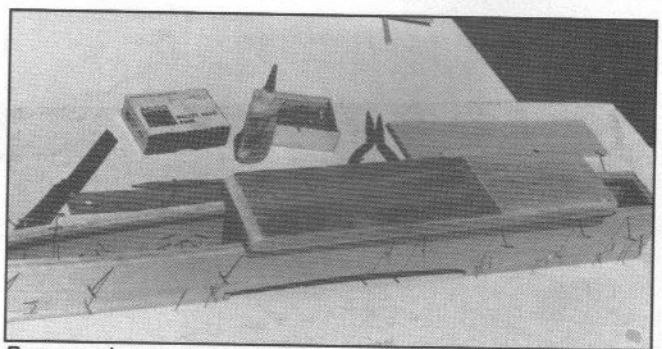
First, a Simitar requires only pitch (elevator) and roll (aileron) functions for perfect flight. Except for pattern flying, a rudder is not required.

Simitar control surfaces are elevons which serve as ailerons and elevators. In essence, consider the control surfaces as full strip ailerons which counteractuate to provide aileron control and also actuate simultaneously to provide elevator control. This means some form of mixing is needed. Such mixing can be provided by either mechanical or electronic means.

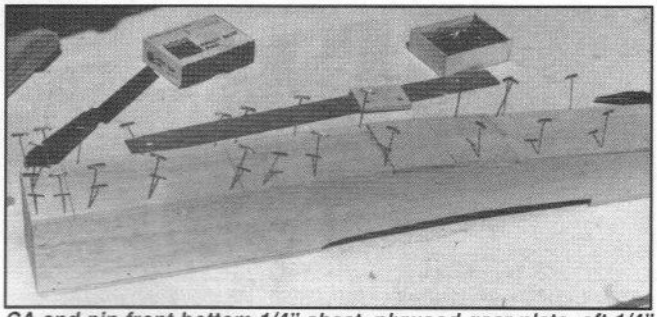
The best mechanical method is to use



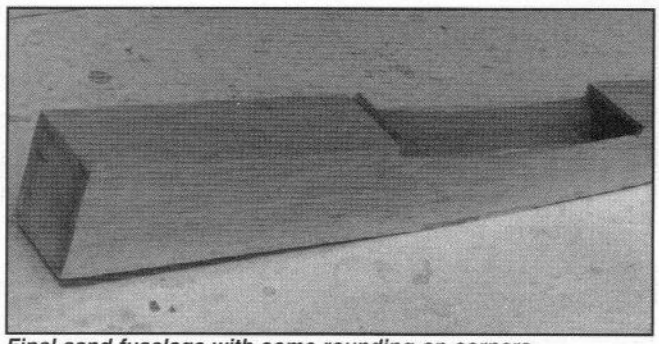
After fuselage sides are joined and CA'ed at rear, pin top 1/4" sq. longerons in place and CA them.



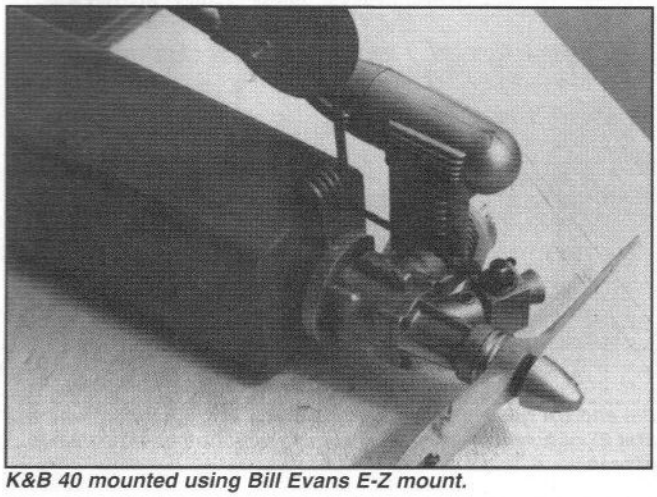
Remove pins as necessary and sand bottom of fuselage flush.



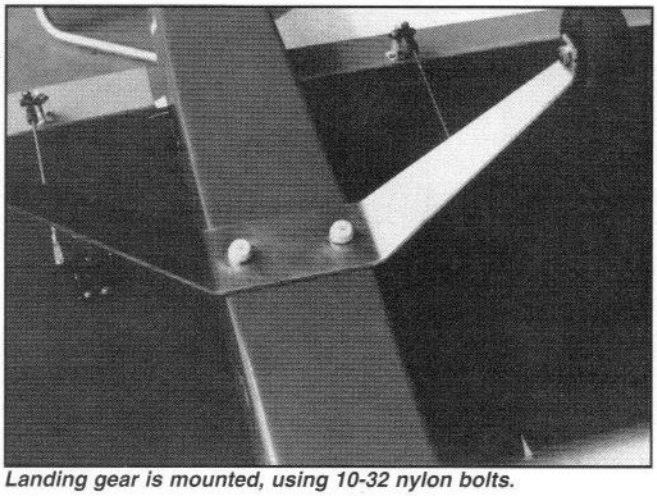
CA and pin front bottom 1/4" sheet, plywood gear plate, aft 1/4" balsa sheet and 1/8" balsa sheet in place.



Final sand fuselage with some rounding on corners.

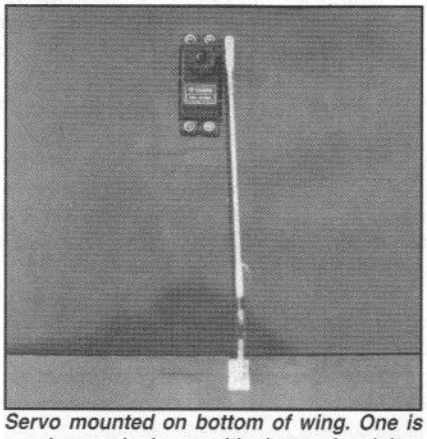


K&B 40 mounted using Bill Evans E-Z mount.



Landing gear is mounted, using 10-32 nylon bolts.

my sliding tray, which works as follows. One of the servos in the tray is set up as you would for strip ailerons. The second servo is for elevator, and its control arm is attached to the stationary bulkhead at the front of the tray so that it will slide the tray fore and aft, providing the elevator function.



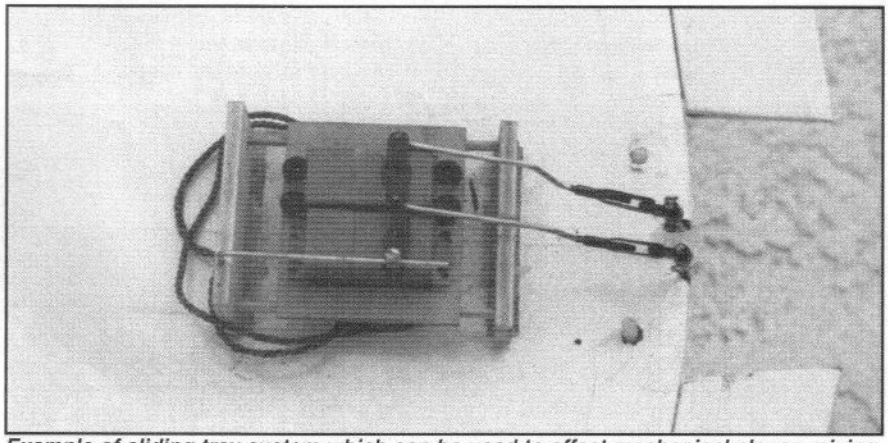
Servo mounted on bottom of wing. One is used on each elevon with electronic mixing.

Electronic mixing can be provided by either a radio with built-in mixing or by using Ace R/C's Christy Mixer which plugs in-between the servos and the receiver. The Christy is about $35.00 and works very well. Alternatively, several of the newer radio systems have built-in elevon mixing functions. I have used several of the Futaba's in this line, such as the 7UAF, 7UAP, and 9VP. Futaba, along with several other radio manufacturers, have some very inexpensive radios available now that will do all this mixing.

Sliding Tray Mixer

Control Set-Up:

The sliding tray fore and aft formers are of 1/4" ply. Drill the 1/8" holes for the dowel through both formers at the same time which will make the holes parallel. Cut the 1/8" plywood tray to fit both aileron and elevator servos. Push the dowels into one of the formers, slide the red outer NyRod over each dowel, then push the other former onto the dowels. Cement the tray in place onto the NyRods (be careful not to get cement inside the NyRods) then install the servos as shown.



Example of sliding tray system which can be used to effect mechanical elevon mixing.

Electronic Mixer

Control Set-Up:

Use 1/8" plywood trays to mount servos into wing. Epoxy the trays flush on bottom of wing after sheeting. Grind a hole in the bottom center of the wing and use a piece of piano wire with a hook bent on one end to tunnel out for each servo lead. The lead is then easily fished through with a piece of string.

Final Assembly:

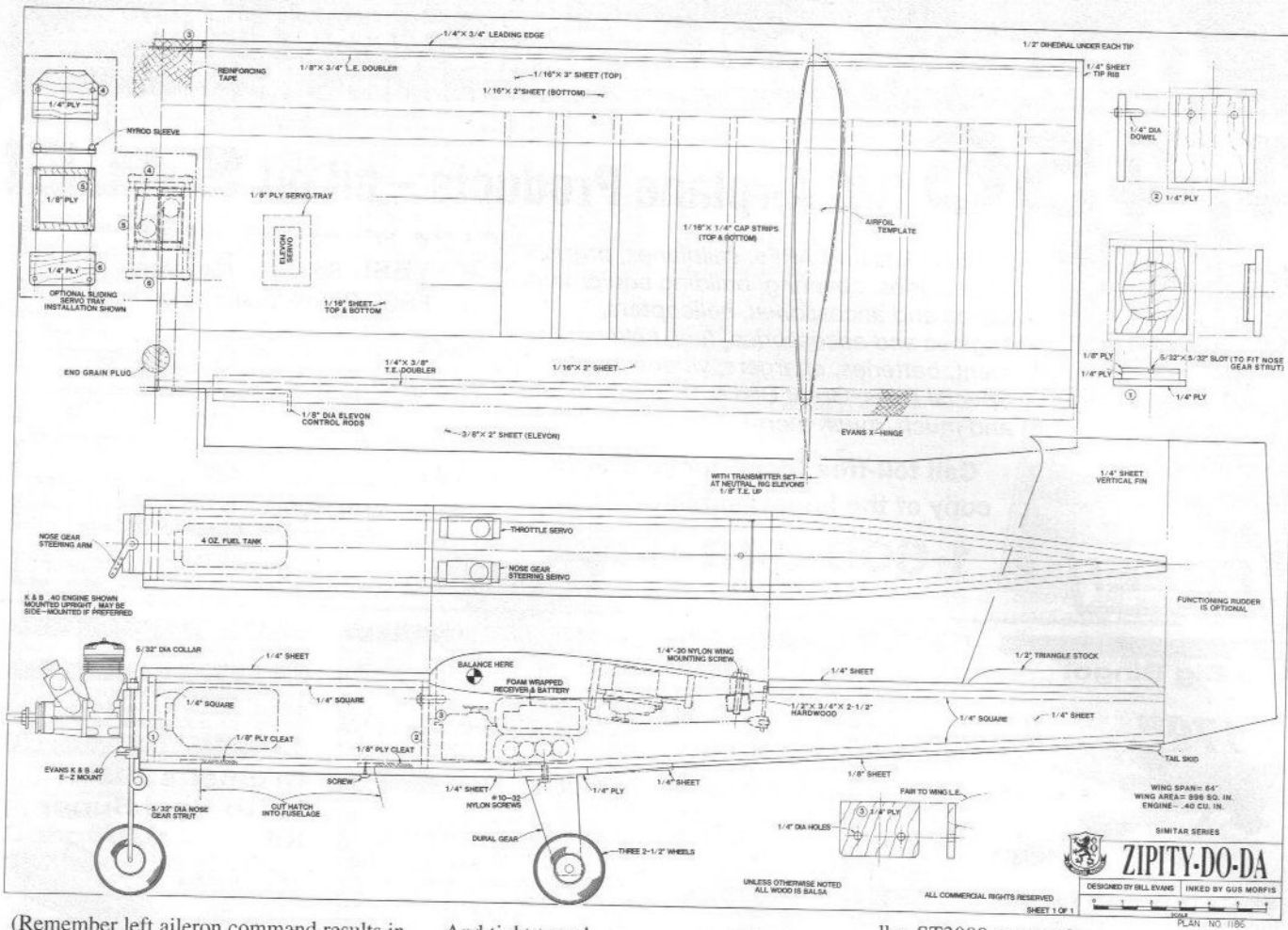
Install the landing gear, engine, fuel tank, and all the radio equipment. Hook up all the controls and check to be sure there is no binding. Check to be sure that your aircraft balances at the location indicated on the plans (approximately 1-1/2" behind the leading edge).

Control Throws:

I put in as much as I can get, then use what I need (3/8" to 1/ 2" of up, down, left and right is fine). Remember, control is not like a light switch (on or off), it's like a dimmer switch, use only as much pressure on the stick as you need to make it do what you want!

Set the nose wheel height so that, while setting on a flat surface, the leading edge of the wing is 1/4" (+) higher than the trailing edge (measured at the hinge line). Also, the trailing edge of the elevons are set 1/8" up with the transmitter trim at neutral.

Check all surfaces for proper motion.



(Remember left aileron command results in the left elevon going up and the right going down; and the up elevator command results in both elevons going up!)

Flying:

Ah yes, flight performance of the Zipity-Do-Da is very smooth and graceful; gives the feeling that it's an extension of yourself in the air; seems to always do the right thing, often before you command it.

Are the thumbs quicker than the eye?

Remember, be safe, be kind, have fun! And tight turns!

Reference Material:

For more information about the development of the Simitar Series, refer to the following listing in Radio Control Modeler:

March '91, Pole Star (50" Jet Looker 40-60);

January '90, Leading Edge (twin fin 40 powered Jet Look);

March '88, Desperado Sixty (60" anhedral rocket), Desperado 3000 (85" 17 lbs. ST3000 powered);

August '86, Tracer 40 & 60 (pattern ships);

March '85, Skywalker 1/2A, 40 & 60;

November '79, Astron 40 (X-Wing fighter);

October '79, Simitar 540 (50" 40 power);

December '76, Simitar (1/2A, the first Simitar);

April '76, Saracen (72" glider, Bill's first flying wing).