



*Terry Ann Allen,
sister of co-designer,
Frank Allen, holding
the Skyraider.*

AD 1 SKYRAIDER

By George Dawe

Clear the workbench! This one builds fast, looks and flies great, and won't send you to the poorhouse.

Design and Photos by George Dawe and Frank Allen

In 1944, the United States Navy sought bids for an assault plane to replace the obsolete Douglas "Dauntless" dive bomber. By the time the first prototype of the AD-1 was ready for test flight, World War II was two weeks

from concluding. The battle worthiness of the "Skyraider" remained untested until the Korean War.

During the Korea "police action" the Skyraider acquired a solid reputation as a robust and reliable airplane capable of

performing bombing missions under the most adverse of weather conditions in heavily defended enemy territory.

When the Korean conflict ended and the jet age of supersonic fighter/bombers and missiles was ushered in, the Skyraider



seemed destined for the scrap heap. However, in 1960, with the advent of American involvement in the Vietnam War, the Skyraider was called upon to provide "close ground support." Given its large wing and comparatively low fuel consumption the AD-1, or A-1 as it was now called, was better suited for the close ground support role. Airplanes utilized in this type of operation are required to soar high above the ground conflict for long periods of time and then swoop down to strafe and bombard the enemy. Supersonic fighter bombers, with their high fuel consumption were inadequate for the ground support role. It was in Vietnam that the Skyraider was nicknamed "Sandy."

Introduction:

In late August of 1992, I had just completed building a .10 size P-51. My neighbor and building partner, Frank Allen, stopped by to comment and critique the model. Somewhere during our conversation, Frank inquired as to the

possibility of designing a .15 model of his favorite aircraft, the AD-1 Skyraider.

The following afternoon, Frank brought over a 3-view from the instructions of a scale plastic model. I took one look at the drawings and proceeded to enlarge them until I had a drawing of what I thought would be a .15 size airplane. I then transposed the shape onto drafting paper, penciled in the lines, and proceeded to design and place the bulkhead locations on the plan. I admit some of it was guesswork!

Frank and I then redesigned several of the bulkheads prior to cutting them out. After hemming and hawing over the use of a scale built-up wing, we decided to use the wing structure which I had designed for the P-51 by utilizing "Ace" tapered foam wings. However, Frank suggested that the wing be fully sheeted, not capstripped as I had originally incorporated into the P-51.

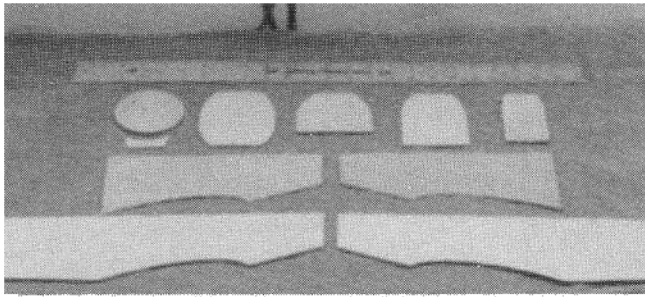
Frank and I spent many an evening in my garage/workshop trying to find a building technique that would allow for easy duplication of the airplane's fuselage. We

decided to use the top block of the fuselage as a "jig" for the bulkheads in order to ensure proper alignment. We thought about the use of balsa blocks for both the radiator and supercharger airscoops, but decided to carve the smaller supercharger scoop from a "light" 1/2" x 2" x 3" balsa block. However, in order to save on nose weight and better balance the airplane, we decided to "build up" the larger radiator scoop located at the bottom of the front fuselage.

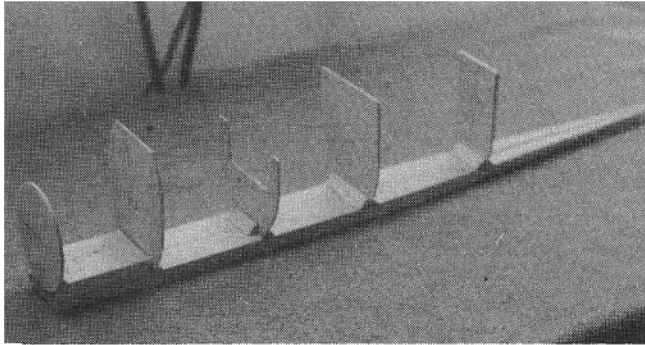
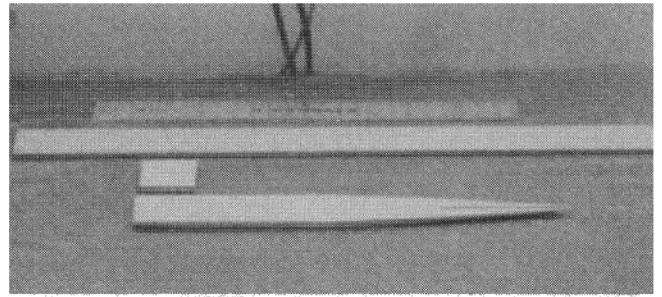
After about two and one half months of a little building and a lot of colorful discussion, we rolled out the Skyraider from the San Diego skunkworks for its first flight on December 10, 1992. It was a beautiful sunny day, nice and warm, no wind. The first flight was flawless. The design and completion of the Skyraider was a true team effort.

Our AD-1 is a 4-channel aircraft designed for a .15 size engine, but it will also fly with a .10. The aircraft in the photo utilizes four micros servos, a standard sized battery pack, and receiver (microreceiver and battery are

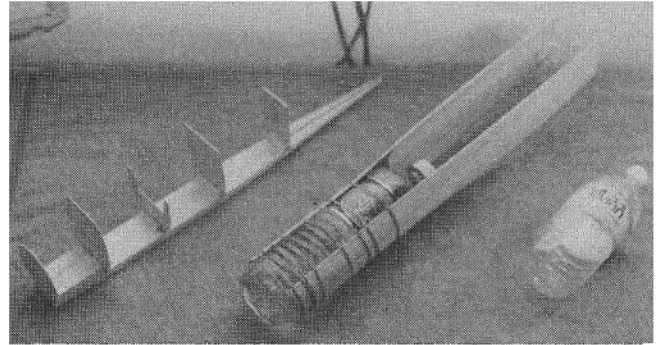




LEFT: Fuselage sides, doublers, and formers are cut out and ready to begin assembly. **RIGHT:** 1/4" and 3/8" sheet balsa is used to form the top of fuselage.



LEFT: The fuselage is assembled upside down, with the formers glued in place to top block. **RIGHT:** The fuselage sides are shaped by forming them around a water bottle.



optional). The total weight is 26 ounces.

CONSTRUCTION

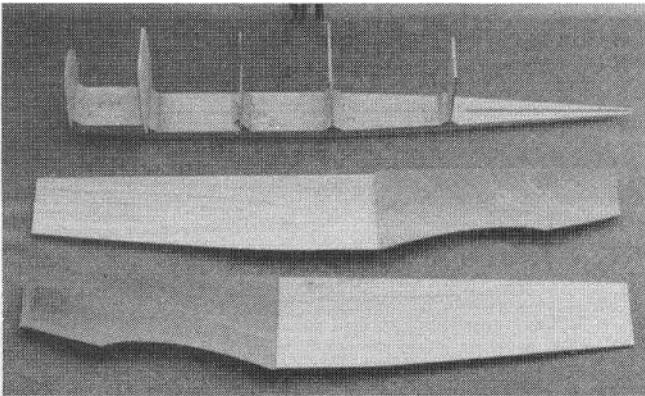
Fuselage:

The shape of the fuselage is achieved by moistening the balsa side pieces with hot tap water then fastening the "front" fuselage around the Evian bottle using rubber bands.

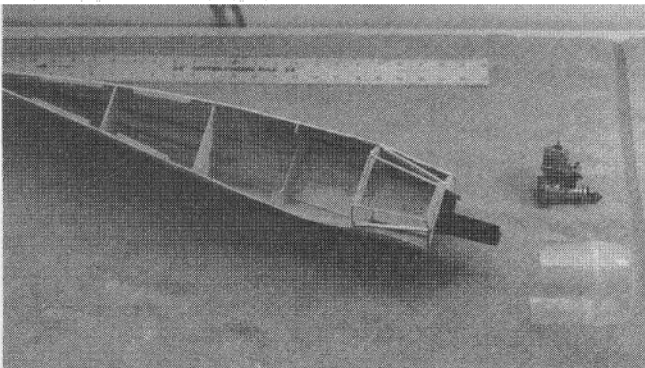
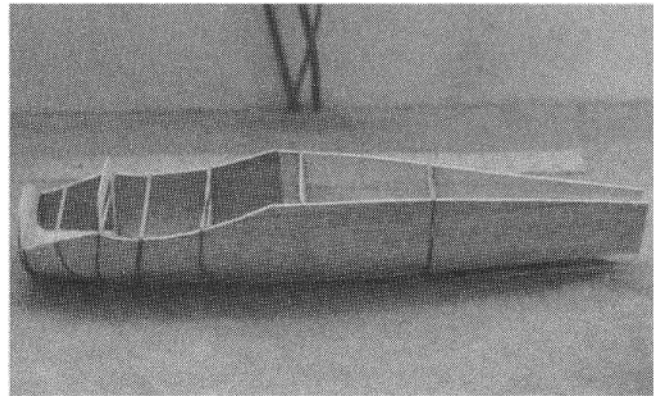
Allow the wood to dry overnight. When taken off of the bottle, the wood remains in near perfect shape. The plywood bulkheads and fire wall are all epoxied into position directly onto the fuselage's top balsa creating a "jigged" fuselage which ensures proper alignment.

The shaped sides are reinforced with

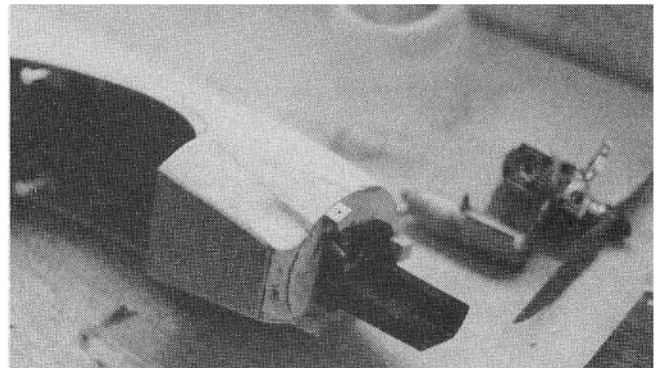
1/64" plywood doublers by squeegeeing epoxy across the plywood. The completed side pieces are then mounted onto the first four bulkheads using epoxy sparingly. The remaining bulkhead and tail end were then glued together. The assembly is held together during the curing process by using rubber bands. The outer pushrod housing

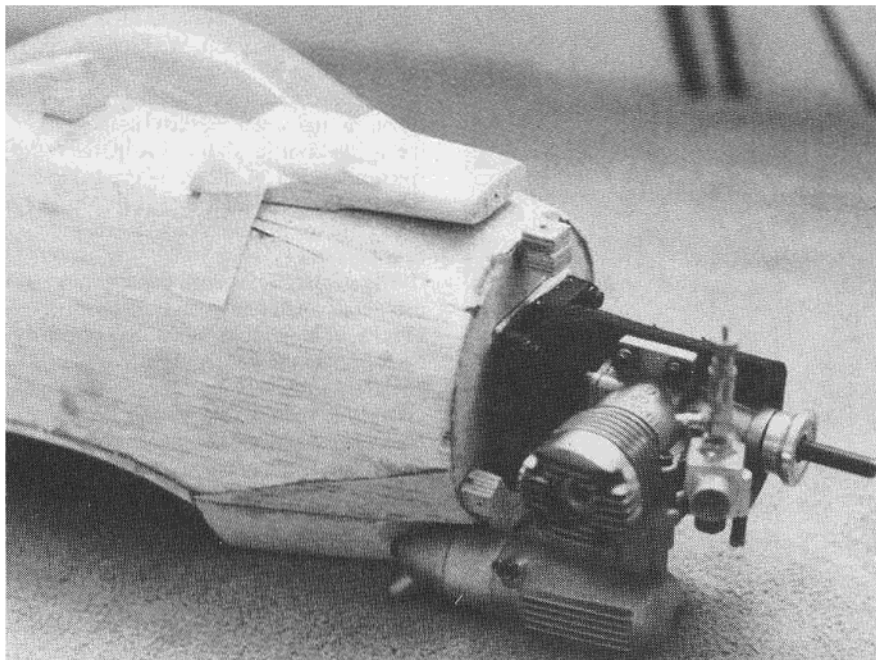


LEFT: After forming the balsa sides, add the 1/64" plywood doublers. **RIGHT:** Fuselage sides are assembled to formers and top. Use rubber bands to hold sides to formers while glue dries.

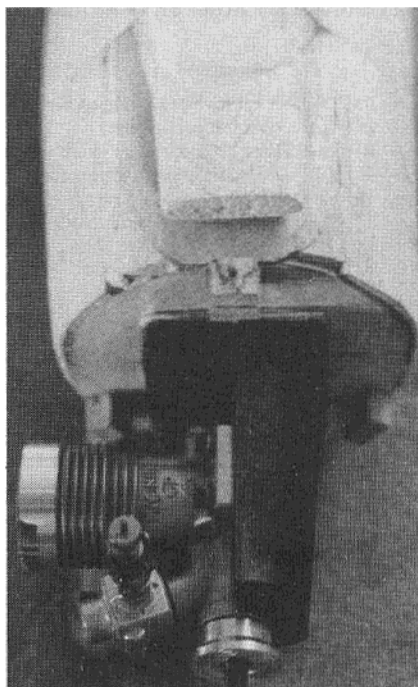


LEFT: Install engine mount and outer pushrod housings prior to sheeting fuselage bottom. **RIGHT:** Relieve fuselage side as required to clear muffler. Fill back side with scrap balsa.

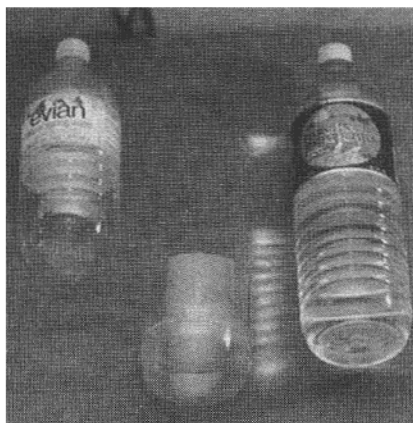




With engine in place, be sure there is adequate clearance for muffler. Shape instrument panel/air scoop, and trial fit canopy.



Use a tapered plywood shim to provide 2° right, and 1° down thrust in engine mount.

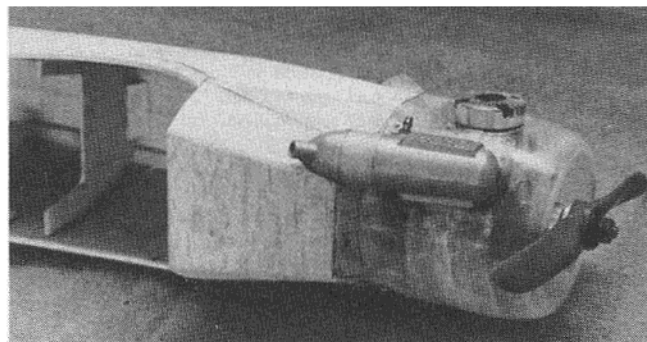


The cowling is made up using parts from two water bottles, glued together.

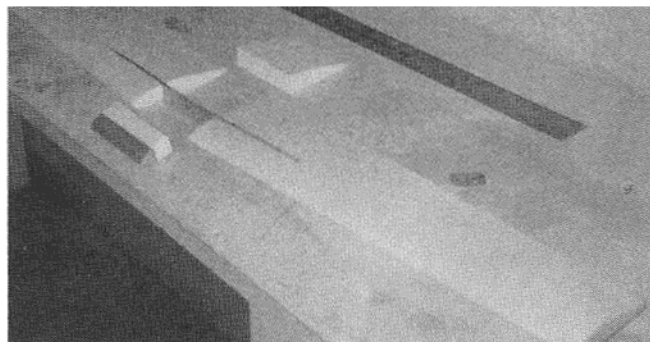
(we used Gold-N-Rods) should be inserted and then the bottom fuselage should be covered using 3/32" balsa sheet "cross grain."

Radiator Scoop:

The radiator scoop, located at the bottom front of the fuselage, is built by attaching the F-1A bulkhead to the F-1 bulkhead according to the plan using epoxy. Four



LEFT: Cut cowling to fit your engine and muffler. Be sure to allow for cooling air exit. RIGHT: Ace R/C foam wing kit using straight center section, with tapered tip panels. Plywood dihedral brace is used to join the panels, and a balsa block is used for the leading edge dowels.



AD-1 SKYRAIDER

Designed By:
George Dawe & Frank Allen

TYPE AIRCRAFT

Sport Scale

WINGSPAN

39 Inches

WING CHORD

5 7/8 Inches (Avg.)

TOTAL WING AREA

229 Sq. In.

WING LOCATION

Bottom of Fuselage

AIRFOIL

Semi-Symmetrical

WING PLANFORM

Double-Tapered

DIHEDRAL, EACH TIP

1 Inch

OVERALL FUSELAGE LENGTH

28 3/4 Inches

RADIO COMPARTMENT SIZE

(L) 7" x (W) 3 1/4" x H 3"

STABILIZER SPAN

15 Inches

STABILIZER CHORD (incl. elev.)

3-5/16 Inches (Avg.)

STABILIZER AREA

48 Sq. In. (approx.)

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

5 Inches

VERTICAL FIN WIDTH (incl. rud.)

3 3/4 Inches (Avg.)

REC. ENGINE SIZE

.10-.15

FUEL TANK SIZE

4 Oz.

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4 (Micro)

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail.

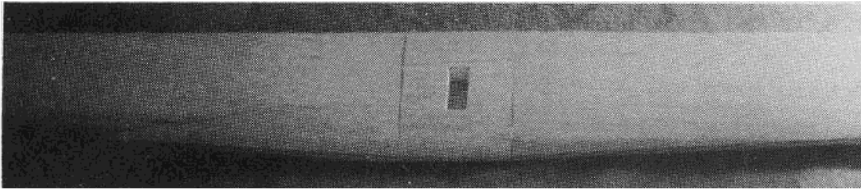
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Foam Core, Balsa
Empennage	Balsa
Wt. Ready To Fly 24-26 Ozs. (1 Lb., 8-10 Ozs.)	
Wing Loading	15-16 Oz./Sq. Ft.

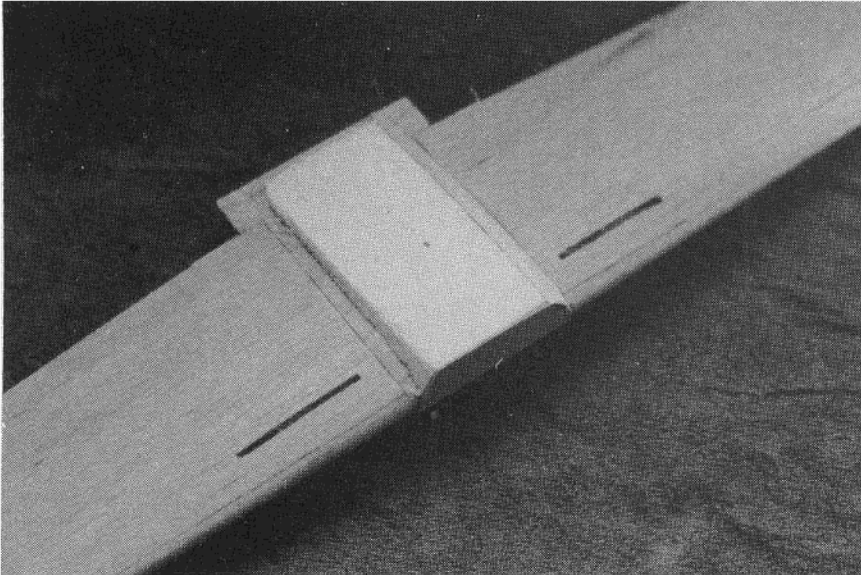
1/8" spruce stringers are attached as shown and covered with 3/32" balsa cut to fit as shown on the plan.

Cowling:

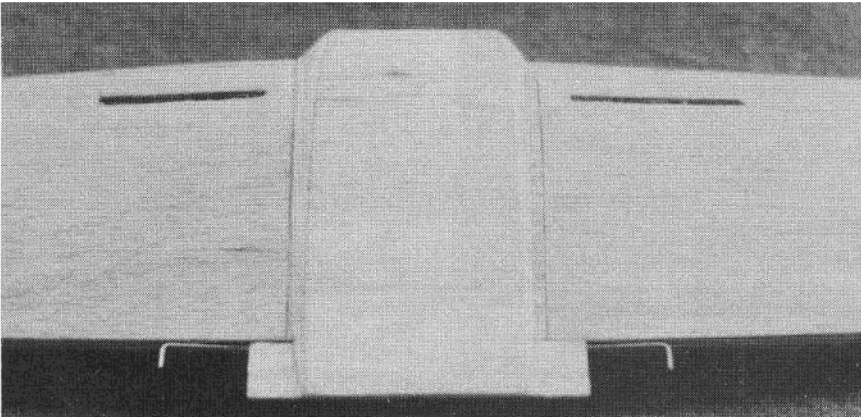
The cowling was manufactured from two



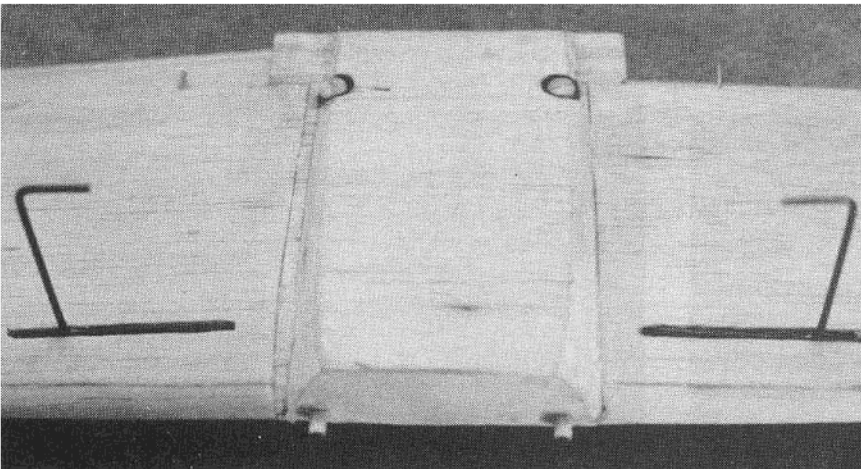
1/32" balsa sheeting covers the wing. Note aileron servo cut out in center section.



Be sure to install landing gear blocks prior to sheeting the wing. Fuselage/wing fillet is foam block, then sheeted with 1/32" balsa.



Fuselage/wing fillet is sheeted and blended in with center section T.E., ready for aileron hinging.



Completed wing with landing gear, wing dowels, and retaining bolts all in place.

small plastic water bottles, then sprayed with polyurethane paint. We used the upper flat portion of a Palomar Mountain Spring water bottle and the bottom portion of an Evian Spring water bottle. The bottom of the Evian bottle slides nicely over the smooth section of the Palomar Mountain Spring bottle and when glued with 5-minute epoxy, makes a resilient, impact absorbing, dent resistant cowling.

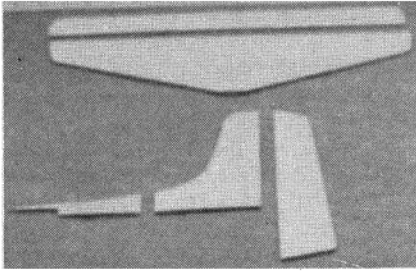
The cowling is fastened onto the fuselage using four small screws and 1/2" hardwood blocks. The blocks must be carefully epoxied onto the front of the fire wall in 90° positions to ensure that the cowling just clears the ends of the blocks. When the epoxy has cured and the blocks are secured to the fire wall, position the cowling and drill the mounting holes.

Wing:

The wing is made from an Ace tapered wing set and a 3/4" piece of an Ace constant chord wing. The wing has a 3/32" plywood spar epoxied into it. The spar dissects the center section and extends 5" into each of the tapered sections. Drill the wing

MATERIAL LIST FOR "SKYRAIDER"

- 1 — 3/4" x 3/4" x 12" balsa (wingtip blocks)
- 1 — set of Ace Foam tapered wings
- 1 — 4" piece of Ace Foam constant chord wing
- 2 — 4" x 48" x 3/32" sheet balsa (one medium, one hard)
- 1 — 2" x 30" x 1/2" light medium balsa
- 2 — 8" x 48" x 1/32" light sheet balsa
- 1 — 8" x 12" x 1/64" birch plywood
- 1 — 8" x 12" x 1/8" birch plywood
- 1 — 1" x 48" preformed trailing edge (1/4" at thickest section)
- 1 — 1/4" x 1/8" x 48" balsa stock
- 1 — 1/4" x 48" triangular stock
- 1 — 3/4" x 1/4" x 12" hardwood block
- 1 — 3/4" x 15" preformed leading edge stock
- 1 — set of 1 3/4"-2" Goldberg "Skylight" wheels
- 1 — 1/2" or 3/4" tail wheel
- 1 — 3/16" hardwood dowel 3" long (wing mounting)
- 1 — 3/4" hardwood dowel 1" long (wing mounting)
- 1 — 3/32" x 24" diameter steel wire
- 1 — 1/16" x 3" diameter steel wire (tail wheel)
- 1 — Goldberg tail wheel bracket
- 2 — sets of Goldberg "flat" landing gear straps
- 4 — 3/32" wheel collars
- 1 — extended .15 size nylon motor mount
- 2 — set of mounting hex screws, washers, and 1 set of blind nuts
- 1 — set of 1/2A strip aileron torque rods
- 1 — package of two control horns
- 2 — Gold-N-Rod pushrods and clevis'
- 1 — package of two 10-24 nylon wing bolts
- 1 — 1/12 scale Williams Brothers military style pilot
- 1 — 6" Sig P-51 style canopy
- 1 — package of "Easy Hinges"
- 1 — roll of Top Flite "MonoKote"
- 1 — O.S. or Magnum .10-.15 engine
- 1 — 91 approved receiver and transmitter using four micro servos
- 1 — 4 oz. fuel tank
- 5-minute epoxy
- New odorless CA
- 5-minute epoxy Gel



Tail pieces are all cut from 3/32" sheet balsa.

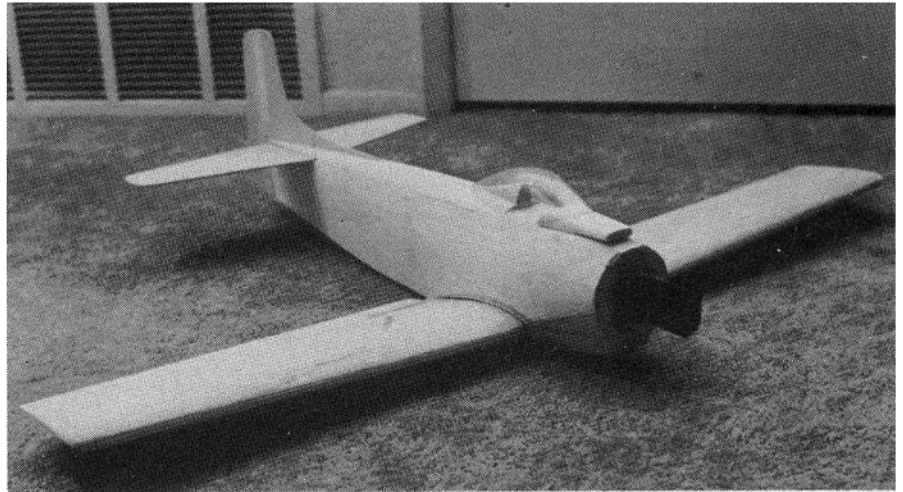
mounting holes to accommodate the nylon wing mounting screws of your choice (refer to plans for exact location). A rectangular balsa subtrailing edge is attached to the "cut-off" foam trailing edge. Carve out a small area of the subtrailing edge stock, near the center section of the wing, and mount the 1/2A strip aileron linkage to the rectangular balsa according to the plan. Measure your fuselage width and cut ailerons from trailing edge stock. Complete the stationary trailing edge which secures the aileron linkage by epoxying into place. To ensure that the epoxy doesn't seize your linkage, a little cooking oil, carefully applied to the linkage (not the wood), prevents the epoxy from gumming up the controls. Using the plans as a guide, make up the landing gear blocks. Carefully position, and cut holes in the wing core to accept the landing gear blocks. Epoxy the landing gear blocks in place.

Wing Sheeting:

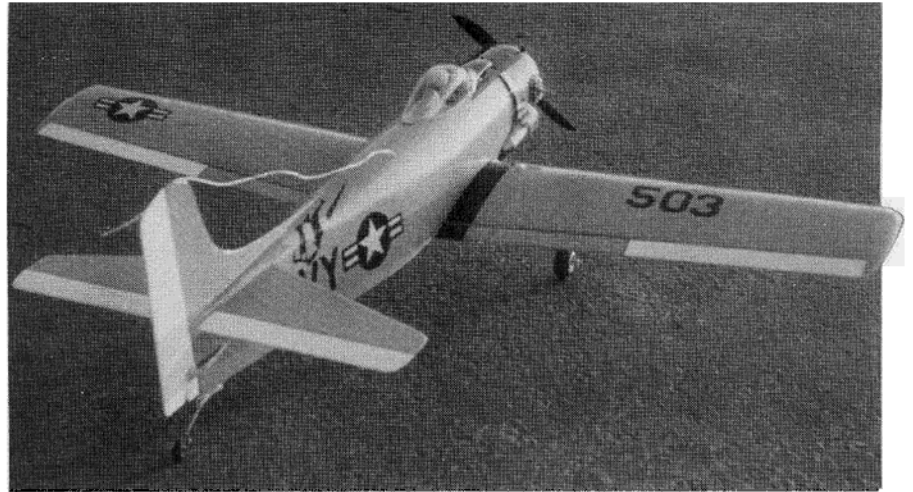
The wing is sheeted by applying 1/32" (light) balsa to the top and bottom surfaces. This procedure was easily accomplished by squeegeeing odorless CA over the wood and applying the wood to the foam surface. It would be wise, after sheeting one side of the wing, to redrill the wing mounting holes through the balsa sheet which has just been attached prior to sheeting the other side of the wing.

Fuselage Fillet and Wingtips:

The bottom fuselage fillet is rough cut from a foam block and attached to the wing using odorless CA. Temporarily fit the wing to the fuselage and sand the fillet to shape. Remember to sand this piece 1/32" smaller than the fuselage lines. Sheet the fuselage fillet with 1/32" balsa. Using odorless CA, attach the balsa stock to the wing to form wingtips, and sand to shape. The wing is attached to the fuselage at the front with two wooden dowels and at the rear, with two nylon screws. Locate, and epoxy the two 3/4" x 1/2" x 1" hardwood blocks to the fuselage. When the blocks are secure, place the wing in its correctly aligned mounting position and drill, then tap the wing mounting screw holes. Drill the front dowel holes in the balsa leading edge. Secure the two 3/16" dia. wing dowels into position in the wing using epoxy. When the dowels are secure, align the wing to the F-2 bulkhead, then mark and drill the wing dowel holes in F-2.



All framed up and ready for final sanding and covering.



The finished model, ready to go!

Tail Assemblies:

The fin, rudder, horizontal stabilizer, and elevator are scale in size. Cut the tail pieces according to the plan from 3/32" balsa sheet. The elevator is joined using 3/32" dia. wire (bent to the shape shown on the plan) with fiberglass used on the top and bottom of the joined areas for reinforcement.

The AD-1 is designed for a 4 oz. tank, which yields a 15-minute flight, long enough to have some meaningful flight time, but not long enough to irritate a fellow club member waiting for the frequency pin.

Covering:

Obviously there are a number of ways to cover this model. We recommend that the entire model be covered with one of the many fine plastic films available on the market (we used TopFlite MonoKote). Remember (unless you are a master, when using plastic film type covering), to achieve best results, cover the tail pieces and fuselage separately. Then, prior to attaching the tail feathers to the fuselage, carefully cut away the portion of the covering on the "gluing area" of the horizontal and vertical tail surfaces. This method of covering makes it easy to cover.

Flying:

The "Skyraider" is not squirrely on the ground. With an adequate amount of elevator back pressure the Skyraider tracks straight and true down the runway with only a minimum amount of right rudder.

Take off is accomplished by pushing the throttle to full and allowing the tail to rise off the ground by easing up on the back pressure (elevator). When the tail rises, allow the plane to accelerate to take-off speed (I don't know exactly how many mph equals take-off speed, but I know what it is when I see it!). Gently release elevator stick pressure so that a proper take-off attitude is maintained. Depart the flight pattern in the usual manner.

Once in the air, I would estimate the speed to top out at 75-80 mph using an APC 8 x 4 prop. Given the planes small size, that's fast enough. The plane is fully acrobatic and will climb on its nose, although it's not a rocket. The roll rate is phenomenal, as set up per the call outs on the plans, but the throw could be adjusted to accommodate a variety of pilots. The AD-1 will complete three revolutions "hands off" the rudder and elevator without appreciable loss of altitude.

Now for the best part. Of the scale "Warbirds" that I have seen fly, without exception, when landing "speed equates to life." This type of landing gives a pilot a wonderful feeling of accomplishment — once the plane is safely down. Unfortunately, I have seen many "slowed" warbird tip stall regardless of the washout fashioned into the wing. However, what we have discovered so far, is that the AD-1 has only mild tip stall characteristics induced below 5 mph. Generally, upon stall, the nose will drop forward allowing the pilot to continue his final approach, or increase the power to re-enter the pattern.

I would estimate that the minimum landing speed is about 10-15 mph. Touch down is accomplished on the main gear. The tail has a tendency to stay aloft, so the pilot must use back pressure to get the tail wheel on the ground and reclaim proper ground handling. **Caution:** Landings attempted at slower than 5 mph could result in a tip stall!

The plane is a lot of fun for a considerably small investment. It fits neatly into a small car without unbolting the wing. It lands as slow as most trainers, yet is as fast and maneuverable as some (correctly powered), .40 size ships and twice as economical. □

**From
RCModeler
Mar. 1994**