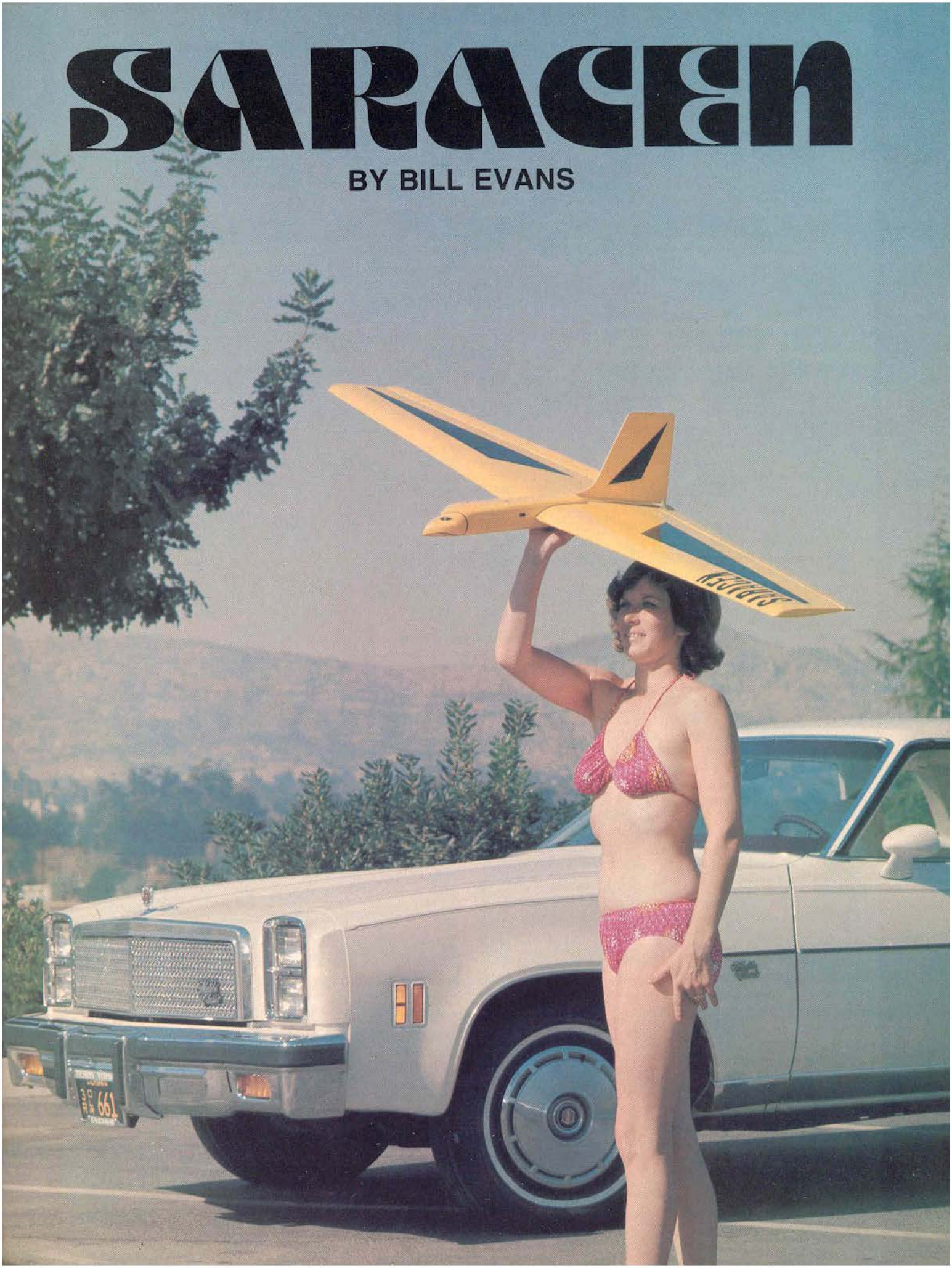
SARACEN

BY BILL EVANS



The "Saracen" is dedicated to all modelers who have had their interest aroused by the mystique of the "flying wing."

If a poll were taken of modelers asking "which aircraft configuration holds most interest and challenge to build and fly," the answer would very likely be "the flying wing."

When asked the obvious second question — "Have you built and successfully flown a flying wing," the majority would answer no . . . because there is a lack of sufficient information about the design and construction of flying wings — the information available tends to be conflicting — if flying wings were practical, we would see them in use as full-sized aircraft — it has been reported by the experts that flying wings are unstable.

Though the above list is partial and you, the reader, could add additional comments, the author suggests that what is needed to satisfy the would-be flying wing modeler is added printed information based on experience and modeler awareness of successful flying wing designs.

As you read on, you will find out about the author's experiences, problems and successes with the "Saracen", a six foot flying wing sailplane that the sport modeler can easily build and fly successfully.

In August of '74, while on a trip back to Indiana, I had a long chat about R/C sailplanes with a long time modeler friend, Bill Braatz. In fact, he and I began flying together more than thirty years ago, anyhow the "old pro" got me to do some heavy thinking about a flying wing sailplane.

In speaking with other modelers about such a project, I became even more turned on when I heard remarks like, "wings won't fly well," "wings are unstable," "wings have serious C.G. problems," etc.

In the past months, since the Indiana trip, I have learned a great deal about flying wings, first hand. During the period from August of '74 to January '75, I have designed, built and successfully flown sixteen flying wings. They are in the order of Airplane Number, Wing Span, and Description and Remarks:

(1) 6' — Glider — airfoil proved to be faster than necessary for thermal flying.

(2) 5' — Glider — repeat of number one, redesigned airfoil and fuselage.

(3 & 4) 4' — Glider — flying weight 15 ounces.

(5) 10' — Glider — high aspect ratio required control surface changes to produce effective turns.

(6) 6' — Glider — repeat of number two with fuselage modifications.

(7) 4' — TD .049 powered — very fast requiring full attention while flying, no landing gear.

(8) 5' — .15 powered — very smooth flying excellent glide on dead stick landings.

(9) 4' — AFI .05 electric powered.

(10 & 11) 6' — Glider — repeat of number six.

(12) 4' — TD .049 powered — repeat of number seven, fuselage redesigned.

(13) 6' — Glider — repeat of number six, construction improved.

(14) 5' — .15 powered — repeat of number eight, with redesigned fuselage.

(15) 5' — .15 powered — repeat of number fourteen, motor control added.

(16) 6' — Glider — repeat of number twelve, final changes complete.

The purpose behind building this number of ships was to insure the design reliability. All of the above listed ships are in good flying condition, with one exception which I never bothered to re-build after a mid-air.

The significant design features of the "Saracen" are:

(1) Straight leading edge with a tapered forward trailing edge, aspect ratio 7.5:1.

(2) A semi-symmetrical airfoil with a slight reflex.

(3) Control surfaces consisting of elevons (combination of aileron and elevator functions.)

(4) Far forward center of pressure, producing longer than normal tail moment.

(5) Foam wing construction for building ease.

The Saracens flight characteristics, from the start, have been excellent. Launching from the Hi-Start or towline is done with ease and you need only to be careful of over-correcting (you may be conditioned to the slower rudder response of large conventional ship). Just go easy on the left/right control, remember the Saracen employs ailerons which make turns very easy. Once in the air, keep your speed up while searching for thermals. When the ship bumps (indicating lifting air) make smooth tip up turns. At this point you will find that the elevons function as flaperons in that down trim will increase the lift producing effect of a thermal.

Those of you readers fortunate enough to have a slope to fly from will find the Saracen to be an aerobatic slope machine with near full pattern ship capabilities.

The following conclusions from my experiences with flying wings are listed for your information:

(1) The straight leading edge and tapered forward trailing edge with C.G. as shown on the plans produces good tail moment which, in turn, produces very stable pitch.

(2) Keep the wing loading as light as possible, 5 to 8 ounces per square foot. The stall speed of the flying wing at a light wing loading will be lower than the stall speed of conventional aircraft at the same light wing loading. Conversely, the stall speed of a flying wing at a high wing loading will be much higher than the stall speed of conventional aircraft at the same high wing loading.

(3) The semi-symmetrical airfoil, slightly reflexed, produces excellent thermal flying.

(4) Elevons produce adequate control surfaces with aspect ratios of 8-to-1 or less. At 9 or 10-to-1 aspect ratio, the elevon effectivity is significantly reduced and will become ineffective, making it necessary to employ spoiler both top and bottom as the aspect ratio reaches 10-to-1 or greater.

(5) The elevon mixer shown on the plans has proven to be very reliable. I have not experienced or been made aware of any failures of this system. At this time, there are more than 100 Saracens being flown, and all reports, without exception, have been good.

All you need to do is follow the plans and construction instructions to make your Saracen building project a flying success. For your convenience, Saracen wing cores are available for $8.00 postpaid from the author. Address to: Bill Evans, 19216 Calvert Street, Reseda, California 91335.

SARACEN
Designed By: Bill Evans

TYPE AIRCRAFT
Thermal & Slope Flying Wing
WINGSPAN
72 Inches
WING CHORD
13¾" Root — 7⅛ Tip
TOTAL WING AREA
751½ Square Inches
WING LOCATION
Mid Fuselage Pod
AIRFOIL
Symmetrical Reflexed
WING PLANFORM
Swept T.E.
DIHEDRAL, Each Tip
2 Inches
O.A. FUSELAGE LENGTH
23¾ Inches
RADIO COMPARTMENT AREA
(L) 9¼" X (W) 2¼"-3" X (H) 2"
ELEVON AREA
112½ Square Inches
VERTICAL FIN HEIGHT
7⅛ Inches
VERTICAL FIN WIDTH (incl. rudder)
6¼ Inches (Avg.)
REC. NO. OF CHANNELS
Two
CONTROL FUNCTIONS
Elevons
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa
Wing	Balsa and Foam
Empennage	Balsa
Weight Ready-To-Fly	32-34 Ozs.
Wing Loading	6½ Oz./Sq. Ft.

Material List

6 — 1/16" x 4" x 36" balsa sheet.
3 — 3/16" x 3" x 36" balsa sheet.
2 — 1/4" x 3" x 36" balsa sheet.
2 — 1/2" triangular balsa strips.

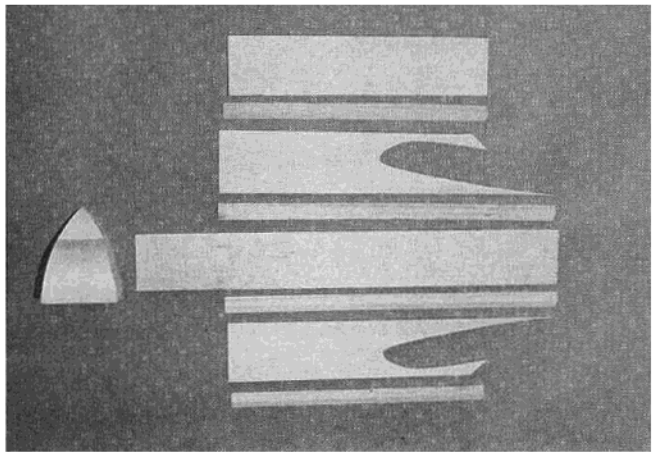
CONSTRUCTION

☐ Cut two 1/2" and two 3/8" strips from the 1/4" sheet.

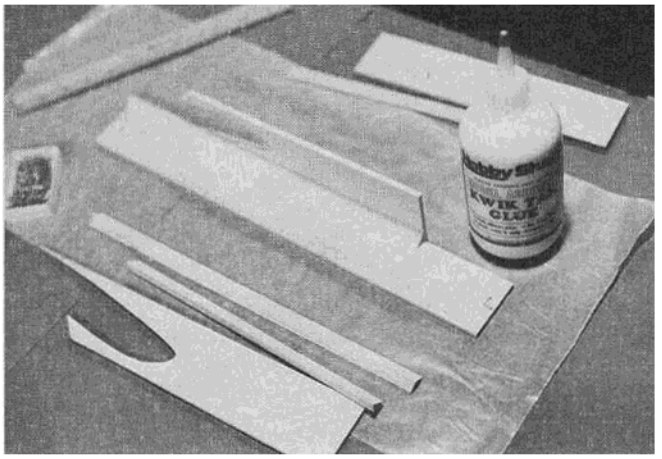
☐ Cement and pin the 1/2" x 1/4" balsa strip to the leading edge of each wing panel, making sure that the leading edge is kept straight.

☐ Cement and pin the 3/8" x 1/4" balsa strip to the trailing edge of each wing panel.

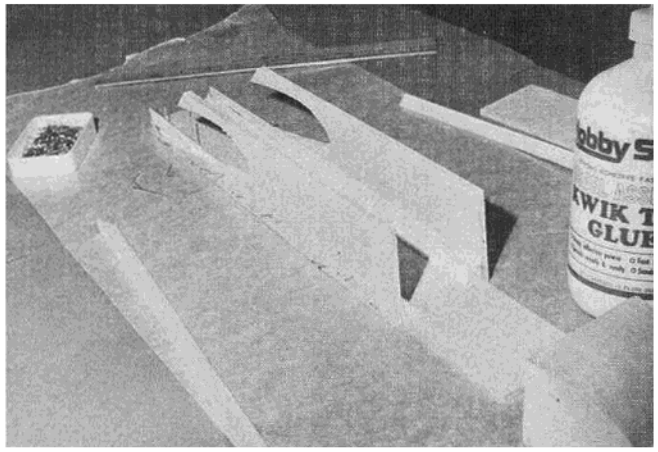
☐ Set these assemblies aside to dry.



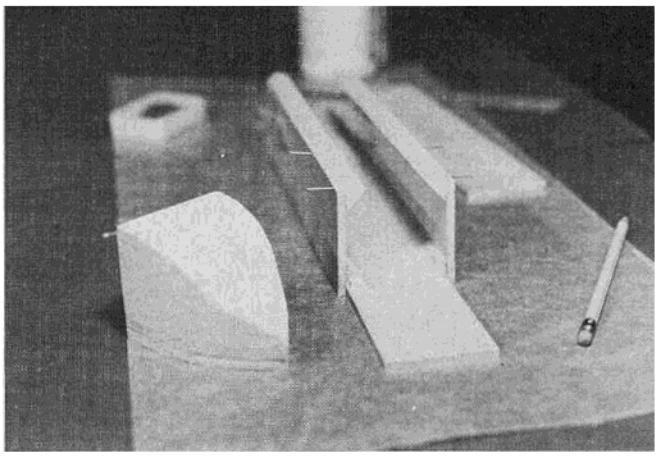
The Saracen fuselage parts cut out and ready for assembly.



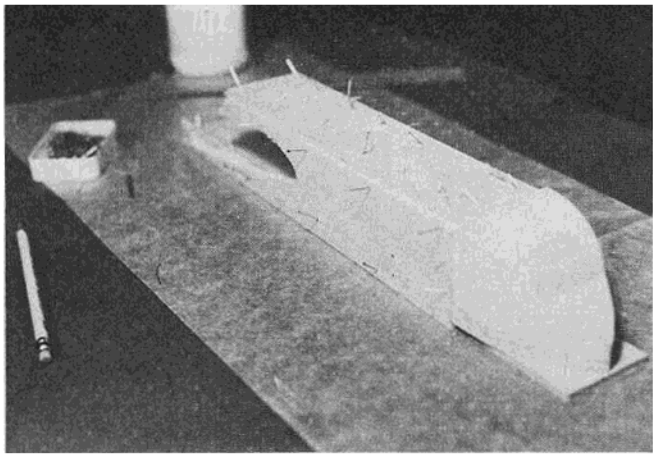
Fuselage bottom with left side and 3/8" triangular stock glued in place.



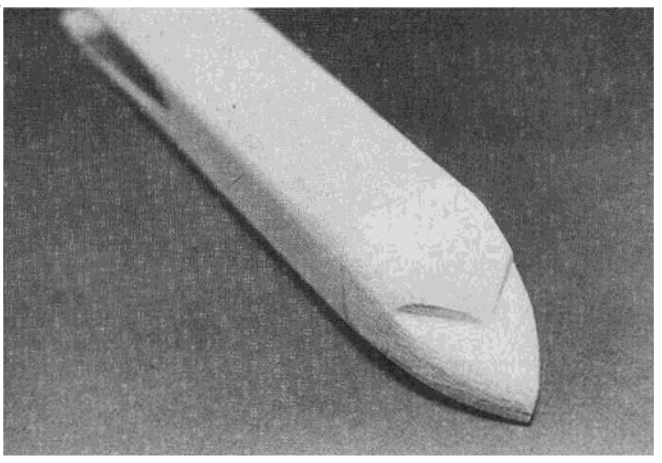
A view of the fuselage with both sides glued and pinned in place.



At this point the top 3/8" triangle stock is glued to the fuselage sides.



This photo shows all the fuselage parts glued and pinned in place.



After drying, the completed Saracen fuselage is rough sanded.

☐ Cut the fuselage sides, top and bottom from 3/16" sheet. At this point, you must decide which fuselage width you require. The plans show a wide fuselage which is for brick installations using the Kraft elevon mixer. The narrow fuselage is designed for independent servos using a sliding tray.

☐ Pin the fuselage bottom to a flat surface.

☐ Glue and pin the left fuselage side against the fuselage bottom. Pin the 1/2" triangle stock against the left fuselage side and the fuselage bottom.

☐ Repeat above step for the right side.

☐ Glue and pin 1/2" triangular stock to the top inside edges of the fuselage.

☐ Glue and pin the fuselage top, making sure not to glue the top to the sides, since this top piece fits between the sides, not over them.

☐ Cut the nose block to shape.

☐ Glue and pin the nose block in place on the fuselage bottom and up against the front of the fuselage.

☐ Glue and pin the 3/16" sheet pieces for the rudder together on a flat surface.

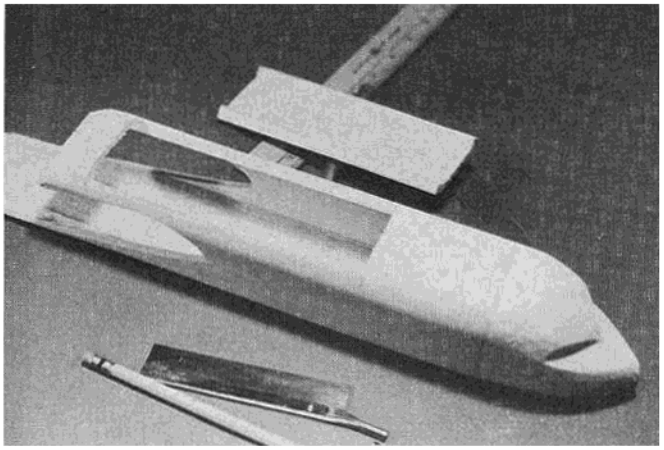
☐ Trim and sand the wing leading edges so that the leading edge wing skins will fit nicely over the leading edge.

☐ Trim and sand the trailing edge strips to be flush with the foam.

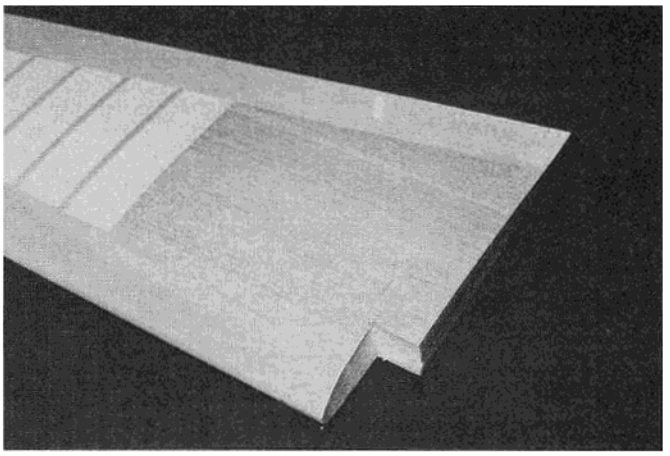
☐ Locate and mark the position of the wing skins on each wing panel.

☐ Apply contact cement to both the foam and the wing skins.

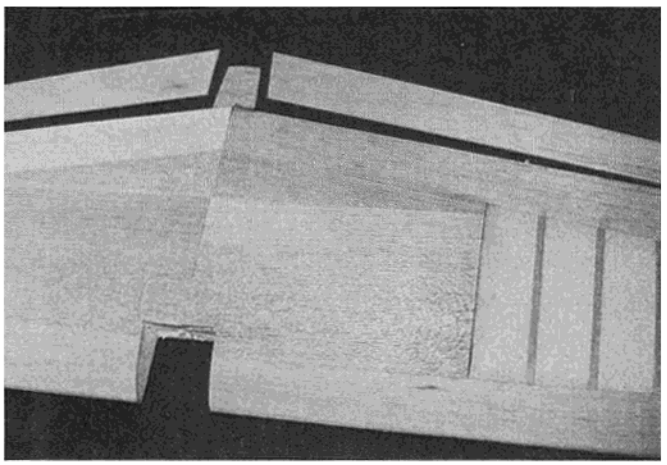
☐ Bond the wing skins to the wing panels, making sure that no warps occur when



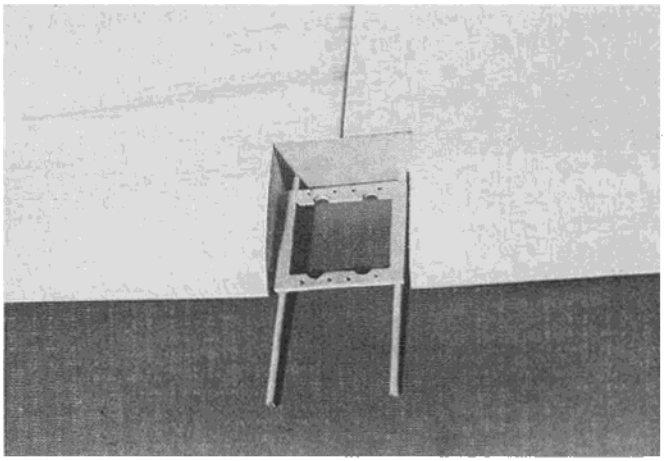
The hatch is cut out with an X-Acto knife for the horizontal cuts and a Zona saw for the cross-cuts.



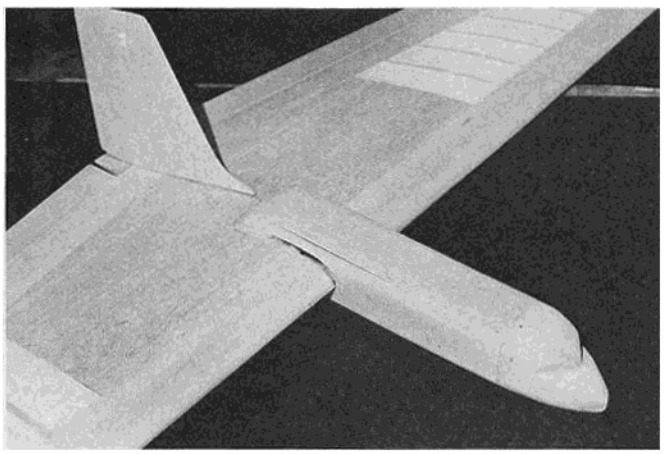
One wing panel showing the sheeting, capstrips, and fuselage cut-out.



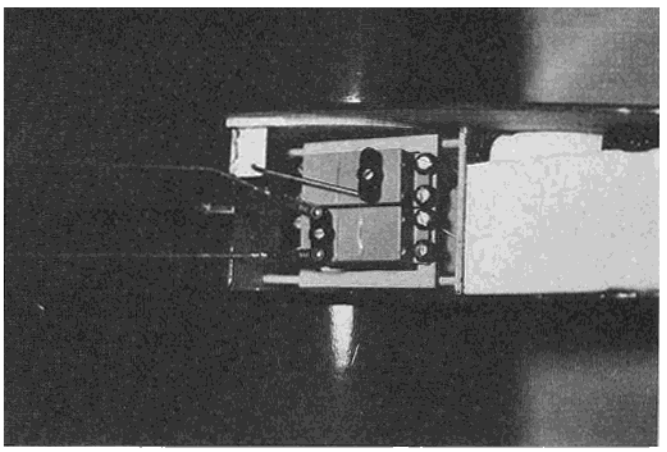
A view of the two wing panels joined together.



At this point, trial fit the servo tray in the wing recess.



The Saracen complete – ready to cover.



A cutaway showing the servos and elevon linkage installed.

bonding the skin to the wing. This should be done on a flat surface.

☐ Sheet the wing center sections.

☐ Glue and pin on the 1/4" x 1/16" capstrips at 2" intervals.

☐ Sand the wing panels smooth, round the leading edge to an airfoil shape, and slightly round the trailing edge as shown.

☐ Epoxy the wing panels together using a 2" block under each tip.

☐ Cut and glue the tail block to the wing (see plans — tail block fits between the elevons.)

☐ Cut the elevons from 1/4" sheet and sand to shape as shown.

☐ Cut the rudder from 3/16" sheet and sand to shape as shown.

☐ Cut a notch in the wing to accept your choice of radio installation. In most cases, cut a 2" wide piece out of the wing at the center section the length of the cut should be about 3" starting at the leading edge.

☐ Cover the wing, elevons, and rudder.

☐ Trim and sand the fuselage to shape.

☐ Cut the hatch as shown.

☐ Cover the fuselage.

☐ Locate the fuselage on the wing and pin in place, then mark the fuselage location with a pencil. Remove the fuselage and trim the wing covering away where the fuselage covers the wing.

☐ Construct and install the sliding servo tray if the narrow fuselage is your choice.

☐ Epoxy the fuselage to the wing.

☐ Epoxy the rudder to the wing,

. . . . . removing the covering before epoxying.

☐ Attach the elevons to the wing.

☐ Install your control linkage, making sure that left rudder control on the transmitter results in the left aileron going up and the right elevon going down.

☐ The neutral position of the elevons should be such that the elevons are raised about 1/8'' to 3/16'' above what you would normally expect as neutral. This will produce a slight reflex.

Flying — **Don't over control**. Easy smooth control must be applied until you become familiar with the craft. Fly it a bit on the fast side to start with. On your first Hi-Start launches, run a bit to give a straight launch and don't apply excessive aileron control — **go easy** on the aileron.

Good flying with your Saracen. ☐

From RCModeler Apr. 1976