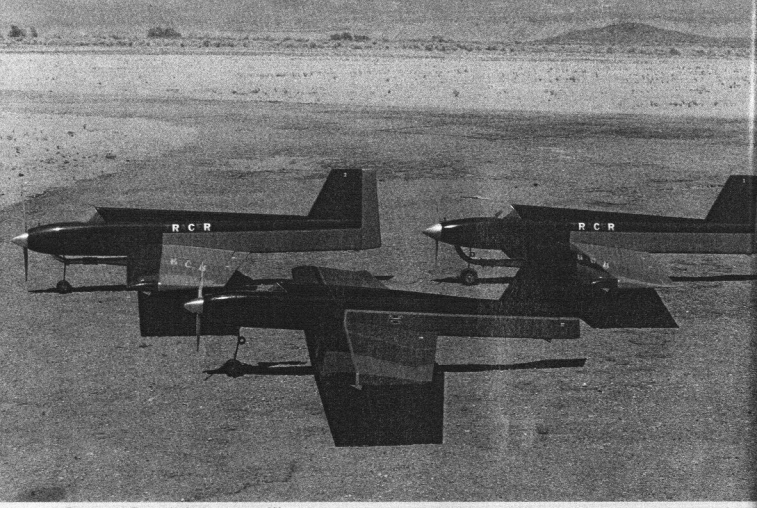


Foreground: Tracer 40, in the rear, two 60's.

TRACER 40/60

By Bill Evans

The Tracer 40 and 60 add up to 100. Actually, either one of them is a 100 percent pattern ship.

After the first glance of the Tracer you may reason that I finally relented and built the Simitar as a conventional aircraft. Well, look again, no stab! No need to worry, it flies great without.

Experience with the many "Simitar" designs over more than a decade has established a hybrid aircraft with several aerodynamic advantages superior to the more conventional aircraft. First is the no stall advantage --- never a snap roll on a premature take-off, or when pulling elevator, while stretching a dead stick landing to reach the field. Next is the wide speed range, from 15 mph to 150+ mph is certainly a plus, excellent control response at all speeds. Now, add total hands-off stability --- touch some aileron, and let off, it holds the turn. Touch up elevator, let off, it holds in a climb.

The significance of the Simitar "Total Performance" had not been fully realized until Bill Winter and I got into the Simitar Slow Motion Project. Guess I had been too close to the forest to see the trees. It's interesting that I'd been flying the

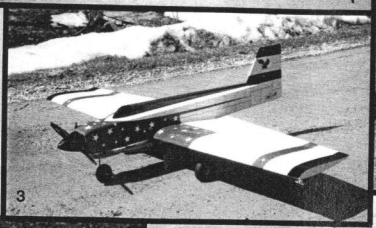
The flying wing expert, Bill Evans, has taken his Simitar design and, at first glance, made it look like a conventional aircraft. Look again, no stab. It performs superb without it.

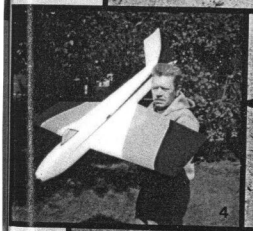
design all these years and took all the performance plus features for granted. Winter's comments about how well the ship performed made me realize how good the performance really is.

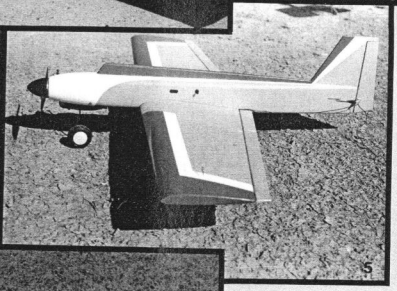
So, I put the "Total Performance" advantage of the Simitar configuration to work in the design of a pattern ship, result is the Tracer 60.

Before I go any further, it's important to name Paul Samaras of Lakewood, Colorado; Ray Holmes, Greenville, Tennessee; Joe Misicka, Hillsdale, Illinois; Larry Smith, El Campo, Texas; Reuben Vargas and Doug Stanek both of Bishop, California. All of the above helped in the development of the Tracer by building and test flying before actual preparation of this construction article. Paul Samaras became so involved that he built the first Quarter Scale size, powered by a Bully, which pulls the 21½ pounder with ease. Paul reported to me that his Super Tracer flies almost the same as his Tracer 60, a bit slower, but still snappy — stalls, loops, snaps, inverted and outsides, all excellent!

Design approach included my basic,







1. *Tracer 60 by Paul T. Samaras, Lakewood, Colorado.*
2. *Tracer 40 by Larry Smith, El Campo, Texas.*
3. *Tracer 40 by Keith Brautigam, Ontario, Canada.*
4. *Tracer 40 by Joe Misicka, Hillsdale, Illinois.*
5. *Tracer 40 by Steve Hosner, Montrose, Colorado.*
6. *Tracer 60 by Ray Holmes, Greenville, Tennessee.*

TRACER 40 & TRACER 60

Designed By:
Bill Evans

NAME OF AIRCRAFT	**NAME OF AIRCRAFT**
Tracer 40	Tracer 60
TYPE AIRCRAFT	**TYPE AIRCRAFT**
Sport Flying Wing	Sport Flying Wing
WINGSPAN	**WINGSPAN**
50½ Inches	60¾ Inches
WING CHORD	**WING CHORD**
11½ Inches (Avg.)	13⅜ Inches (Avg.)
TOTAL WING AREA	**TOTAL WING AREA**
580 Sq. In.	846 Sq. In.
WING LOCATION	**WING LOCATION**
Low Wing	Low Wing
AIRFOIL	**AIRFOIL**
Semi-symmetrical Reflexed	Semi-symmetrical Reflexed
WING PLANFORM	**WING PLANFORM**
Swept T/E	Swept T/E
DIHEDRAL EACH TIP	**DIHEDRAL EACH TIP**
7/8 Inch	1 Inch
O.A. FUSELAGE LENGTH	**O.A. FUSELAGE LENGTH**
40 Inches	51¾ Inches
RADIO COMPARTMENT SIZE	**RADIO COMPARTMENT SIZE**
(L) 12" x (W) 2¼" x (H) 2"	(L) 15" x (W) 2¾" x (H) 2¾"
ELEVON AREA	**ELEVON AREA**
78 Sq. In.	103 Sq. In.
VERTICAL FIN HEIGHT	**VERTICAL FIN HEIGHT**
5½ Inches	7¼ Inches
VERTICAL FIN WIDTH (incl. rud.)	**VERTICAL FIN WIDTH (incl. rud.)**
6½ Inches (Avg.)	8½ Inches (Avg.)
REC. ENGINE SIZE	**REC. ENGINE SIZE**
.40	.61 Cu. In.
FUEL TANK SIZE	**FUEL TANK SIZE**
8 Oz.	13 Oz.
LANDING GEAR	**LANDING GEAR**
Tricycle	Tricycle
REC. NO. OF CHANNELS	**REC. NO. OF CHANNELS**
4	4
CONTROL FUNCTIONS	**CONTROL FUNCTIONS**
Elevons, Rud., Throt., Nosewheel	Elevons, Rud., Throt., Nosewheel
BASIC MATERIALS USED IN CONSTRUCTION	**BASIC MATERIALS USED IN CONSTRUCTION**
Fuselage ..... Balsa & Ply	Fuselage ..... Balsa & Ply
Wing ..... Balsa, Foam & Ply	Wing ..... Balsa, Foam & Ply
Empennage ..... Balsa	Empennage ..... Balsa
Wt. Ready To Fly ..... 72 Oz.	**Wt. Ready To Fly ..... 116 Oz.**
Wing Loading ..... 17.9 Oz./Sq. Ft.	**Wing Loading ..... 19.7 Oz./Sq. Ft.**

slightly reflexed airfoil and the proven swept forward trailing edge wing planform. The Skywalker 60 (RCM March '85) fuselage was stretched rearward and a generous fin and rudder attached. Due to the length of the fuselage and far forward C.G., the rudder moment arm is quite long and produces very good yaw characteristics necessary for pattern maneuvers.

What would be gained by adding 10 to 12 oz. of gear works and servo for retracts? Also it could be that the drag created by the open wheel wells is almost equal to the drag with fixed gear. The question of retracts was debated and as you can see, the easy way out, fixed gear.

As with my Simitar, the Tracer has control surfaces at the trailing edge of the wing. These surfaces function as elevators (for pitch) and ailerons (for roll). They are elevons, which produce a very smooth delivery of control response.

Foam cores, 1/64" ply sheeting, 3/8 balsa sides and top, iron-on covering, a Webra 61 with Mac's pipe and your Tracer 60 weighs in at 7½ lbs. With an 11 x 7 prop the vertical is outrageous.

After first flying the Tracer 60 I concluded that all maneuvers looked fine. Must be, if **it could** do it all without a stab! I really got excited when pattern fliers, Wayne Sakamoto and Rich Verano began to smile very pleasantly while flying the Tracer. While discussing the ship's performance with Wayne and Rich, I told them I planned to change a few things. They both said, "It works, don't fix it!" Rich's specific comment was that the Tracer easily performed maneuvers the first time he flew it, other ships he had flown required much more time to become proficient with.

No discussion of the Tracer 60 could be complete without including its radio, the Futaba PCM. The PCM is amazing, fantastic and more than I could have ever hoped for. Since my first radio was a Vern McNabb gas tube with a wind-up escapement which operated only the rudder, and going through reeds, and finally the more modern radios of today, I truly appreciate what the PCM can do.

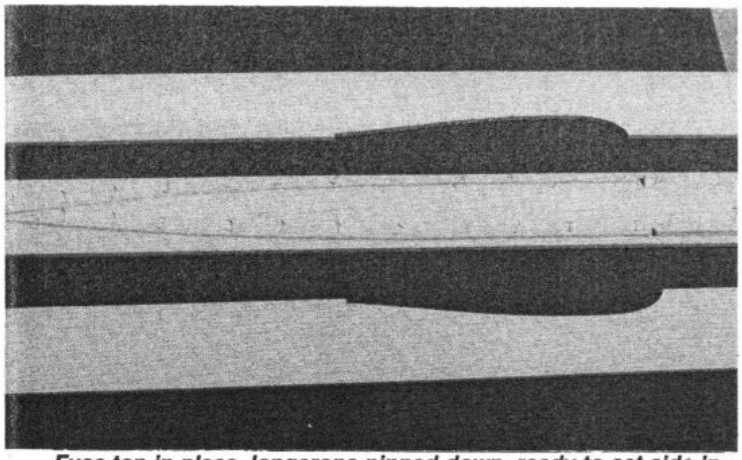
At first glance, the PCM smacks of a fine piece of machinery, some say it's complicated, but complicated from a positive view. It's easy to use, the sequence of steps required to set up any of the many, many functions may be mastered in no time at all, and they are easily remembered. I could go on and on about the many super features from the count up and down timer, the built-in tach and all the various mixing and coupling functions, but let me say how great an accomplishment it is to actually create so fine a radio system. My hat is off to the engineers and special folks at Futaba who had the wherewithal to make the PCM a reality.

The Tracer 60 was so well-received, that it naturally followed that a Tracer 40 had to come. Though the 40 means, like K & B 40, I naturally had to mount a 6.5 in mine and as you would expect at 4½ pounds, the vertical is more than outrageous.

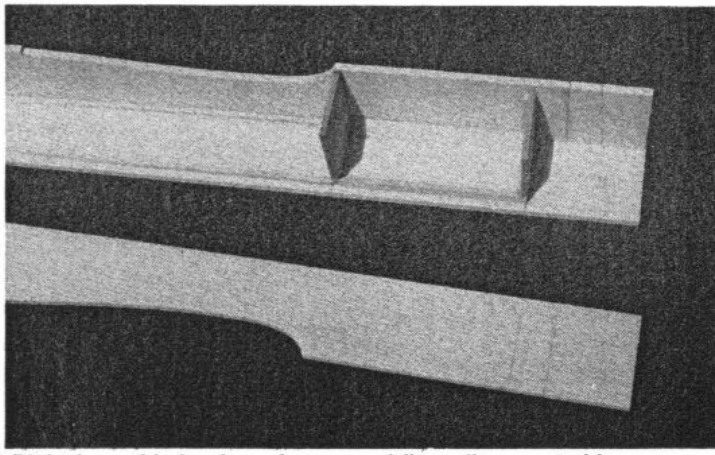
For the Tracer 40 I picked the Futaba 7FGK-FM radio. I should mention that the 7FGK has a V-tail mixer which can be easily converted to an elevon mixer. The best thing to do is contact Futaba and make the necessary arrangements to have your 7FGK changed from V-tail to elevon.

Certainly the absence of a rear mounted horizontal stab is an issue which results in mixed reaction. In fact, one of the more devilish fliers in our neck of the woods set up a Tracer with a fake stab. He fixed it up so the stab released and popped off when full throttle is applied. You can imagine the reaction of the unsuspecting observer when he watches the ship ease down the runway and lose the stab as full power is applied, then take to the air and fly as if nothing had happened.

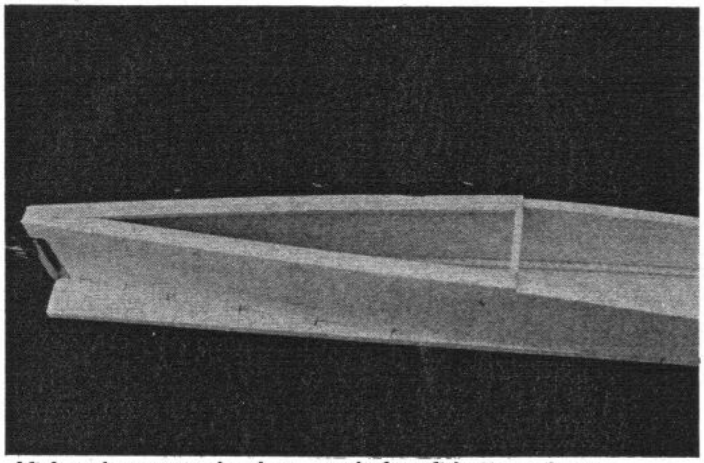
Construction is quite simple, four 2-hour building sessions should



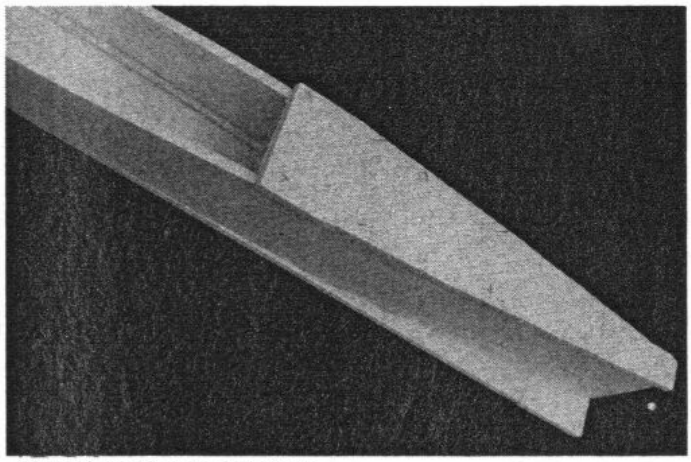
Fuse top in place, longerons pinned down, ready to set side in place.



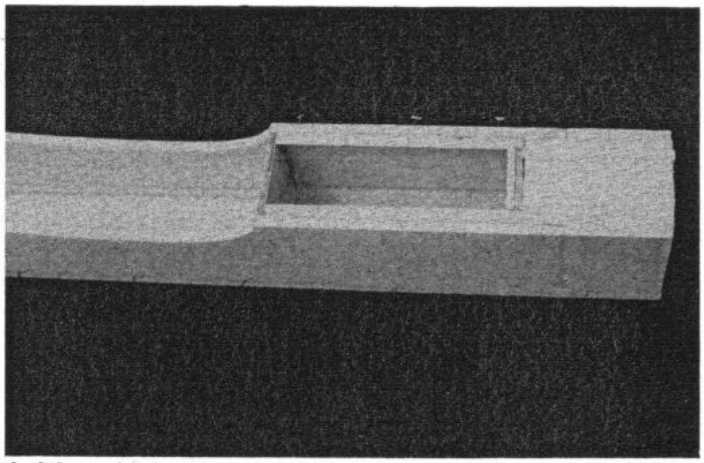
Right fuse side in place, former and firewall cemented in.



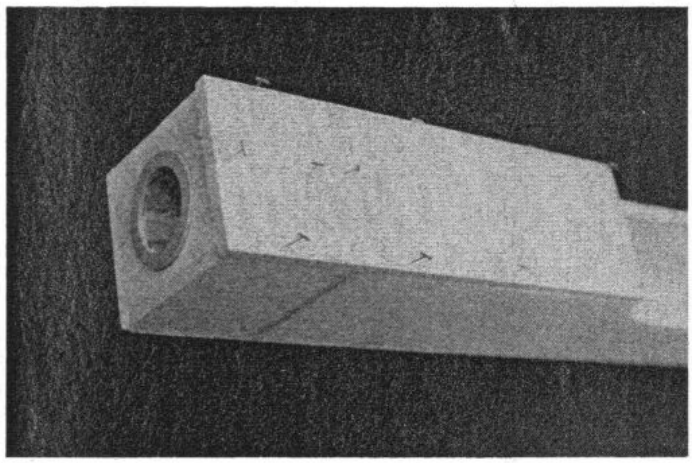
Aft fuse longerons in place, ready for aft bottom sheet.



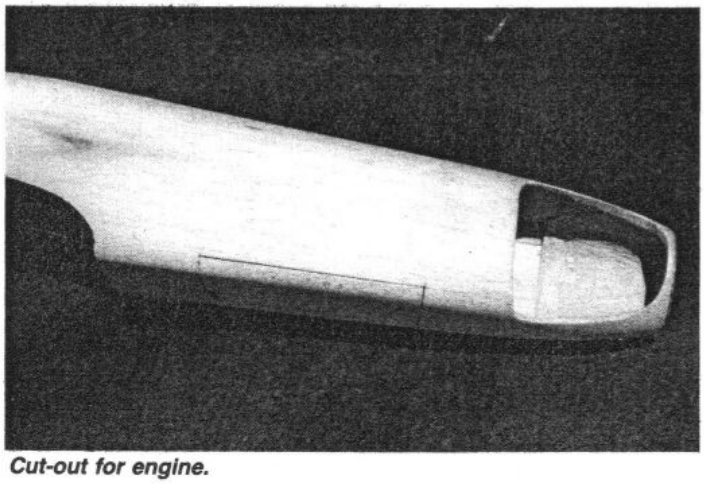
Aft bottom sheeting in place.



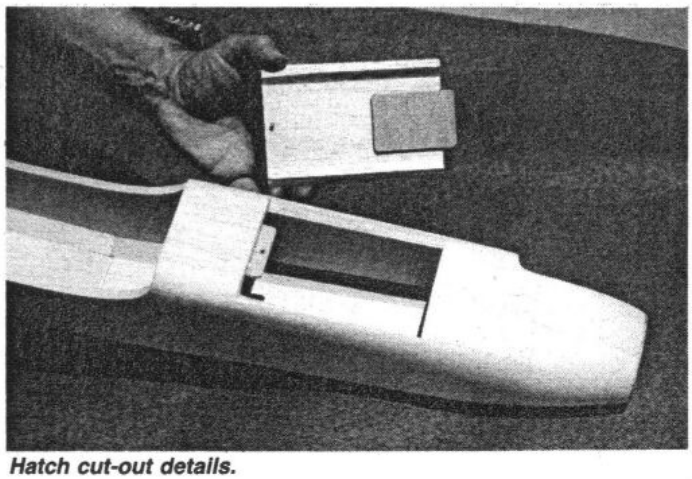
Left fuse side in place, nose blocked. Ready for bottom sheeting.



Front bottom sheeting in place.



Cut-out for engine.



Hatch cut-out details.

produce an air frame, ready to cover. Tracer cores and 1/64" ply sheeting can be ordered from Soaring Research, 454 Wildrose Lane, Bishop, California 93514, (619) 873-4932. Cores for the 40 are $12.00, the ply sheeting is an additional $12.00, add $4.00 for shipping. The 60 cores are $14.00 plus $16.00 for the ply, add $4.00 for shipping. California residents add 6%.

CONSTRUCTION

1. Glue (aliphatic) and pin the 1/8" leading edges and 1/4" trailing edges to the foam cores; be sure not to bend or warp the cores. Set aside, in cradles, to dry.

2. Make fuse sides, cut wing saddle. Cut firewall and former.

3. Mark a centerline on the fuse top. Mark position of firewall and former on fuse sides and fuse top.

4. Pin fuse top down on flat surface. Pin and cement (Hot Stuff) triangle stock to fuse top.

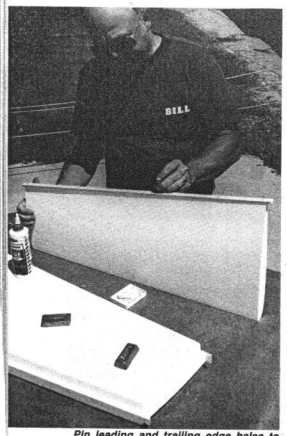
5. Glue and pin first fuse side to top, set in firewall and former.

6. Glue and pin in second fuse side to fuse top, firewall and former.

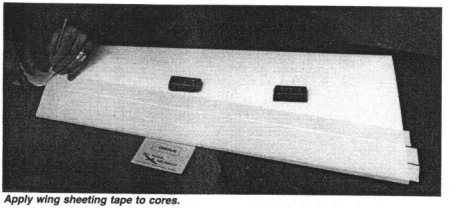
7. Glue and pin in fuse bottom longerons in place.

8. Cut and glue in balsa nose block pieces.

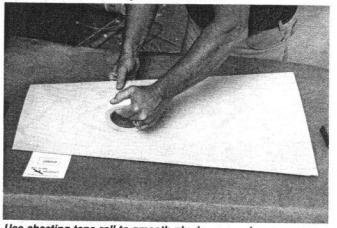
9. Sand bottom flush and cement



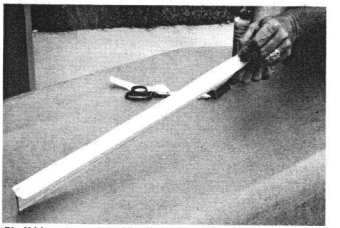
Pin leading and trailing edge balsa to foam core. Set aside to dry in core cradles.



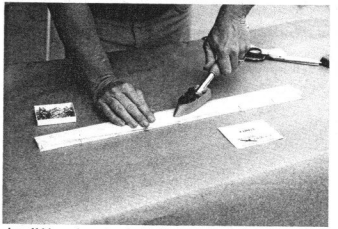
Apply wing sheeting tape to cores.



Use sheeting tape roll to smooth ply down on wing.

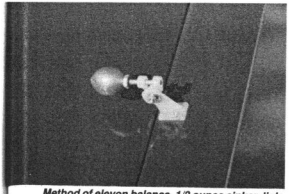


Pin X-hinge to center of leading edge of elevon.

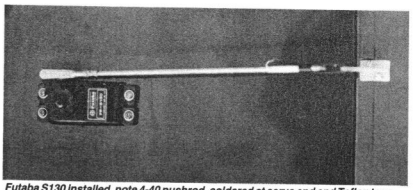


Iron X-hinge down on elevon (both sides).

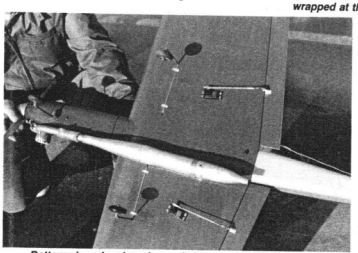
Pin elevon in place on wing and iron X-hinge down on both sides.



Method of elevon balance, 1/2 ounce sinker, link from elevon and cut down large control horn.



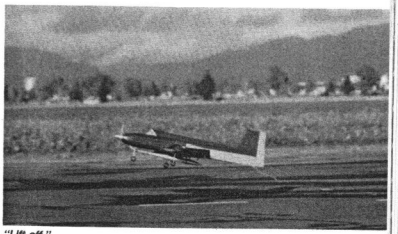
Futaba S130 installed, note 4-40 pushrod, soldered at servo end and Teflon tape wrapped at threaded end at elevon horn.



Bottom view showing pipe and elevon servos mounted in wing.

Futaba PCM system installed. Servo layout shows separate rudder servo at left, right of rcvr. is mixture control, top right is throttle and bottom right is nose wheel steering. A "Y" connector ties rudder and nose wheel together.

Tracer 60 by Wayne Sakamoto of Granada Hills, California. Wayne shows his standard answer when asked if it flies without a stab.



"Lift off."

bottom front and rear sheeting in place.

10. Sand nose square and cement 1/8" ply spinner ring in place.

11. Trim and sand balsa leading and trailing edges so the wing sheeting will fit smoothly over.

12. Bond sheeting to wing cores (we used Corefilm, a sheeting tape), be sure to vacuum the cores and sheeting. Trim sheeting, sand leading edge, then cement leading edge cap into place.

13. Carve and sand fuse to shape, cut out for engine, fit engine and final sand fuse.

14. Cut and sand canopy to shape, also vertical stab (fin and rudder).

15. Sand and join wing panels with 5-minute epoxy.

16. Cut and sand elevons to shape, fit to wing.

17. Dowel and nylon bolt wing to fuse as shown in photos.

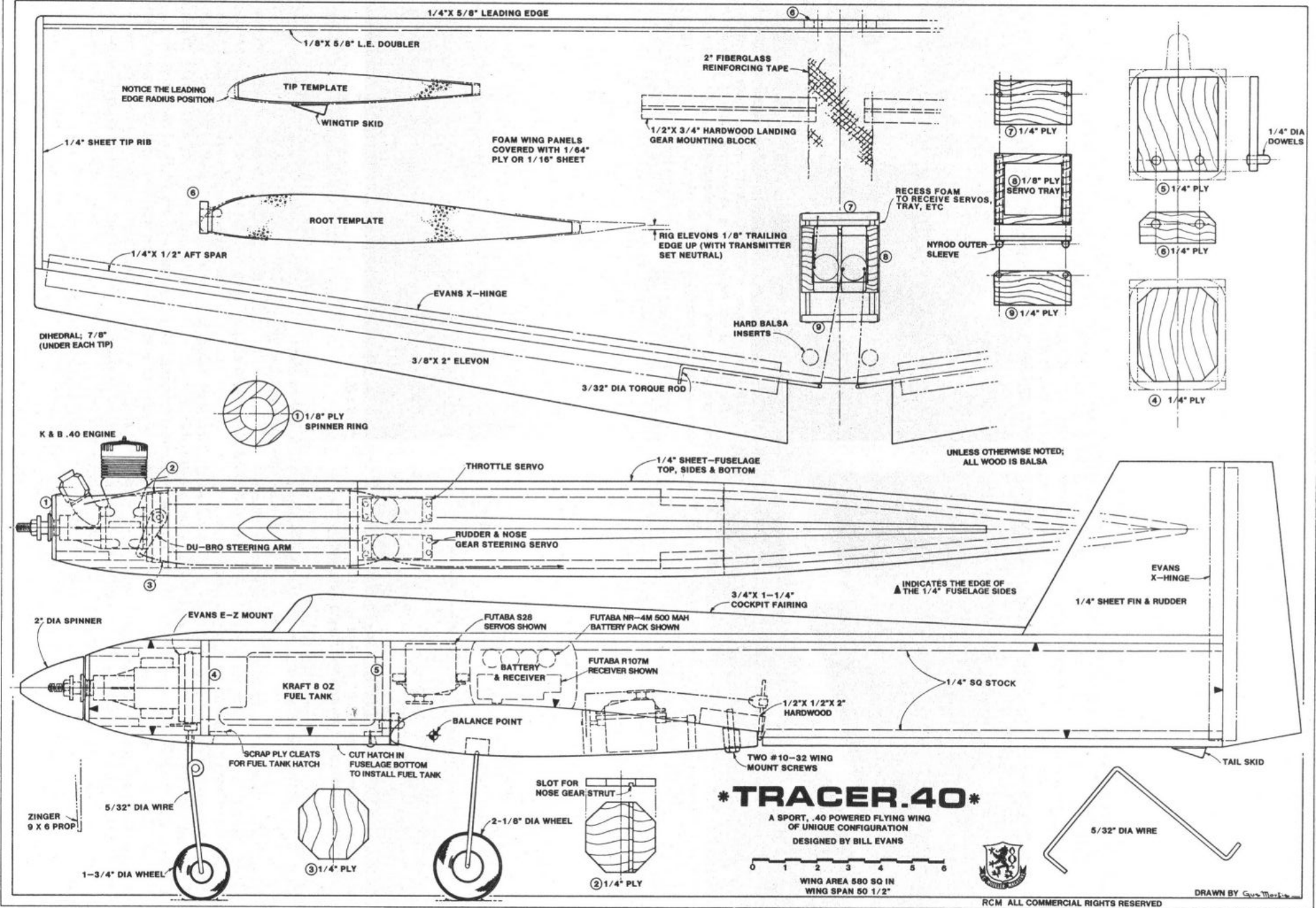
18. Hinge control surfaces. (We used X-hinge which is easy to apply, seals the gap and improves the effectiveness of the control surfaces.)

19. Cover and install radio. Check control surface movement for proper direction! Also, notice that the elevons (elevators) should be set so that at neutral trim they have about 1/8" of up. This is to provide the necessary reflex, required for tailless aircraft. Balance per plan! For the Tracer 60, it is important to use at least 35 inch ounce servos and balance the elevons as shown in photos. Balancing of the elevons is required to obviate the possibility of elevon flutter during pull out on vertical maneuvers.

You will find that the Tracer has no bad habits. I do suggest that for the first few flights you keep it fairly close so you may become familiar with its new look in the air.

What can I tell you? All aircraft should have been designed like the Tracer!

□



TRACER.40

A SPORT, .40 POWERED FLYING WING OF UNIQUE CONFIGURATION

DESIGNED BY BILL EVANS

0 1 2 3 4 5 6

WING AREA 580 SQ IN
WING SPAN 50 1/2"

DRAWN BY Gus Morkis

PLAN NO. 973