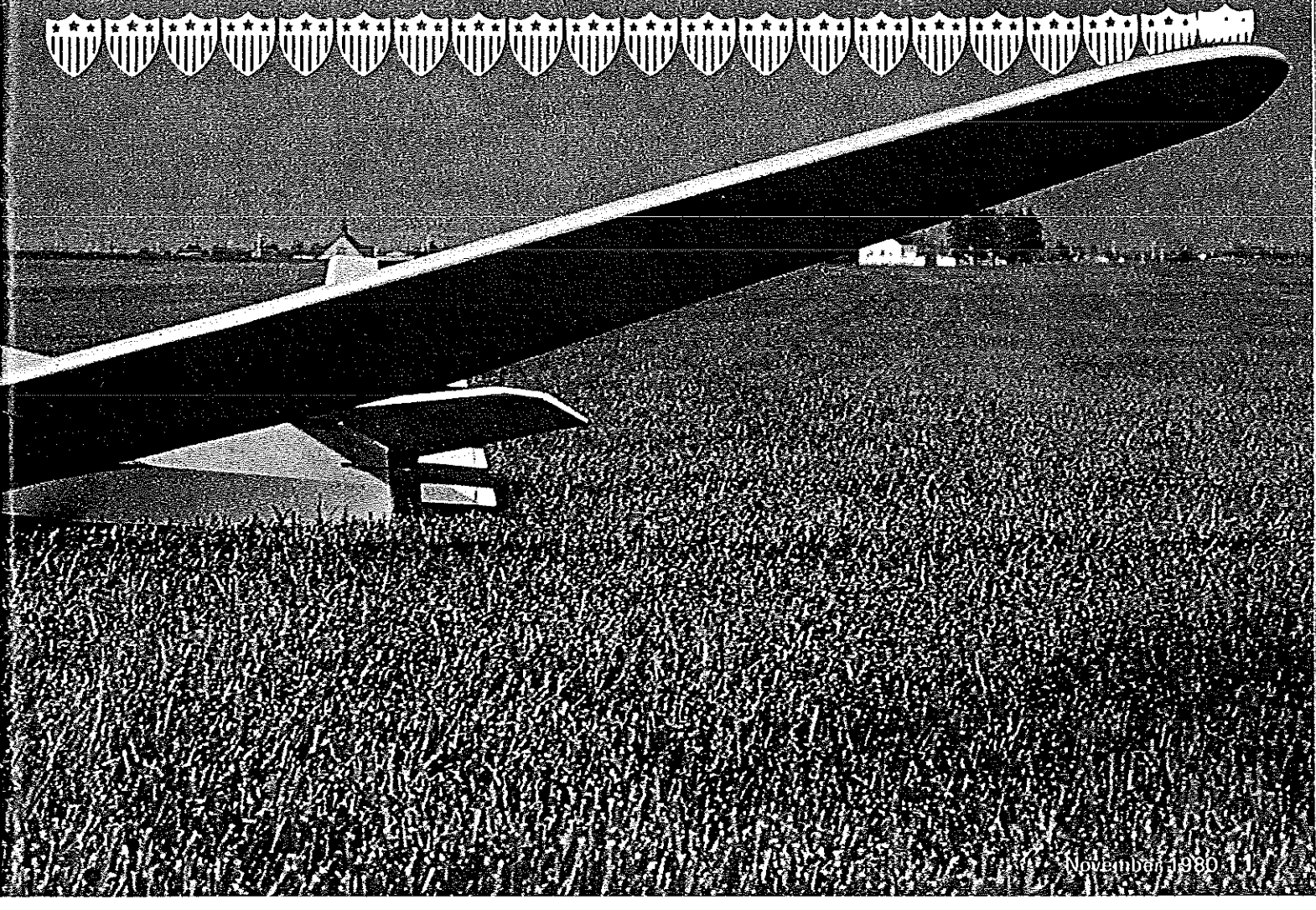
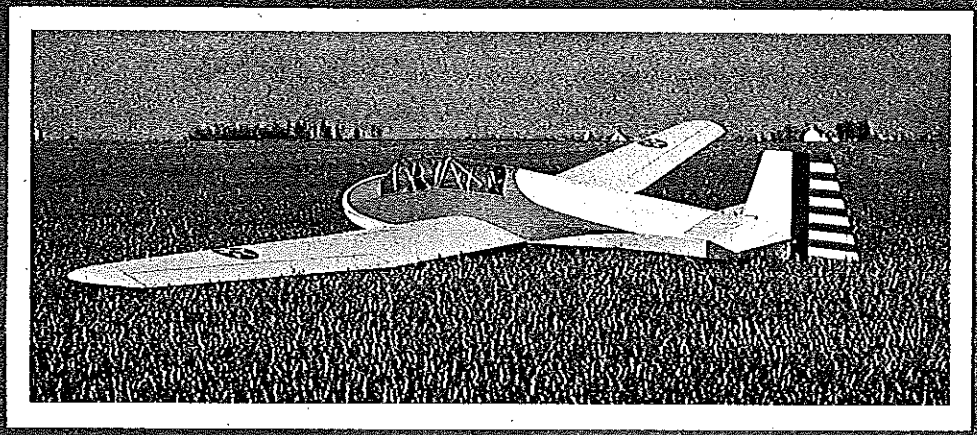
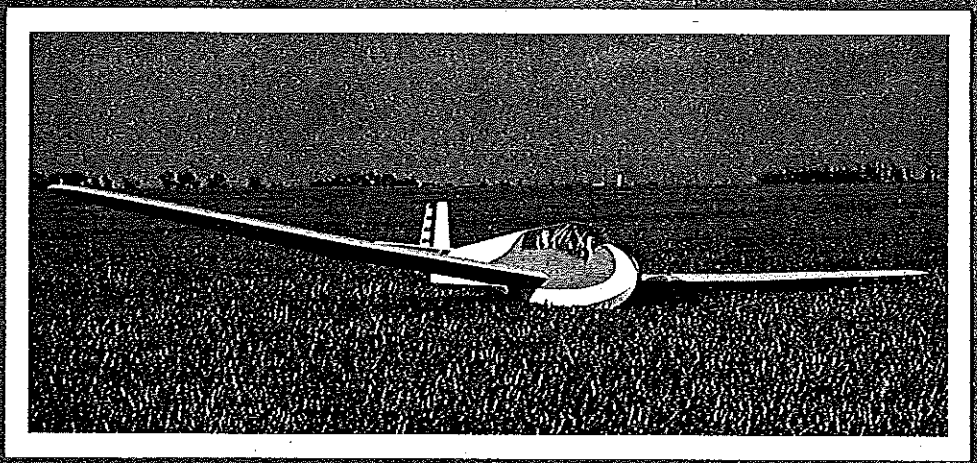
SCHWEIZER 1-26 SPARROWHAWK

This RC Sport Scale Sailplane not only has great looks, but it is also a real performer—setting an AMA altitude record of 3,400 feet in 1979. For those who like working with formers and stringers, it's a builder's delight. ■ **Jack Hiner**





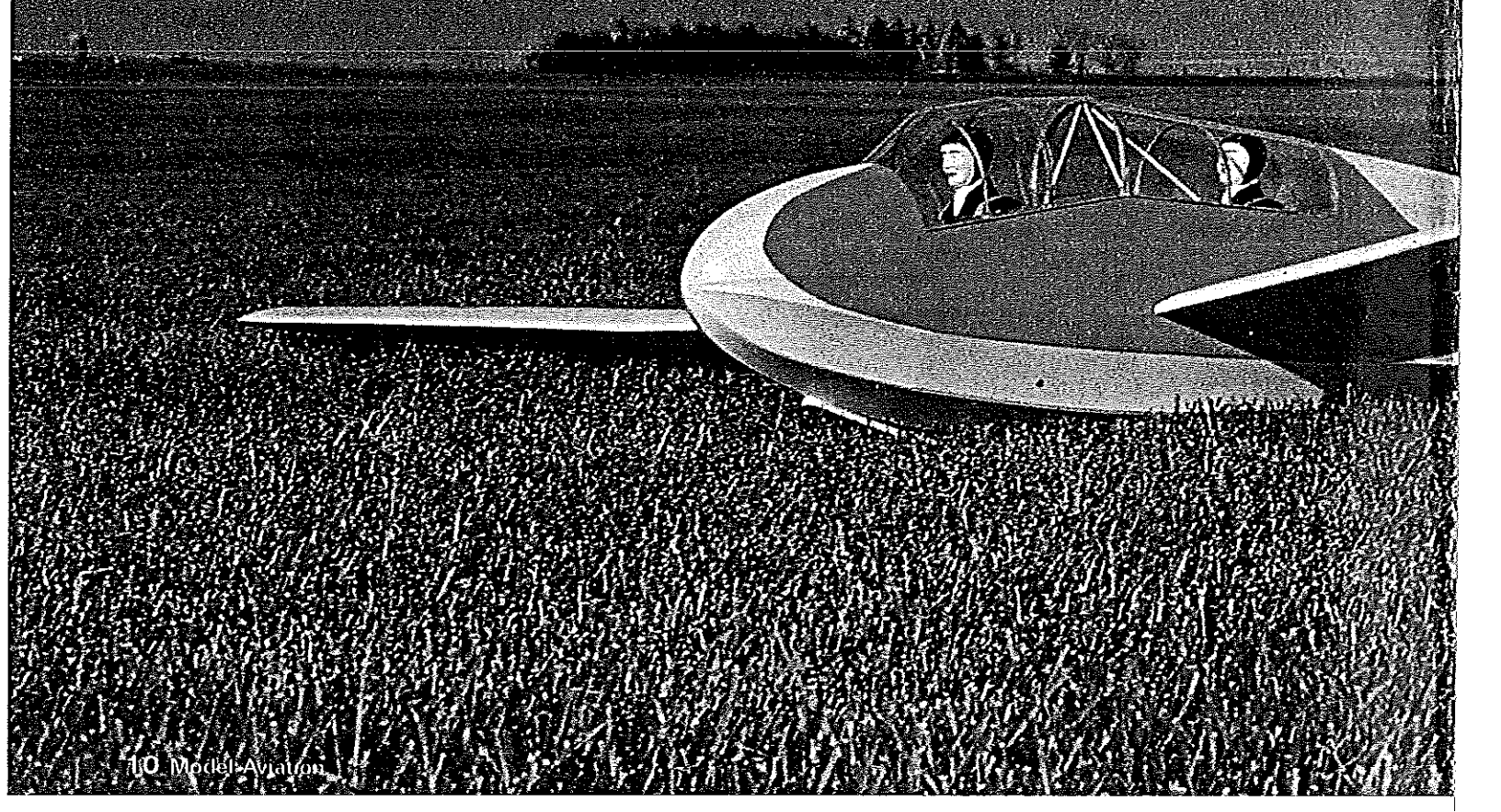


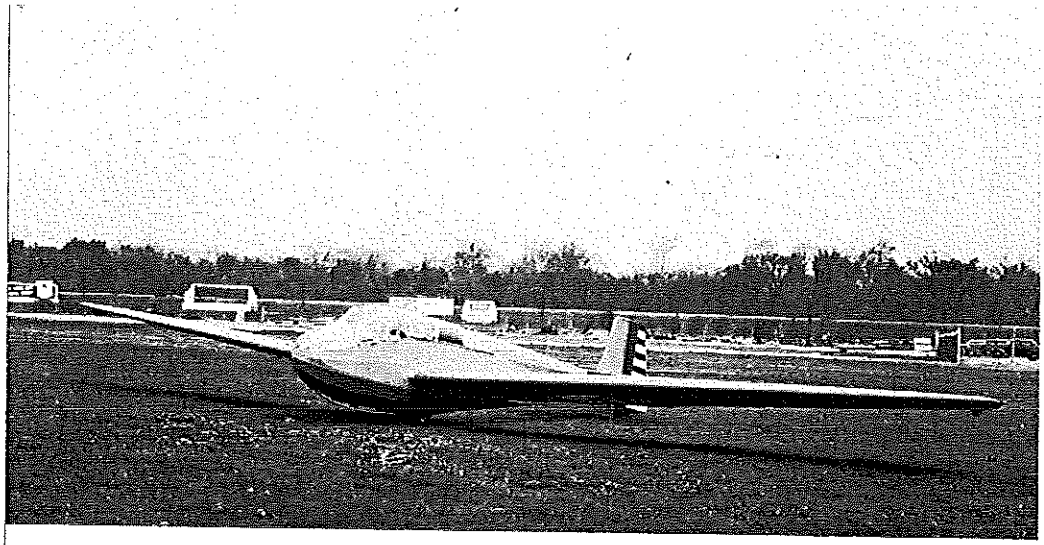
Sport Scale TG-3A model weighs 7¾ lb., ready to fly. Not as sleek as a sailplane (after all, the prototype was a glider *trainer* back in WW II days), it is capable of long thermal flights. It recently set an AMA record, for Unlimited Class RC sailplanes, for altitude: 3400 ft., and it was carrying a full-size barograph in the rear cockpit! Wingspan is a tad short of 11 ft., making this model approximately 1/5-scale.

THE TG-3 WAS a two-seat training glider used during World War II to train pilots for U.S. troop gliders. A total of 114 TG-3s were built by Schweitzer Aircraft Corp., Elmira, NY.

Three prototypes, XTG-3s, were test-flown from April 1942 to July 1942 at Elmira and Wright Field, Dayton, Ohio. Various detail changes were made in the nose, controls, and seating arrangements of the second and third XTG-3s. The ship was then released in July 1942 by Wright Field for production, as the TG-3A. The production contract was completed by July 1943, and no more TG-3As were produced.

The TG-3 was designed from a functional point of view. Certain performance requirements, roomy cockpit, and rugged strength were priorities. The TG-3 fuselage structure was welded steel tubing, and the turtle-back was built with plywood frames and wood stringers. The construction of the wings and tail surfaces consisted of open





We didn't use scale grass, so this must be the real thing! Scenes from the XTG-3 flight test program at Wright Field in 1942 (look at the cars in the background). A careful look at the paint schemes reveals that these are photos of at least two different airplanes (there were only three XTG-3s built). The model's paint scheme is the same as in the lower picture.

wood structure with a D-tube leading edge of plywood. Rudder and elevator were fitted with trim tabs. The completed airframe was fabric covered. The fuselage was fitted with a single wheel and a nose skid. The TG-3s were equipped with a radio and navigation lights.

The first TG-3s were painted yellow all over, with only a blue trim "flash" on the fuselage. A few TG-3s had blue fuselages and yellow wing and tail surfaces.

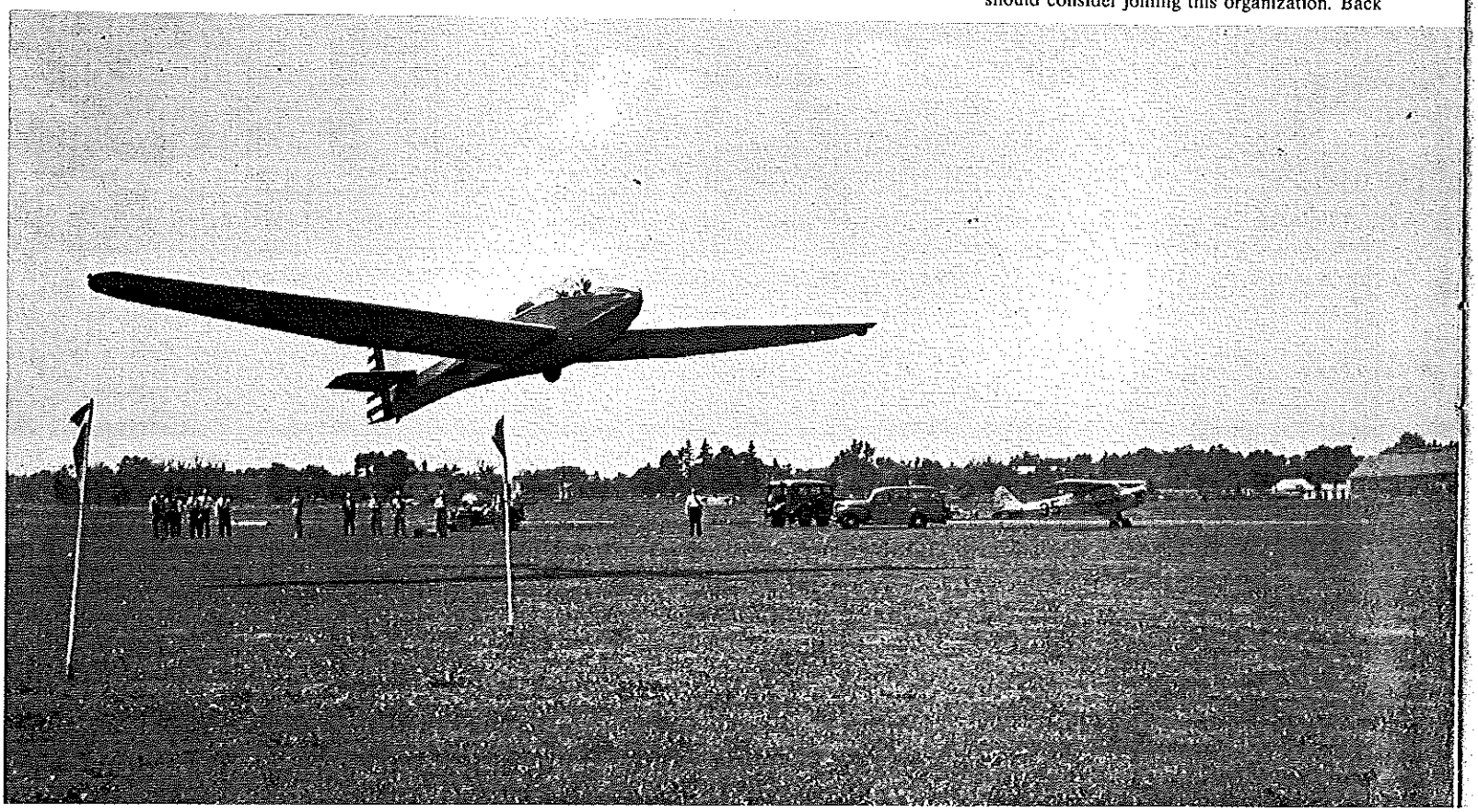
National insignia were applied to both surfaces of both wings, consisting of a blue circle with a white star, and a red ball in the center of the star. The rudder markings consisted of a vertical dark blue band on the forward portion, and 13 horizontal red-and-white alternating stripes (red first). The underside of the wings were lettered with "U.S." on the right and "ARMY" on the left.

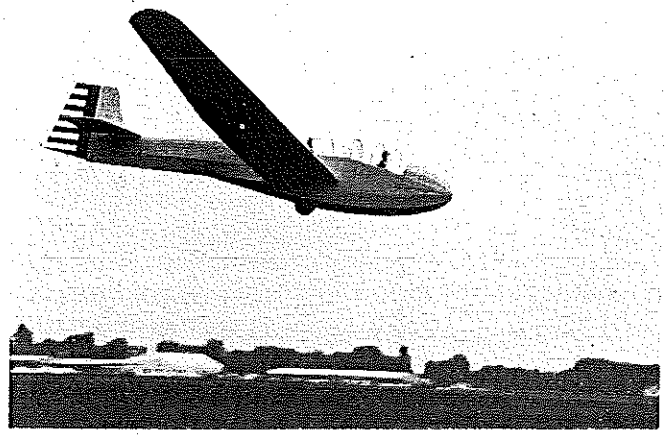
In the middle of 1942, the overall color was changed from yellow to silver. Tests in 1941 revealed that the yellow color was reducing fabric life. Although there are some photos of silver gliders with the "meatball" insignia and "candy-striped" tail, these were deleted in June 1942, when it was feared that these markings could be confused with the Japanese "Rising Sun." At the same time, the new national insignia (without "meatball") was added to rear fuselage sides. In November 1942, the U.S. Army lettering on the wing underside was deleted.

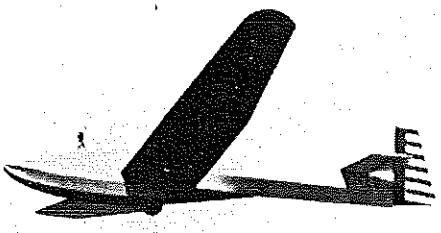
For brief times in 1943, the national insignia was outlined with red, then yellow, but it is unlikely that many gliders were so marked. Later, the wing insignia was applied only to the upper right and lower left wings, and then there were horizontal white bars with blue borders applied to each side of the national insignia. As these changes came late in 1943, and the glider training project was disbanded in November, very few photos exist of these configurations.

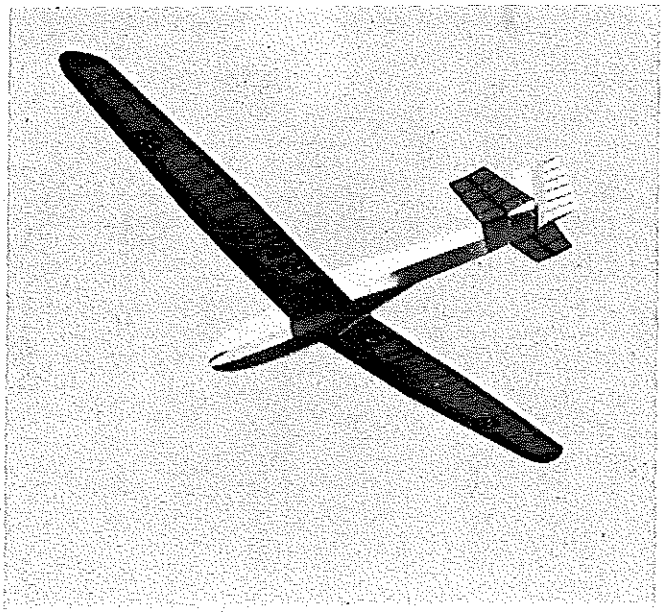
Color and markings information was obtained from an article in the June 1979 *Bungee Cord:* "Paint That TG," by Bob Storck. *Bungee Cord* is a fine newsletter put out by Vintage Sailplane Association, 6053 25th Rd., N., Arlington, VA 22207.

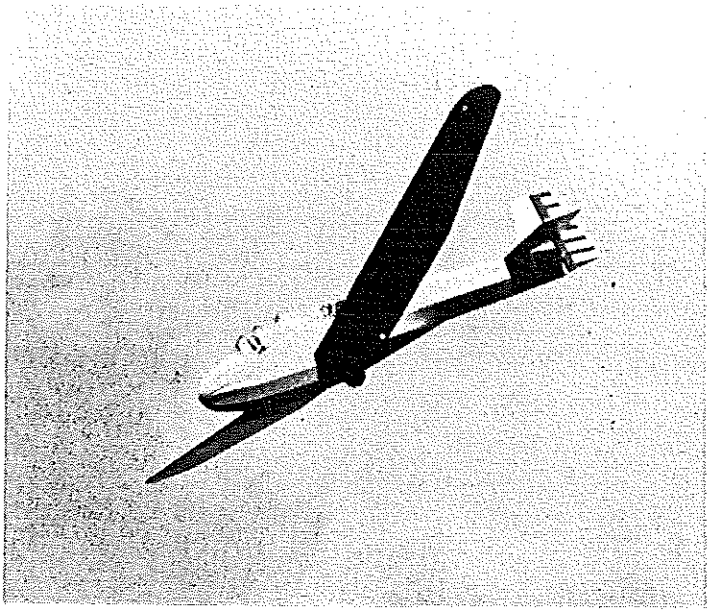
Any model builder interested in old gliders should consider joining this organization. Back











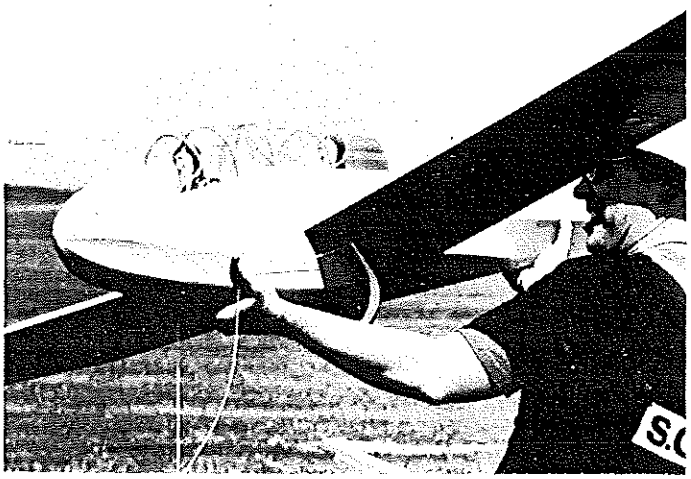
Flight shots of the model. See how much improvement there is in the illusion of reality if you put crew figures in the cockpit? Jack departed from scale in the wing dihedral—he put in a slight amount of polyhedral, starting at the point where there is a sharp taper-break in the wing planform. It is hardly noticeable in any of these photos. Pictures by Dan Pruss and John Czeszak.

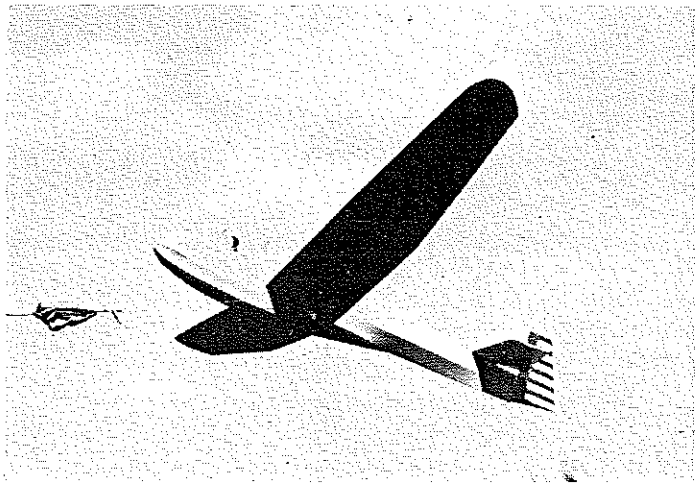
issues of *Bungee Cord* can be obtained from VSA. Bob Storck is the VSA's archivist, and can provide VSA members with information and photos on TG-series gliders.

At the end of the war, the surviving TG-3s were sold as surplus. After the war, a TG-3 was credited with setting and holding a U.S. duration record for an extensive period. A number of TG-3s are still flying, today. The Air Force Museum was gathering information on TG-3s in 1975 for a restoration project; hopefully, a TG-3 will some day be on display there. Also, a member of the Vintage Sailplane Association is restoring a TG-3 with an authentic training paint job.

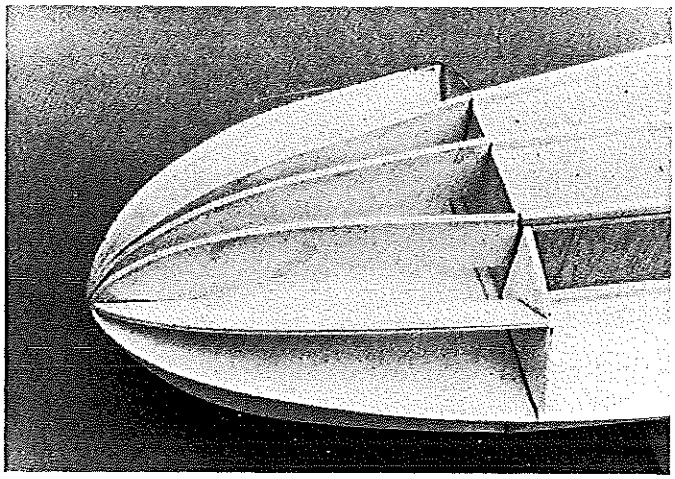
The TG-3 is a natural for Stand-Off (Sport) Scale. Its slab-sided and stringered fuselage is easy to duplicate, as is the squared-off empennage. The ship has no wing fillets or struts to worry about. The canopy is simply built out of flat sheets.

The biggest advantage of the TG-3 for modeling

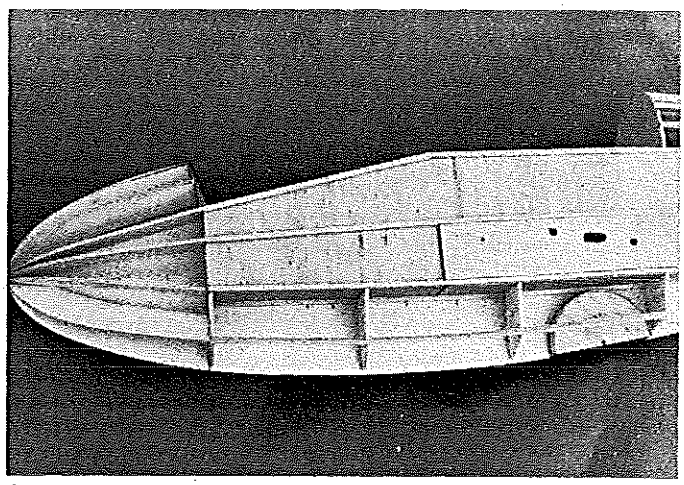




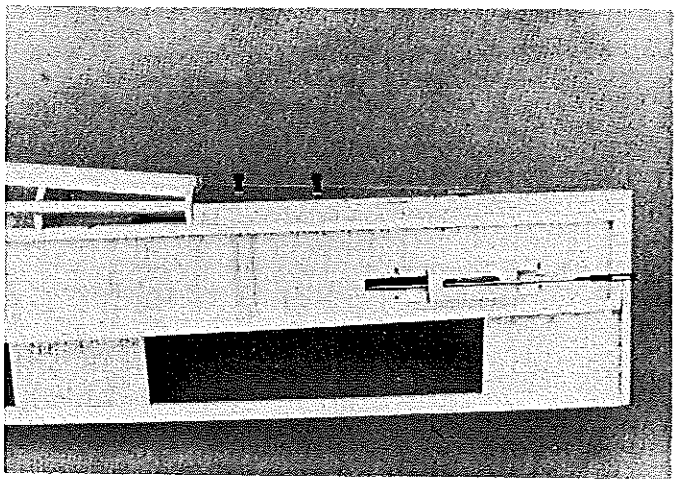
At left, Stan Watson shows the preferred method of holding the model for launch: You must also keep tension on the tow bridles, so that a tow ring will not slip off either of the two wing-mounted towhooks. At right, the glider climbs out on the tow rope. Note the retrieval 'chute. Jack has never had a tow problem in some 200 flights using this twin-bridle system.



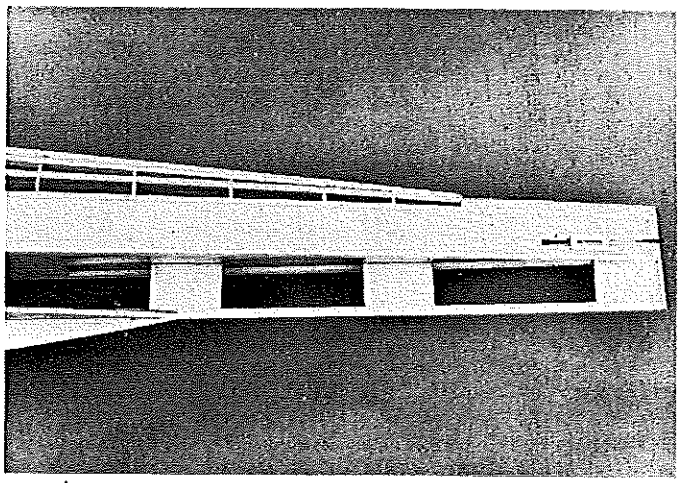
Nose ribs are added to duplicate the appearance of the prototype's curved steel tube fuselage structure. Like the keel, they are plywood.



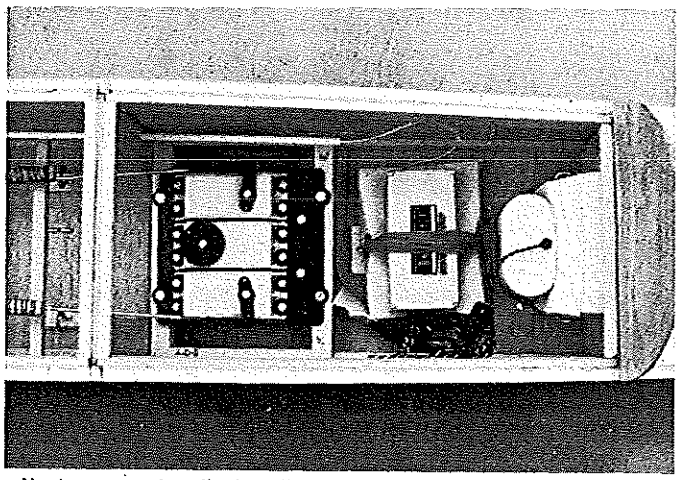
An overall view of the nose structure. The wheel well and the plywood wing mounting plate show up well here.



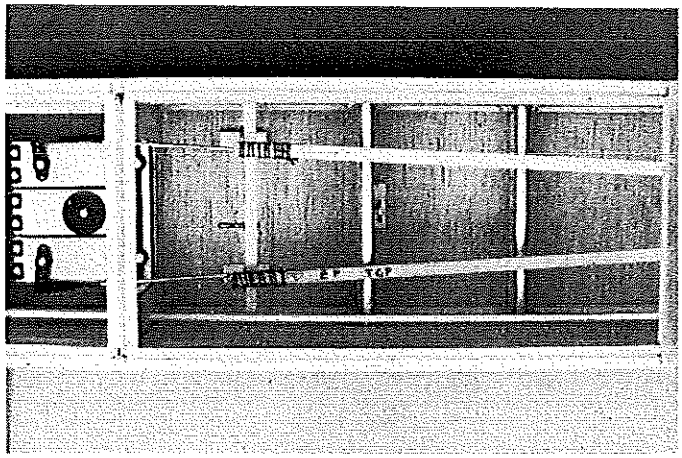
The aft fuselage, showing pushrod exit and stabilizer mounting bolts.



A closer look at the aft, lower fuselage construction.



Neat, compact radio installation. Servos for rudder, elevator, and spoilers (center). Antenna housed in outer Nyrod tube epoxied to side.



The object protruding forward from the spruce strip, located just below and between the pushrods, is a screw eye. It is used as a guide for the spoiler actuation lines, turning them 90 to attach to the servo.

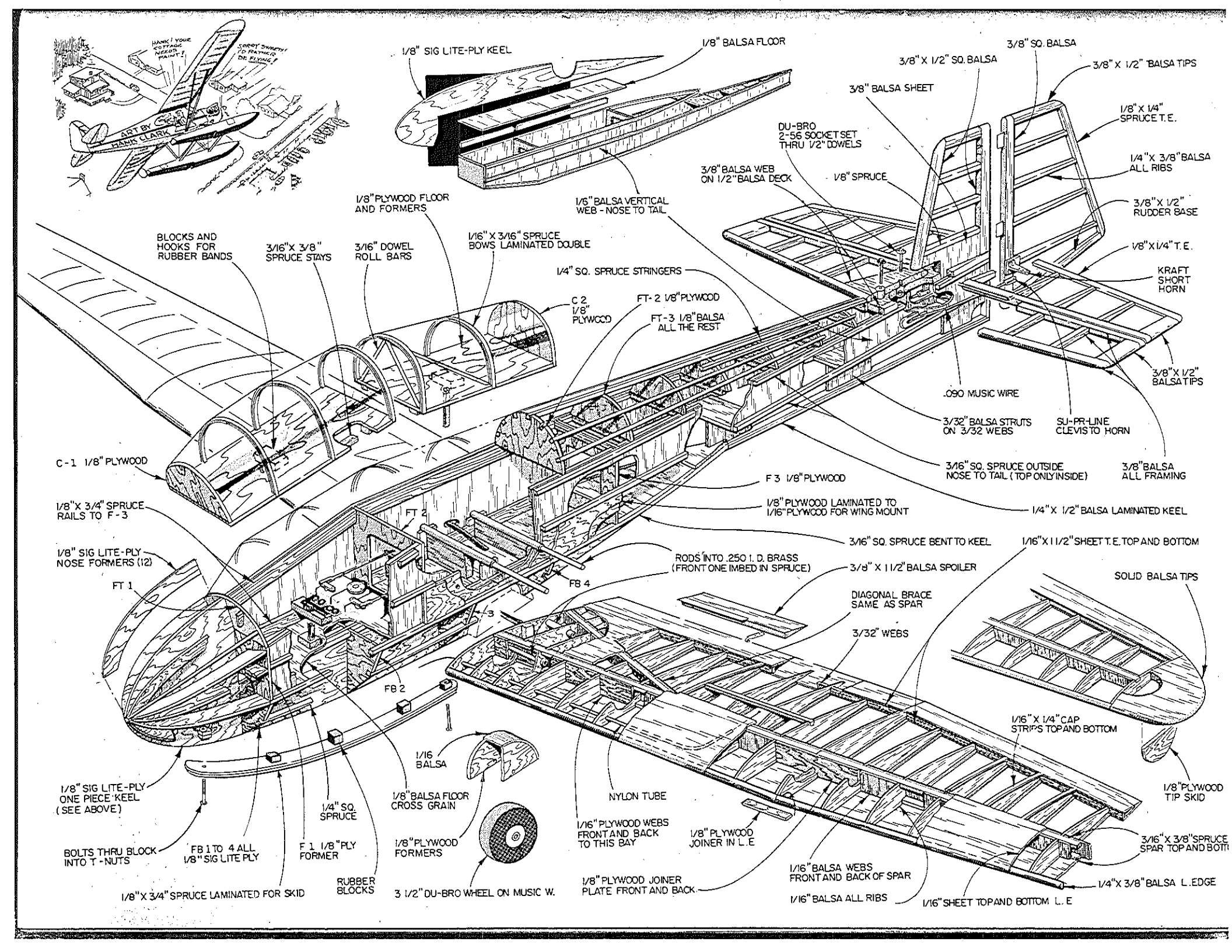
is the wing geometry. The wing planform of the full-size prototype is close to that used for the average sport RC glider. The TG-3 has an aspect ratio of 12.3-to-1, and a relatively large dihedral of 4½ degrees per wing. Also, the wing has constant-chord main panels, with moderate taper in the tip panels. About the only thing missing is polyhedral! All these features add up to an RC model with a strong wing, plenty of area, good stability, excellent tow characteristics, and no nasty tip stalls.

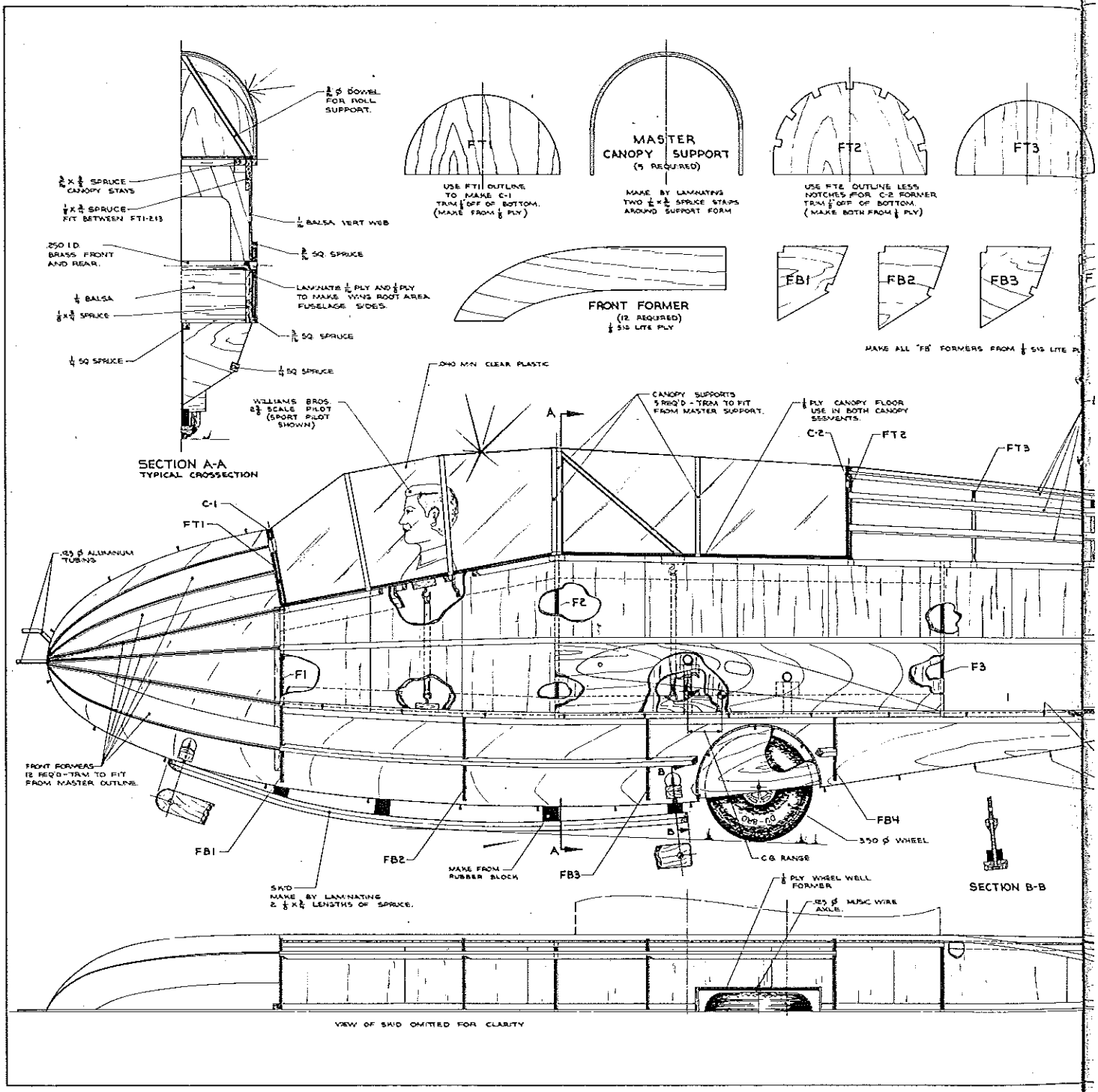
TG-3 Construction

Before beginning, I like to cut out all wing ribs and fuselage bulkheads. Make a template of the fuselage keel out of .015 clear plastic sheet (this way you don't have to cut up the plans). Using the template, cut out the keel from ⅛ Sig Lite-Ply. After plywood wing ribs are cut out and holes are drilled for tubes, use wing root rib as template to drill holes in fuselage plywood wing mounting plates. Now is a good time to make up some leading edge material out of spruce. Dremel's new table saw with fine blade works well here. If you don't have access to a table saw, taper spruce strips with a razor plane to the correct angle for leading edges. A band saw can also be used to shape leading edge stock.

Wing. Construction is borrowed from the Aquila. I like to build the tip panels first, complete with plywood dihedral braces. Be sure to build in washout, as this is very important for an easy-to-fly glider. Now block up the tip panel as per the plans, and build main panel onto the tip panel.

I used aliphatic resin for construction, with the exception of wing tubes and plywood wing webs, where I use slow-setting epoxy. I also use slow-setting epoxy to glue in spruce filler between wing tubes and spar. This makes for a strong wing, and gives adequate wood to attach the tow hooks. Also add ⅜ balsa webs between the end of the wing tubes and the next wing rib, in order to


HANK! YOUR COTTAGE NEEDS PAINT!
SORRY SHARKEY I'D RATHER BE FLYING!
ART BY HANK CLARK
1/8" SIG LITE-PLY KEEL
1/8" BALSA FLOOR
3/8" SQ. BALSA
3/8" X 1/2" SQ. BALSA
3/8" X 1/2" BALSA TIPS
3/8" BALSA SHEET
1/8" X 1/4" SPRUCE T.E.
DU-BRO 2-56 SOCKET SET THRU 1/2" DOWELS
1/4" X 3/8" BALSA ALL RIBS
3/8" BALSA WEB ON 1/2" BALSA DECK
1/8" SPRUCE
3/8" X 1/2" RUDDER BASE
1/8" PLYWOOD FLOOR AND FORMERS
1/6" BALSA VERTICAL WEB - NOSE TO TAIL
1/8" X 1/4" T.E.
KRAFT SHORT HORN
BLOCKS AND HOOKS FOR RUBBER BANDS
3/16" X 3/8" SPRUCE STAYS
3/16" DOWEL ROLL BARS
1/16" X 3/16" SPRUCE BOWS LAMINATED DOUBLE
1/4" SQ. SPRUCE STRINGERS
C 2 1/8" PLYWOOD
FT-2 1/8" PLYWOOD
FT-3 1/8" BALSA ALL THE REST
3/8" X 1/2" BALSA TIPS
.090 MUSIC WIRE
3/32" BALSA STRUTS ON 3/32 WEBS
SU-PR-LINE CLEVIS TO HORN
3/16" SQ. SPRUCE OUTSIDE NOSE TO TAIL (TOP ONLY INSIDE)
3/8" BALSA ALL FRAMING
C-1 1/8" PLYWOOD
F 3 1/8" PLYWOOD
1/8" X 3/4" SPRUCE RAILS TO F-3
1/8" PLYWOOD LAMINATED TO 1/16" PLYWOOD FOR WING MOUNT
1/4" X 1/2" BALSA LAMINATED KEEL
FT 2
3/16" SQ. SPRUCE BENT TO KEEL
1/16" X 1 1/2" SHEET T.E. TOP AND BOTTOM
1/8" SIG LITE-PLY NOSE FORMERS (12)
RODS INTO .250 I.D. BRASS (FRONT ONE IMBED IN SPRUCE)
3/8" X 1 1/2" BALSA SPOILER
FT 1
FB 4
DIAGONAL BRACE SAME AS SPAR
SOLID BALSA TIPS
3/32" WEBS
FB 2
1/16" X 1/4" CAP STRIPS TOP AND BOTTOM
1/16 BALSA
1/8" SIG LITE-PLY ONE PIECE KEEL (SEE ABOVE)
1/8" BALSA FLOOR CROSS GRAIN
NYLON TUBE
1/8" PLYWOOD TIP SKID
1/4" SQ. SPRUCE
1/16" PLYWOOD WEBS FRONT AND BACK TO THIS BAY
1/8" PLYWOOD JOINER IN L.E
3/16" X 3/8" SPRUCE SPAR TOP AND BOTT
BOLTS THRU BLOCK INTO T-NUTS
FB 1 TO 4 ALL 1/8" SIG LITE PLY
F 1 1/8" PLY FORMER
1/8" PLYWOOD FORMERS
1/16" BALSA WEBS FRONT AND BACK OF SPAR
1/8" PLYWOOD JOINER PLATE FRONT AND BACK
1/4" X 3/8" BALSA L.EDGE
1/8" X 3/4" SPRUCE LAMINATED FOR SKID
RUBBER BLOCKS
3 1/2" DU-BRO WHEEL ON MUSIC W.
1/16" BALSA ALL RIBS
1/16" SHEET TOP AND BOTTOM L.E



restrain wing wires in tubes. I cheated and added a small amount of polydihedral at the taper break, in order to get the glider to turn properly without ailerons.

The polydihedral could be eliminated if functioning ailerons are added. I would suggest coupling the rudder and ailerons; use about 30 degrees of rudder throw, with small aileron deflection for best results. Another possibility to try would be coupled spoilers and rudder, together with scale dihedral; for a right turn, you would use right rudder and right spoiler. I have tried this on other gliders, and it works well.

Rub baby oil on the wing plan to make the paper transparent. Then turn over the plan, and build the second half of the wing.

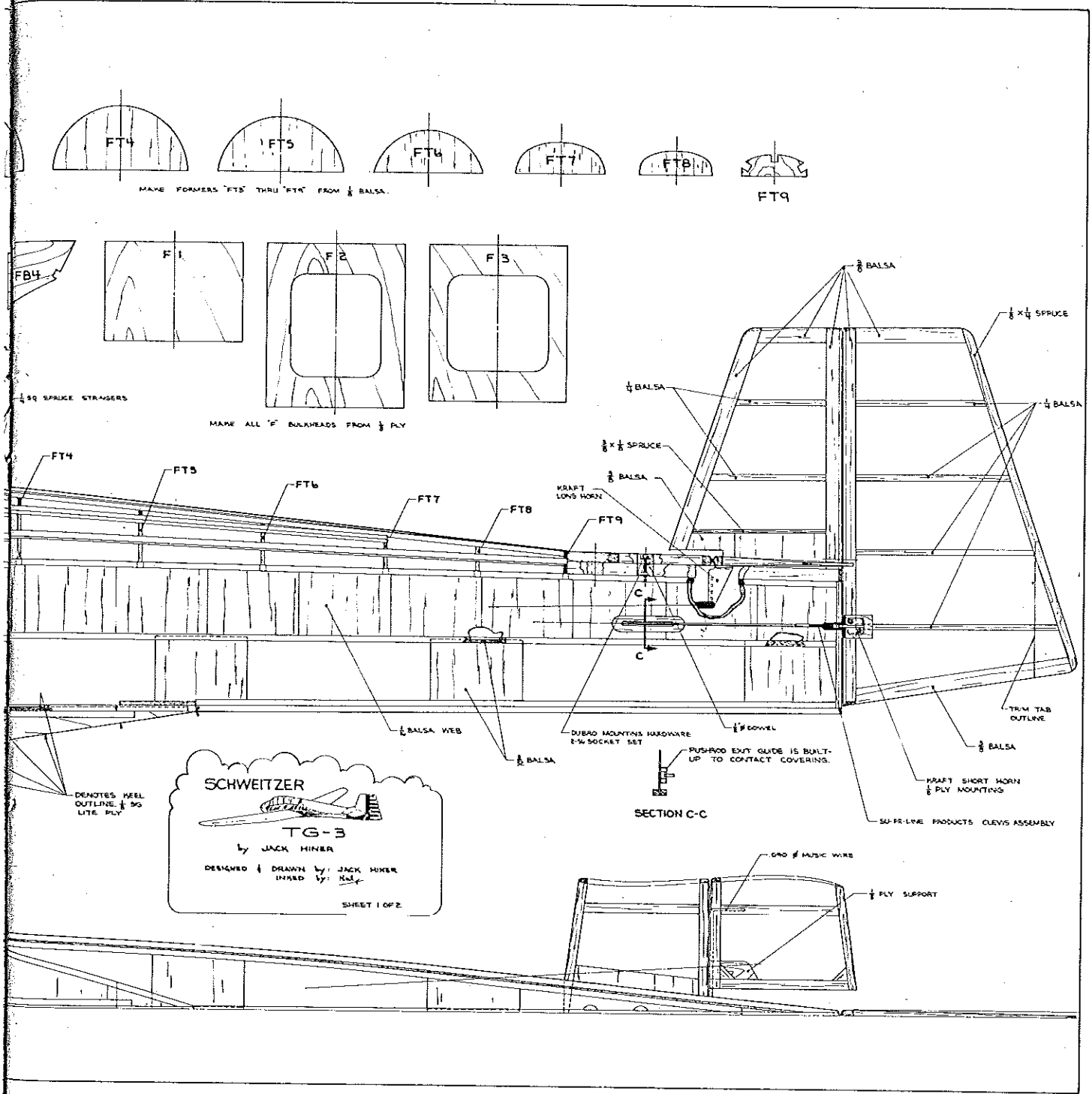
Tail surfaces. Not much needs to be said about the tail surfaces, as construction is rather simple. It's a good idea to make the horizontal stabilizer removable from the fuselage for transportation and storage purposes. I cut the taper in the rudder and elevator ribs with a razor saw. Cut a little oversize, and dress down with a sanding block. Use sheet metal screws to attach control horns to plywood mounts.

Fuselage. Lay down three main longerons over plans, and pin in place. Allow bottom longeron to extend to the rear of former F3. Right and left bottom longerons will later be pulled together to meet the rear of the fuselage keel. Add 1/16 balsa webbing to longeron as shown on plans. After glue dries, remove from plans and mark position on sides for F1, F2, and F3. Now add spruce strips on inside of fuselage sides, leaving gaps for formers. Turn plans over, rub on the baby oil, and build the other side.

Glue in formers F1, F2, and F3. When dry, pull tail together and glue. Add bottom cross-grain sheeting from F1 to F3.

Pull the bottom longerons together to meet the rear of the keel. Add cross-grain sheeting. Add cross braces at each turtle-deck former position to maintain correct width. Add spruce strips on bottom sheeting between F1 to F3, and on the front of F1 to key in the keel. Next, glue on turtle-deck formers and stringers. Add stab mounting structure, epoxying blind nuts for mounting. Glue in keel and former FT1. Glue in 1/16 balsa wheel-well, followed by 1/8 plywood wheel sides. Add sub-bulkheads for keel and associated stringers. Now add spruce tail post. Add stringer from rear of keel to tailpost. Next, add the three vertical-grained braces between this bottom rear longeron and the box structure.

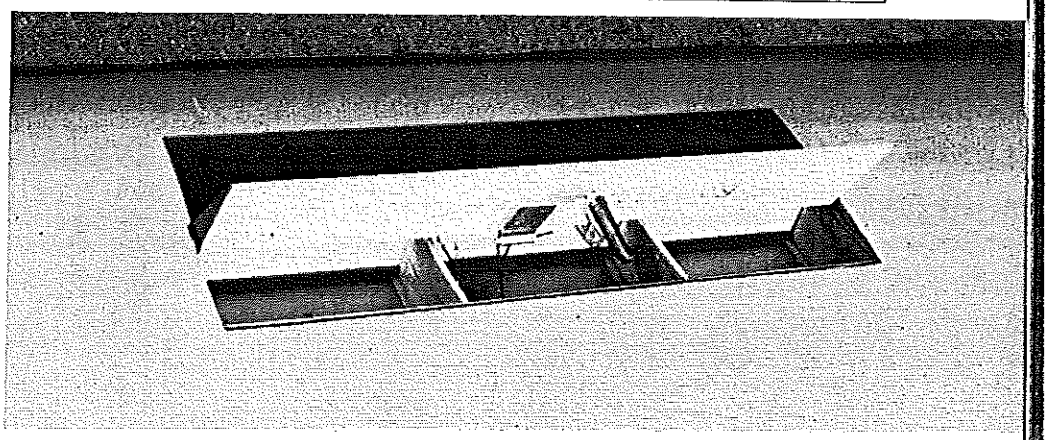
Fit and add plywood plates for wing mounting. Make sure the right and left plates are lined up accurately fore and aft. Now epoxy wing support tubes in the fuselage (with wings and wires in



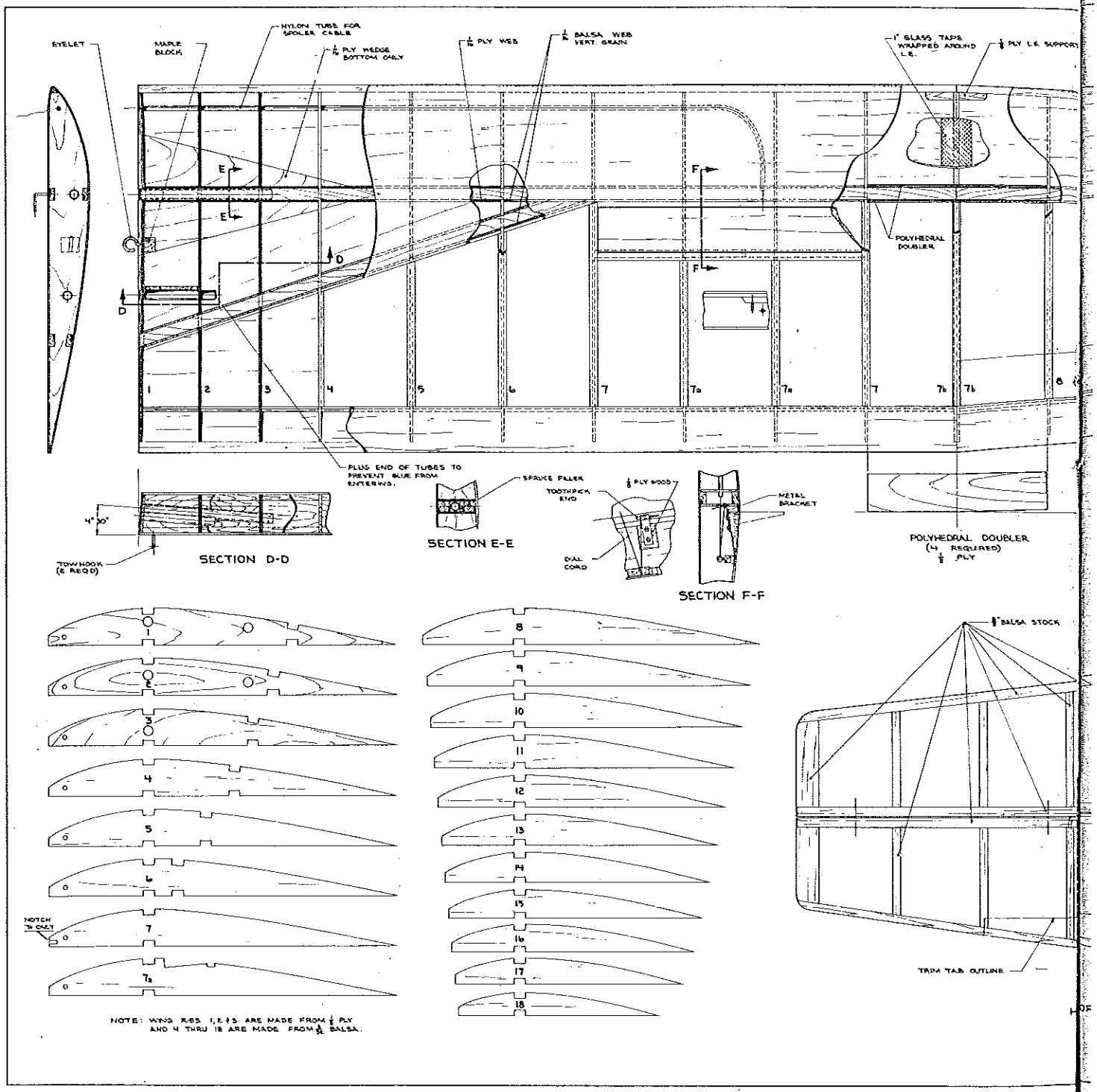
place, to ensure proper alignment). Glue in ¼ balsa from bottom of wing tubes to the floor of fuse. Next, add the 12 Sig Lite-Ply nose ribs; trim and fit each of those individually. The wheel is not added until the fuselage is covered. After covering, cut out the wheel-well, and cut a small hole in the covering in order to insert brass tubing wheel axle. Place wheel into well, and insert axle —using a dab of epoxy to keep axle from backing out. A small covering patch over the axle access hole completes this step.

The skid is laminated from two strips of spruce. Use slow-setting epoxy glue. Mold in the curve with the aid of a jig made with finishing nails nailed to a board.

Canopy. Make ⅛ balsa forms to mold canopy bows around. Laminate two strips of 1/16 X ⅛ spruce strips for canopy bows. Use slow-setting epoxy, and allow to cure for 24 hours. Make



Rear view of one of the spoilers shows typical "Aquila-type" linkage, with a fine spring under tension to return spoilers to closed position.



plywood canopy base for fore and aft sections. Glue forming on bottom of bases to key canopy assembly accurately to fuselage.

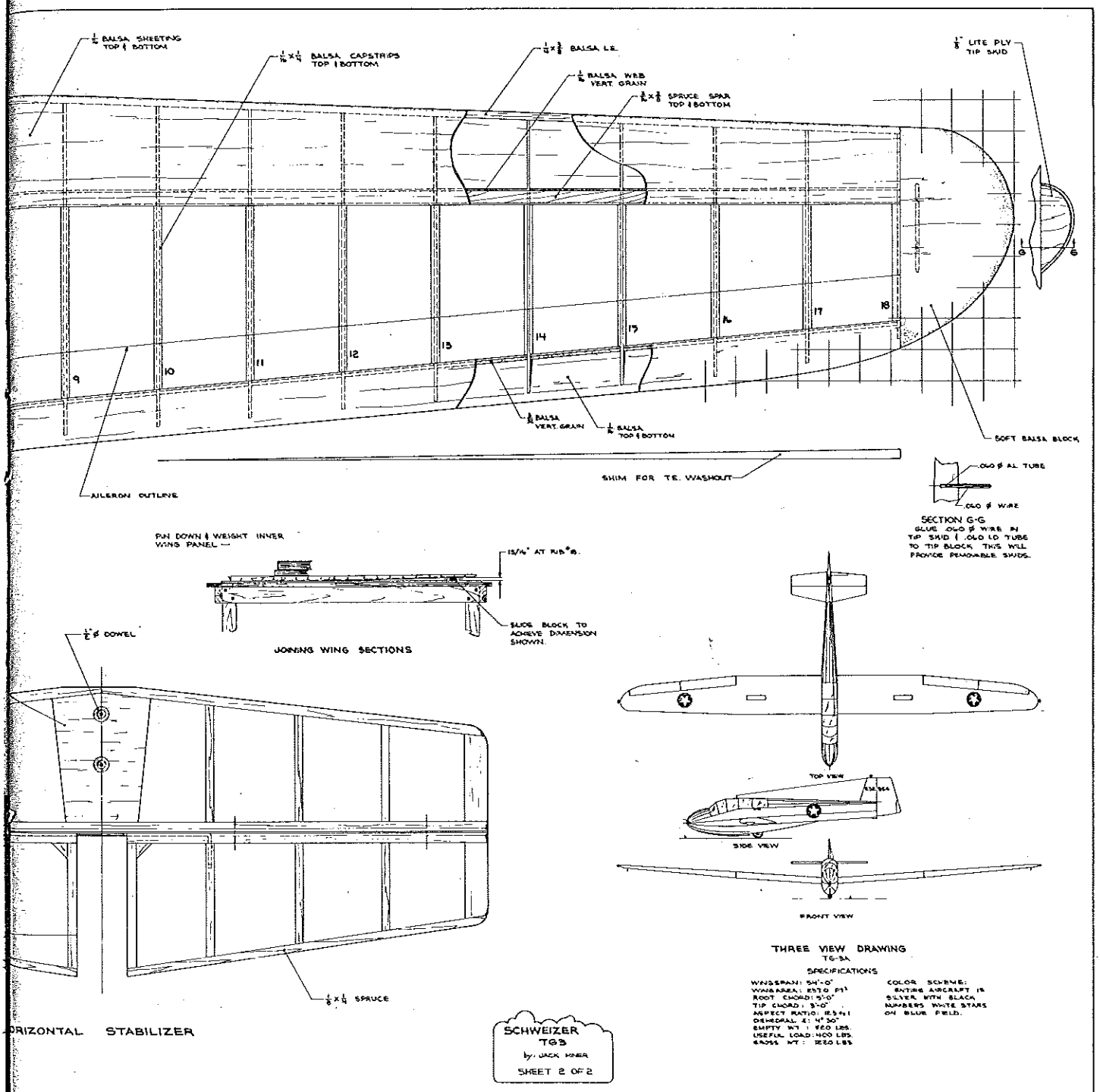
Epoxy instrument panel and rear bulkhead to canopy bases. Notch canopy bases to accept bows. Epoxy bows to base after trimming to required length. Epoxy hardwood dowels to simulate roll-over structure.

On full-size aircraft, the canopies were left the natural color of aluminum. Paint the canopy frames with silver epoxy, after filling with thinned-out "Stuff." Epoxy paint gives superior adhesion. This is important, as servo mounting tape is used to attach pilots to canopy base. Add any instrument panel detailing desired at this point. A cluster of instruments for the instructor riding in the back seat was located at the roll-over cage.

Cut out canopy sections from heavy sheet acetate. The rear canopy is one piece. The front canopy is in three pieces. I attached the plastic canopy to the base with 3M clear plastic tape. Tape canopy to one side of base, rolling it over bows, and tape to the other side of base. Wrap approximately ¼-in. of tape around on the bottom of the canopy base to ensure good adhesion. On the front canopy section, attach rear acetate piece first, followed by the center section, and the front section last. In this way, the slipstream can't get under the canopy sections during flight, which might otherwise rip off a section.

Covering. I suggest using super MonoKote. The plans and three-view drawing depict the all-silver version. This is the easy route: just cover the airframe with silver MonoKote, and cut tail numbers out of black trim MonoKote. Insignia also can be made out of blue and white trim MonoKote. If you go for the earlier yellow color scheme, the additional markings can be made from trim MonoKote. Spray paint the light blue fuselage flash with epoxy paint after cleaning the area to be painted with thinner. Trim tape was used to outline trim tabs, ailerons, and dive brakes on the bottom of the wings.

Flying. Now we come to the fun part. Don't worry about the weight too much, as my TG-3 weighed 7¾ pounds ready-to-fly. The plans show fore and aft center-of-gravity (CG) positions. Use the forward position for initial test flights, and continue using the forward CG until you feel comfortable with the launch and have confidence in the glider. As soon as possible, move to the aft center-of-gravity position, as the glider will thermal better in this configuration. With the aft CG, the TG-3 does beautiful spins if you have enough control surface movement. I like to use a spin to lose altitude after working up for a max with this ship. You could just spiral down, or use spoilers and dive, but the TG-3



looks neat spinning down.

A few comments about launch technique. First, make up a towing bridle approximately three feet long. I like to use heavier line than used on the winch. Tie a tow ring in one end of two 3-ft. lengths of line. Tie the remaining end of the two lines to a large snap swivel. Using a towing bridle and the wing-mounted tow hooks, I have never had a towing problem in approximately 200 flights.

For your first flight, get someone to assist in the launching—preferably a person who has flown a large glider, such as a Sailair, Astro Jeff, or an Aquila XL. They will know how much line tension is required for a launch. Let your helper launch the airplane, while you concentrate on operating the winch and flying.

Because of the fuselage size and the airfoil I used, the TG-3 has a lot of drag, so the lift-over-drag ratio is nothing to brag about. Also, the sink rate is higher than the average RC sport glider. Due to the higher drag, the TG-3 does not like tight circles when thermalling, so keep circles in lift a bit larger than normal. The added drag has one advantage: it makes for easy landings.

With all this talk about drag, you might get the impression that the TG-3 is a real turkey, but it isn't. If there is lift, the TG-3 will go up. In fact, early in the summer of 1979, I had two flights of over one hour duration at our flat-land flying site, without the help of a thermal sniffer.

At the end of the summer, I installed a thermal sniffer and built a little larger wing in order to make an altitude attempt for the National AMA RC Soaring Record and the FAI World Record. A Replogle barograph rode in the back seat. All-up weight was 10 pounds, 14 ounces.

All paperwork was accomplished for a record try over Labor Day weekend. But on Saturday and Sunday, the weather did not cooperate. Monday was better, with light winds and scattered fair-weather cumulus clouds. Aviation Weather's forecast called for a cloud base of 2,000 to 3,000 feet in the morning, moving up to 3,000 to 4,000 feet later in the day. I was hoping for a cloud base of 5,000 to 6,000 feet. During late morning and early afternoon a number of flights were made, but only reached 2,000 feet or so.

Around 2:00 p.m. I finally got the TG-3 up to 3,400 feet, at which point the TG-3 entered a large cumulus. I let the old bird fly in the cloud for a few seconds, then I deployed spoilers and down trim. In a few more seconds the TG-3 reappeared, driving out of the bottom of the cloud. Conditions didn't get any better that day, and 3,400 feet was the highest altitude recorded. That wasn't enough for an FAI World Record, but since all AMA

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even a tougher proposition was the achievement of stability. On twin pushers of the day, Charlie put dihedral in the canard surface and added a small vertical fin atop it so it flew arrow straight. Later, he upset the pusher world by winning big meets with sensational tractors. Incidentally, when we timed an early gas meet at Tecterboro, NJ in 1933 or '34—Leo Weiss, Frank Tlush, Frank Ehling, Charlie Grant, and Joe Kovel were among perhaps a dozen entrants—the sky was filled with twin-pusher rubber jobs that climbed like javelins. We got to time a lone rubber modeler with a diamond fuselage tractor, who turned in a winning flight of four-plus. That was Hank Struck.

Charlie was equally prominent in full-scale aviation, a prolific inventor and revolutionary designer—you'll find him in some history books. One about air racing, devoted a chapter to him. He holds valuable patents and, always the fighter, won a law suit against Martin on the 202 airliner—they paid a royalty and hired him in settlement. He was into deltas, possibly before the world-famous Dr. Lippisch ever thought of them. The segmented flap was Charlie's idea. Nobody is able to solve the riddle of the "spinning" flap, and Charlie has been burnt enough to keep that secret to himself. The answer lies in mechanics.

By 1910 Charlie was jumping off a roof in a tiny hang glider—he weighed 100 pounds sopping wet—and was sailing out over a sloping meadow for hundreds of feet (the first airplane in Vermont, he thinks). He tried it first on a bike, hit a downhill bump, and was unceremoniously airborne for about 35 feet, ashes over teakettle. They picked gravel out of his empennage for three weeks.

He was a "biggie" in model plane manufacturing before 1920. A salesman for Ritchie-Wertz of Dayton (his designs), he sold over $300,000 yearly to New York buyers. His company produced 1,000 Minute Men a day—limited by the capacity of the one prop carving machine he invented. They employed 50 people in his shop, had a moving production line of little cars riding on rails (he also mentioned a cable), from initial small parts right through to packaging. He even stopwatched the process. Around 1920, he learned how to reduce the 50% weight increase from painting to only 5%. These were not kits but genuine flying machines! He milled cambered wings from long balsa planks, slicing them off like bologna.

In the refrigeration room (!) they chilled the wood, then dipped the wings in diluted fish glue, varnished them, and finally painted them yellow. All this gook barely penetrated the wood. He also had his own company (Grant), and in the late Twenties, threw in with Kinksbury Toys (a depression victim) to produce 2,000 Silver Arrows a day. These had cambered silver-colored wings, with aluminum ribs to hold shape, and blue twin sticks for a fuselage, small aluminum U-shaped pieces retaining the sticks and allowing the rubber to pass. We had one in 1927, and it flew 650 feet. You could buy them all over America.

By then, his secret "sheep dip" was blue-dyed casein glue. Its weight increase was only 2%. *MAN* saw many of his fabled rubber designs, fine articles on aerodynamics, and books that are now collector's items. Charlie was on the design team for the remarkable Dayton-Wright Racer soon after 1920, and was responsible for both leading edge slats and wing flaps—60 years ago! It had a retractable gear. Today you can get a Peanut kit by Hank Struck from Jetco.

Charlie was, and is, driven by his illustrious ancestors, all "mad" inventors. His great grandfather designed the Governor DeWitt Clinton and John Bull locomotives. His grandfather installed the propulsive machinery in the Monitor. Charlie now has a revolutionary windmill which could affect the energy picture—his is light years ahead of those modernized "Dutch" windmills.

He is testy with us all, and says that if AMA doesn't do something soon about kids, he'll start his own organization. He loves boys, and had an airplane modeling boy's camp in the mid-Twenties where the late Howard McEntee was an instructor, and people like 1935 Wakefield-winner Gordon Light, and Joe Kovel were "vacationers." We keep telling this supercharged octegenarion that, at age 68, we can't join a crusade. Why not write this monumental man in care of AMA Headquarters? Do it while he is there to challenge your wits. He's a demon on the phone!

Charlie's new book, *Gateway to Aero Science*, has over 300 pages and is loaded with fine drawings of great flying models. (Distributed by Polks and available through Supply and Service at AMA HQ.) He has already written another; he prints and markets these things out of pocket. They are first class. Fittingly, his initials are C.G. He is our C.G.

Schweizer TG-3/Hiner

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National Soaring Records were at zero, an AMA record was set. This proves that the TG-3 will thermal, is stable, and can carry a full-size barograph.

The TG-3 is an easy-to-build and easy-to-fly Stand-Off (Sport) Scale Sailplane that is a bit different from the average Scale job. Because of the rules we use, I compromised scale accuracy somewhat in favor of better flying characteristics. You have to be aware of the stopwatch and landing tape when you fly Sport Scale Gliders. In fact, at the 1979 LSF Tournament, the Scale birds not only flew duration, but also flew a speed/distance task!

The TG-3 is real fun, and if you like building a fuselage with stringers, give it some consideration. If you have any problems in building a TG-3, drop me a line at 2213 Prentice Creek, Apt. 104, Downers Grove, IL 60515, and I will try to help.

References

Soaring, May-June 1944, "The TG-3A," by Ernest Schweizer.

AIR TRAILS, Spring 1979, "Glider Factory."

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