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PHOTOGRAPHY: DICK SARPOLUS

Hidden under the somewhat rakish outlines of the *Choice Cut* are some fairly conservative "numbers" that contribute to a steady flying aircraft.

Choice Cut

By Dick Sarpolus

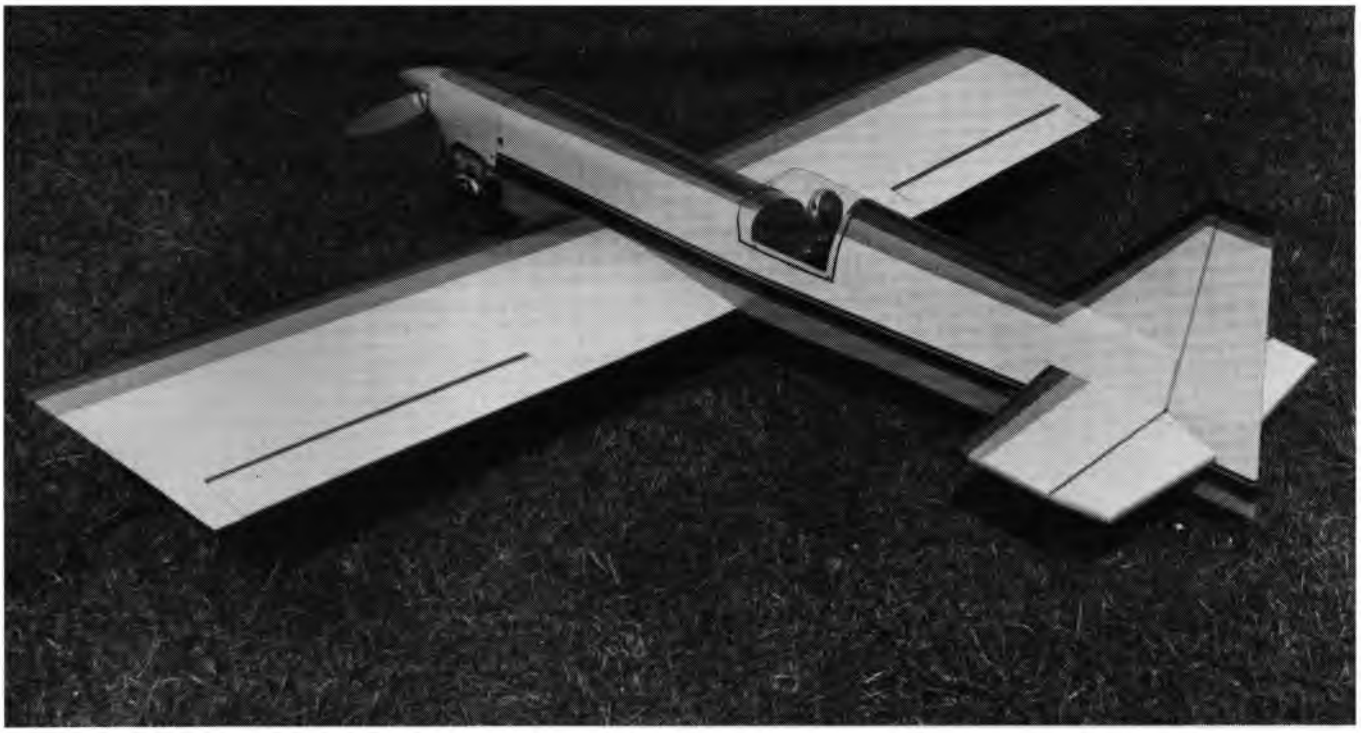
This aircraft offers straightforward, rapid scratchbuilding construction in a large size; easy flying characteristics for sport, and aerobatics with the larger gas burning engines; and a somewhat different appearance, along with a choice of wing planforms. The basic construction techniques are well proven, as are the overall proportions and design layout. It's based on my *Prime Cut*, a large sport design published several years ago in *Model Aviation*, which has been well accepted. The biggest reason for development of a new version were the number of comments I received concerning the tapered wing planform on the *Prime Cut*.

The *Prime Cut*, on the ground, was the sire of the *Choice Cut* which Dick holds. The primary differences are the no-taper constant chord wing and the narrow turtle deck of the *Choice Cut*.

Although many, many design features affect the flying characteristics of an aircraft, a lot of sport flying modelers appear to be wary of a tapered wing. I had people tell me they liked the *Prime Cut* but they weren't good enough pilots to handle the tricky, tapered wing. They referred to other tapered wing designs which they felt snapped too easily and fell out of the air when slowed down for an easy landing. And, there are a number of sport aircraft on the market with barn door wings which are known for their easy flying. I prefer a tapered wing; I like the appearance and believe they will roll faster and easier, perform aerobatics better than the barn door, constant chord wing layout.

To go with a tapered wing and still maintain the "easy" flying characteristics desired by the less than expert sport flier, there are other features to go after. A reasonably light wing loading, thick airfoil, reasonable taper, thick wingtip section, proper stab and vertical fin size, all will insure a good handling aircraft. But for those who will not be convinced that a tapered wing design can still be reasonably docile, I wanted to lay out a new design with the constant chord wing; the *Choice Cut* is the result, incorporating a few other ideas along the way.

The big wing has an area of 1440 square inches, helping to insure a light wing loading. I narrowed the fuselage to 6 inches wide and used the Fiberglass Specialties cowl from my P-51 *Mustang* design; it provides smooth lines to the nose section, fairing into a 4-inch spinner. The Quadra 42 carburetor protrudes through the cowl; that doesn't bother



Gene Hoyas' *Choice Cut* was the first the new breed to be built and features the optional squared-off P-51B canopy.

Take a comfortable step up with this gentle R/C giant. Features construction techniques familiar to any sport modeler. Can be built with a straight or tapered foam wing. Sized just right for the popular, inexpensive Quadra 42.

me and makes it easily accessible.

I'm sure sold on foam core construction as it's so quick and easy, particularly for scratchbuilding. I'm not convinced a built-up structure of equivalent strength would save enough weight to be noticeable. Foam core construction like this makes it tough for a commercial kit manufacturer, because the resulting kit boxes are so large; for the scratchbuilder, that's not a problem. The fuselage top sections are foam cored, for fast and easy construction. The high rear turtledeck and rearward location of the canopy give a little different styling, and the vertical fin and rudder are styled after the popular *Ultimate* biplane. Nothing radical in the styling, and the overall "numbers", I was sure, would provide good performance.

The numbers I mentioned, for Quadra 40 or equivalent weight and power, are 1200-plus square inches wing area in a wingspan of about 90 inches, an overall length of about 64 inches, a weight of 16 to 19 pounds or so, a thick wing section, and the right proportions. These aren't the numbers for a hot performing competitive pattern aircraft, but they work for a sport/aerobatic machine for the average—if there is such a thing—Sunday/sport flier. Sure, a larger engine can greatly improve the vertical performance, if that's what you want, and a little more weight doesn't hurt things too much. These numbers can accommodate a Quadra 50, a Zenoah G-62, a Sachs 3.8 or 4.2; the bigger engines also cost more, and economy is a consideration for most of us.

For the tail surface construction, rather than using a cut foam airfoil section, I went to the flat plate style. I hot wire cut 3/8-inch thick foam panels to use as cores inside the surfaces. An alternate built-up construction could be used, but the foam makes it easier and quicker for me. Built-up unsheeted tail surfaces would save weight, but would require external wire bracing for strength; I wanted the cleaner appearance without the bracing.

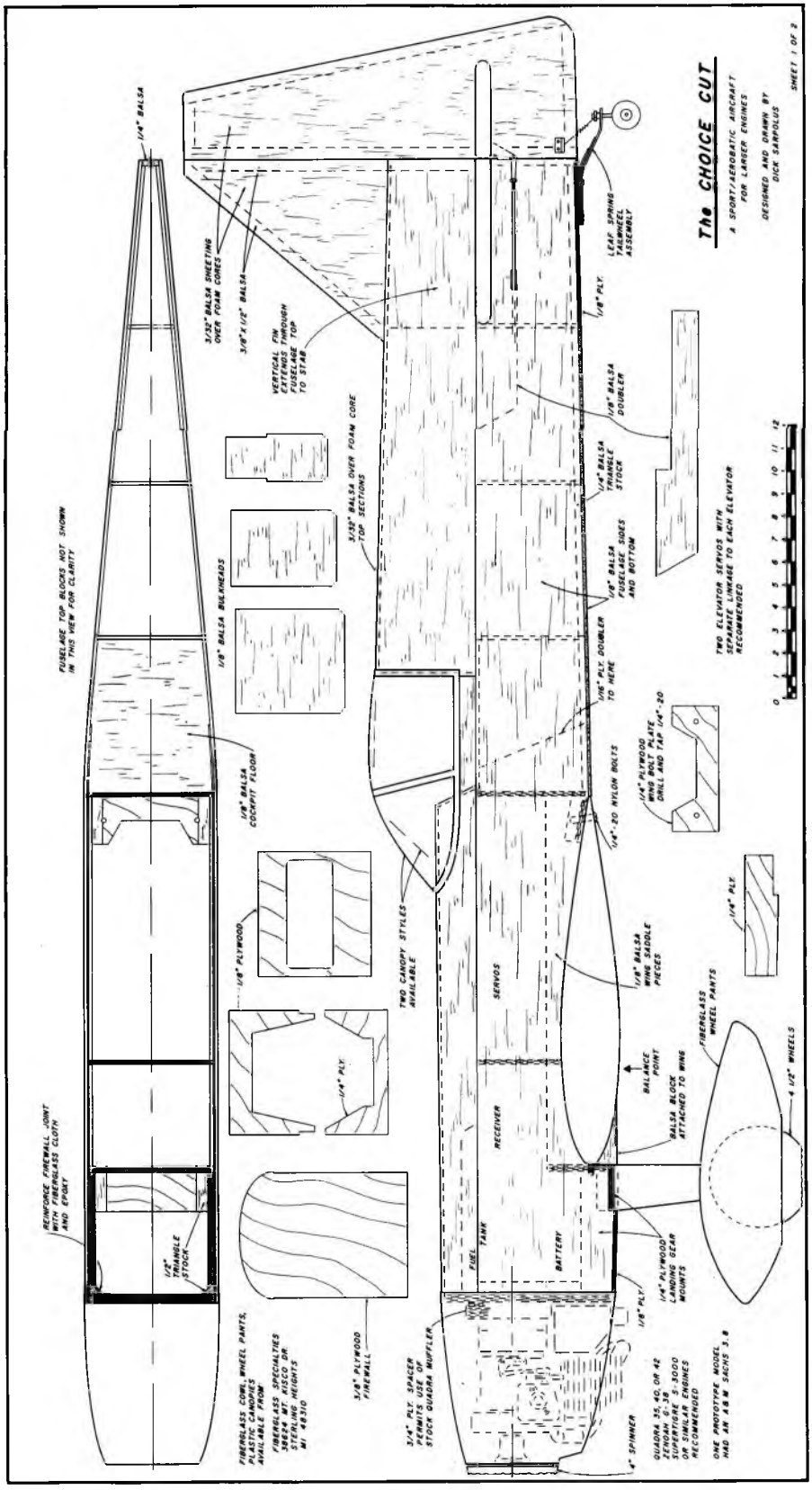
My friend Gene Hoyas built the first *Choice Cut*, using an A&M Sachs-Dolmar 3.8 powerplant. Gene also installed a smoke system, using the Slimline muffler and a B&B smoke fluid pump. Gene is a good builder, and we were both surprised at his aircraft

Gene's model used the Sachs-Dolmer 3.8 powerhouse, and even at an all-up weight of 23 pounds, his model flew great. Part of the weight came from the smoke system which Gene installed.

Choice Cut

overall weight. Ready to fly, it was 23 pounds! The 1440 square inch wing handles that much weight, and the plane flies fine; snaps and spins like crazy when desired, but with the thick wing and all that area, it's almost impossible to stall.

Gene's plane was ready to fly several months before mine; that's the way to try a new design, get somebody else to build one first. With a number of flights on Gene's version, I expected no problems with mine. My *Choice Cut*, with a new Quadra Q-42, weighs in at 16 pounds ready to fly. Flies just fine. Several more are now under construction locally.



With the barn door wing tested, the plans also show two tip section foam templates for those who prefer a tapered planform. The smaller tip section will give 1215 square inches, and the larger section provides 1282 square inches, with less taper. Pick the one you want, keeping in mind your engine choice and the weight you'll be shooting for; I like the tapered wing's appearance and feel it still results in a mild, easy handling aircraft. If you don't mind burning a bunch of higher priced glow fuel, the bigger SuperTigres or other glow engines would save some weight and also provide good performance in the *Choice Cut*.

If you hesitate to build from magazine plans, be assured that the hard to make parts are available. Fiberglass Specialties (38624 Mt. Kisco Dr., Sterling Heights, MI 48310, 313-978-2512) produces the glass cowl and wheel pants, along with the plastic canopies. ACE R/C's new aluminum landing gear works fine on the 6-inch wide fuselage. This only leaves the foam cores and the balsa and plywood; if you don't have access to a local foam cutter, Scott Smith of Aerosmith Model Aviation (RD #1 Box 290, Athens, NY 12015) does an excellent foam cutting job. If you don't want to do the wood part cutting yourself, you might contact Chuck Gill of The Aeroplane Works, 2134 Gilbride Road, Martinsville, NJ 08836; he's a custom cutter and could probably fix you up with a parts kit.

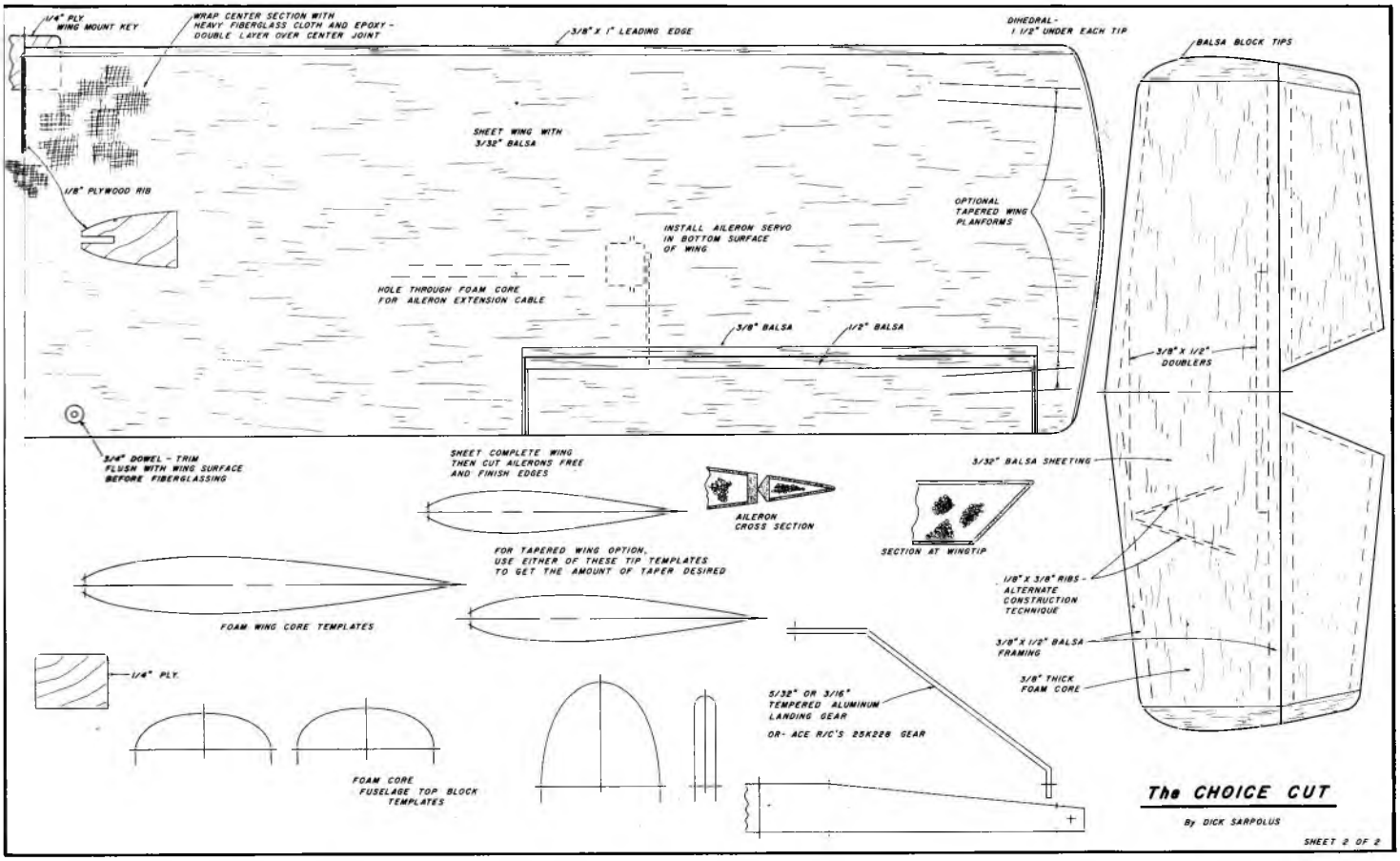
Construction

The *Choice Cut's* structure is conventional foam core design. If you've scratch built large projects like this before, you've probably already developed your own preferred building techniques and would be comfortable working directly from the plans. I'll go over the techniques I use. Beginning with the foam wing cores, it helps if the cores are cut off at the tips at a 45 degree angle before they're sheeted. Cutting the cores like this provides a curved shape to the wing planform and requires only wingtip sheeting, which is easier and lighter than carving large balsa tip blocks to shape.

The cores are sheeted with 3/32-inch medium weight balsa, which is edge glued as necessary for the needed width. Edge glue the sheeting by taping the joints together with masking tape to make up the size needed. Flip the wood over, open the taped joint over the edge of the workbench, and apply the glue. With the wood flat on the workbench, scrape the excess glue off the joint with a putty knife, and weight the wood down until the glue dries. Peel off the masking tape, and use the taped side as the outer surface of the sheeting. I sand the inside surface of the sheeting with rougher sandpaper to speed up the work, and use finer sandpaper to finish off the outer surface.

The toughest part of this job is getting a tight fit between the individual sheets; most balsa sheets do not have good straight side edges. I use a long sanding straightedge made from a piece of aluminum right angle stock, working on the edges until the sheets fit well enough to be taped and glued. I use the aliphatic resin type glues for this, finding them easier to sand for a smooth joint.

The only external difference between the two models are the canopies. Underneath the skin, there are major equipment differences.



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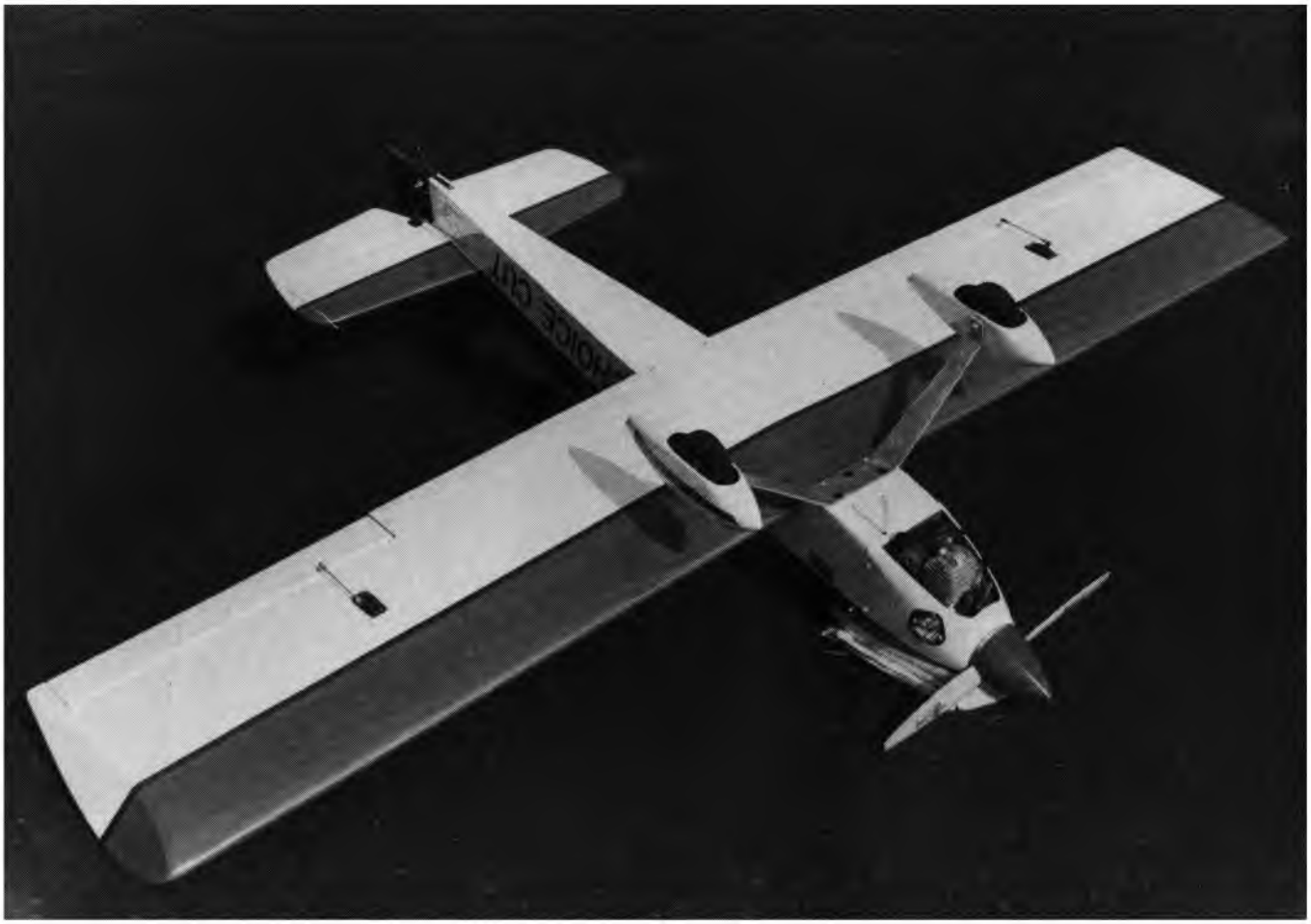
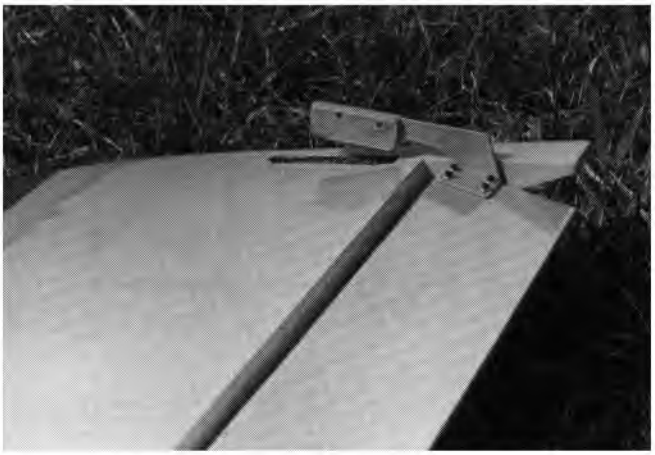


Dick's *Choice Cut* came out to a much lighter 16+ pounds, part of which was due to the minimal equipment and the much lighter Quadra 42 powerplant. The Q-42 cylinder head will still stick out of the cowl, as does the carburetor. At this weight, with this engine, the model is very aerobatic, yet still docile.

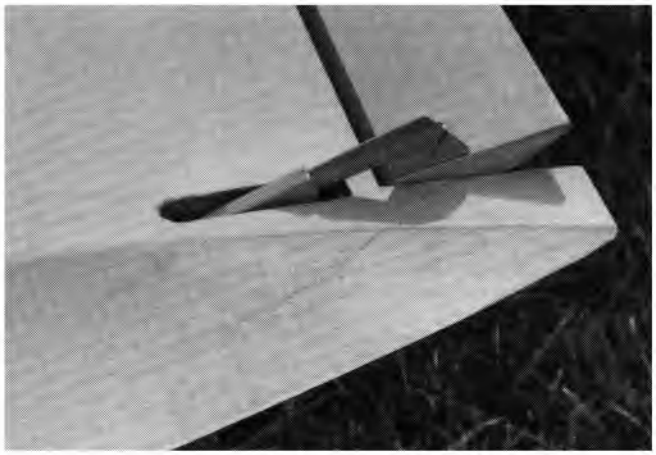
I've used for many years and strongly recommend Dave Brown's Southern Sorghum contact cement. Alternatives are thinly applied epoxy glue, 3M's No. 77 spray contact cement, or any other material you may prefer.

With the core sheeted top and bottom, trim off the leading edge and block sand it square. Add an oversized leading edge strip, and plane and sand it to shape. Cut and sand the sheeting to match the cut-off tip angle, and add the sheeting here. The ailerons are cut from the sheeted wing, trimmed down to allow for the balsa edging, and sanded to shape. Hinge the ailerons along the centerline using large, sturdy, freely moving hinges; and plenty of them. If you're using a larger than usual engine, you might consider adding aileron counterbalance weights to prevent any chance of flutter; it's good insurance. Cut recesses into the lower wing panel surfaces for the aileron servo mounting.

And before you join the two wing halves, be sure to make the holes through the foam cores for the aileron servo extension cables. I heat the end of a piece of ¼-inch steel rod, then push it through the foam core from the root to the aileron servo location. Removable hatches can be installed above the servos, but the trend seems to be to simply install the servos into the wing surface and leave them visible. Doesn't look as neat, but they and the aileron linkage are easily accessible.



With larger engines like the Sachs, flutter could be a problem so an aileron counterbalance **(above left)** on the bottom of the aileron should be considered.



The bracket is cut from sheet aluminum, then bent. The lead weights bolt on. When the aileron goes down, the weight nests in a cut-out pocket **(above right)**.

A plywood wing mounting tongue is used at the leading edge to position and retain the wing. It is reinforced by a plywood rib, installed at the root of the wing cores. Done this way, the contact area of the fuselage bulkhead retaining the wing mount can be trimmed or shimmed as necessary to get the correct wing-to-fuselage fit. Butt glue the two wing halves, then wrap the center joint of the wing with heavy fiberglass cloth and epoxy. Use double layers of cloth in the center. I've been using 9-inch wide strips of glass cloth, overlapped in the center to give a 5-inch wide double layer. I brush on a coat of epoxy, position the fiberglass cloth, and brush on additional epoxy to be sure the cloth is saturated. For a good, smooth appearance without too much sanding, I squeegee off the excess epoxy, leaving enough so the cloth is saturated for strength, but is smooth and level, needing little sanding before covering. Hobbypoxy's Smooth 'n' Easy epoxy is ideal for this use.

For the fuselage, select firm to hard balsa for the two sides, edge gluing and splicing as necessary to get the size required. Glue the 1/16-inch plywood doublers, 1/4-inch plywood landing gear block doublers, balsa wing saddle pieces, stab saddle doublers, and balsa lower edge strips to the two fuselage sides before adding the bulkheads. I like to use a 3/8-inch thick plywood firewall for mounting these large engines, usually laminating a piece of 1/4-inch and a piece of 1/8-inch thick plywood together.

With one fuselage side flat on the workbench, add the firewall and the next three bulkheads to the side, installing them perpendicular to the side. Glue the second side to those bulkheads; the sides are parallel from the firewall to the wing trailing edge position. Add triangle stock and heavy fiberglass cloth behind the firewall to reinforce its junction with the sides.

Add the 1/4-inch plywood wing bolt plate, then pull the tail end together, installing the rear bulkheads. As this is done, be sure the fuselage sides taper in a straight line to the rear so the straight cut foam top block will fit correctly. Add the cockpit floor; this piece will stiffen the fuselage assembly. Before sheeting the foam fuselage top blocks, check to see that when sheeted they will line up flush with the bottom fuselage assembly; the foam can be sanded if necessary for proper alignment. Sheet the foam blocks as was done with the wing cores; trim the sheeting, and glue the top blocks in place on the fuselage. A slot

Some parts of the *Choice Cut* have been borrowed from Dick's P-51 *Mustang*. The streamlined cowl comes from it, as does the optional squared-off canopy. A 4-inch spinner fits nicely.

Another "borrowed" item on the design is the fin-rudder outline that comes from Dick's *Ultimate* bipe conversion (**FM** 5/91, CF-854).

must be cut through the rear top fuselage block to allow for the vertical fin installation. Add the plywood landing gear mount and forward bottom section to the fuselage. Before adding the fuselage bottom sheeting, cut holes in the rear bulkheads for the elevator and rudder pushrods. I wait until the tail surfaces are installed on the fuselage and the wing is fitted before adding the bottom planking.

The tail surfaces are built flat on a workbench surface. The 3/8-inch thick foam cores are cut to shape, with 3/8 by 1/2-inch balsa framing added, then sheeted with 3/32-inch balsa as was done with the wing cores. Tip blocks are added, and the edges shaped as appropriate. I prefer to fit the wing to the fuselage next, adjusting the fit of the wing mounting tongue as necessary through the fuselage bulkhead, and drilling and tapping the wing mount plate for the two 1/4–20 nylon bolts which hold the wing in place. With the wing mounted, I add the horizontal stab, aligning it with the wing. The vertical fin is added, perpendicular to the stabilizer. A 1/8-inch plywood section on the bottom rear of the fuselage is used to mount the leaf spring tail wheel assembly.

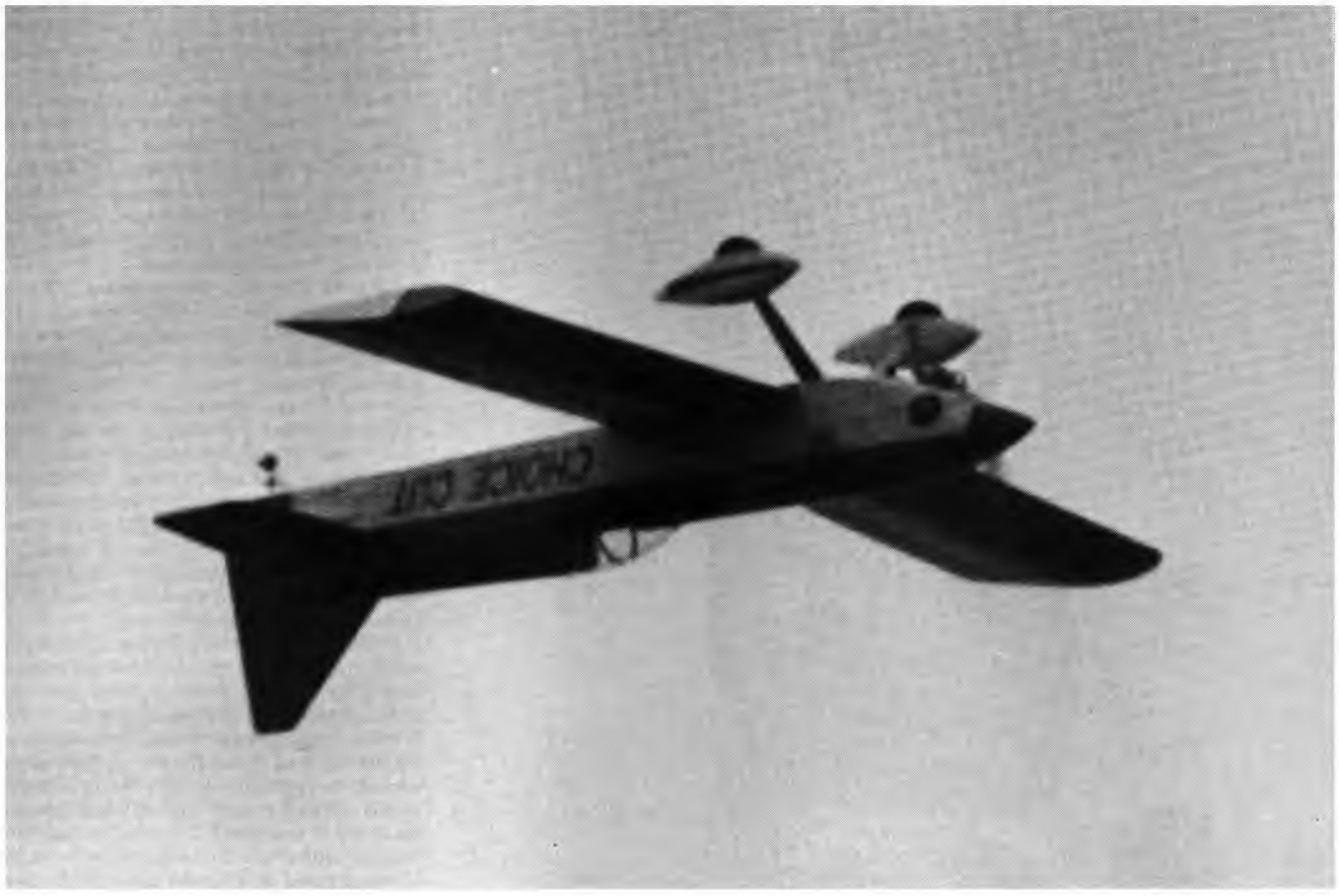
Whatever type of hinges you use—either the various molded nylon flat hinges or the hinge point style—cut the notches or drill the holes along the center lines of the surfaces and notch the control surfaces as appropriate to permit a close fit of the surfaces to the main structure, still allowing proper movement. I recess the control surfaces to accept 1/4-inch plywood mounting pads for the nylon horns, which go on the ailerons, elevators, and rudder. Epoxy the plywood mounts into the surfaces; the horns are mounted with self tapping sheet metal screws.

I use 1/4-inch plywood for the servo mounts in the fuselage, and recommend the larger 4–40 threaded rods and clevises for all linkages. Fiberglass tube pushrods are used for the elevator linkages. Using separate servos for the elevators, each with its own pushrod, allows the pushrods to be perfectly straight. Since the pushrods cross over within the fuselage, one of the elevator servos is mounted higher than the other to keep the two pushrods from rubbing together. The tail wheel steering is tied to the rudder with small springs; the actual rudder linkage can be done with a pushrod or a twin cable pull-pull setup if you prefer.

I make up aileron extension cables into a "Y"-harness for the two aileron servos mounted in the wing. A 1200 mAh battery pack is used, wrapped in foam rubber and positioned beneath the fuel tank. If necessary for balance, the battery pack can be located behind the wing position.

The exact engine mounting must be worked out to suit the engine used. For the Quadra 42, I prefer the large, quiet stock muffler that comes with the engine. To permit its use, I use a 3/4-inch thick plywood pad behind the engine mount which provides

As Dick (standing) and Gene (kneeling) pose with their planes, the thick constant chord wing and conventional ailerons are very evident.



This inverted pass by Dick's model shows some of the aerobatic potential in the plane. At the same time it remains stable at slow speeds.

space for the muffler ahead of the firewall. The fiberglass cowl is trimmed as necessary to fit around the engine, and held in place with four nylon bolts; drill and tap the fuselage sides for these cowl mounting bolts. The plywood landing gear mount is also drilled and tapped for the bolts which hold the gear in place. I mount the ignition switch on the front of the firewall, and cut a hole in the cowl for the switch handle. There's room for two 16-ounce tanks, one for a smoke system if desired. A 4-inch spinner is required. The fiberglass wheel pants are mounted to the axles on the aluminum landing gear with SIG's nylon pant mounts. There are two plastic canopies available from Fiberglass Specialties, with a choice of styles. One is their P-51B *Mustang* canopy; it has a squared-off appearance. The other is a longer, streamlined canopy, for a racer or aerobatic look. Your choice.

For the covering and trimming, chances are some sort of iron-on plastic film will be used. Not only are the iron-ons easier and faster, they save a lot of weight. There's a wide variety of these products on the market, and I've been using Coverite's covering materials for a lot of years now; I prefer their Black Baron Film.

I had no concerns over the flight testing of the *Choice Cut*, and there were no surprises. The plane is a solid, stable flier that responds well and handles most aerobatic routines. It requires the same caution and attention due any large aircraft, but it's not overly demanding; I can relax with this one. Fly safely.

Compared to the *Prime Cut*, the *Choice Cut*, which Dick holds has a narrower, sleeker fuselage. The span is 90 inches with a 16% thick, symmetrical airfoil. Wing area calculates to 1440 square inches.