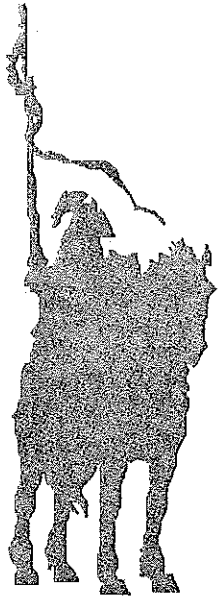
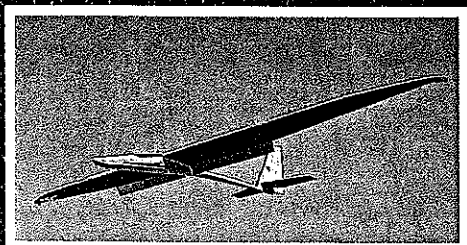
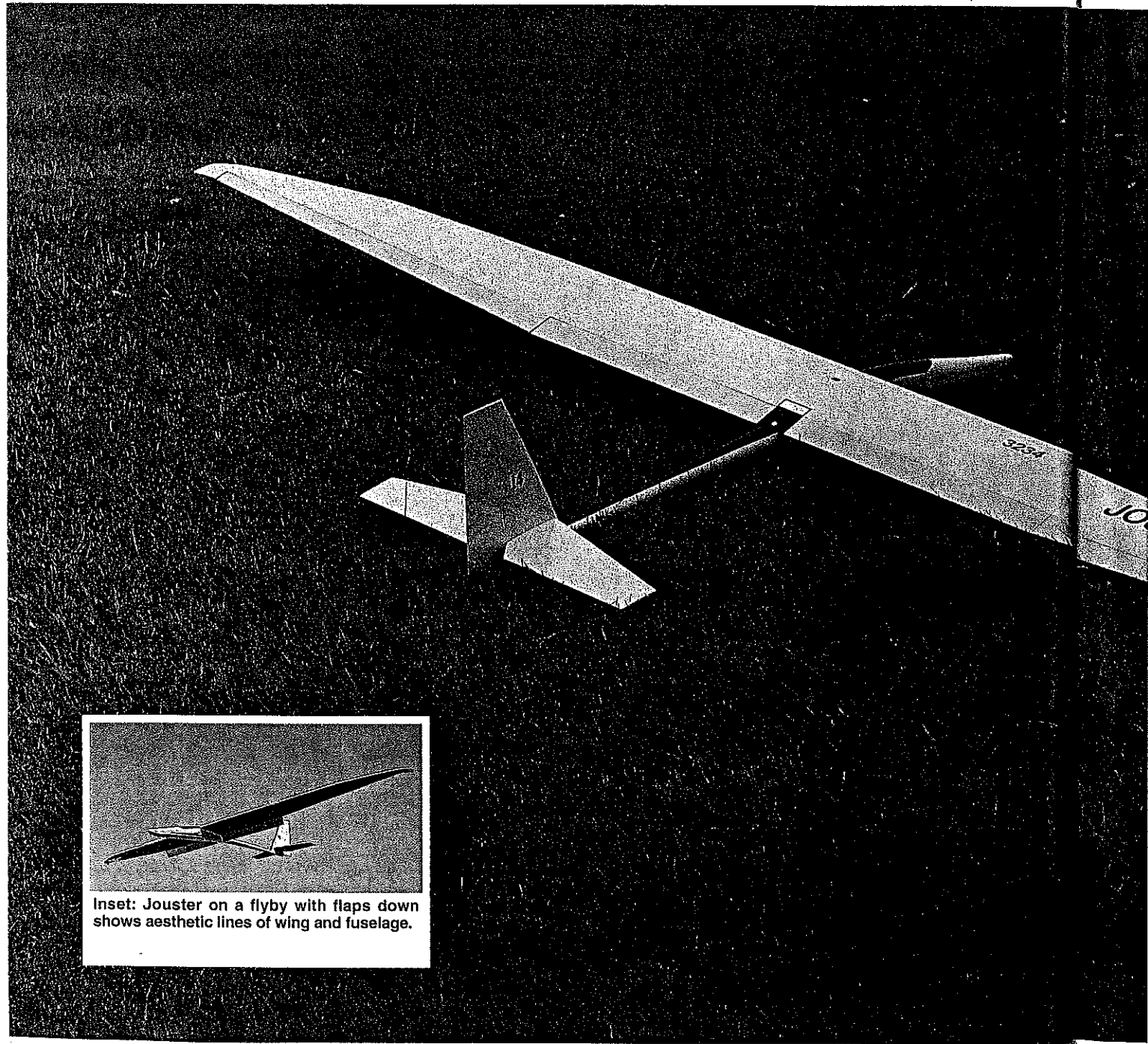


JOUSTER



This low-tech, low-cost RC sailplane offers high performance and excellent handling characteristics.
■ Harley Michaelis

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Inset: Jouster on a flyby with flaps down shows aesthetic lines of wing and fuselage.

THE JOUSTER had its origins in the Atrix (December 1986 *MA*). It is a most capable, efficient, and sophisticated sailplane, specifically designed for low-tech, low-cost scratch-building.

When properly built and trimmed, it should please even the most discriminating of the soaring fraternity. While it's designed for competition, its easy handling suits it to sport flying, too.

Its performance is simply everything desired from a thermal airplane. It tows steeply, zooms well, is buoyant and thermal-sensitive, and responds promptly to stick input. It does flat turns on rudder only, and it does wrenching turns with coupled ailerons. It can be safely pushed for speed, descends vertically with flaps down, and slows well

for landings. Stalls are gentle. It displays an especially flat glide, with a low sink rate and excellent penetration, without the addition of ballast. It is totally predictable, with no bad habits.

For optimum performance, the model can utilize the capabilities of today's most sophisticated radios, but the Joustler can be flown with basic four-channel sets.

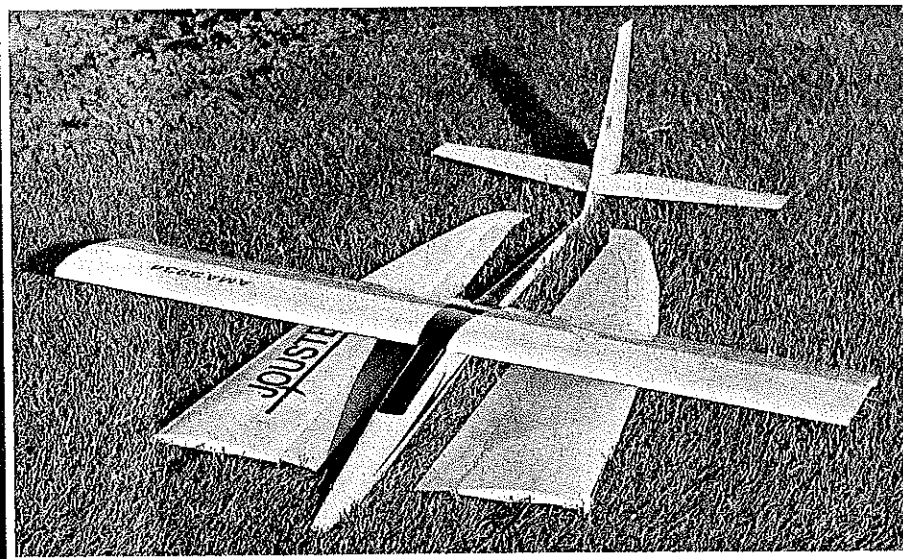
A primary departure from typical plug-in wing panels is the one-piece flat center section. I have built some 30 sailplanes of this general type, including 16 Joustlers. Each was improved in some way to reach the present state of refinement.

A variety of airfoils have been used, including the E205, S2091, S4061, SD7037, and, as favored and presented here, the

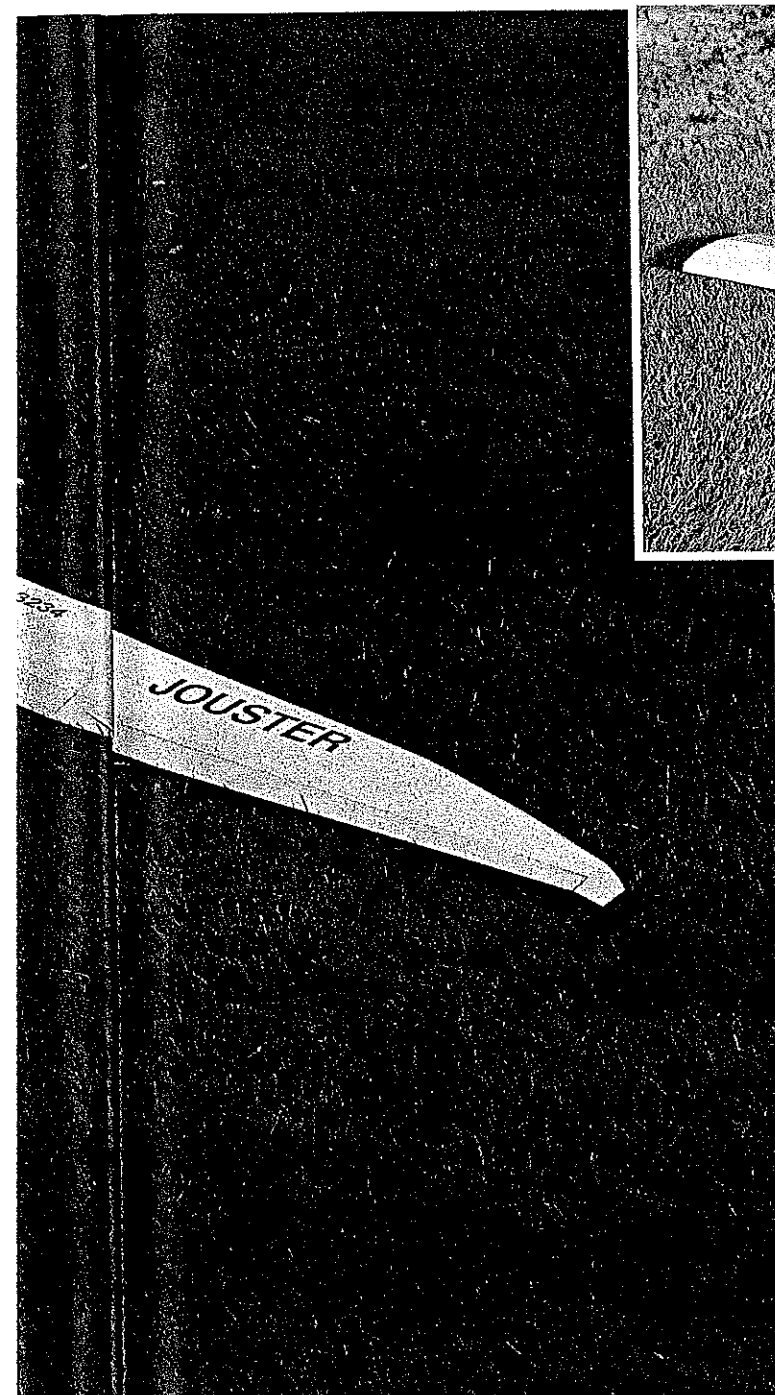
SD7032 with fully sheeted foam cores (see core source below). Center-section spars are sandwiches of plywood strips and carbon fiber laminate that give the wing bending resistance under high stress.

Using the only Joustler flown in Expert class in 1990, I was first in season points standing in the NWSS. This is a group of some 100 fliers in which kitted designs are numerically dominant. Although I have completed Level 5 League of Silent Flight (LSF) requirements, I claim no real expertise—I prefer to give credit to the model.

The Joustler is definitely *not* run-of-the-mill. This truly beautiful and original design is full of practical innovations. Let's take a walk around it.



Above: Wing tips attach or detach easily. They are supported by spring-steel blades, which lock the tips firmly in place.



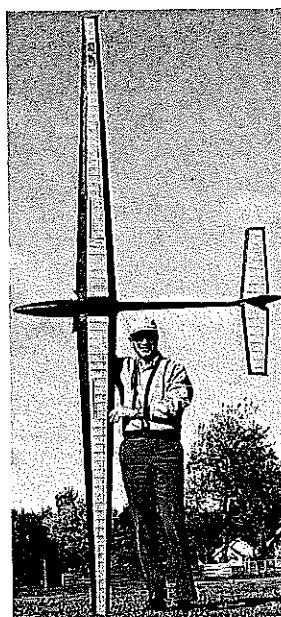
About the Designer

I began model building at age 8, stripping up bamboo rakes, cedar shingles, fence posts, and old cigar boxes for building materials. Covering for these early models was tissue and wrapping paper; adhesives were flour and water, school paste, and LePage's 48-Hour Iron Glue.

I later pursued rubber power, free flight, and, since 1967, RC sailplanes. My Mod-Pod, Hi-Pro, Miskeet, and Easy Eagle designs have been kitted. The Joustler is my 15th published design.

I'm now retired, and a totally involved-for-fun designer, builder, and competitor. My greatest satisfaction is discovering new things for others to enjoy. The Joustler includes many of these things.

League of Silent Flight (LSF) #023, I am Level 4 and did Level 5 competition tasks in 1975, but lacked Level 3 witnesses for the other tasks.



Harley Michaelis and his 1969 Miskeet sailplane. The Joustler is his 15th published design. Note LSF #023.

Its cleanliness is immediately apparent. Nothing hangs out of the wing—even the hingelines are hairlines. The tips lock on tightly with a snug fit. The wing saddle and fin-fuselage joints are filleted. The small glass canopy merges smoothly with the fuselage lines (see canopy source below). The stab is a close fit to the fin. The fuselage is sleek and slim, with narrow, oval-shaped cross sections.

Contributing to the clean wing is a new type of easily made, all-internal Direct Aileron Driver (DAD). The DADs eliminate slop, bind, and the unsightly clutter of horns, backplates, bolts, clevises, threaded rods, set nuts, and bulky exit guides or ratty-looking slots.

Inside, in utmost simplicity, a music wire pushrod goes directly from the DAD to the servo with no intermediate linkages. The flap mechanism is also internal and is always flight-ready.

The hairline hinges on all moving surfaces utilize Ace R/C's rubber Harley's Hinges. The flying surfaces are a butt fit, without beveling, spacing, or rounding—they simply pivot on their edges. The hinges are installed under a light tension, so the surfaces hug each other and lock on, eliminating unsightly gaps or tape. With this hinging, the DADs, aerodynamically clean lines, a low-drag airfoil, clean wing attachment, and a close-fitting canopy, the model just *whispers* by, in

testimony to overall cleanliness.

Light wing tip sections help with firm roll response and thermal indication. The wing tips are firmly supported by light spring-steel blades (see below for source), which slip into light but sturdy receptacles secured between the center-section spars. A simple, spring-loaded connect/disconnect setup quickly couples aileron mechanics between the center and the tips.

The wing planform is a Schuemann variation with a straight TE and several breaks to provide clean chordwise airflow. I experimented with various LE break points and angles, LE radius near the tips, tip chord, and washout. The features used on this model worked best in practice. The raked, Christensen extreme tip is feathered to its $\frac{1}{32}$ plywood core. A piece of yarn attached there for testing displayed no vortex in level flight—it extended straight back.

Standard servos for rudder and elevator are mounted in tandem in the fuselage. Flap and aileron servos fit into a recess at the wing center, avoiding long extensions necessary with outboard servos. This allows use of miniservos, which are more rugged than micros servos. Clustering all servos keeps more mass inboard, helping roll response without the use of two flap servos and a radio to mix the flaps in to act as ailerons.

The slim, curvaceous fuselage is all

Jouster

Type: RC sailplane

Wingspan: 122 inches

Number of RC channels recommended: Four

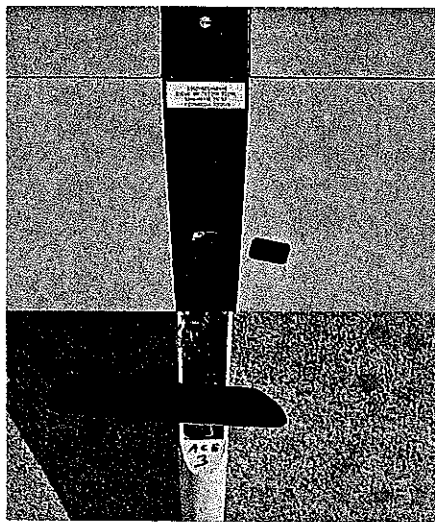
Expected flying weight: 64-72 oz.

Type of construction: Sheeted foam-core wing, fiberglass/balsa fuselage and fin, balsa stabilizer

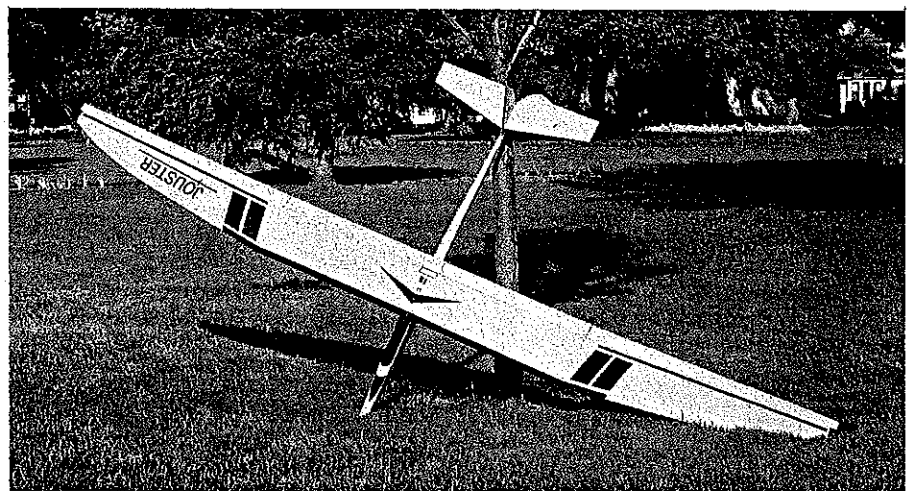
Type of covering/finish recommended: UltraCote and epoxy, enamel, or polyurethane

wood, and it is glassed over and painted for beautiful appearance. It has only two formers and is actually quite simple to make. The glassing procedure (detailed on plan sheet) yields a structure that is plenty rugged, despite the delicate appearance of the tail. Carbon fiber/epoxy laminate was also used, and in calamities where the nose was buried a foot, that area survived intact.

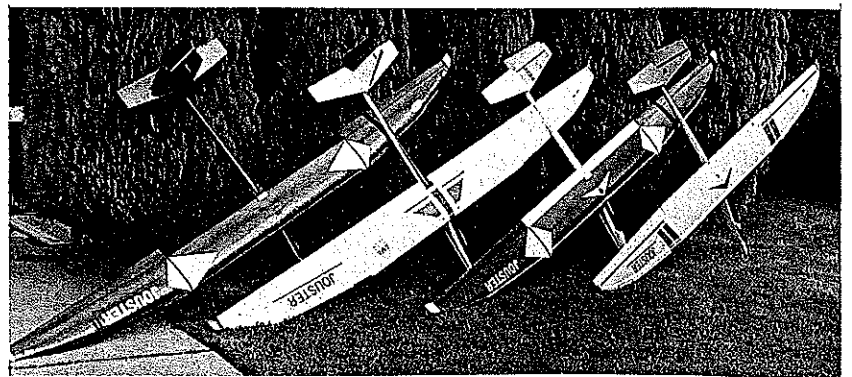
The long, distinctive droop snoot serves several practical purposes. There is no low belly to rotate on and lose landing points. It lowers the center of gravity (CG), and with the top-mounted wing, extended hands-off flight is possible—unusual for a high-performance, low-dihedral, non-polyhedral model. The nose shape keeps the wing high



Small fiberglass canopy is shaped to fit around the wing's leading edge. Wing is secured with recessed nylon bolts.

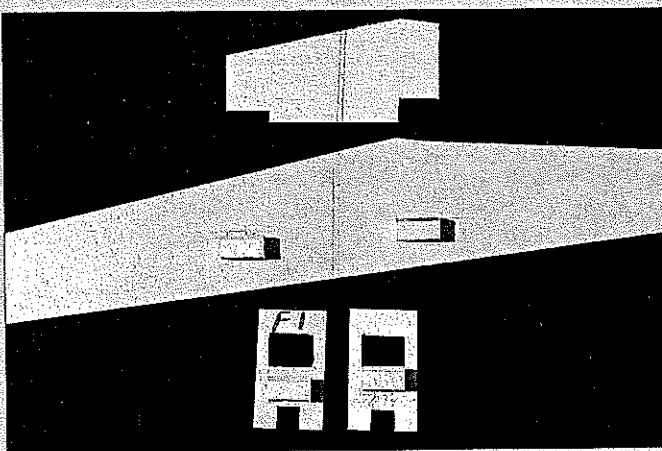
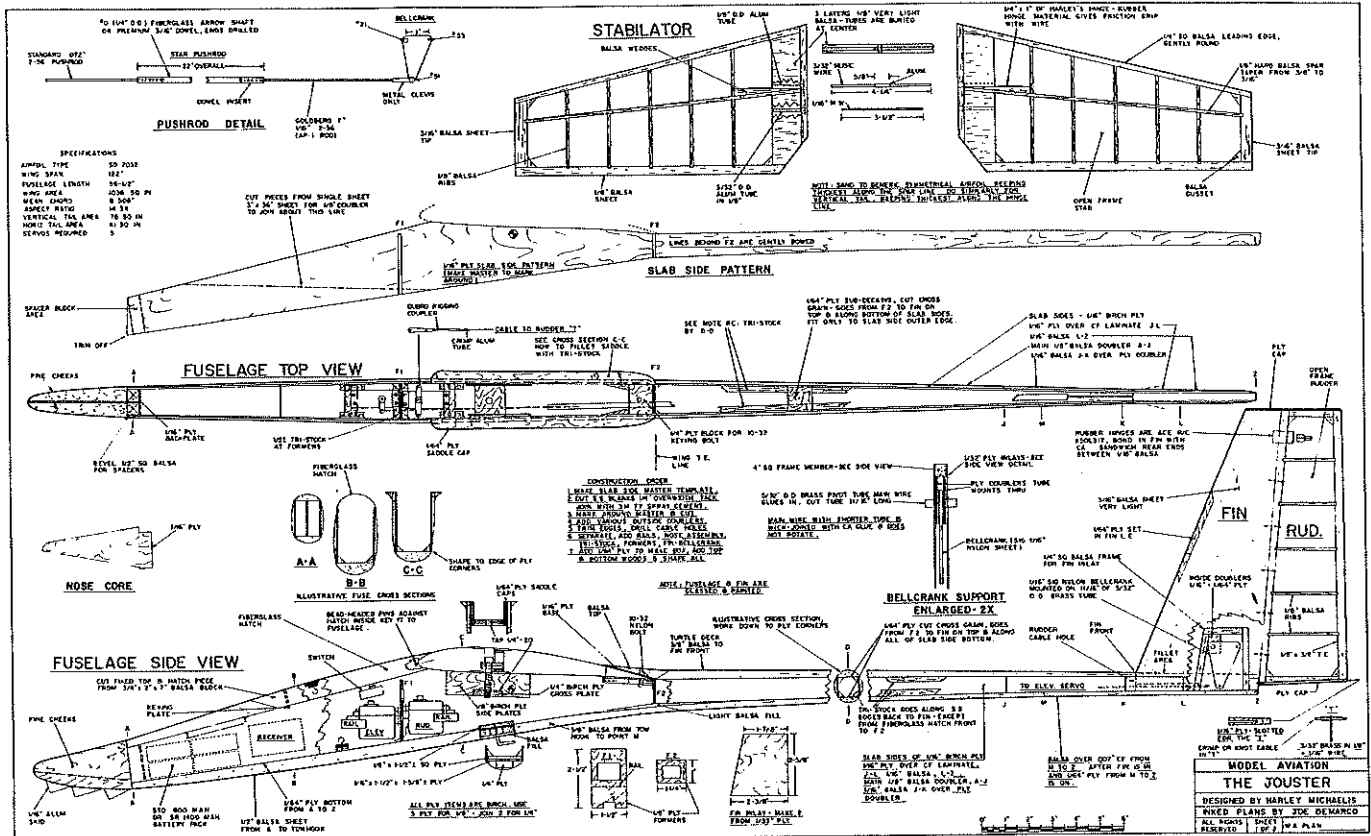


Eye-catching color scheme and easy-to-make logo were accomplished with Goldberg UltraCote and Zynolyte Premium Polyurethane paint. UltraCote was also used for wing trim.

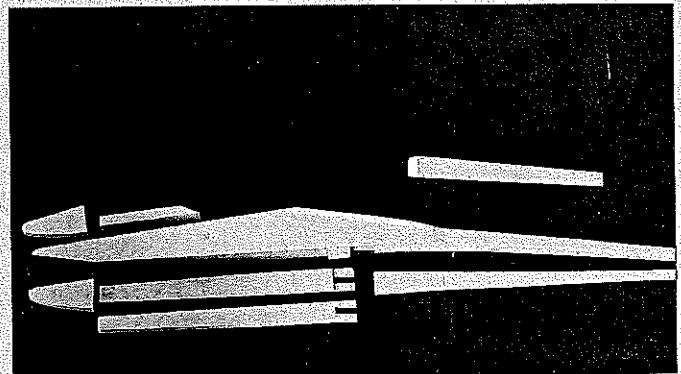


Part of the author's personal Jouster fleet, including four of six models built since 1991. Friends have built 12 others during that time.

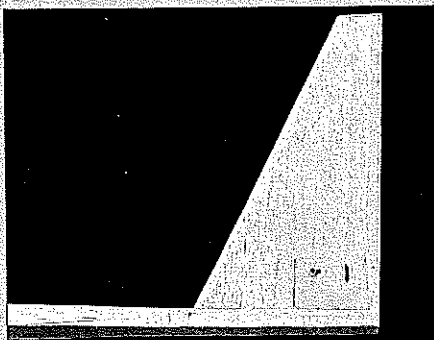
Light tips help roll response and thermal indication. Raked Christensen tip is feathered to $\frac{1}{32}$ plywood core. Tip shape helps chordwise airflow.



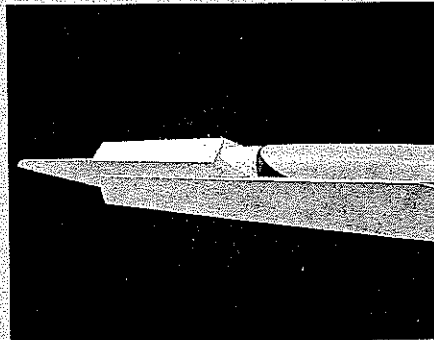
Fuselage slab sides are 1/8 plywood. Formers are 1/8 plywood, supported by triangular balsa stock. Note servo rails in place.



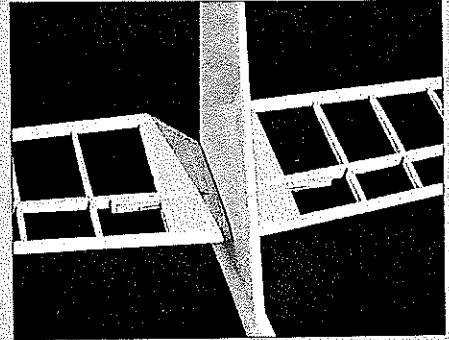
Main fuselage components are ready for assembly and shaping. Joust offers high performance with low-tech construction.



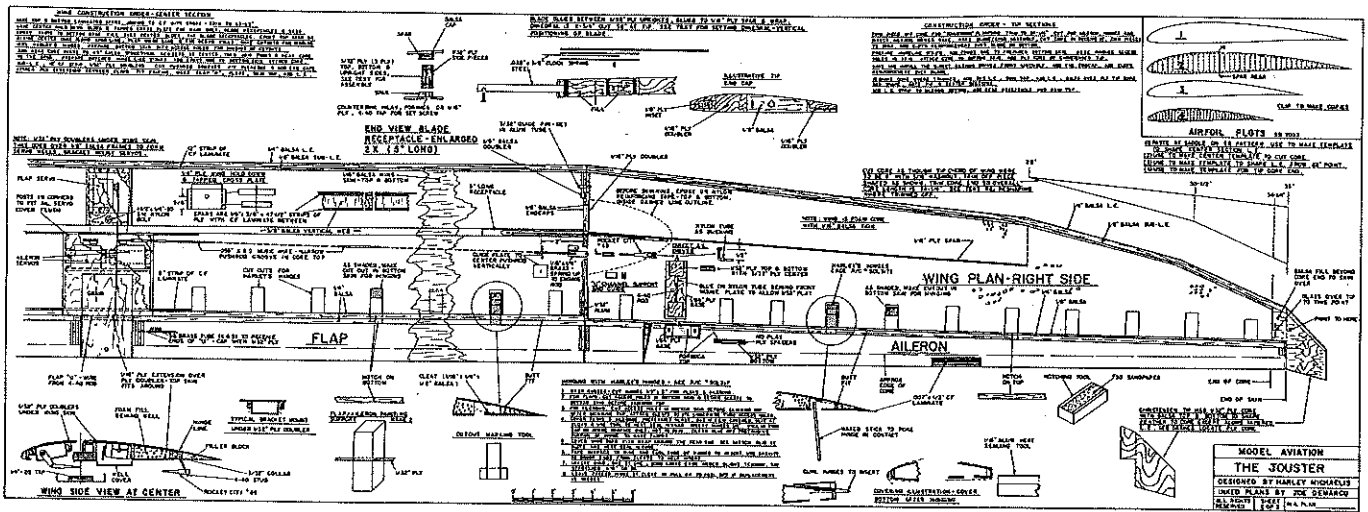
Profile view of fin features stabilizer attachment setup. Light balsa is a must to avoid additional nose weight.



Nose section ready for addition of pine cheek blocks prior to final shaping. Nose core is 1/8 plywood.



Built-up stabilizer is shaped to a generic symmetrical airfoil section with high point along the spar line.



during landings, which saves gears if the flaps are down and makes catching a wing tip less likely.

During landings, the low-point, integral "shark's teeth" are the first part of the model to touch the ground, and they dig in to brake the model. Since the canopy is small and light, it's less likely to come off during a sudden stop (which would cause a loss of landing points). If the Joustier is brought in level and slow, with the flaps neutralized just before

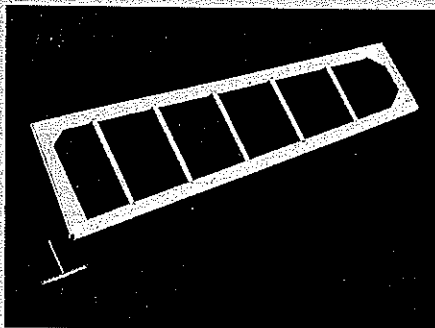
touchdown, the model will usually "pancake" and stay put at the intended spot.

The all-moving stab has a rigid mount, pushrod, and triangular bellcrank, which combine for a well-defined neutral setting. Internal rubber grippers securely retain the stab halves. This assures fine-tuned, positive, safe pitch control through a wide range of flying speeds. The rudder is cable-operated.

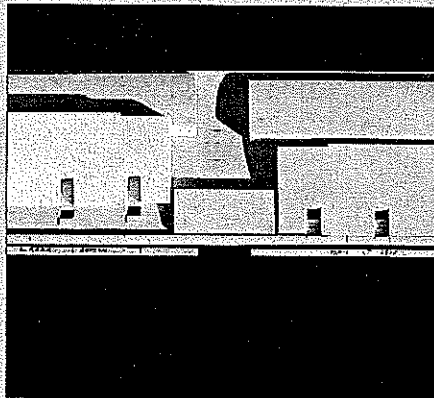
The long, slim front end has space for a Sanyo 800-mAh "stick" battery pack. SR

makes a 1,400-mAh pack that is the same size and weight. Use of these packs, combined with the model's long nose and a light tail section, make it possible to achieve the desired CG without the addition of lead up front. This contributes to the model's buoyancy and pitch-axis response. My models' weights ranged from 64 to 72 ounces, for wing loadings of nine to 10 ounces per square foot.

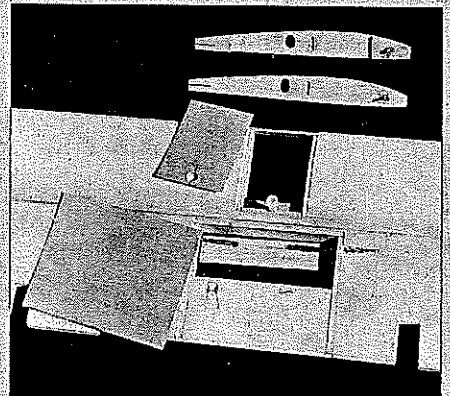
Detailed construction text is provided with



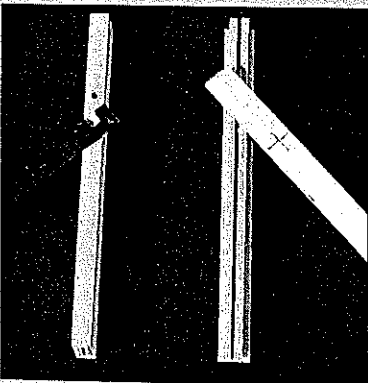
Rudder framework uses 1/8 balsa ribs. Pull-pull cable setup uses brass-and-music-wire "T" shown at lower left.



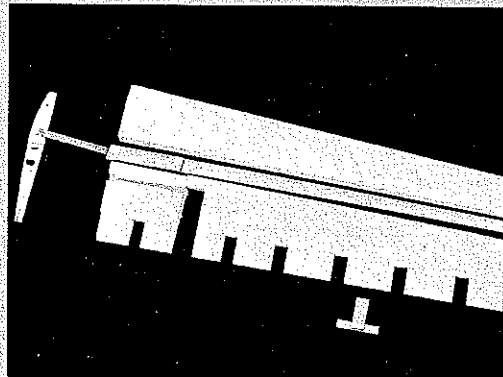
Foam core and wing sheeting have cutouts for Ace R/C's Harley's Hinges. Detailed instructions provided with plans.



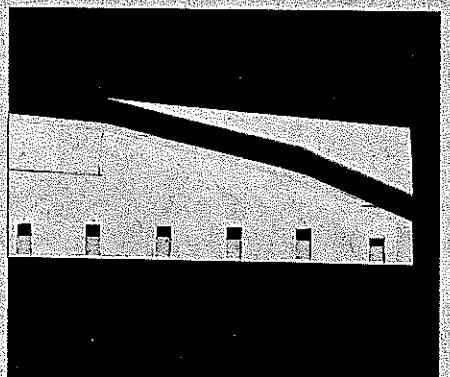
Center-section view shows 1/4-20 nylon bolt, servo wells, and covers. Main panel endcap ribs visible upper center.



Plywood receptacles allow accurate positioning of .032 x 3/8 spring-steel wing tip joiner blade.



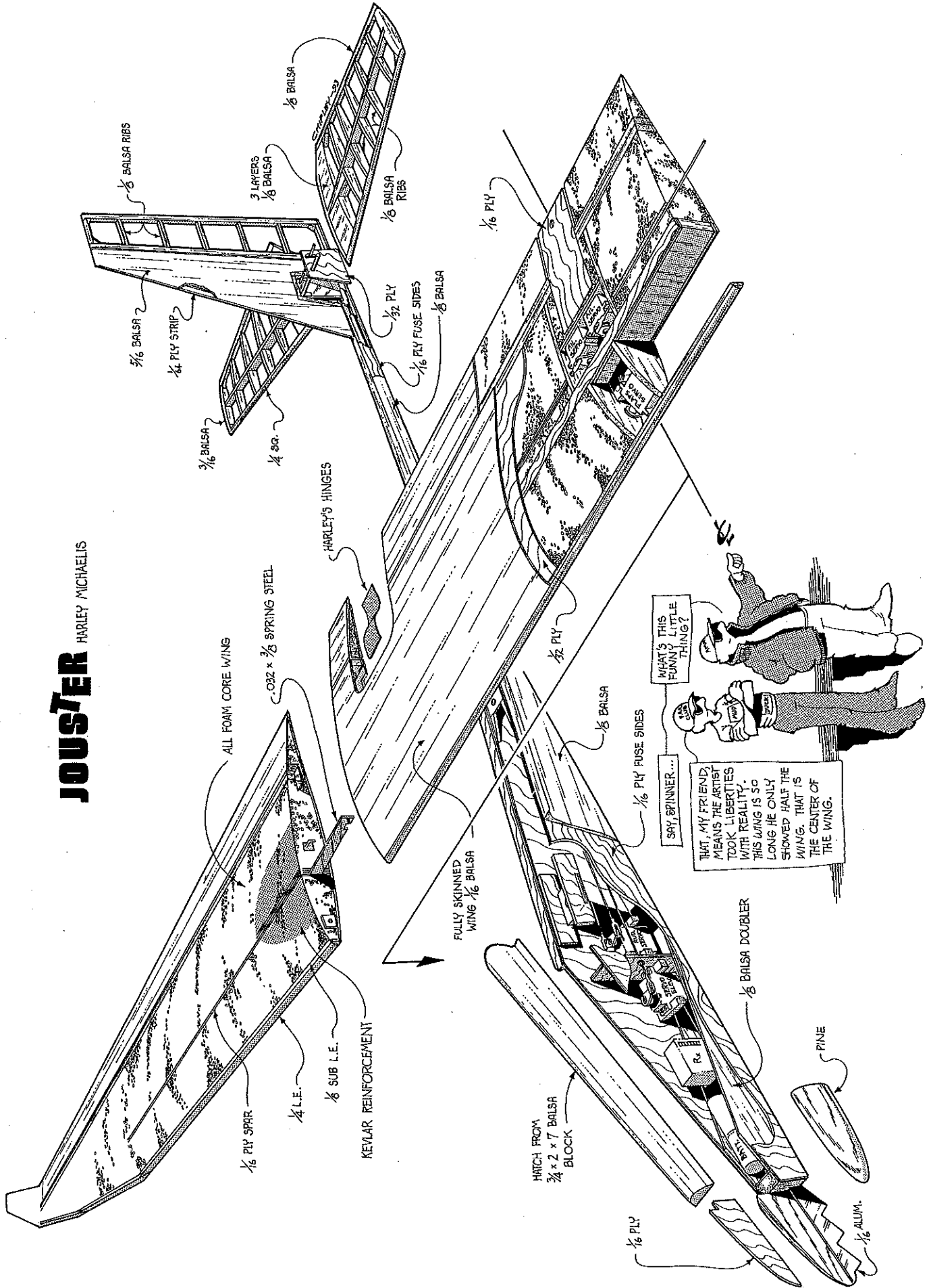
Wing tip subassembly shows 1/8 plywood main spar with joiner attached, tip endcap, and hinge cutout marking tool.

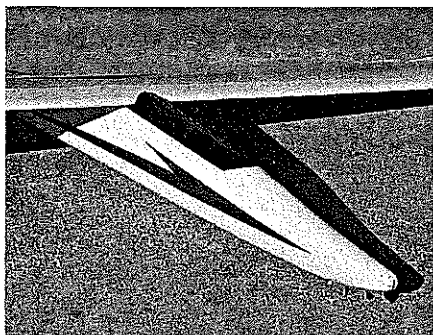


Wing tip cores are cut as though tip chord is six inches, then trimmed as shown and sanded to final shape.

JOUSTER

HARLEY MICHAELIS

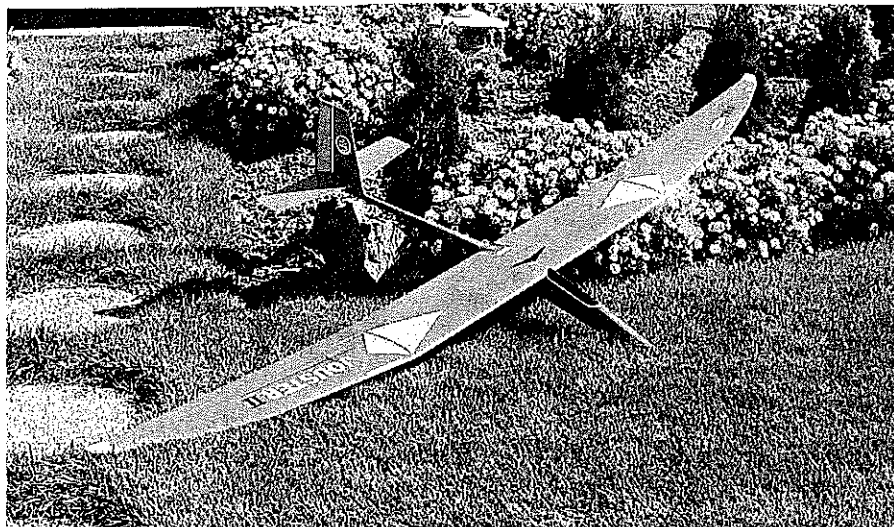




Finished fuselage with $\frac{1}{16}$ aluminum "shark's teeth." Fiberglass hatch is available from the author—see text.

the plans. A step-by-step explanation is given to clarify procedures and minimize building time. A materials list is included. SD7032 plots are provided for those who prefer to make templates and cut their own cores.

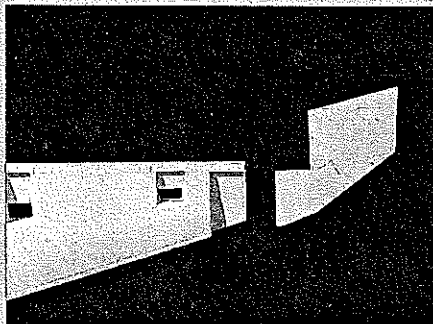
Sources: Fine extruded cores (SD7032 airfoil) are available from Harry Smith, 814 Home, Walla Walla, WA 99362; Tel.: (509) 525-1554. Price is \$40, postage paid.



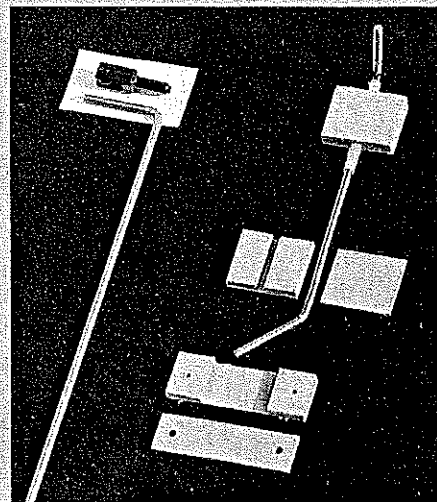
One of the 16 Joustlers built by the author. Spars in the one-piece flat center section are sandwiches of plywood and carbon fiber. Versatile model was designed for competition, but handles easily for sport flying as well.

A notched spring-steel blade set for \$2.50, postage paid, and molded polyester hatch for \$4 are available from Harley Michaelis, 26 S. Roosevelt, Walla Walla, WA 99362; Tel.: (509) 529-2562. →

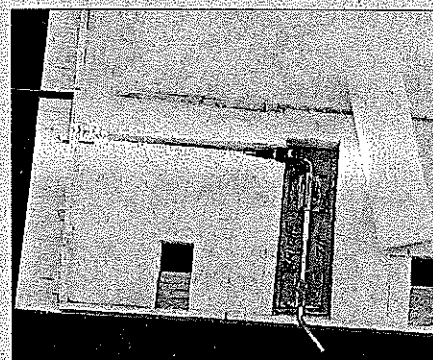
Keep this issue of *Model Aviation* to refer to as you build this elegant, high-performance beauty. →



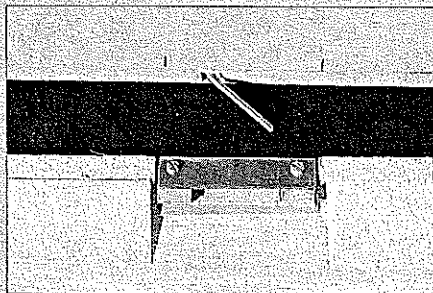
Christensen extreme wing tip is $\frac{1}{32}$ plywood with balsa top and bottom feathered and shaped to the tip core.



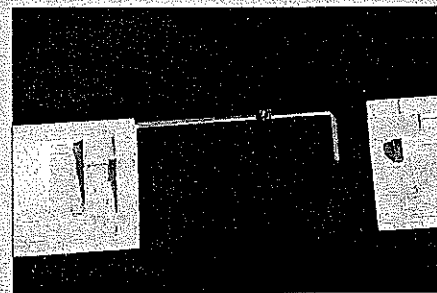
Direct Aileron Driver (DAD) components. This system keeps all linkages internal and maintains smooth airflow.



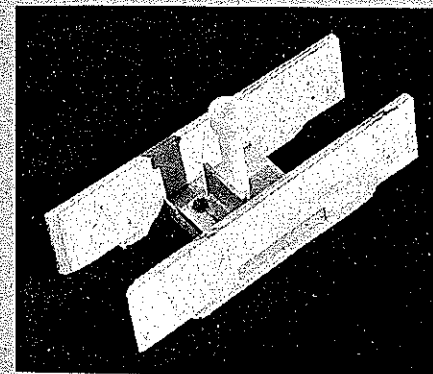
DAD mounted in right wing tip. Base is $\frac{1}{64}$ plywood. Main rod for DAD is 4-40. Assembly mounts flush to bottom skin.



Receptacle for DAD has a $\frac{1}{64}$ plywood base, $\frac{1}{32}$ plywood bottom, no-play plywood spacers, and a Formica top.



Flaps are connected with a "U" made from 4-40 threaded rod. The ends of the U fit into square brass tubes.



Wing hold-down is $\frac{1}{4}$ -inch plywood with $\frac{1}{8}$ plywood crossplates. Main wing bolt is a nylon $\frac{1}{4}$ -20; rear bolt is a 10-32.