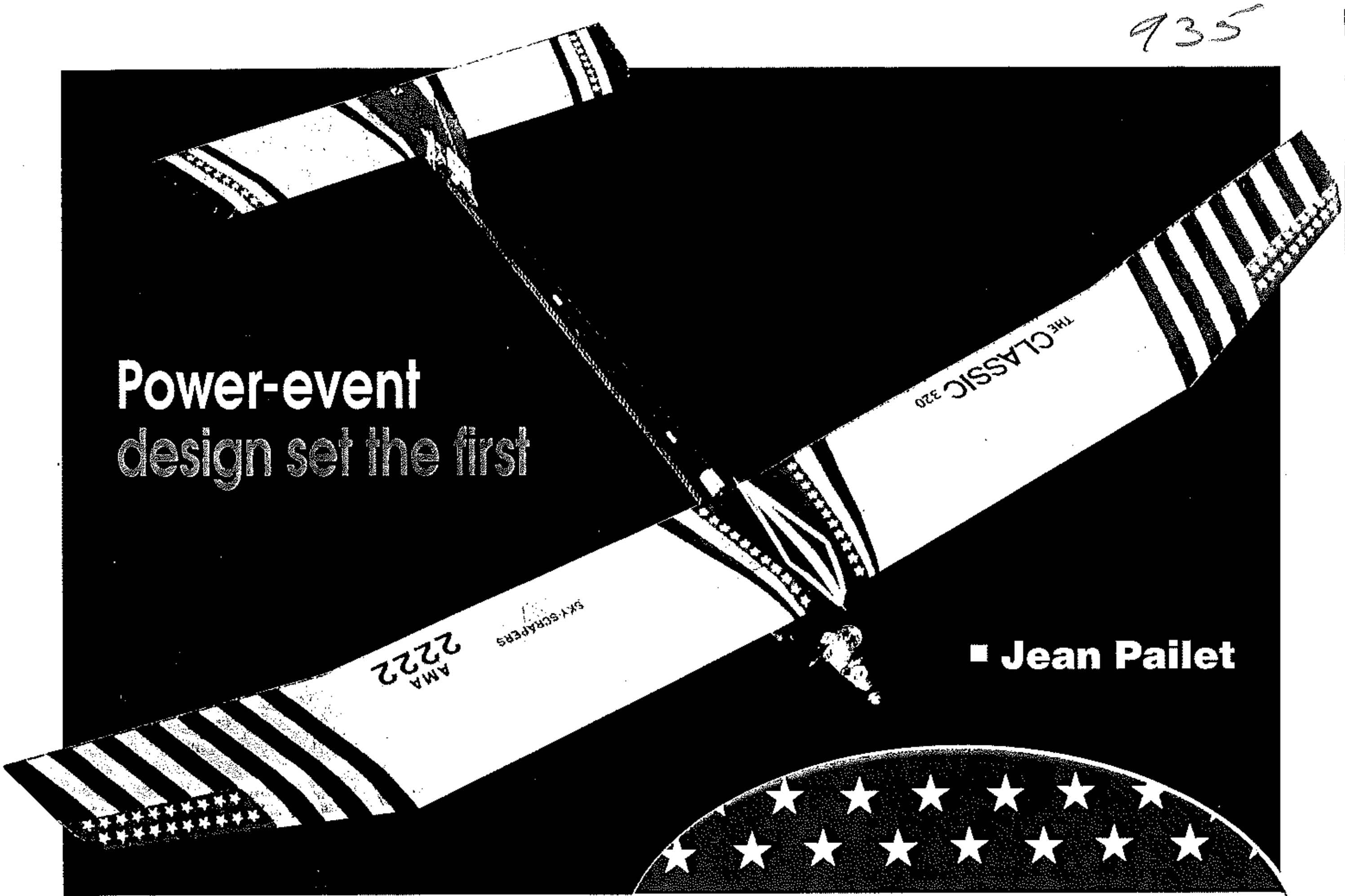
935

Power-event design set the first



■ **Jean Pailet**

Classic 320

Jean's design is simple and inexpensive compared to today's contest FF models. With it, he established the first national record in ½A Classic of 11 minutes, 48 seconds.

THIS IS A bit of a fairy tale with (I think) a happy ending. Once upon a time, long, long ago, there was only Free Flight, and all the models flew truly free—free of lines and radios and auto surfaces. Then along came radios and control lines, but the Free Flight models still flew free. (Try saying "Free Flight models still flew free" three times quickly!)

That is, until the advent of auto surfaces. Then the models' flight paths (at least under power) were preprogrammed. Combine the high-tech complexities of prop brakes and geared propellers and auto surfaces and electronic timers with the availability of custom-built, "store-bought" models, and you have the modern Fédération Aéronautique Internationale (FAI) Power events, all of which have been major contributing factors to the drop-off of participation in the FAI events. As some of these "advances" became more prevalent in the AMA events, a comparable decrease in participation became evident.

The decreased participation in FAI and AMA events was virtually concurrent with the growth of the Nostalgia and Old-Timer categories. There was a discernible pattern: *complex and expensive models equal less participation; simple and inexpensive models equal more participation!*

The message got through to AMA's Free Flight Contest Board (FFCB). Effective in 2002, it approved and implemented the new (really old) Classic Power events. The ban on auto surfaces in these events, coupled with AMA's long-standing Builder-of-the-Model rule, should encourage a resurgence of interest and participation in the AMA Free Flight Power events. That's the happy ending to this fairy tale.

A hearty "thank you" to the board members for *unanimously* approving the event rules and particularly to FFCB member Jim Bocckinfuso, who lobbied so diligently for their passage. Thanks also to board member Russ Snyder, who devised the original rules, to National Free Flight Society President Bob Stalick, who formally proposed them, and to Charlie Caton, whose modifying cross-proposal gave us our new Classic Power events.

All of this brings us to the ½A power model depicted here: the Classic 320.

Among the dictionary definitions of classic are "standard," "established," "traditional," "enduring," and "simple." At least two of those were guiding principles in this model's design; its format is traditional, and its construction is simple.

The only "exotic" materials or parts used are the readily available carbon-fiber (CF) rods incorporated into the fuselage, wing, and stabilizer structures. There are no Kevlar™ or carbon D-boxes, no aluminum-carbon-aluminum fuse tubes, and no multifunction timers and tail fittings. Virtually all-balsa construction is used, and Polyspan is the covering material of (my) choice.

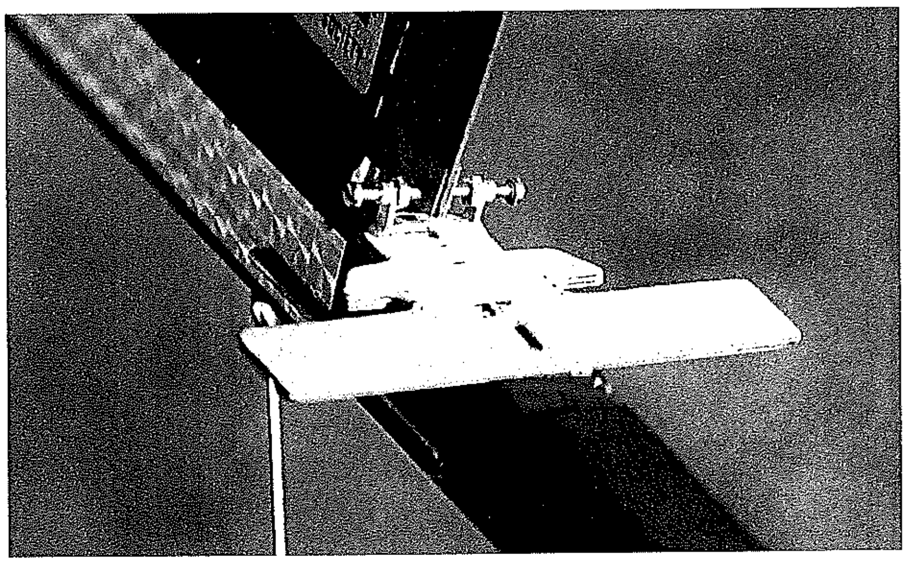
In large part, the design is based on the predecessor Genie, Genie II, and Soarcerer models. Let's build a Classic 320.

CONSTRUCTION

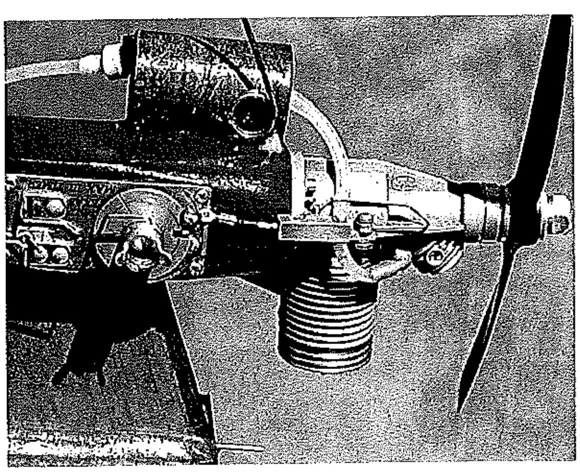
Wing: The 8%-thick airfoil was developed to accommodate a simplified geodetic-type structure while being aerodynamically effective. Its straight/flat surfaces on the bottom and top rear assure that the covering material can be fully and easily adhered to the upper and lower surfaces of the geodetic crossbraces. This ensures the necessary torsional rigidity of the lightweight structure.

The four wing panels are built independently and directly over the plans *without* the 3⁄16-inch center and polyhedral ribs and the adjacent diagonal crossbraces. As noted on the plans, the upper and lower 1⁄16- x 1⁄8-inch geodetic crossbraces *must* be

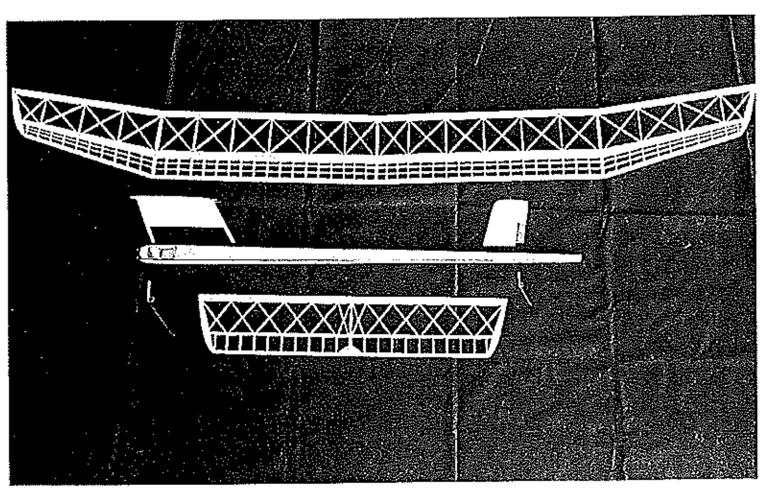
Jean demonstrates the proper launch pose from the front and from the rear. The Classic 320 can be flown for sport or competition. It's rugged, yet light.



Viewing aft end of fuselage, you can see stabilizer mount and rudder-adjusting bracket.



Looking at the "business end" of the model, note timer, remote fuel cutoff, manual fuel pinch-off, tank holder, front skid, and CL clip on DT line.



Wing, tail structures feature straight ribs with geodetic bracing aft of spar. Wing has spanwise turbulator strips in front.

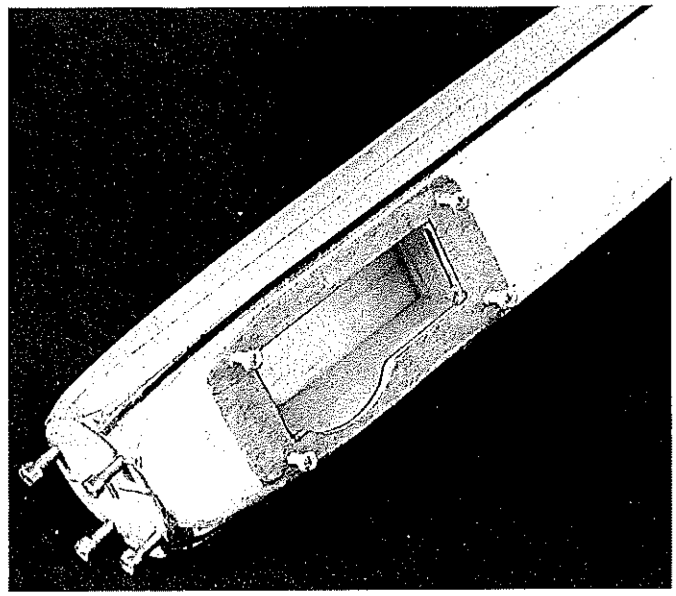
glued to each other wherever they cross. (This applies to the wing *and* horizontal stabilizer construction!)

On the wing, the intersection will have to be "bridged" with scrap balsa to accommodate gluing them to each other. On the stabilizer they may have to be notched, but they *must* be glued to attain the critically required torsional strength in the wing and tail structures. Because of the undercamber, a 1/16 x 1/4-inch shim is required under the entire length of the lower spar during construction. On the outer panels, the undercamber transitions to a flat bottom at the tips, requiring a tapered shim.

During initial construction, all spars (top and bottom main spars and both turbulator spars) should be at least 1/4-inch oversize in length to permit the proper angular lap joints when the wing panels are joined at the center and polyhedral points. These lap joints add strength without the weight penalty of extra bracing—particularly at the polyhedral joint, where the strength requirements are not nearly as great as at the center dihedral joint.

After the four wing panels have been built, the full-depth rear shear webs can be added *except* immediately adjacent to the dihedral and polyhedral joints. The panels are assembled as follows.

Join the outer tip panels at the proper polyhedral angle to their respective inboard panels. The center and polyhedral joints are secured by installing their 3/16-inch ribs and gluing the various spars to each other using lap joints as shown on the drawing. Except for its lesser dihedral angle, the center joint is made the same as the outer



This is the front end of the Classic 320 fuselage under construction. Note the engine and timer mounts. This is neat work!

Type: 1/2A Classic Power FF

Wingspan: 58 inches

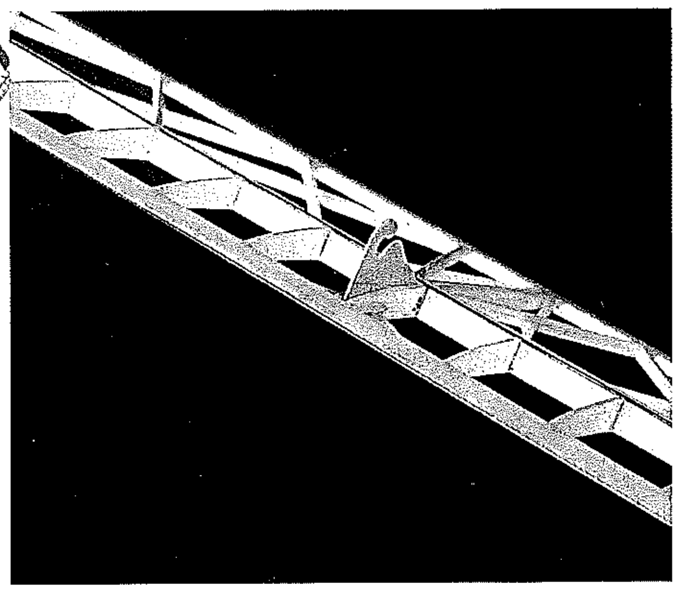
Engine: Cyclon .049 or equivalent

Flying weight: 8 ounces

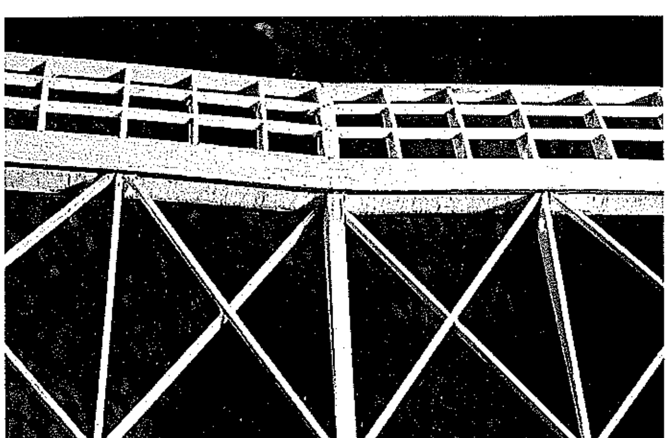
Construction: Balsa and carbon fiber

Covering/finish: Polyspan and dope

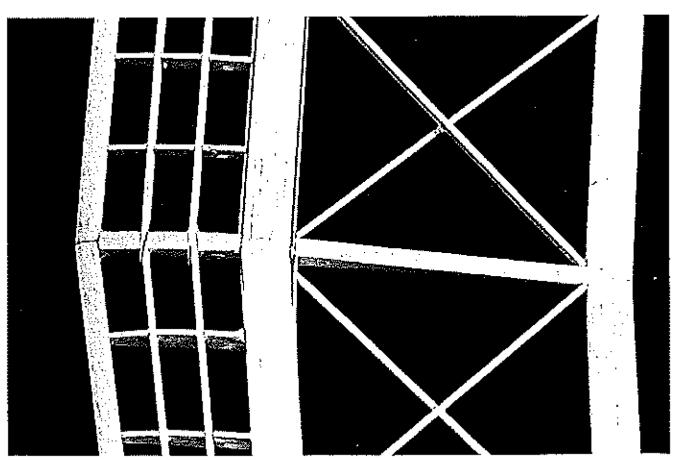
Classic 320



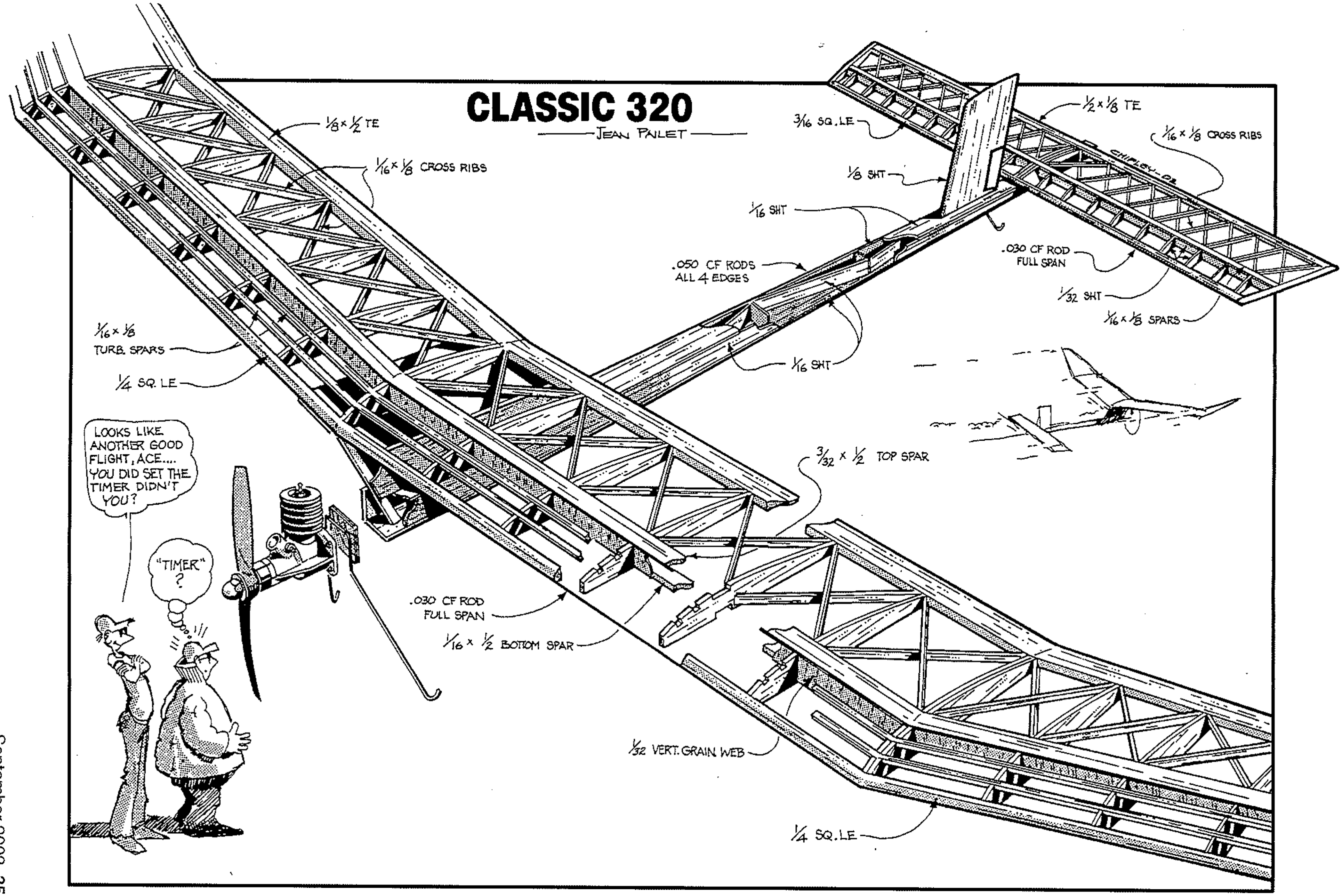
In this low angle shot of the stabilizer you can see the dethermalizer horn. Notice the carbon-fiber reinforcing rods.



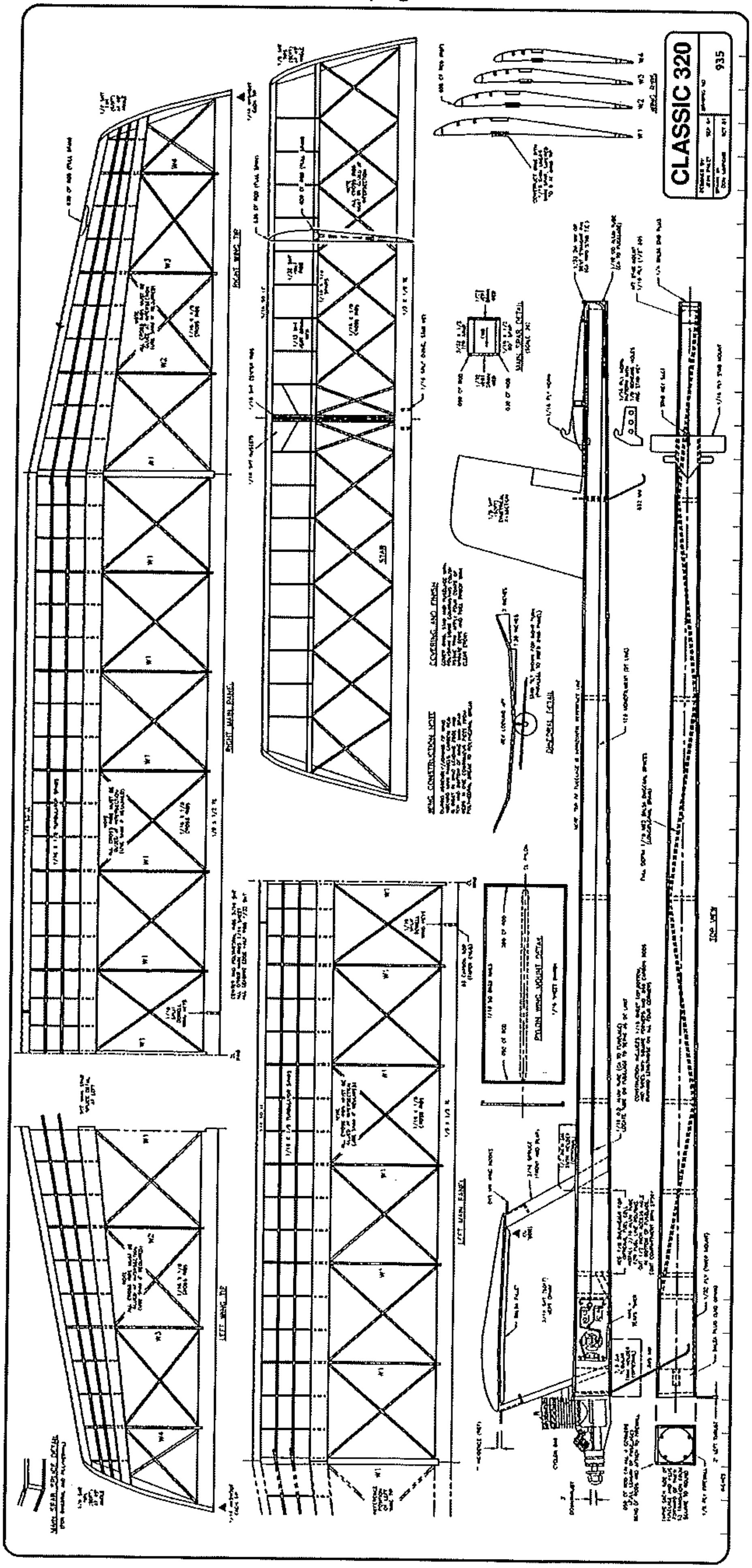
In a close-up of the wing dihedral joint, notice the upper and lower carbon-fiber reinforcing rods on the spars.



A close-up of one of the polyhedral joints shows the turbulator spar lap joints and carbon-fiber rod behind the main spar.


CLASSIC 320
JEAN PAILET
1/8 × 1/2 TE
1/16 × 1/8 CROSS RIBS
3/16 SQ. LE
1/8 SHT
1/2 × 1/8 TE
1/16 × 1/8 CROSS RIBS
CHIPLEY-02
1/16 SHT
.050 CF RODS
ALL 4 EDGES
.030 CF ROD
FULL SPAN
1/32 SHT
1/16 × 1/8 SPARS
1/16 SHT
1/16 × 1/8
TURB. SPARS
1/4 SQ. LE
LOOKS LIKE ANOTHER GOOD FLIGHT, ACE.... YOU DID SET THE TIMER DIDN'T YOU?
"TIMER" ?
3/32 × 1/2 TOP SPAR
.030 CF ROD
FULL SPAN
1/16 × 1/2 BOTTOM SPAR
1/32 VERT. GRAIN WEB
1/4 SQ. LE

Full-Size Plans Available—see page 191



polyhedral joints. Install the CF rods; *they are one-piece, continuous, from polyhedral joint to polyhedral joint.*

The .030-diameter rod imbedded in the leading edge (LE) provides bending strength, impact protection, and LE contour for the wing. It and the .050 top-spar and .030 bottom-spar rods can easily be bent through the required central dihedral joint angle. Although you'll have to "fudge" a bit at the center bend location, these spar rods should be flush with the outer (top and bottom) wing spar surfaces. This allows for installation of the forward 1/32-inch vertical-grain shear webs *between* the CF rods and *against* the front surface of the balsa spars.

Install the remaining rear shear webs. You have built a full-depth box spar with CF-rod reinforcement and integral shear webs. The lighter (.030 diameter) bottom rod absorbs the tension loads, and the heavier (.050 diameter) upper rod absorbs the compression or buckling loads. A short length of .030 CF rod can be added at the center joint to reinforce the trailing edge.

Horizontal Stabilizer: The horizontal tail (stabilizer) structure is virtually identical to that of the wing, with the exception of no undercamber and no dihedral joints. The LE has an .030 CF rod imbedded in it, and the top spar is reinforced with a full length of .020 CF rod. Vertical-grain 1/32-inch shear webbing is on the front surface of the spars only. The plywood "horn" has a tab extending downward on the bottom to "key" the stabilizer to its forward plywood mount on the fuselage.

Vertical Stabilizer: The vertical tail is 1/8 sheet balsa sanded to a symmetrical cross-section with a rounded LE and a tapered trailing edge (TE). I use commercially available nylon hinges for the rudder, but anything that will allow for small deflections (rudder trim settings) is okay. Similarly, I use small, commercially available fittings to set and secure the rudder deflections.

Pylon and Wing Mount: The pylon itself is 3/16 sheet balsa with spruce or basswood LEs and TEs to provide strength and a secure anchor for the wing-attachment hooks. However, the LE and TE extend into the fuselage and butt up against and are glued to the fuselage bottom for strength and stability.

The wing-mounting platform is 1/16 *hard* balsa sheet with a lateral grain and is bent slightly to match the wing's undercamber contour. The platform's LE and TE are reinforced with .050 CF rod. Basswood or spruce outer-edge rails are added of sufficient depth to accommodate the wing's dihedral angle. Install a balsa fillet at both sides of the mount-to-pylon mating corners to provide added strength.

Do not attach the pylon to the fuselage until every other part of the model is finished (including covering, doping, trimming, and fuel-proofing).

Fuselage: The fuselage is a simple, flat-sided, square cross-sectioned balsa box with

.050 CF rod reinforcement at each corner. Forward of the timer-mounting area, the cross-section transitions into a circle to mate with the round firewall.

To accomplish this cross-sectional shape transition, the round plywood firewall, with blind or T nuts installed (for radially mounting *your* engine), is glued to a square balsa block. It is important that the grain of this balsa block (or plug) runs fore and aft (that is, the firewall is attached to the end grain of the plug). For additional security, and peace of mind, I run a flat-head #4 wood screw through the plywood and *epoxy* it into the balsa block.

Downthrust of 3° should be built into the firewall/engine mount. Built-in side thrust is an option. During flight-testing I always seem to end up with approximately 2° of left thrust, which can be built in now or added (with flat washers between the engine and firewall) as testing and trimming later tend to dictate.

I reinforce the timer-mount area with 1/32 plywood on the inside of the balsa side and 1/64 plywood on the outside. The .050 corner rods should be installed from the aft end forward but not yet glued in place forward of the timer area.

With the round firewall and square balsa plug glued between the fuselage top and bottom, and between the fuselage sides, grooves can be cut into the corners of the area forward of the timer to allow the CF rods to be bent inward to attach them to the outer edge of the firewall. Now carving and sanding can accomplish the cross-sectional transition from square to round.

That finishes the basic fuselage construction except for the installation of the stabilizer mounts. I glue a blind/T nut into the aft fuselage plug to facilitate the later addition of tail ballast, if flight-testing indicates any is required.

Covering and Finishing: As stated earlier, I cover all open framework with Polyspan; other options are tissue or silk. Whatever you choose, it must be a material which shrinks and can therefore provide torsional "skin strength" to the wing and stabilizer.

All the structure that will contact the covering material (that includes the top and bottom of each rib, half rib, and crossbrace, every spar, the LEs and TEs, and the wing and stabilizer tips) should receive two coats of thinned and a final coat of unthinned nitrate dope.

The covering material is applied with unthinned nitrate dope; this assures good adherence on the spar and rib bottoms (for proper undercamber) and on the tops of the 3/16-inch joint ribs, where the covering will tend to pull away as it shrinks and tightens. After shrinking and tightening the covering material (with heat, if it is Polyspan), I apply two coats of thinned nitrate dope.

If you use all white Polyspan, you can trim with tissue of any color, shape, or design by applying it directly over the Polyspan with very thin nitrate dope. The all-balsa surfaces of the vertical tail, pylon, and wing mount, and the entire fuselage are also covered with colored Japanese tissue.

After everything has received at least four coats of nitrate dope, decals, logos, and license numbers can be applied. After the final coat of nitrate dope has dried *for at least a week*, a fuel-proofing coat of clear epoxy should be applied. Unthinned epoxy is used on the fuselage, fin, and pylon, and thinned epoxy is applied to the wing and horizontal stabilizer.

Final Assembly: This includes attachment of the vertical tail and installation of the pylon and the nose and tail skids. The fin must be glued in place at 0° offset; it must be true to the fuselage fore-and-aft centerline.

The 1/32-inch-diameter wire tail skid is inserted into a short (roughly 1/2-inch) length of 1/16-inch-diameter dowel which, in turn, is inserted through the fuselage bottom and into the aft-most fuselage former. The wire itself can extend upward into the fin to help in the fin's attachment to the fuselage. The .045-diameter-wire nose skid is inserted into a 1-inch length of 1/8-inch-diameter dowel which, in turn, is inserted through the fuselage bottom and up through the balsa nose plug.

Now comes the tricky part: correct fore and aft installation of the pylon.

The pylon position shown on the plans is *okay* for the heavier ball-bearing engines such as the .049 Cyclon, Shuriken, and CS. For lighter plain-bearing engines such as the .049 Cox Tee Dee, Stels, VA, and AME, the pylon will have to be located farther aft to attain the required center of gravity (CG) position at 90% of the wing root chord.

To obtain the correct fore/aft pylon position, the model must be fully assembled, *in its flying condition*. This includes installation of the timer, propeller, fuel tank (and fuel-tank holder, if using one), airborne tracking transmitter (if using one, and you'd better be!), and the engine and the horizontal stabilizer.

The trick is to rubber-band the wing to the top of the fuselage immediately aft of the engine, lay the inverted pylon/wing mount atop the wing with the mount LE aligned with the wing LE, then support the whole works at a point 1/2 inch forward of the wing TE (the 90% spot).

By shifting the wing fore and aft, you should be able to balance the model so that the fuselage is horizontal, thus locating the proper pylon position. Measure and/or mark that place on the top of the fuselage, and disassemble the wing and stabilizer from the fuselage. Now the pylon can be permanently installed on the fuselage unit's correct location for your particular engine and model.

The hardwood pylon LEs and TEs should extend through the fuselage and attach to its bottom. As with the fin, the pylon must be true to the fuselage centerline in a 0° offset position.

Testing and Trimming: All hand-glide and power testing should be done with the airplane in its final flight configuration (propeller, tank, and transmitter installed). I use a 6 x 2 (cut down from 6.5 x 2) CF propeller of my own design that was developed for F1J and ½A use. (See "Sources" list for availability.) Alternatives are the 6 x 2 or 5.5 x 2 APC propellers. Be sure to do your testing and trimming with whatever propeller you intend to use.

Initial hand-gliding should assure a moderate turn with little tendency to stall or dive. Adjust as required with stabilizer tilt and/or ballast. The Classic is designed to fly a right/right power/glide pattern.

Engine runs on the first few flights should not exceed three seconds with a slightly rich needle adjustment to reduce power a bit. Use a short (one to five seconds) dethermalizer setting, and don't worry about glide trim at this point unless whatever glide pattern is discernible seems dangerous.

Adjust the power pattern using horizontal stabilizer (decalage) and rudder trim. Sidethrust adjustments can be made if deemed necessary, but they are only effective immediately after launch and diminish as the model accelerates and rudder and stabilizer and wing trim take over.

Experimenting with washin and/or washout on the inboard wing panels is the usual way to correct or induce rolling tendencies. I prefer washout to washin because the drag created by any significant amount of washin can induce a turning effect that overpowers the intended rolling effect. Conversely, any drag and turning effects from washout tend to work in concert with the intended rolling effect.

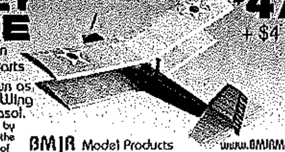
As the flights progress, gradually tune the engine to full power and increase the run duration to the maximum (generally seven seconds at most fields here in the East and in the Midwest). The final power pattern should be a steep climb (almost vertical) with roughly three-quarters of a turn from launch to engine cutoff and subsequent transition to the glide pattern.

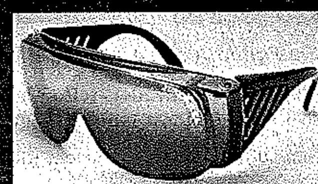
The model's attitude at launch should be 75-85° to the right and forward; with a "locked-up" model without auto surfaces, a vertical (90°) launch attitude could lead to disaster if an errant gust of wind forces the model to the left or onto its back.

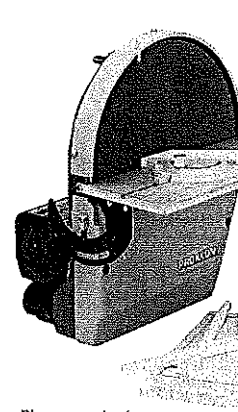
As you become more secure in the safety and perfection of the power pattern, you can begin to extend the glide duration and observe the glide pattern more closely. A slow, flat circle with an almost-stalled glide attitude is the goal.

Adjustments to the stabilizer tilt and ballasting to vary the CG are the means to the desired end. Remember that they must be done in small increments and with caution because stabilizer-tilt changes in particular will probably alter the decalage, which will affect the power pattern. Once you've gotten to this stage, it's a matter of fine-tuning, tweaking, and compromising to obtain the optimum balance between the powered and gliding flight cycles.

At record trials at Palm Bay FL in January, the model flew five consecutive





two-minute maxes and a sixth flight of 86 seconds, for a total flight time of 686 seconds. Contest Director Ron Sharpton is submitting a record claim for Category III in the new Classic Power ½A event. Since this is a new class, it is probably the first such record claim and should be certified by the AMA.

Although not fully trimmed and adjusted to be ready for the ½A Classic Power event at the 2001 King Orange contest to be held December 29-31, the model did eke out a third place in the regular ½A Power event.

Good luck, and here's hoping that the Classic 320 turns in some classic performances for you! *MA*

Jean G. Pailet
30 Emerson Rd.
Brookville NY 11545

Sources:

Carbon-fiber rods:
Aerospace Composite Products
14210 Doolittle Dr.
San Leandro CA 94577
(800) 811-2009

Hang-Em High Fabrics
1420 Yale Ave.
Richmond VA 23224
(804) 233-6155

Timers and fuel cutoffs:
Texas Timers
3317 Pine Timbers Dr.
Johnson City TN 37604
(423) 282-6423

Cyclon engines:
Doug Galbreath
3408 Topsail Pl.
Davis CA 95616
(530) 757-6058

Pailet/Hazel propellers:
Mike Hazel
1073 Windemere Dr. N.W.
Salem OR 97304
(503) 364-8593

Polyspan, miscellaneous Free Flight supplies:
Campbell's Custom Kits
Box 3104
Muncie IN 47307
(765) 289-7753

Retrieval systems:
Jim Walston
725 Cooper Lake Rd. S.E.
Smyrna GA 30082
(800) 657-4672

Rudder adjustment fittings, miscellaneous Free Flight Supplies:
FAI Model Supply
Box 366
Sayre PA 18840-0366
(717) 882-9873