818

NIBBLE 300

½A GAS HAS TRADITIONALLY been one of the most popular Free Flight events, for a variety of reasons including simplicity, low cost, and small size. Some of the same attributes apply to the generation of, and recent surge in, the F1J Power event. Miniaturization of Schnuerle-port engine technology into .061s and .049s has breathed new life into the small gas events heretofore dominated by Cox Tee Dees.

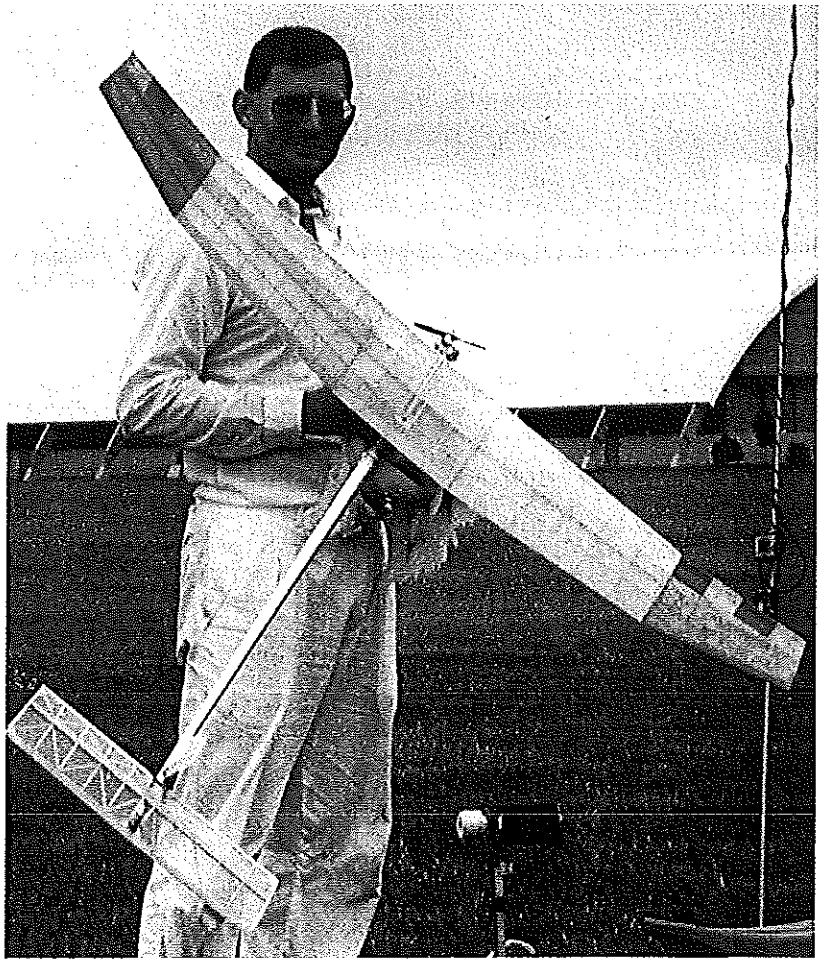
Editor's note: F1J is an FAI event—the "international ½A" class—for models powered by engines with displacement of .061 cubic inches (1cc) or less. AMA ½A Gas limits displacement to .050 cubic inches.

Nibble 300 was created to fill a void in Poti's Hangar: that of a small, reliable, fun model that could perform a dual role in ½A Gas and F1J Power. The process from conception to first flight spanned three years.

The dual role of Nibble 300 revolves around the CS .049 engine. A powerful Doug Galbreath-modified CS was procured (note: Galbreath no longer offers this engine!). Research into the experience base with this power plant resulted in the selection of a 300-square-inch wing.

At this point, progress was sidelined for other priorities, but interest was rekindled the next winter. Comparison of aspect ratios and tail volume coefficients for the author's successful B and C Gas Niblites lead to the final planform layout. Acquisition of a fuselage system from Ken Oliver (2213 El Cejo Dr., Rancho Cordova CA 95670) and construction of the flying surfaces was accomplished the second year, before another hiatus put the project on hold again. The concept was finally brought to fruition in 1995 with completion of the model and first flights.

While the development of this model was quite lengthy by most standards, its rise to prominence was not. Nibble 300 captured a new Cat. III ½A Gas record during its first contest, epitomizing the term "right off the board." This record, accomplished at the Muncie flying site, was to prove no fluke. Although flying during its this first contest



\bove: The author prepares for a flight in ½A Gas
ıt the 1995 Nats in Muncie.

Right: The well-worn original model at Wright-Patterson AFB, Dayton OH, where Nibble broke its own Cat. III ½A record.

Photos courtesy the author Graphic Design by Carla Kunz

eason was hampered by several minor nechanical glitches associated with new-ystem failures, the model surpassed its first ecord to establish the current mark of 7:19.

The design has shown an inherent onsistency, atypical of most ½A models, nd flies equally well in both calm or windy onditions. The arrow-straight power attern is unparalleled, and transition to lide through bunt is breathtaking. The nodel's light weight and associated low nomentum yield minimal damage from rashes. (This is a welcome departure from what I am accustomed to in F1C!)

The resiliency of the design was emonstrated during the '95 USOC F1J vent. Nibble 300 crashed (floodoff nalfunction) five minutes before the start of round. Model repairs, including piecing ogether two wing halves, commenced mmediately. The model was repaired and rimmed, then proceeded to score a max uring that same one-hour round (much to he astonishment of Hardy Brodersen, who vas casually observing the activity).

By the end of the flying season the model was riddled with patches and repairs, yet it retained a high level of consistency and performance. Nibble 300 has delighted its creator and should also delight you!

CONSTRUCTION

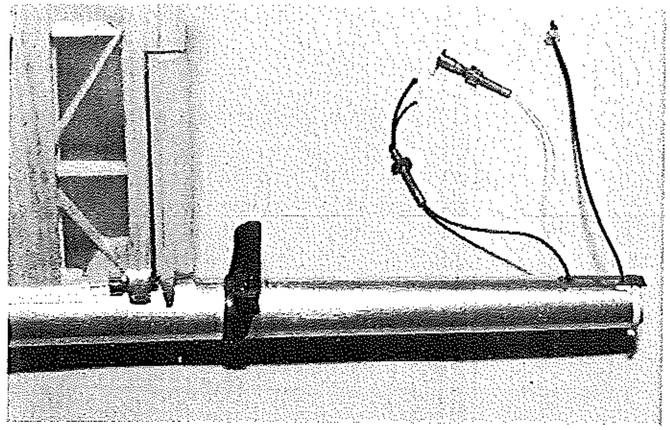
The following sections assume builder familiarity with basic construction techniques; therefore, only special or unusual procedures and details will be covered.

Success in any Free Flight event involving small models relies greatly on lightweight construction. If adequate strength came be achieved with a part cut from light 1/32 sheet, take the time to find a light piece—don't settle for a heavy piece of 1/32 or a light piece of 1/16. If an .020 wire hook is required, resist the temptation to use a paper clip. Small things add up to big weight gains.

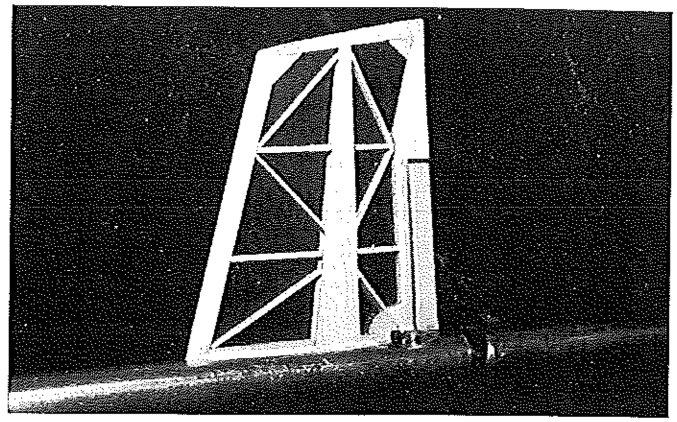
Minimize glue wherever possible. Make joints tight. A gap filled with glue can weigh 10 times the weight of the balsa it replaces. Simply putting a second coat of thin cyanoacrylate (CyA) glue on all joints can add as much as two grams of weight to this wing—a 5% increase in total wing weight. I learned this lesson recently and will never again double-glue anything. As the former free-flighter, sometimes philosopher Norman Getzlaff once said, "The only way to ensure a part will not add much weight is to leave the part off altogether!"

The flying surfaces are built on a straight surface (glass, board, etc.) that is big enough to mount all of the wing panels. The plans are stuck to the work surface by lightly spraying them with a contact adhesive such as 3M 77. A cover sheet of waxed paper is sprayed on its underside and placed over the plans. Finally, a mist coat of 3M 77 is sprayed on top of the waxed paper. The last layer of adhesive holds balsa pieces in place during construction, eliminating the use of pins.

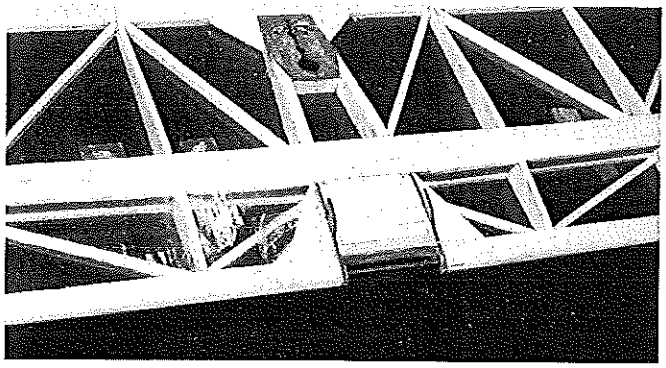
The sandwich of plans and waxed paper and/or balsa framework can be separated by softening the 3M 77 with heat from a hair dryer. If you are not familiar with this procedure, practice on scraps. This will ensure that you don't ruin a set of plans by using too much adhesive!



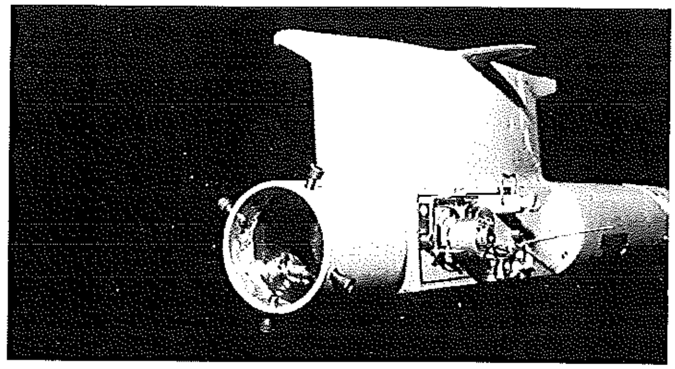
Bunt and auto rudder mechanism—plan has details. Carbon pedestal-type stab mount is provided with Oliver fuselage.



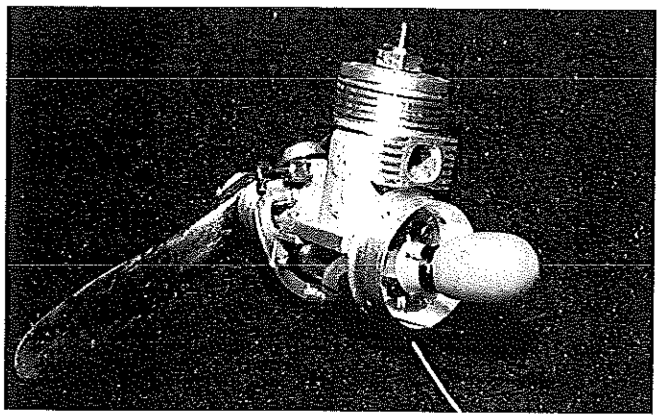
Rudder is built flat on plans, then sanded to airfoil shape. Movable portion has music wire torsion rod, Easy Hinges.



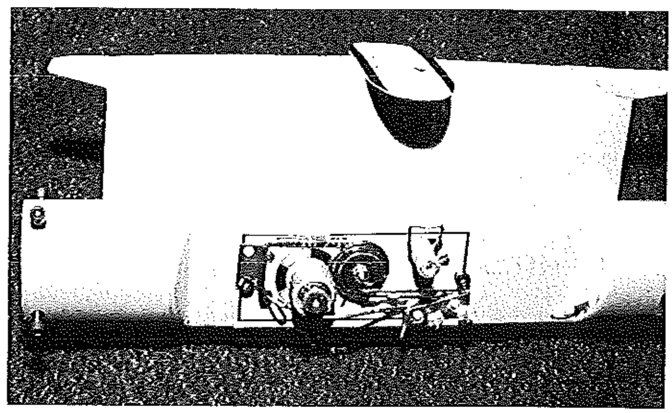
Stabilizer has blunt leading edge to avoid "over the top" power pattern. Use very light balsa and cover with ¼-mil Mylar.



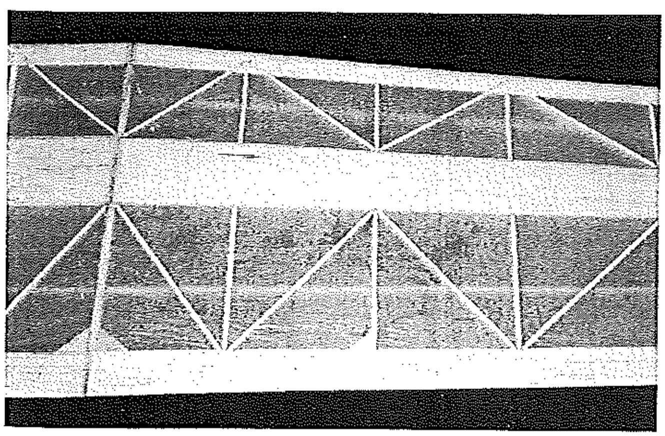
Four 2-56 screws retain the engine mount. Lightening holes in mounting ring form epoxy "buttons" for strength.



CS .049 is mounted on a custom radial mount for efficiency and weight savings over commercially available units.



Built-up pylon is butt-glued to top of carbon fuselage tube. Seelig Minicombo handles engine, bunt, rudder, DT functions.



Box spar carries the majority of the wing loads. Diagonal braces contact spars for additional strength and support.

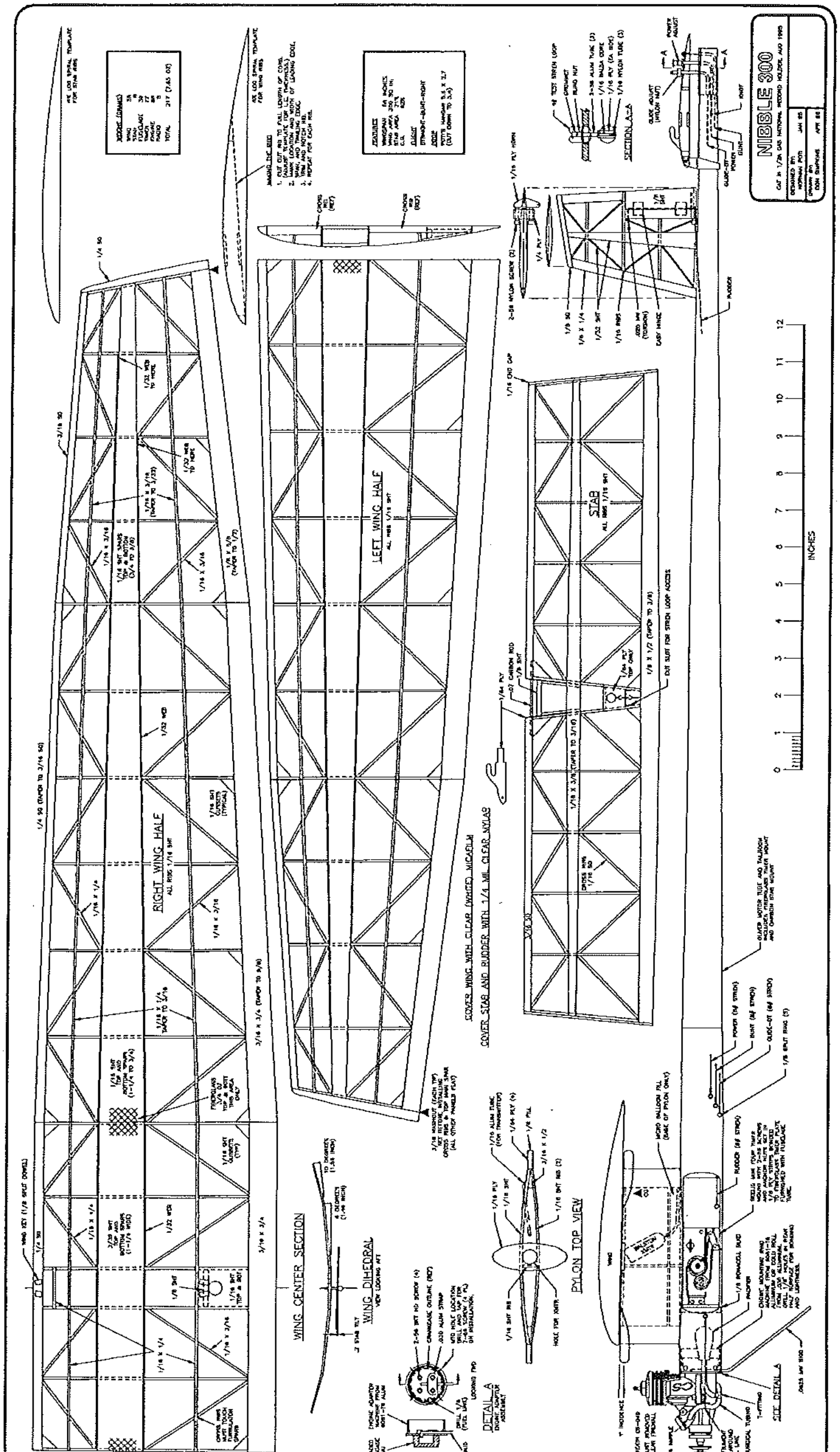
Wing: The Nibble 300 has a five-section wing and uses a logarithmic-spiral airfoil. The five panels eliminate a center joint where the highest bending stress is concentrated. Multiple dihedral breaks allow easy tailoring of wood size and densities.

Note and follow the wood sizes indicated on the plans. The tapered, closed box spar carries a majority of the bending and torsional loads. Center, main, and tip spar wood should be 8-10, 6-8, and 4-6-pound/cubic foot density respectively. The other wing pieces simply provide a that which defines the airfoil and should be constructed of 4-6-pound wood.

At first glance, wing construction appears to be overwhelming; therefore, it will be covered in some detail.

Begin by cutting and sticking the wing spar bottom, leading edge, and trailing edge pieces to the building plan. Assure tight-fitting dihedral joints, but do not glue at this time. Use an 8% logarithmic spiral curve to cut all straight ribs. This spiral has the unique characteristic than any length curve, emanating from the source, will be geometrically similar. Ribs of the various lengths

Full-Size Plans Available—see page 184



equired for tapered planforms can be easily ıade using this characteristic.

Cut six ribs to the full-size pattern hown and glue in place on the wing center ection with thick CyA. Each rib in the ıpered portion of the wing is cut to fit. horter ribs use the main rib, without otches, as a pattern. A full-size rib is laced on the plan, the desired length is ıarked, and the rib is then cut to size. A traightedge is placed on the bottom of the hort rib and at the desired leading edge and ailing edge heights. The rib is sliced and ıen placed on the plan to mark the desired ıain spar location. This produces a rib imilar in shape yet shorter and thinner than ıe main ribs.

Repeat the procedure for every rib in the ıpered part of the wing. Once you are omfortable with this trim-to-fit method, a omplete set of ribs can be quickly roduced. Cutting the ribs in pairs will also ıve time.

All ribs, except for those at the dihedral ɔints, are glued in place using thick CyA. Vhile the panels are stuck to the plan, use a ɔng sanding block to even out any minor nperfections in the rib shapes.

All five panels are then removed from ıe plans and joined to each other at the roper dihedral angles. This partially built ving structure will be very flexible. Do not anic! Remember, only one side of the box ɔar is in place at this time.

CyA the straight dihedral ribs in place. ay the structure flat on each consecutive anel and glue the main spar tops in place. t this time the turbulator spar locations are ıarked, the ribs are notched for the spars, nd the spars are glued in place. Complete ll wing panels in the same manner.

Now the wing has taken on a ructurally sound characteristic. Holding ıe wing in your lap, install the main-spar ertical webs and dihedral gussets. Position ıe half-depth cross braces. Mark, then trim ıe cross-braces so that the thickness at the ailing edges match the straight ribs ready glued in place. With proper fit, ıese cross-braces just touch the turbulator ɔar bottoms. Gluing this joint adds ɔnsiderable strength. Glue in place the ross ribs and your wing is structurally ɔmplete.

Carve the leading edge shape, final-sand ıe top and bottom of the wing, and prepare ı cover. Apply one coat of covering dhesive (I use Sig Stix-It), allow to dry vernight, and cover with light, clear vhite-appearing) Micafilm. Dying the ıside of the Micafilm with Higgins ermanent Marker, available in office-ıpply stores, provides a colorful low-eight variation to the otherwise white nish. Sealing all Micafilm joints with a ⅛-ıch strip of MonoKote will greatly ıcreased the durability of the seams. Use ıre to evenly apply and shrink the licafilm, without introducing any ıwanted warps. During the final shrinking rocess, ensure tip washout as indicated on ıe plans. Your completed wing should

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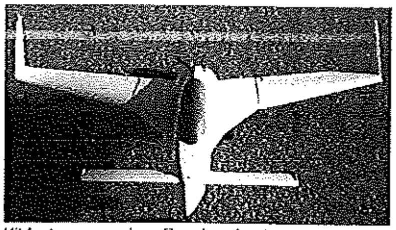

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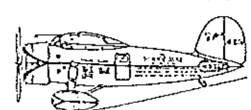

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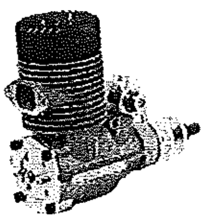

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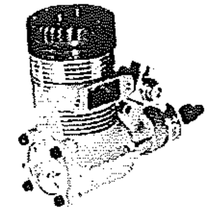

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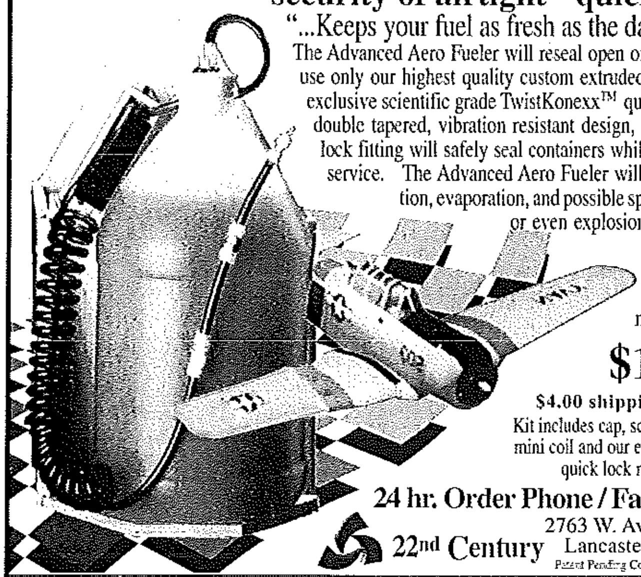

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weigh 54 grams and be adequately strong for this application.

Tail Surfaces: The stabilizer and rudder are built over the plans using the 3M 77 hold-down technique. There is very little load on the these structures; therefore only 4-6-pound wood should be used.

Note the blunt shape of the leading edge of the stabilizer. It has been determined that stabilizer leading edge radius can be directly linked to the "over the top" phenomenon. This bluntness increases drag; however, that increase is compensated many times over by the more consistent power pattern.

Carefully drill and align the bunt hold-down piece of 1/64 plywood. This piece is glued to the stabilizer top surface and the bottom is left open. This allows maximum clearance for the glide and bunt posts.

The rudder is built on the plans, with no airfoil shape. The symmetrical airfoil is developed by carving and sanding once the structure is complete. Easy Hinges secure the rudder tab and a buried music wire torsion rod provides movement to the glide position. Rudder position stops are provided by 2-56 socket-head bolts. These bolts are secured to the fuselage by a part formed from a 1/4 plywood piece. The rudder tab position must be very positive for consistent power adjustments. Both stabilizer and rudder are covered with 1/4-mil Mylar. Upon final shrinking of the covering, ensure warp-free surfaces.

Fuselage: The original Nibble 300 crash-tested the Oliver boom on several occasions without incident, attesting to the fuselage's superior strength. If the fuselage survives a crash, the model can generally by repaired on the field, and flying can continue the same day.

Ken also provides an insert doubler that serves to reinforce and mount the timer. A small lightweight stabilizer rest is also provided. This system makes short work of the fuselage.

A pylon is built and butt-glued to the carbon tube with 3M DP-460 epoxy. *(Editor's note: This is an industrial-grade product available through 3M distributors.)* Drill some 1/8 holes in the top of the fuselage where it will mate with the pylon. The epoxy will run into the holes and form "buttons" of glue to help hold the pylon in place. A fillet of microballoons and 5-minute epoxy reinforces this joint.

Both motor tube and tailboom will have to be shortened for the Nibble 300. The nose length is left longer than indicated on the plans during initial build-up. The final length is determined by assembly of the nearly-complete model, with long nose, and determining the Center of Gravity (CG). Trim the nose length until a proper CG is obtained.

The engine hold-down sleeve is secured to the inside front of the tube using DP-460. This sleeve interfaces with the custom-turned backplate, which provides a very ight engine mount. Doug Galbreath sells a imilar (but heavier) system. The mounting ing inserted in the fuselage has many ightening holes, when the epoxy fills these ıoles, it acts as buttons that lock the ring to he carbon tube. I have used this style nount on .049-.40 engines, and it has urvived even the most severe crashes.

The rudder, stabilizer rest and VIT Variable Incidence Tailplane) mechanism ıolder are secured using 3M DP-460. ₹udder alignment is critical and is ensured ıy using calipers to align the leading and railing edges. Stab tilt is provided by the ıngular position of the stabilizer rest.

Attach the wing to the pylon, measure or correct tilt, and glue in place. Begin inishing the front of the fuselage with three oats of Super Poxy filler, sanded horoughly between each coat. \pproximately 80% of all filler coats hould be removed by thorough sanding. ;pray the final coat of filler and sand ightly with 600-grit paper before spraying ı final coat of color. The original Nibble ;00 used aluminum-colored Super Poxy, vhich matched the tailboom color quite vell. Use Super Poxy paint sparingly, as it an build up weight quickly. A light topcoat ıf thinned clear Super Poxy will give your uselage a brilliant shine.

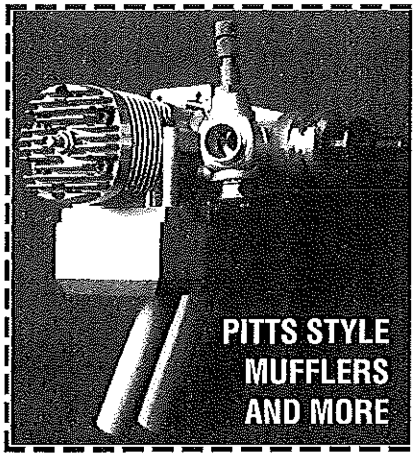
'inal Assembly: At this point your model s 95% complete, but avoid the urge to rush he final assembly and rigging.

The brain of your model is the timer. It hould be noted that a significant ıercentage of this model's weight is in the ;eelig Minicombo timer. Plastic Tomy-toy tyle timers were considered for this ıpplication, but were rejected on the basis ıf reliability. The auto-surface functions, ıunt, and floodoff timing are critical for ;at. III engine runs.

All control lines are made of lightweight nonofilament. There is very little load on he lines of this or any small model. ightweight monofilament is very stretchy, ınd experience must be gained to utilize it uccessfully. The stretch eliminates the equirement for springs, but is variable with emperature. The original Nibble 300 was lown all season without breaking or hanging a line, so it can be done uccessfully.

Since there is no tailboom joint, rigging s accomplished by threading a feeder line hrough the rear of the fuselage and the ront exit holes, forward to the timer ompartment. This is made possible by the ack of any bulkheads aft of the timer ompartment. These two feeder lines are oined and then used to pull final lines.

Check all variable functions 20 times in ,our shop. Become comfortable with ıdjustments of your stabilizer and rudder. ;et the initial power position for 0° wing-o-stab alignment. Add ⅛-inch trailing edge ıegative (up) for initial glide position. ;heck your dethermalizer (DT) angle and et your timer for a two-second floodoff ınd quick DT (just after floodoff).



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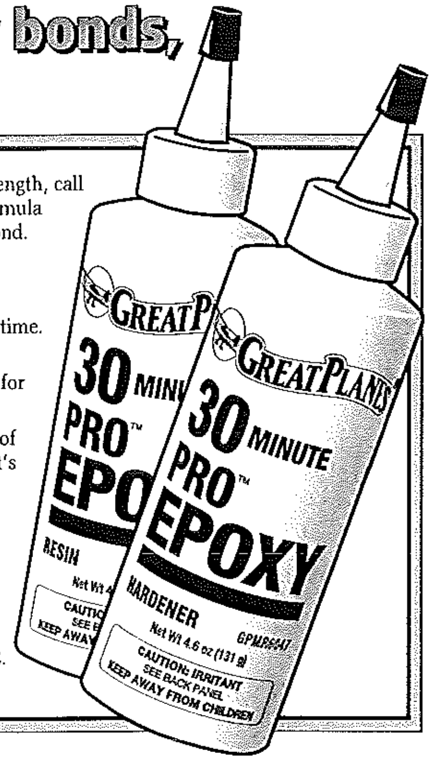

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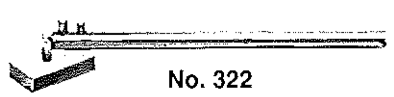

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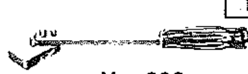

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324 Coil Winder

No. 324

SEND $1.00 FOR PRICE LIST AND CATALOG

K&S

Belabor the final details to ensure a uccessful first flying session. If you are ushing to meet some imminent contest, re-:valuate your schedule. No one can afford he time to rebuild because of an avoidable :rror.

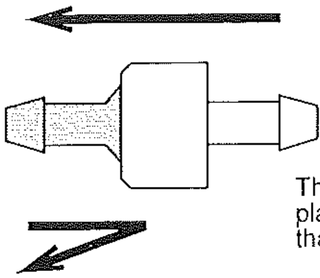
?lying: Begin your first flying session with ι series of test glides with the stab set in the ;lide position, then in the power position. The objective is a floating glide with a ;entle right turn, and a shallow straight live under power. If you are unsure of this procedure, take a trimmed model and hand-oss in the power position to develop :onfidence in the idea of a shallow dive.

Run your engine several times to ensure :onsistency and test your two-second loodoff setting. Flood-off reliability is :ssential for initial flights, since power trim ias not yet been obtained. Launch your irst flight straight up and under full power. f you followed this procedure and have no nechanical failures an event-free first flight s guaranteed.

Gradually increase engine runs, rimming for a straight-up climb with a ;light turn to the right. The only purpose of his roll is to position the model into the hermal, which I find is generally located to he right of the launch position. The first ;liding flight is done with the DT set at 20 ;econds. This allows for DT with plenty of iltitude if the glide trim is grossly off, or a nalfunction occurs in the power-to-glide :ransition.

The initial ½A record was set with a Poti's Hangar 5.7 x 2.7 prop running on 50% nitro at 27,000 rpms. The engine was difficult to tune in this configuration. Exhaustive rework of the fuel system and nead clearances proved fruitless. Noted F1C flier Ed Keck discovered that "unloading" the engine by trimming the prop diameter to 5.4 inches provided the consistency being desired. This reworked prop increased the rpm to 28,500. Observers studying the model's performance throughout the flying season stated that a significant increase in altitude was attained with the second propeller/ engine combination. The smaller-diameter prop was used to set the second record.

NEW! **Auto Plug / One Way Valve**



The Fourmost Auto Plug / One Way Valve can be used in a variety of circumstances that require the maintenance of air or fuel pressure.

The Auto Plug can be used in place of a plug in fuel systems that utilize muffler pressure.

The Auto Plug / Valve may also be used in conjunction with bladders to eliminate continual pinching of the line during the fueling process.

The Plug/ Valve is also ideal for the pressure line between the muffler and fuel tank to prevent pressure and fuel from escaping back into the muffler.

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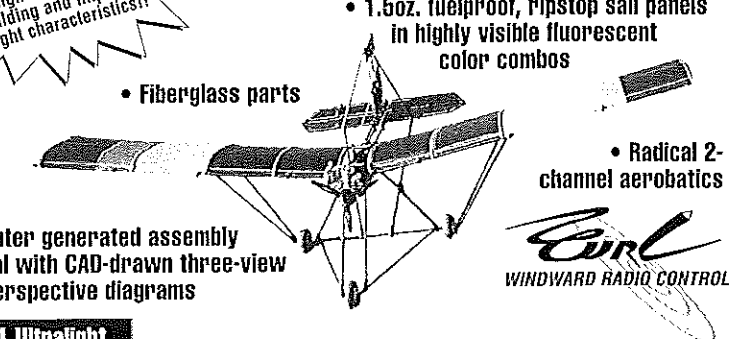

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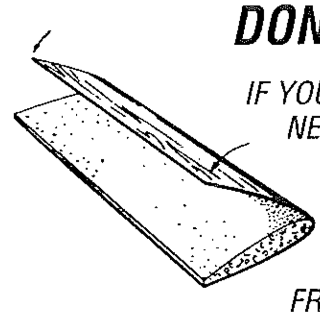

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A second wing has been built, featuring a 9% mid-section airfoil (logarithmic spiral) that tapers to 7% at the tips. The mid-section thickness increase (and associated strength increase) allowed for a lighter structure. Complexity and weight were reduced by omitting the cross-ribs (they can be added later if required). This wing weighs 48 grams. This yet-unproven design change will be evaluated with back-to-back testing of the wings on the common fuselage.

Other design changes that might be considered smaller tail volumes (shorter tailboom or less stab area) and a higher wing aspect ratio. The fuselage front tube could be made lighter through extensive sanding or possibly by convincing Ken Oliver to use less carbon in the lay-up. Weight could also be reduced with a Tomy-toy-derivative timer.

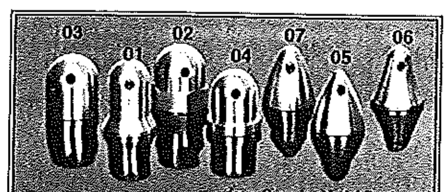
For application to an F1J model with .061 engine, the design should be scaled up to 380 square inches. Most Kinko's operations have an engineering service that can accept 40-inch drawings and can perform enlargement or reductions for a nominal cost. This makes quick work of scaling to any size.

The Nibble 300 will make an impressive addition to your stable of power models. I have made every attempt to accurately document the design so that duplicate models can be built. A special thanks is extended to Don Simpkins, whose computer skills developed the unparalleled plans set.

Nibble 300 has great potential in the hands of an experienced flier. It can achieve all but the four-second engine run, 150-second max easily. Both competitors and spectators enjoy the spectacular performance of this model.

A collection of Nibble 300 photos will be assembled; please send me a photo of your model. Both you and I will be pleased once your Nibble 300 is airborne and collecting hardware. Thermals! ✈

Norman D. Poti
5695 Marshall Rd.
Dayton OH 45429-6022



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