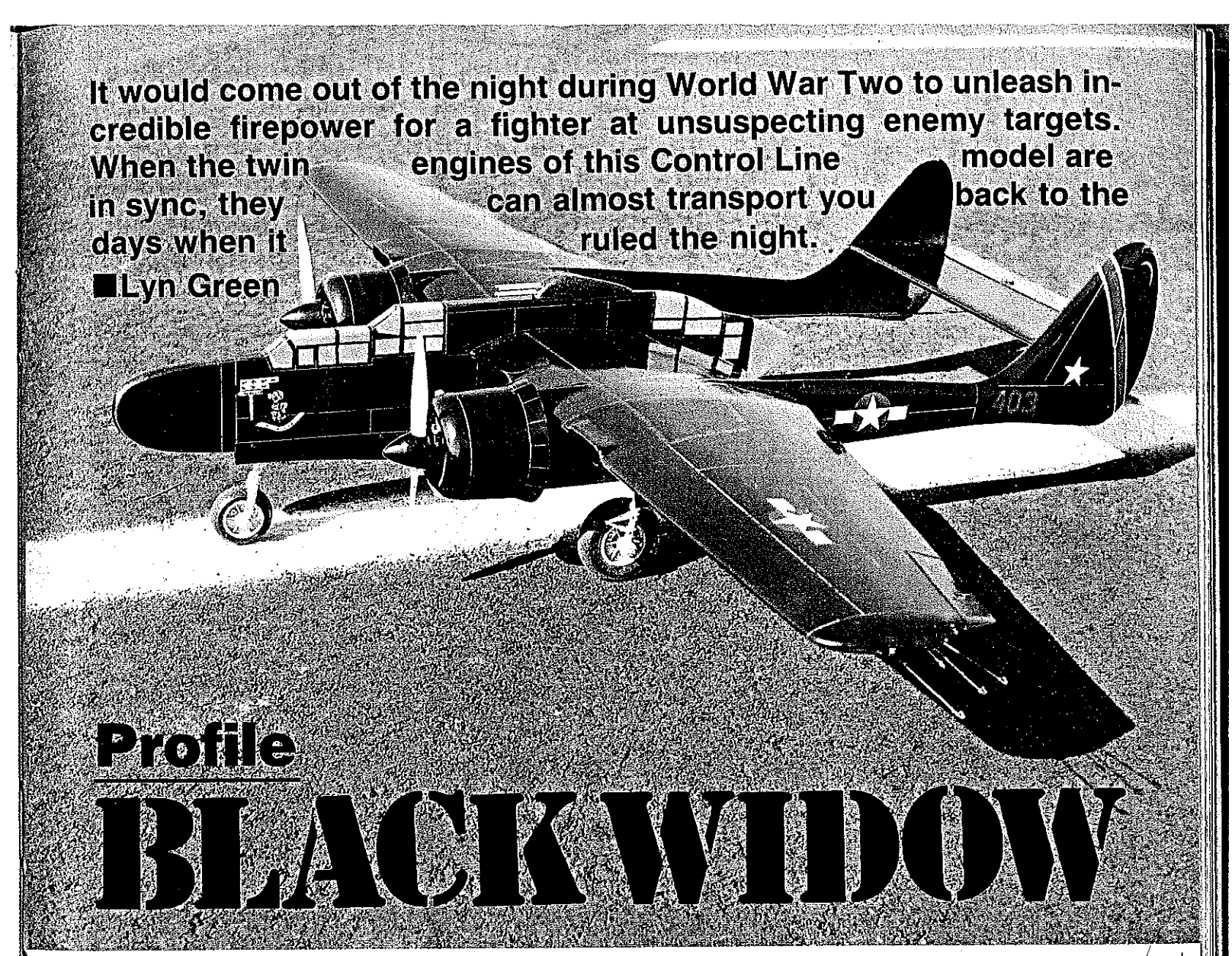
**It would come out of the night during World War Two to unleash incredible firepower for a fighter at unsuspecting enemy targets. When the twin engines of this Control Line model are in sync, they can almost transport you back to the days when it ruled the night.**

■Lyn Green



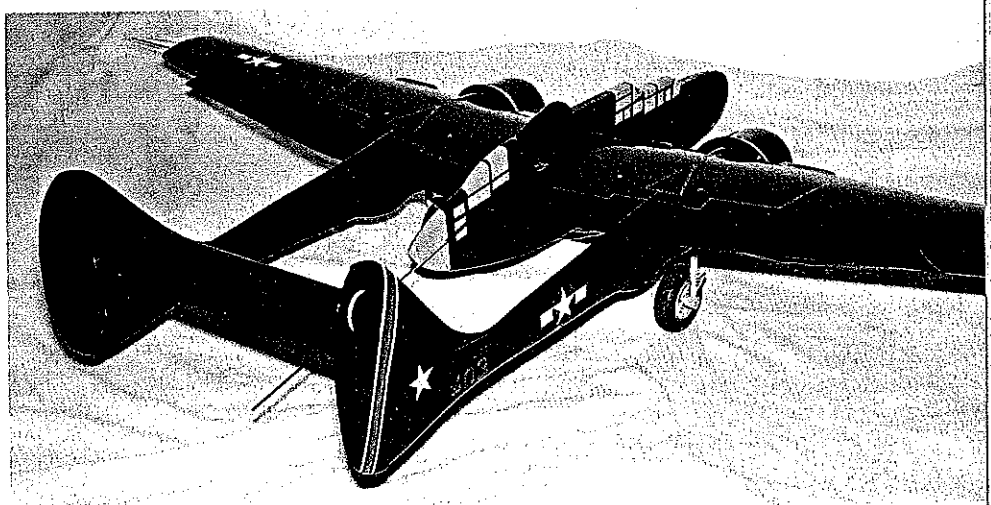
# Profile BLACKWIDOW

MY LOVE AFFAIR with the P-61 Black Widow goes back a good many years. In fact, it probably began when my dad took me to the Air Force Museum in Dayton, OH for the very first time. There was the Widow, sitting in the outside lot in the afternoon sun, its black paint faded, chipped, and weatherworn. Right away I was smitten. My dad said, "It looks just like the ones I saw over 40 years ago in the Pacific, a little on the worn side." But what really fascinated me were the outlines, brute size, and sheer firepower of the airplane.

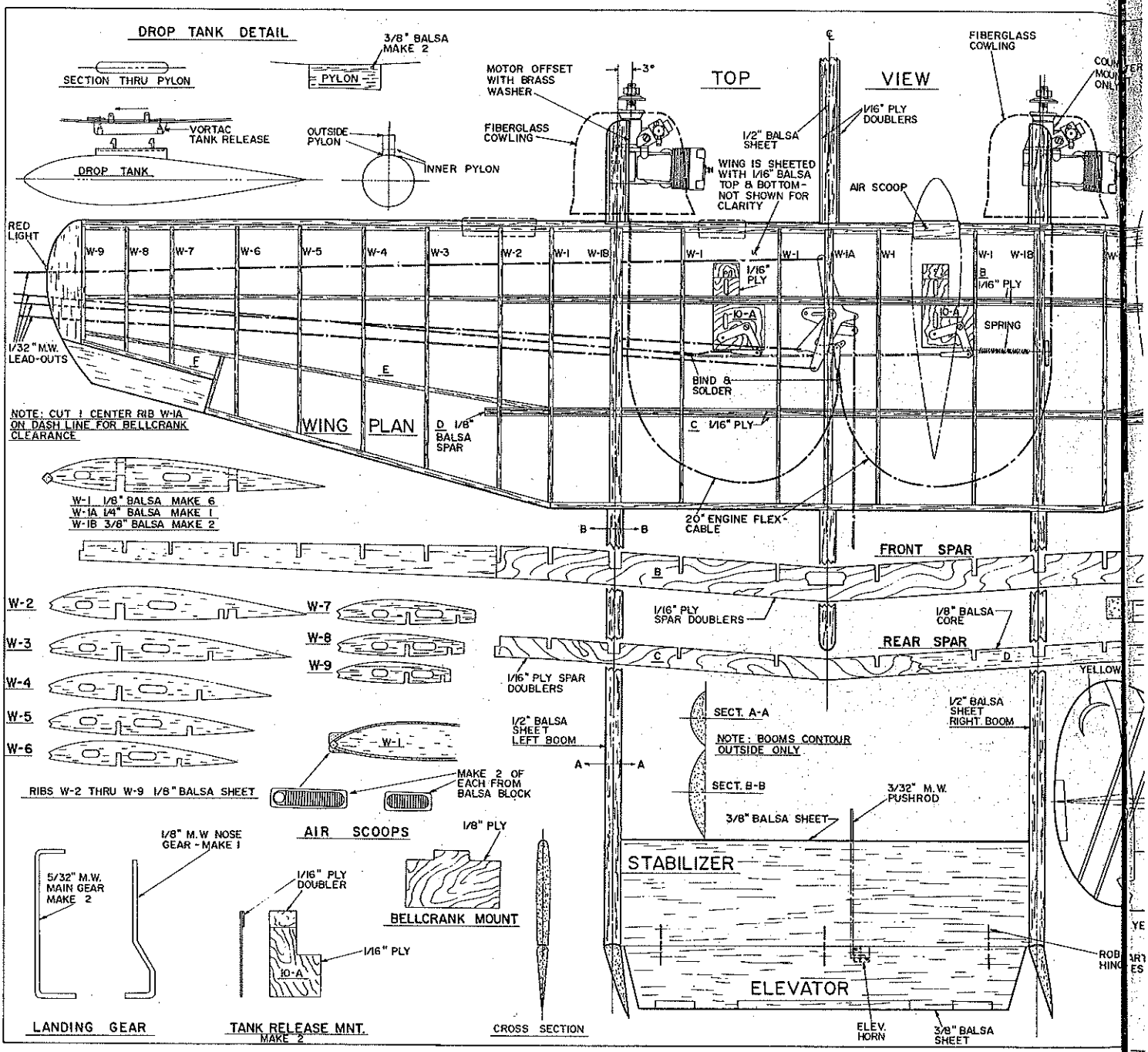
Insofar as I can recall, our first trip to the Air Force Museum took place about 21 years ago. Since that time, the museum has been rebuilt, and is today the largest military aviation museum in the world with over 200 restored aircraft on display.

Generally, I visit the Air Force Museum two to three times a year. Sometimes I like to go during the week and browse through the aircraft files in the second-floor Research Department, which is open to the public on weekdays only from 9:00 a.m. to 4:00 p.m. You must have a reservation to enter, but I've called as little as two hours (and as long as two days) in advance. For further information on making your reservation to the Research Department, call (513) 255-3284. The department is well stocked with cabinets laden with photos, blueprints, and drawings of your favorite aircraft. It's a pure gold mine of that hard-to-find information you've looked for so long.

**The Black Widow achieved** a stunning record in both the Pacific and European theaters during the Second World War. The aircraft weighed over 27,400 lb., and its 66-ft. wingspan was comparable to that of a medium-sized bomber. The Widow's two 2,200-hp engines powered it to a top speed



**Top: The Black Widow sits ready and waiting. The plane pictured here is over two years old and still looks and flies great. Above: This is the P-61 as it looks before the lines are scribed into it. It's hard on the nerves to scratch lines into a finish, but that's part of Scale modeling.**




of over 370 mph, while its radar was capable of locating and tracking down enemy aircraft up to 30 miles away in complete darkness. Combining the speed and maneuverability of a fighter plane with the capacity to carry four 50-caliber machine guns and four 20mm cannons gave this warbird an extremely deadly prowess.

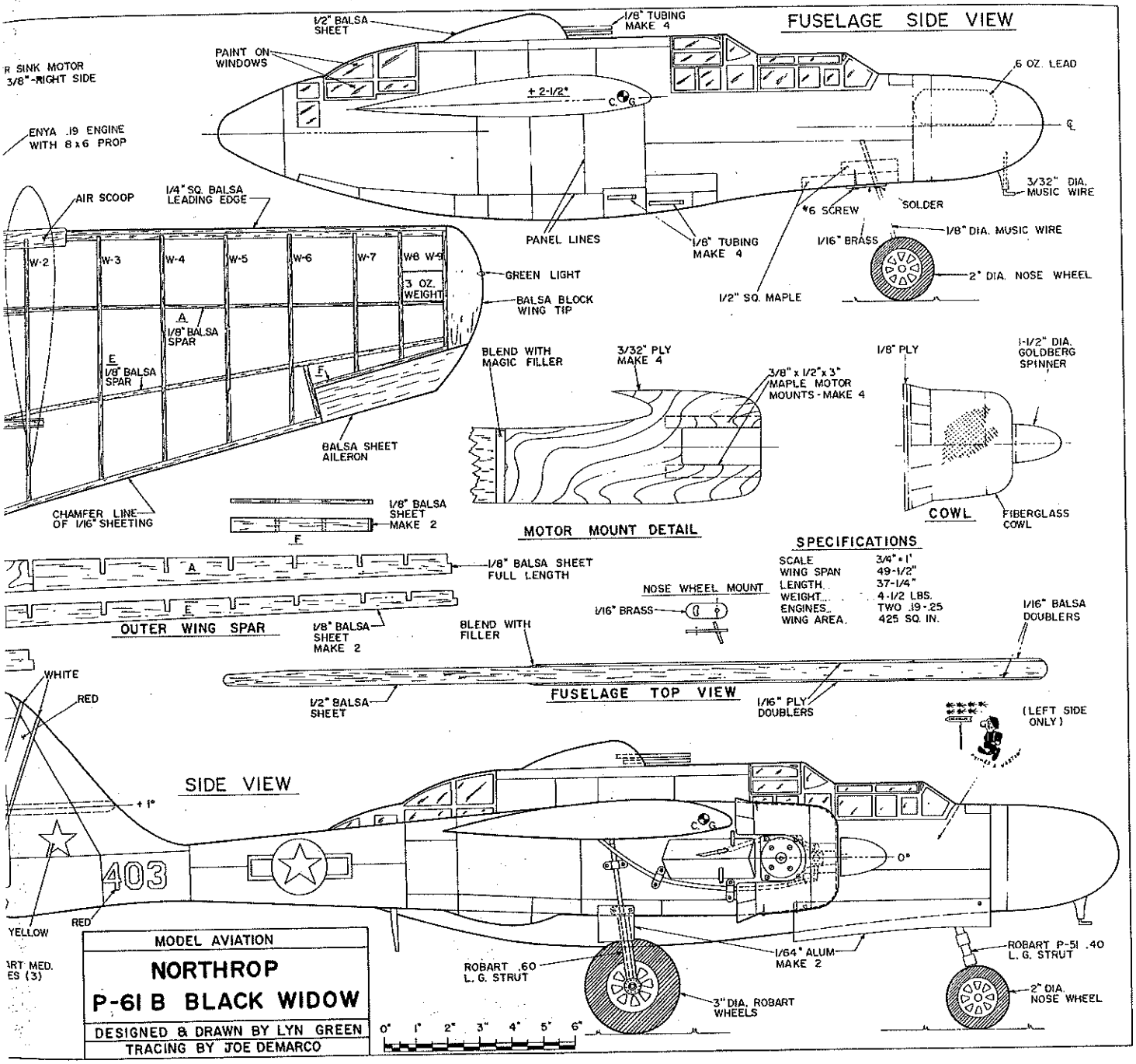
The prototype for my model was a noted P-61-B nicknamed "Times A Wastin'," which was piloted by Major Carroll C. Smith of the 418th Night Fighter Squadron stationed in the Pacific. In a single night, December 29, 1944, Major Smith and his radar operator, Lt. Phillip Porter, destroyed four Japanese aircraft off the coast of Mindoro in the Philippines. This coup earned Major Smith the distinction of highest-scoring U.S. Night Fighter Ace with a total of seven kills.

**Construction.** I designed the P-61-B model exactly to scale, including the wing, the ribs, and the plane body outline. It was originally intended as a test aircraft for my then-projected full-body Black Widow, which is now under construction. Building and flying this Scale model was enjoyable, but there are two caveats. Keep the tail section as light as possible, and make sure the model is properly balanced before flying. If you don't lose sight of these key points, flying should present no problems.

**Wing.** Completing the wing beforehand makes for an easier final assembly job. After cutting out all necessary parts, laminate together the two main spars with 1/16 plywood on both sides. Trial fit the midsection—W1, W1A, and W1B—onto the main spars without gluing. If this looks good, finish the wing assembly, but do not glue. Check that the ribs are square off the main spar, and align the leading and trailing edges. Tack glue (I used Hot Stuff Super-T) the ribs in position; for regluing them later, I used Pica Gluit white glue.

Trial fit the bellcrank (mine was a Sturdi-Built one) onto the mount, and glue it in place. After sheeting the bottom half of the wing, position and attach the tank releases and the throttle cables. My two tank releases are made by the Vortac Company. If you really want to put on a show, all four releases can be easily installed. Make sure everything works smoothly before sheeting the top wing half.

For best results when sheeting the wing, use Hot Stuff Super-T to glue together 6-in.-wide and 4-in.-wide balsa sheets, then sheet the entire wing panels with one large piece. This results in less sanding of seams, and hence a smoother contoured wing surface. The new Grate Shapes contour sanding

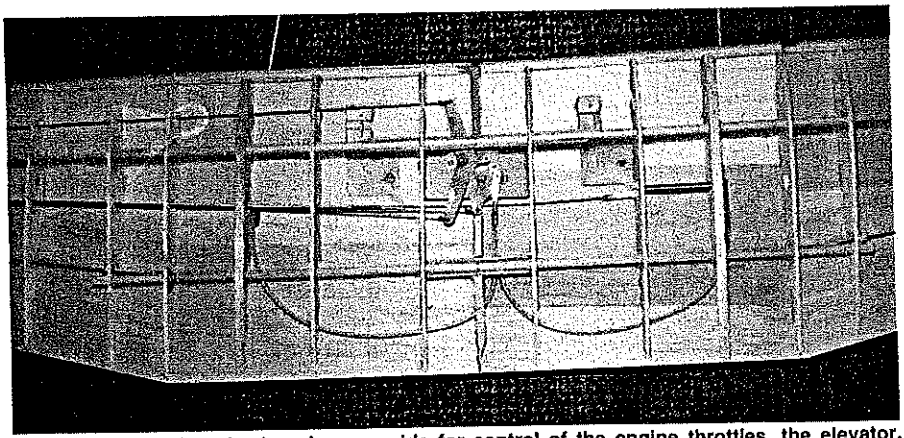



blocks did a fantastic job of shaping my leading edge and tail surfaces. A set of these blocks should be considered indispensable equipment in every modeler's workshop. I don't know how any Scale builder could do without them!

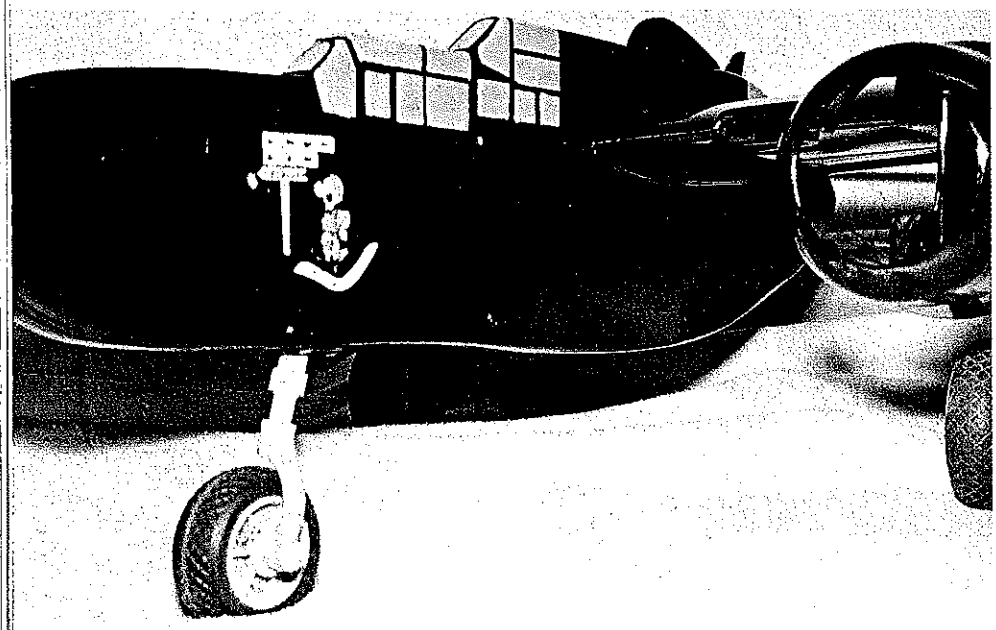
Defer permanent installation of the airscoops and outer tank pylons until the fuselage has been constructed and glued to the wing along with the booms. After shaping and final sanding of the wing tips, drill holes for the navigation lights. Mine are the colored H.O.-size train lights.

**Fuselage.** Basic materials are ½-in medium-grade balsa laminated with 1/16 plywood and balsa. To ensure that the joint is midwing, first cut the fuselage out of 4-in.-wide and 2-in.-wide sheets of balsa. Alternatively, you can use 6-in.-wide balsa, and slip it over the wing. However, because it requires a 36-in. length of balsa, the latter method involves considerable waste and is twice as costly. Having the joint at the middle of the wing makes it easy to mount the wing in two pieces.

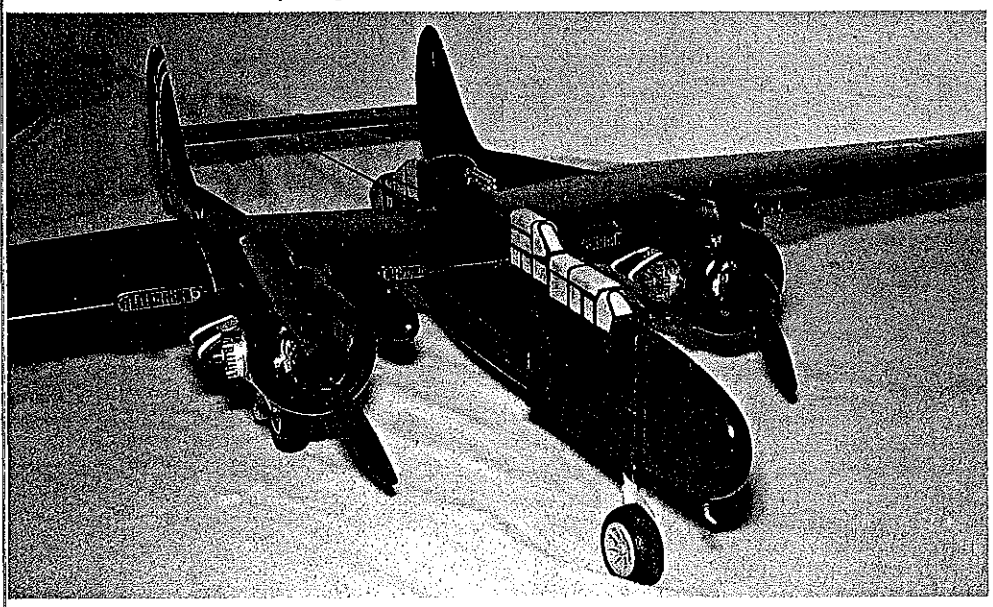
Cut the openings for the wing and the



**The internal workings in the wings provide for control of the engine throttles, the elevator, and the twin bomb drop mechanisms. This has proven to be a simple and very reliable setup.**



Above: Most notable in this shot is the detail of the engine cowl. These cowls add a great bit of fullness to this otherwise flat model. Below: The author's model is powered by two Enya .19s. With an all-up weight of 4½ lb. it is advisable that no smaller engines be installed.



Author with the P-61 just prior to the flight that took 1st place at the Indiana State Meet.

Our author says his daughters occasionally lend him a hand and act as his pit crew. From left to right they are Lisa, Tina, and Jessica.

landing gear blocks; do the same for the balance weight in the nose. Epoxy the landing gear blocks in place. When dry, drill a ⅛-in.-dia. hole into the blocks at approximately the angle shown on the plans. Make sure the nose gear wire fits snugly in the hole so that it's wobble-free during landings. Locate the center of the wing. With a pencil, and using the wing center as a midpoint, mark a ½-in. line extending ¼ in. to each side. Epoxy the top and bottom fuselage halves to the wing. Remember to square the fuselage off the leading edge and the top of the wing *before* the epoxy sets up.

Following the pattern on the plan side view of the fuselage, cut out the two fuselage sides from 1/16 plywood. Epoxy additional 1/16 plywood to each side; this reinforces the wing saddle and landing gear blocks, providing a reserve of strength (which we all hope we won't need!) for those dreaded hard landings. Add the rudders, elevators, wheels, engines, and the correct balance weight in the nose, then sheet the nose on both sides with 1/16 balsa. Finish contouring and shaping the edges and the nose.

**Booms and tail surfaces.** Both the left and the right booms are made of ½-in. balsa, with ⅜ x ½-in. maple engine mounts sandwiched between 3/32 plywood and epoxied. For a uniform scale appearance, the inside of both booms should be equidistant from the fuselage. Knowing that this condition would throw off the centers of the engines, I compensated by using my Dremel tool to rout and countersink ⅜ in. into the engine mounts on the right side of the right boom. Although this won't be exact dimensionally, it will greatly improve the appearance of the engine offset. Only one brass washer was needed to properly offset each engine.

I used a medium-lightweight grade of balsa for the twin booms, and the lightest grade available for the rudders and stabilizer. A 2-in. formed aileron strip was used for the elevator.

At this stage I decided to contour the outer surfaces only. I purchased a 1/48-scale plastic P-61 kit manufactured by Monogram to aid in contouring. The kit can also help later, in detailing the model to any imaginable degree that I desire.

**Cowls.** I wanted a profile Scale model, but without the ugly protuberances of engines and tanks. To achieve that, I tried a different approach.

Using the profile of the cowling on the plan, cut a ⅛-in.-thick plywood disc the same diameter as the back of the cowling. Glue polyurethane foam blocks (yellow, in this case) to the disc, mount it onto a wood lathe, and shape it to the profile with just a Perma-grit file. Apply two coats of K&B resin; allow it to dry between coats, and sand. After the second coat is dry, it should be left smooth with no sanding.

Screw an I-bolt into the center hole in the plywood disc to help in removing the plug

*Continued on page 165*

evaluate it in competition conditions. Ensure that the change does all that you want it to and nothing that you do not want it to do. If your intent is not plain in the rule wording, there is no way that a Contest Director can know what you wanted.

## CL Combat/Johnson

*Continued from page 73*

DE)—69 pt.; 8) Al Jorgensen (Fargo, ND)—68 pt.; 9) Paul Curtis (Jacksonville, FL)—66 pt.; 10) Bob Oge (St. Charles, IL)—65 pt.; 11) Terry Bynum (Phoenix, AZ)—64 pt.; 12) Tom Fluker (Houston, TX)—63 pt.; 13) Greg Wojetecki (Chicago, IL)—59 pt.; 14) Ed Brzys (Detroit, MI)—58 pt.; 15) Paul Smith (Sterling Heights, MI)—56 pt.; 16) Terry Sobolak (Cary, NC)—52 pt.; 17) Wallace Krueger (Maywood, IL)—43 pt.; 18) Abbie Olson (Fargo, ND)—42 pt.; 19) Mark Smith (Ft. Worth, TX)—41 pt.; 20) Phil Cartier (Hummelstown, PA)—37 pt.

Taking individual honors in the various events were Tom Fluker in FAI Combat, Jerry Sabin in Slow Combat, Terry Bynum in ½A Combat, and Michael Willcox in Fast Combat. Congratulations, guys. That's a lot of matches in the win column.

**District X MACA VP Barry Baxter** has proposed a new event that would take the place of Slow Combat. The basic restriction would be an 80-mph speed restriction (79.09 mph—6.5 sec. for two laps). Just about anything that can fly on 60-ft. lines would qualify, although a lightweight model would have a definite advantage over a heavy model. Barry's proposed rules cover all the loopholes in timing, but I'm sure we'll all think of more.

As horrifying as this event sounds to some who have a big investment in Slow Combat models, it wouldn't obsolete any of them, and you could detune them easily to fly under the 80-mph limit if they actually fly much faster than that. It would allow use of a strong and efficient Fast-type model with detuned engine and rid the skies of the long nose and tail moment arms that we all hated when Slow Combat first came into being.

You could go back to balsa spars and lightweight engine mounts, suction venturis, and low-nitro fuels. Bladder-fed engines are generally a lot more fuel-efficient than one fed from a tank, plus there's the weight savings—not to mention the expense of the tank. The chance of using the *same* model with only an engine change in Fast and Slow is a whole lot better than trying to use your current Slow against top-lane Fasts.

Barry's club has been putting on a series of contests featuring this new concept in Combat flying, and they've had sport models, "real" Slows, FAIs with diesels and glows, and all the leftover Fox/Voodoo and Fox/Goldberg combinations. The real measure of success of the event is fun. Barry Baxter can be reached at 6490 Sonora Way, Cypress, CA 90630. He is also a big Nostalgia Combat buff and has plans available for many of the classic models, such as the Orbit Ace, WOW, and many others.

**The Second Annual Money Nats** turned out to be quite a success, with last year's "almost" winner and good sportsmanship recipient getting the thousand-buck first place. Michael Willcox parlayed his nine-win and two-loss record into the big payoff, plus a share in the Calcutta Final which benefited the backers of various fliers, the winning flier, and also the MACA FAI team fund. Michael already had a record of eight-and-one at that time, while the other three quarter-finalists each had one more loss.

Richard Stubblefield ended up in fourth, Steve Kott in third, and Larry Driskill as runner-up to Willcox. Larry received a Carver Corp. stereo for his second place, and Glen Dye presented Steve Kott with one of his late-edition TWA .36s.

As with the FAI team trials, there seemed to be near-parity amongst the top half of the entrants. Engine/model combinations seem to be closer than ever, with some lesser-known fliers having equipment at least as good as any of the top guns.

Chuck Rudner, Howard Rush, and Phil Granderson were at their best on the PA system. Howard gave a demonstration of the quickest kill method by disposing of his first-round opponent in about one second, although his next six rounds were spectacular too, even if he didn't win all of them.

**If any one flier has a chance to dominate** the flying over the next couple of years, it has to be Michael Willcox. Michael and his father, Pat, have put a lot of effort into analyzing what is really going on during matches. They've made extensive use of the videos they shoot at all the meets. They have a record of what went on during the match and have been able to learn from their mistakes and triumphs.

I asked Michael if he'd planned some of the neat moves he'd put on people, and his reply was exactly what you'd expect from the crafty fox: "What moves?"

Picture Michael flying along at about 20 ft. with his opponent above and behind him all ready to pounce in for the kill. A little fake toward the opponent's model, and he instinctively pulls up a little to avoid a midair. Wrong move! Michael does a quick U-turn inside the guy and gets a kill. He had the pilot in just the right place in the circle—and the guy's plane just where he wanted it.

**ABC piston/liners for the masses?** Tired of hearing about the exotic items that were sold out before you could get one? The son of a well-known design whizz and engine-builder extraordinaire may be cranking up to produce enough setups for everyone. Tentative orders were being taken at the Money Nats. Price will be about $60 for the piston/liner and about $20 more for a Venturi connecting rod.

## Black Widow/Green

*Continued from page 84*

later. Mix up some plaster, and put it into the bottom of a rubber bowl or bucket deeper than the plug. When it's pushed in, the plug shouldn't touch the bottom of the container, and the back of the plug should be flush with the top of the container. Fill the rest of the container with plaster, trying not to get air bubbles alongside the plug. In 15 to 30 minutes, the plaster will start to grow hot and will harden. When hardening has begun, wiggle the plug slightly by holding the I-bolt, and carefully lift the plug from the plaster. Let the mold dry overnight before lightly sanding the interior.

Cut ¾-oz. fiberglass into 1½-in.-wide strips, and start layering coats of resin and glass cloth in the mold. Five or six complete layers should give you a cowling at least 1/16 thick. Let it cure overnight, then break or hammer away the plaster from the cowling. When the cowl is removed, there should be plenty of extra material left to

true and square it up. After a light sanding, cut the opening in the cowl, and seal it up well with one last finish coat of resin inside and out.

**Finishing and painting.** Give the model a final sanding with 400-grit sandpaper before filling dents and blending everything in with Model Magic Filler. Apply a coat of K&B Finishing Resin, followed by a sanding with the 400-grit paper when dry. Add a second light coat of resin, and go over the model again with the 400-grit sandpaper.

I applied two coats of gray NAPA auto lacquer primer. When dry this was lightly sanded with 600-grit sandpaper. Two coats of glossy black Perfect Paint (Cheveron) were then sprayed on. The rest of the trim paint and decals were added, and one coat of clear satin was sprayed on. I used Cheveron Perfect Paint exclusively; it's the easiest and most forgiving paint you are likely to encounter.

**Flying.** The first order of business is to check that your model balances at the center-of-gravity shown on the plan; better yet, make the airplane a little nose-heavy. Before connecting the lines, be certain that the plane will roll straight forward or to the outside of the circle. The adjustable nose gear comes in handy for this operation.

My good friend from Indianapolis, Steve Ashby, gave me a helpful hand in starting the engines on my first flight. We started the outboard engine and leaned it out, then we started and leaned out the inboard engine to match the outboard one.

"Boy, let me tell you," I crowed, "when the inboard was matched to the outboard it was pure magic to my ears!" What a beautiful, hypnotic sound. I just stood there like a plant soaking it up, until Steve had to ask was I going to merely *stand* there or was I planning to *fly*. You know the answer to that one . . . and believe me, fly it did!

From that day on, the P-61 has been a terrific flier with never a letdown. It's very stable and smooth in the wind. The touch-and-go maneuvers are great, as are the wing tank drops. My .19 engines provide the model with adequate power; but if anything, go for something bigger—don't go for less.

Whether flown in competition or purely for fun, the Black Widow has consistently been a winner. A modeler can't ask for more than that.

## Dihedral/Beron-Rawdon

*Continued from page 95*

These moment fractions for each panel are simply multiplied by the panel dihedral angle and summed to find the EDA.

Further examples are provided by Figure 1, all of which have an EDA of 10°.

**Analogy with ailerons.** The amount of dihedral a wing panel has determines its roll power when the plane is yawed. Thus, in a plane with a flat center panel, the center panel makes no contribution to roll power, and the tip panels do everything. This is approximately equivalent to an aileron wing with partial-span or "barn door" ailerons. A V-dihedral wing makes an equal contribution (delta alpha-wise) all along the length of the wing. This is analogous to strip ailerons which taper in proportion to wing chord. These and other analogies are illustrated in Figure 6.

Note that these analogies may be turned around and used to better understand the function of ailerons. For instance, we can see from Figure 4 that 0.5 semi-span barn door ailerons will be about 65% as powerful as full-span strip ailerons of the same percentage chord.

**Transitional maneuvers.** While steady-state maneuvers such as rolling and circling are managed very well by rudder and elevator airplanes, transitional maneuvers, such as initiating or ending a roll maneuver, are their weak point. This is because a double series of events is required to initiate or end a maneuver.

For example, the series of events required to transition rapidly from straight flight into a steady-state turn is fairly complex. A large rudder deflection accelerates the plane in the yaw axis. As the plane becomes yawed, it begins to accelerate in the roll axis. As the plane approaches the maximum yaw angle for the rudder deflection selected, the plane decelerates in yaw until the maximum yaw angle is reached (if the airplane is underdamped in yaw due to heavy wing tips or an undersized rudder, it may overshoot the steady-state maximum yaw angle and then oscillate briefly about the maximum angle). Shortly after the plane reaches maximum yaw angle, maximum roll rate is achieved. Rudder deflection is held until the desired bank angle is approached. Then the rudder is neutralized, the airplane yaws back to zero yaw, and the airplane stops rolling (again with delays for acceleration and deceleration).

As you can see, in order for the plane to roll, first it must yaw. In order for it to stop rolling, it must stop yawing. In order to minimize the lag between control input and response, yaw and roll acceleration and deceleration should be maximized. This is achieved with a large fin/rudder, a long tail moment arm, generous dihedral, and lightweight airplane extremities (namely the wing tips and tail group). If the extremities are overweight and the vertical stabilizer is undersized or on too short a moment arm, the plane will be difficult to fly precisely. Its response will be slow to start with, and then it will tend to coast past the desired response, prompting a control input in the opposite direction. This input may also be overshot, and the airplane will end up wallowing around. This will force the pilot to be very slow and smooth on the control inputs, giving up the potential for rapid, precise control.

If the dihedral angle is insufficient, larger yaw excursions will be necessary to generate a desired roll response. This will make the plane's response more sluggish and will reduce the maximum roll rate.

Conversely, if a plane has ample dihedral, lightweight extremities, long tail moment, and generous vertical stabilizer, its handling can be immediate, precise, and powerful.

**General comments.** There are some interesting properties to point out about the behavior of dihedral. For a given airplane, the roll moment generated is a function of the yaw angle and airspeed. It is noteworthy that the overall angle of attack is not important unless the airplane is nearly stalled. If the speed and yaw angle are the same, the