Stan Powell poses with the Dove 650 and the awards won at the 1982 National Contest—PAMPA Concours d'Elegance and 8th in Precision Aerobatics. The model was awarded 19 out of a possible 20 appearance points, the most of any model in the 1982 Nats. It's truly a beautiful and well-designed model.

Stan Powell's DOVE 650

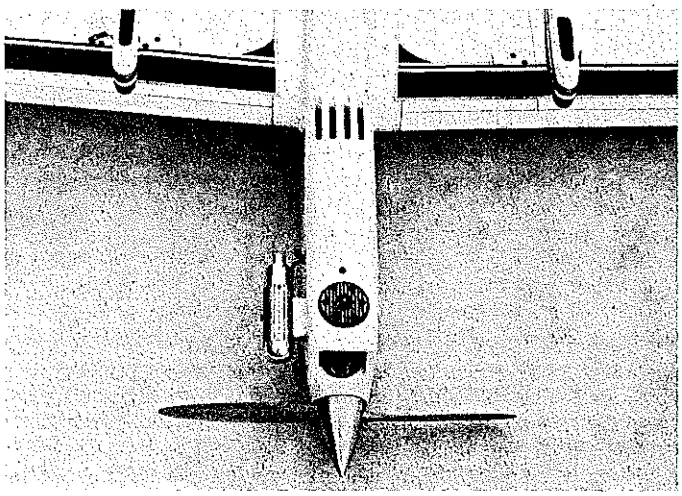
Stan Powell

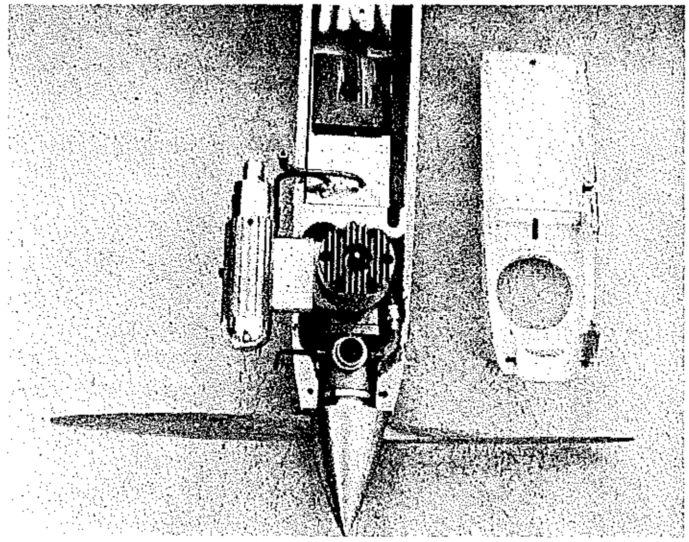
THERE ARE MANY addictive influences in our society; we read about the most common ones in daily newspapers. Little did I realize, that day in the spring of 1975, that I was about to become an "addict."

I had just finished building a workshop in my house, and I was itching to find a project. I had accompanied my wife, Sandy, to a craft shop, and while she was shopping I spied a small model airplane department on the other side of the store. You can guess what happened. When we left the store, Sandy had her goodies, and I had mine—a Top Flite Nobler kit.

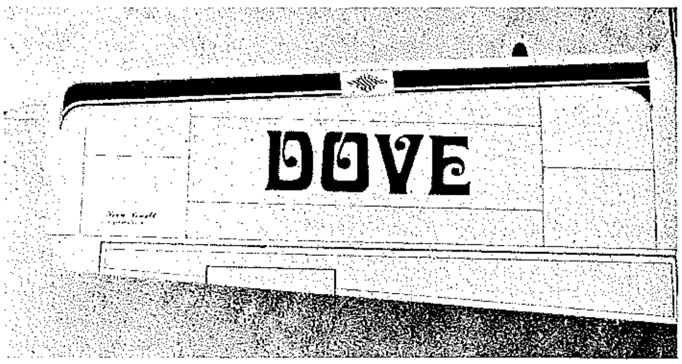
Later that summer, Sandy and I made a detour on our vacation to the Southeastern Regional Championships in Winston-Salem, NC, where we watched Les McDonald and Gene Schaffer battle it out for first place in Expert Precision Aerobatics. Boy, was I impressed! I wanted to do what they were doing so badly that my mouth watered. That was it—the "injection" that did me in—I was hooked! Since that day, Stunt flying has occupied a prominent part of my life. Fortu-

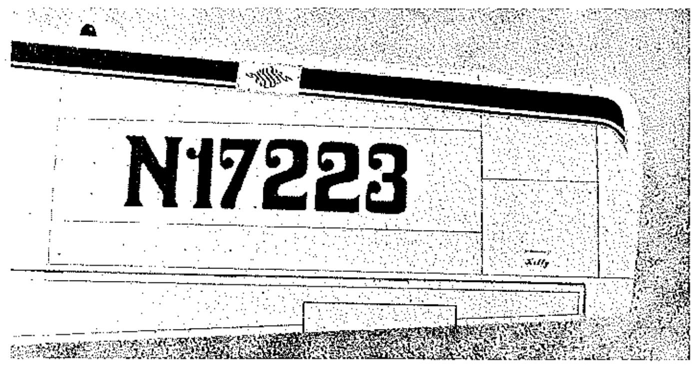
This plane won the Control Line Precision Aerobatics Concours d'Elegance award at the 1982 Nationals, so you know it has what it takes in the looks department. Then the author/designer went on to finish a very respectable eighth in the event. Subsequently, he won at the 1982 King Orange International. Design philosophies are worthy of note.





Left: Access to the engine intake for choking and quick starts was one of the criteria in the cowl design. Engine cooling ability is more than adequate. Right: With cowl removed, the engine compartment comes into view. Note the through-the-tank tie-down. The tank can be removed quickly if needed. Engine shown is an OS Max .40 FSR-S that the author especially modified for use in CL Precision Aerobatics flying.





Unique lettering on the wing was done with the aid of stencils cut from Contac paper. Photo-enlarged Chart-Pac graphics lettering was the guide for the lettering design. Trim and panel lines are of India ink applied with a Rapidograph technical pen. Note precise hinge-line fit of the flaps.

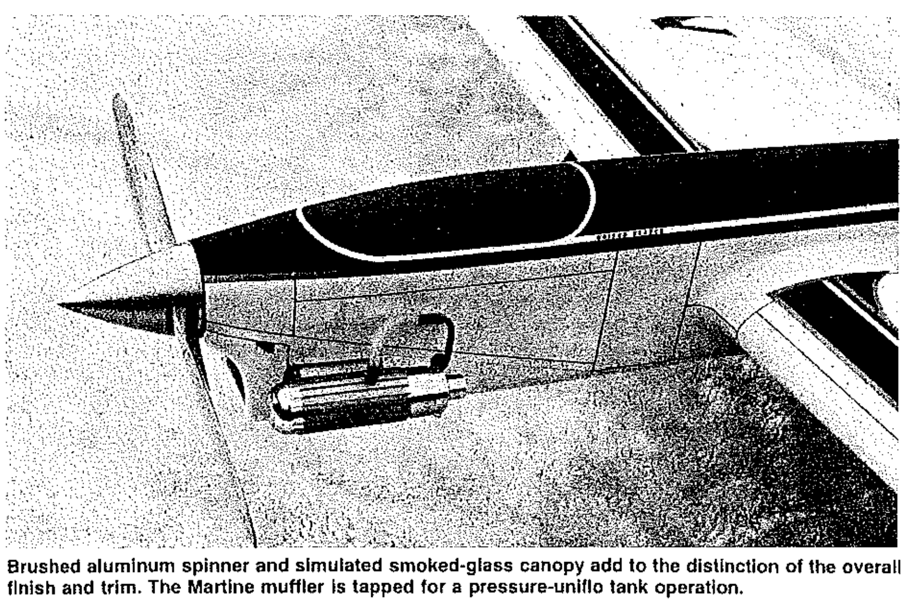
nately, God blessed me with the perfect wife and family who have actively supported me in my drive to become the best.

Now that you know where I'm coming from, let's talk about the Dove 650. This airplane represents a composite of the best features of my previous airplanes and, of course, some borrowed ideas. The main theme in all of my airplanes has been simplicity and reliability. A competition airplane must *support* the flier, not be a *burden* to him.

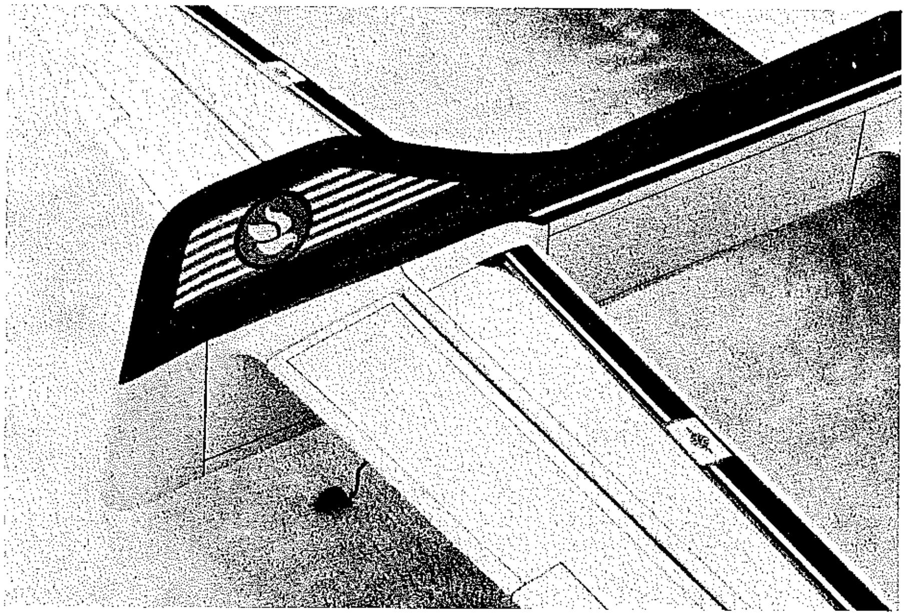
For example, at every contest I see fliers who can't get their engines started because their fancy cowl design prevents normal choking. How about the guys who spend 30 minutes changing an engine or fuel tank? The tank should be removable without disturbing the engine. Dove's engine or tank can be replaced and be ready to go again before your flying buddy has completed his flight (provided he doesn't crash!). Time at the flying site or contest is precious, so build your airplanes to be functional as the first priority and pretty as the second. Dove 650

Specifications

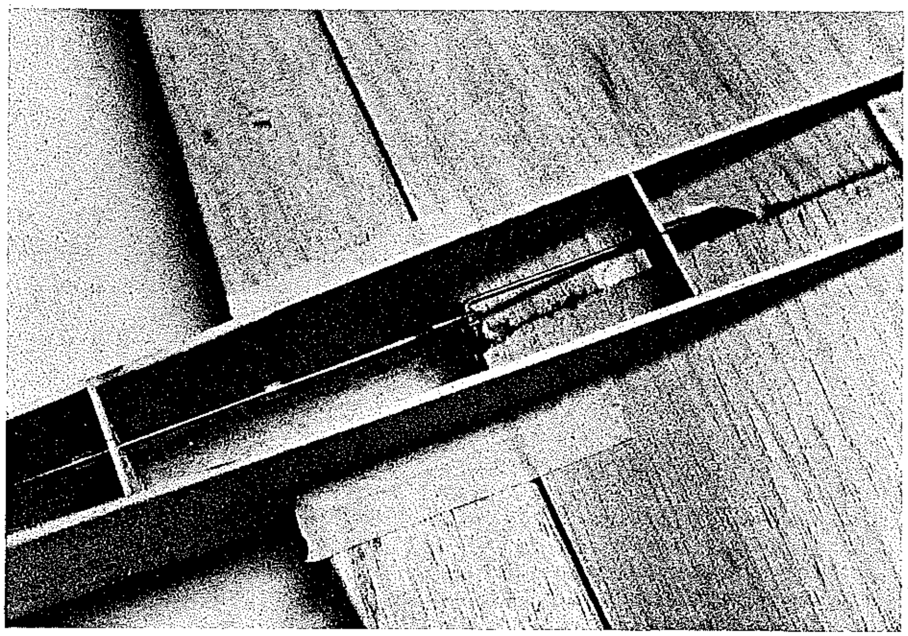
Wing	
Span (equal panels)	59 in.
Root Chord	13 in.
Tip Chord	9⅛ in.
Root Thickness	2⅛ in. (16.3%)
Tip Thickness	1¾ in. (19.2%)
Area	650 sq. in.
Aspect Ratio (span^2/area)	5.4:1
Flaps	
Span (both equal)	24¾ in.
Root Chord	3 in.
Tip Chord	1⅛ in.
Area (movable)	102 sq. in.
Flap Area/Wing Area	15.7%
Flap Area/Elevator Area	155%
Horizontal Tail	
Span	28 in.
Area	144 sq. in.
Stab, Root Thickness	¾ in.
Tip Thickness	9/16 in.
Elevator, Root Thickness	9/16 in.
Tip Thickness	7/16 in.
Elevator Area (movable)	66 sq. in.
Tail Volume (tail area/wing area)	22%
Moments	
Nose (rear of prop to L.E. of wing)	10¼ in.
Tail (flap hinge-line to stab-elev. hinge-line)	16¼ in.



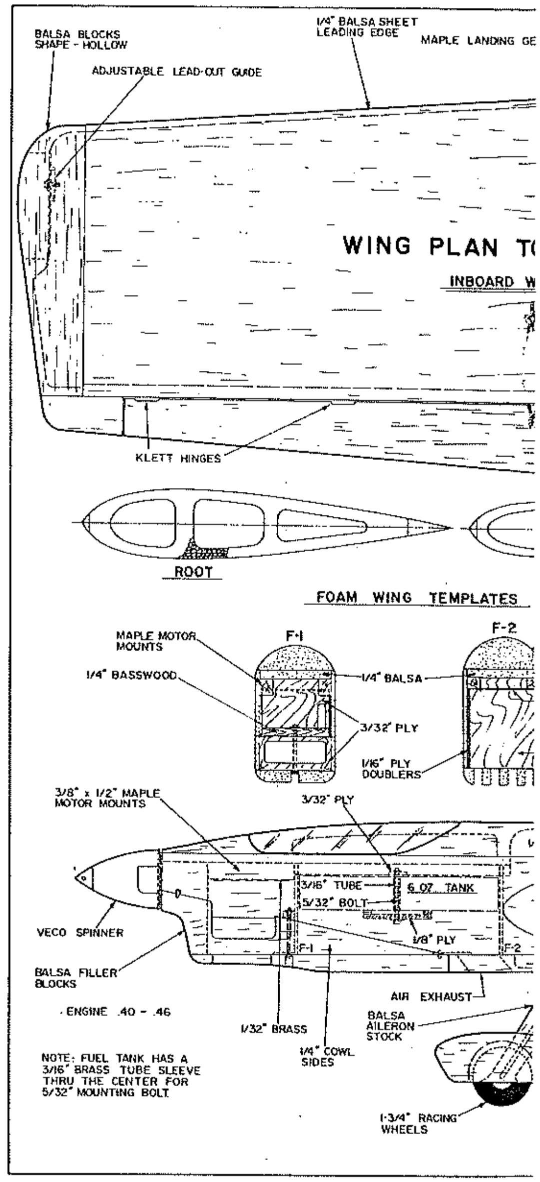
Brushed aluminum spinner and simulated smoked-glass canopy add to the distinction of the overall finish and trim. The Martine muffler is tapped for a pressure-uniflo tank operation.



The dove logo on the vertical fin also made use of a stencil from Contac paper, plus Scotch Fine Line Tape. Stan says that the logo has a special significance for him.



This is Stan's unique control hookup. The two pieces of plastic you can see on the pushrod are guides that haven't yet been affixed to the formers. Flaps are taped in neutral while aligning controls.



proves that both are possible.

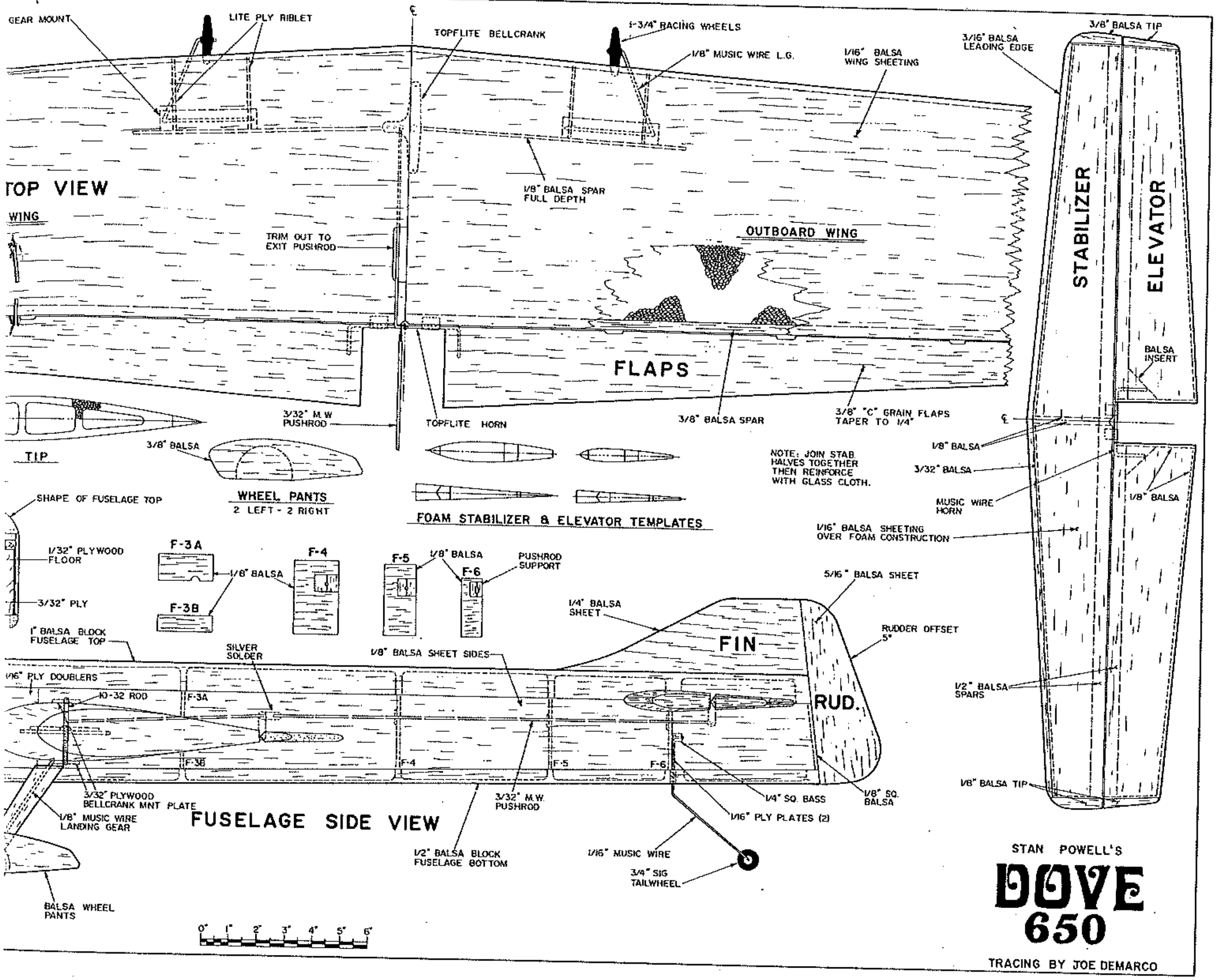
Another more subtle feature of Dove's design is the landing gear. How many flights have you seen that you thought were great but were scored low? Think back. What did the takeoff and landing look like? There's a better than even chance that they weren't up to snuff. Front wheels that are too far rearward by even ½ in. can really upset the way an airplane lands (too far forward will cause it to "porpoise;" too far rearward will cause it to bounce too easily). A tail gear that is too short can cause the airplane to lift off too quickly. If it's too long, it will be difficult to make a gradual, smooth lift-off. The position of Dove's gears are optimized to give those consistent 35(+)-point takeoffs and landings.

Dove's aerodynamic proportions are a bit unusual when compared with the current crop of competitive Stunters (which generally have long tail moments and large tail areas for stability). This plane achieves the same effect by lengthening the nose moment instead. The combination of control surface areas, moments, high aspect ratio wing, and control hook-up are designed to provide super stability and still have the ability to turn lightning-sharp corners. Those who observed Dove 650 at the 1982 Nats will attest to its cornering ability.

Another advantage of using a shorter tail moment is the reduced weight. I build my wing, stab, and elevators of foam, leaving very little margin for building errors (which invariably add weight). Remember, every unnecessary gram of weight behind the CG requires that up to twice that amount be added to the nose for balance purposes. Here is where inertia comes into play.

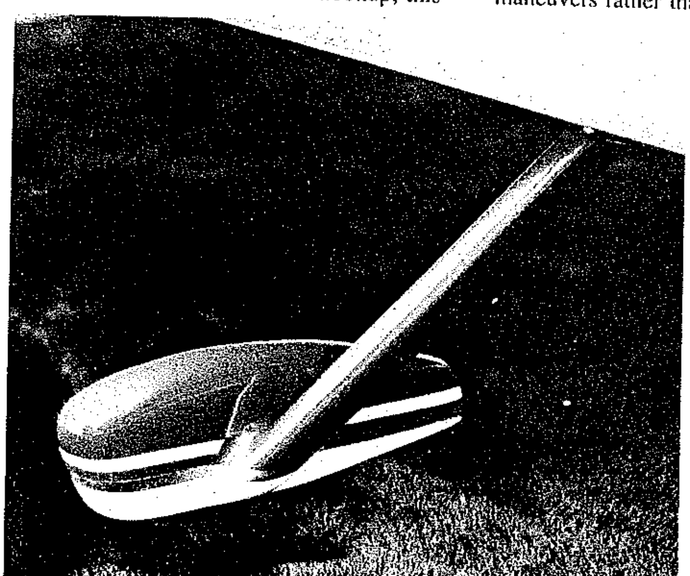
Suppose your tail section came out too heavy, and you had to bury 2 oz. of lead in the nose to balance for pitch. The airplane is still within reasonable weight limits, so you may have thought you weren't hurt. Wrong! The law of inertia roughly states that a body traveling in a straight line will continue to move along that line until a force acts upon it to change its course. The force needed is directly proportional to the mass (weight) of the moving body. That heavy nose and tail, even though balanced, will require more force to change direction. The bottom line is that you're going to need more horsepower, and you'll be demanding more of your control surfaces. It also works in reverse. Once you've got the airplane turning, particularly in a corner, it's going to take more force to change to straight flight.

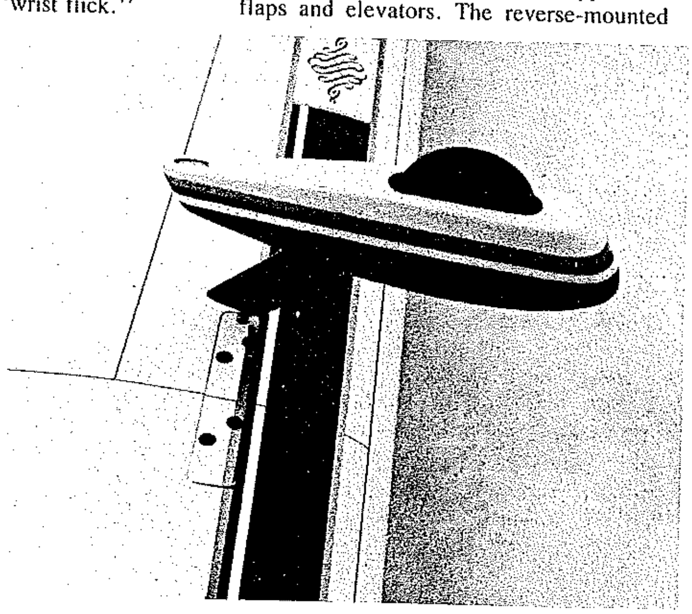
Today's larger airplanes require a control system with greater strength and durability than the old, standard Nobler hookup in order to handle the strong, gusty winds that frequently are found at contests. Dove's control system was designed with that thought in mind. The control setup gives relatively high handle movement in relation to control surface movement for a "groovy" flight with less sensitivity. This also allows greater



freedom in selection of line spacing on the handle. The pushrods are farther out on the horns than the standard Nobler hookup; this gives greater leverage. The resulting airplane is one that you "drive" through the maneuvers rather than "wrist flick."

The rather unusual rear pushrod hookup allows identical leverage to be applied to flaps and elevators. The reverse-mounted





The landing gear treatment is pure class when seen either from above or below. Note music wire skid at bottom rear of the wheel pant. That's to prevent damage to the wheel pants in the event of a rough landing—and it's characteristic of attention to details throughout the whole model.

bellcrank is a matter of personal preference. The more usual "rear up-line" hookup should work just as well. Both the flap and elevator horns are bushed with 3/32-in. I.D. hard brass tubing. If you are handy at silver soldering, you might consider making your own horns from 1/8-in. piano wire to reduce flexing of the control surfaces. My next airplane will have these beefed-up horns.

Construction. I am a slow builder, mainly because of family obligations. The thought of completing a project as complex as a competition Stunt ship can sometimes seem to be staggering. Even after a number of years of modeling, this thought has caused me to hesitate in making a start. I overcame this "fear" by looking at the total construction project as a group of "mini-projects." For example, on one day I'll cut foam cores, the next day I'll make control horns and pushrods, then I'll make skins, etc. By dividing the project mentally into smaller jobs, the task doesn't seem to be insurmountable. Ideally, all the individual parts should be completed before assembly begins. It really doesn't matter which part is constructed first; just start where it suits your fancy.

Wing. I usually build this first. The wing is the most critical part, and I want to concentrate on it while my interest is at a peak. The templates shown on the plan are for a foam-core wing, but it can be easily modified for standard C- or D-tube built-up construction. If you choose the built-up route, I recommend rib spacing be no wider than 1½ in. to help prevent the planking from sagging between ribs. Very fine quality foam-core wings can be purchased, but I personally like the feeling that comes with knowing "I built the whole thing."

Let's assume that you purchased a foam wing, anyway, and it is complete with sheeting and leading edge installed. Before proceeding, trace an outline of the wing root cross section onto cardboard for later use. After you have installed the hardwood landing gear blocks with Hobbypoxy Formula #2 epoxy, the weight per panel should be 4-4¼ oz. maximum. Next the bellcrank/front pushrod assembly is installed. The length of the front pushrod is determined by holding the flap horn at a neutral position on the back of one wing panel with tape while also holding the bellcrank assembly in a neutral position, centered on the balsa center spar; the required length is then measured. After making the pushrod and installing it onto the bellcrank, the completed assembly (including lead-outs) is aligned and tack-glued onto the outboard wing spar. A pushrod exit slot is cut in the inboard panel. You're then ready to join the two panels.

My method of joining the panels differs from the norm. Most people use the foam blocks from which the cores were cut as a cradle to lay the panels in while gluing. This method did not work well for me; I always got unwanted anhedral or dihedral. My method involves joining the panels together with the trailing edges (T.E.) pinned to a building board such that the wing is perpendicular to the board.

First, draw a straight line on the building board several inches longer than the wing. The trailing edge of the wing will be centered on this line. Pin the outboard panel (with controls installed) onto the board with T.E. centered on the line. Fit and align the inboard panel such that it makes a good gap-free joint with the outboard panel. When you are satisfied with the fit and alignment, apply Hobbypoxy Formula #2 to both panels and join them.

Check for anhedral/dihedral by placing a straightedge on the board against the T.E. on each side of the wing. Adjust to neutral. For extra support while the epoxy cures, I brace the panels with four bricks wrapped with masking tape. Be careful to use the minimum amount of glue; very little should ooze from the joint.

Wing tips should be installed next. Carve them from 1 × 2 × 12 blocks that have been laminated with cyanoacrylate (CyA) glue. Each block should weigh 1.0 oz. maximum. Carve them roughly to shape and hollow. Install the adjustable lead-out guide, and then install both tips with epoxy *on the foam only*. After the epoxy has dried, glue the sheeting to the tips with CyA, and finish carving them to shape.

At this time 3/32 ply bellcrank braces are glued in place. Next, a strip of 1/32 × ¼ balsa is glued over the wing center joint with CyA. The edges of this strip are feathered to flow into the wing skin. (This strip is added only to cover the epoxy and avoid any possible incompatibility later when installing the wing in the fuselage with polyester resin/glass cloth.)

Flaps are carved from 3/8 lightweight C-grain balsa planks of equal rigidity. Keep the taper to a minimum (¼ in. at the T.E.) to preserve rigidity. After beveling the leading edge (L.E.), apply two coats of polyester resin to the beveled area and to the T.E. of the wing, sanding between coats. Next, install the flap horn with Hobbypoxy Formula #2. Cut slots in the wing T.E., and install Klett hinges with Formula #2. I prelubricate the hinge axles with a light coating of Vaseline to protect against glue seepage. Notch and slot the flap assembly, and install the flaps. The front pushrod is slipped onto the flap horn but not installed permanently at this time. Neither should the stationary flap ends be installed at this point.

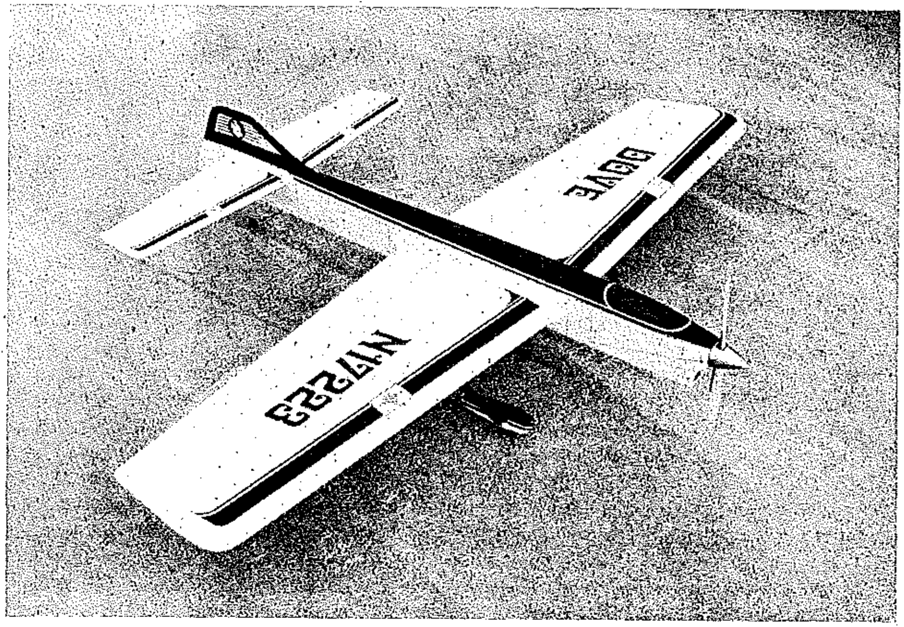
The wing is now ready for installing in the fuselage. It should weigh a maximum of 12.5 oz. (without the landing gear).

Fuselage. The design is box-style with hollowed top and bottom blocks. It is important to select very lightweight 1/8-in. sides of identical grain to assure a straight fuselage. Cut out identical fuselage sides; draw the wing line on the outside of each. Note that the wing, thrust, and stabilizer lines are parallel to the top of the fuselage sides for easy alignment.

Glue the maple engine mounts onto the fuselage sides with polyester resin; apply resin to both surfaces. Note that the mounts are routed out to 3/16 in. behind F-1. Align the mounts with the top of the sides using a piece of ¼ balsa as a positioning guide. Weight the mounts until the resin has cured. The 1/16 plywood doublers are glued in place in the same manner. (I use polyester resin for glue wherever possible, because it weighs less than epoxy.)

Locate and mark the positions of F-1 and F-2 on each side . Lay one side of the fuselage down on a flat surface, and glue F-1 in place with CyA while holding it perpendicular with a right-angle template. Repeat with F-2, and then CyA-glue the other side to F-1 and F-2, aligning on a flat surface

Continued on page 168



It's necessary to obtain top appearance points if you are to do well in competitions, especially at the national level. Dove's design and your inspired workmanship can help you be a winner.

ozone don't leave stains.

11. Multi-motor aircraft are very easy with Electrics, because electric motors are usually well-matched in performance characteristics. When powered from the same battery, several motors will run, and run down, at the same rate. No chance of losing one side! This is really great for Scale. Some local fliers have several twins and quads that are operational.

12. Electric motors can be fully controlled in flight. This can be done in an on-off fashion, with power steps in-between, or with fully-variable speed control from zero to maximum. Try that with gas!

13. Electric power is virtually vibration-free. This often allows a simple radio installation, as less foam packing and shock mounting is needed. Many of my installations are nearly "rigid"—receivers, servos, etc. are squeezed in tightly. More on this as we go along.

14. Electric is simply perfect! *Wrong!* Like everything else in life, Electrics have both limitations of capability and requirements for proper handling. Example: just as any conscientious modeler should be careful not to allow his gas engine to overheat, so also should such a modeler pay close attention to battery heat. This series will attempt to be thorough, honest, and realistic, and include "everything you didn't know you needed to know" about Electrics.

I realize that some of the writing above makes redundant points. My purpose is not to fill pages with (the same) words, but rather to express a range of thoughts in several ways to give you, the reader, variety in viewpoint and perspective.

The next installment in this series will get into the electric power systems—motors, batteries, and some other Electric goodies. Later, we'll get into installations, suitable planes, and more. Till then, just ponder the possibilities!

Any questions related to this part of the series may be directed (with SASE) to the author: Bob Kopski, 25 West End Dr., Lansdale, PA 19446. Please resist the temptation to jump ahead. I have yet to write all of this series, and I'm unable to handle letters which require a book's worth of writing to answer properly. Otherwise, I will attempt to respond in an expedient fashion.

Dove 650/Powell

Continued from page 88

to assure the sides are parallel. CyA-glue the 1/8 sq. tail post to one side of the fuselage.

On a flat building board, draw two parallel lines slightly longer than the fuselage, separated by the width of the fuselage. Draw a third parallel line centered exactly between the first two. Line up and pin the front part of the fuselage to the board (top down) exactly between the lines. Make sure it's pinned securely and rigidly. Adjust, pin, and glue the sides together at the tail post such that the tail end is centered exactly on the centerline. Pin F-3, F-4, F-5, and F-6 in place and glue with CyA. (The sizes of these formers shown on the plan are nominal; they should be cut to the actual sizes that are needed.) The rest of the fuselage is relatively straightforward.

Glue the 1/32 ply tank compartment floor in place over the engine mounts, and install the blind nut for the tank hold-down. Drill the engine mount holes, and install the blind mounting nuts. Add the nose filler blocks and 1/4-in. top block insert.

A "building motor" with spinner but no cylinder is mounted on the 1/32-in. brass shims shown on the plan. Tack-glue the top block, bottom block, and cowl assembly in place, and carve the fuselage to shape (as one piece). The cowl is then removed and completed, including tie-downs, after which the top and bottom blocks are removed and hollowed. The carved and hollowed top and bottom blocks should weigh about 1¼-1½ oz. total. Reinforce the inside of the nose and cowl with fiberglass cloth and polyester resin. Fuel-proof the entire engine compartment with several heavy coats of the resin.

The stab-elevator assembly on the original model was constructed from foam cores as shown. Lightening holes in the foam (not shown on the plan) may be cut to reduce weight. A built-up assembly will work as well. The key is strength, rigidity, and lightness. The center joint of the stab should be reinforced with glass cloth. The completed assembly should weigh 1¾-2.0 oz. The fin and rudder assembly can be made from very lightweight 1/4 and 5/16 sheet; the weight shouldn't exceed 1/4 oz.

Assembly. I advise you to reweigh the component parts before assembly to be sure they are within stated tolerances, particularly the tail section. If anything is too heavy, build it over. This is your last chance to correct any weight problem.

The first step is to install the wing in the fuselage. Draw a cross section of the wing root in the proper location on the fuselage sides, and cut out these sections. Next, remove part of the fuselage sides, at the bottom from the doublers to the T.E., to allow installation of the wing through the bottom.

I use a jig to align the wing with the fuselage, as follows. Take a piece of building board about 60 inches square, and lay it on a flat surface (i.e., a table or the floor). Draw a straight line down the center of the board; the fuselage will be centered on this line. Determine where the T.E. of the wing would intersect this line, and at this point draw a line across the board perpendicular to the first line; the T.E. will be lined up along this line. Pin the fuselage top-down and centered on the fuselage line. Place the wing in the fuselage, and line up the T.E. with the T.E. line. Next, line up the centers of the L.E. and T.E. with the wing line drawn on the fuselage. Also, the vertical sides of the fuselage must be perpendicular to the wing.

Once you have the wing aligned with the fuselage in all three directions and it is pinned in place, tack-glue with CyA. Proper alignment is even more critical than controlling weight, so don't rush things. Fill any gaps between the wing and fuselage with soft balsa strips and CyA glue. The previously-removed fuselage bottom is now replaced, and the wing is permanently glued in place and reinforced with polyester resin and 1.5 oz./yd.^{2} glass cloth.

Glue in the tail-wheel gear with epoxy; brace it with balsa strips for extra strength. The bottom fuselage block is then glued back in place permanently with CyA. Carve and glue in place the inserts between the flaps and fuselage. Using these inserts as guides, tape the flaps in neutral, and glue on the stationary flap extensions. Be sure they are in a "neutral" position. Leave the flaps taped in neutral for installing the stab-elevator assembly.

Aligning an airfoil-shaped stab with a flat fuselage top can be difficult unless you have a good procedure. Mine is to build-up the bottom center of the stab with balsa strips so that when the stab sits on top of the fuselage, the angle of attack is zero (parallel with the wing and top of the fuselage). Now, permanently install the pushrod onto the elevator horn. Mark the position of the stab on the fuselage sides, and cut out 5/16 × 3¼-in. mounting slots. Thread the pushrod through the fuselage, and temporarily hook up the controls as shown on the plans. Line up the elevators in neutral with the stab square as seen from above and behind; pin securely in place. Check and recheck the alignment. Once you are satisfied, tack-glue the stab in place with CyA.

Remove the masking tape from the flaps, and check controls for binding. Glue the rear pushrod guides in place. Again, check for binding; the controls should be absolutely free. Solder on the pushrod retaining washer, again checking for binding. Lubricate the horn bushings.

Cut the top block in two just in front of the stab, and permanently attach the front part with CyA glue. Recheck the stab alignment; it will probably be off a little after attaching the top block. Realign the stab if necessary, and then fit and glue the rear portion of top block in place, taking care not to exert pressure on the stab. Finish gluing the stab permanently with CyA, filling any gaps with soft balsa strips. Next, align and CyA-glue the rudder/fin assembly in place. Carve and glue the inserts between the elevators and fuselage. Install the struts and wheel pants on the landing gear, being careful with alignment.

I use K&B polyester resin with Prather phenolic micro-balloons for fillets. Although a little more trouble, this system is lighter than epoxy-based fillets, and dope adheres very well. The usual techniques apply—except that pot life with this mix is short, so apply it to one area at a time. The fillets can easily be sanded to shape with 100-grit garnet paper glued on the rounded edge of a strip of 5/16 balsa.

Finishing. I use the traditional dope-talc-silkspan finish, which will add about 7 oz. to the weight. Start by fixing all the little "dents and dinks," and handle the airplane with "kid gloves" from here on out. I use a dope and talc paste to fill dents, then sand the airplane with 400-grit and vacuum it clean. Next, apply a coat of Aerogloss clear over the fillets and then two coats of Sig Lite-Coat over the entire airplane, sanding lightly between coats.

Cover the entire airplane with "00" silkspan using 25/75 Lite-Coat/thinner to affix the paper. The silkspan should be slightly damps to help with wrinkle removal. After applying the silkspan, brush on a coat of Lite-Coat and then carefully sand away any overlaps in the silkspan. Brush on two more coats of Lite-Coat, and sand lightly. Brush on one coat of a mixture of ½ pint Lite-Coat, ¼ pint thinner, and 2 oz. Johnson's Baby Powder. Let this dry overnight, and sand off most of this mixture with 400-grit sandpaper on a padded block. Repeat with a second sealer application if necessary.

Vacuum away any dust, and spray two mist-coats of 50/50 Lite-Coat/thinner, followed by a mist-coat of Sig silver. The silver coat will make imperfections show up like a neon sign. After fixing any remaining flaws, spray on two mist-coats of 50/50 Lite-Coat/thinner.

Base color and trim colors are now added. I use various combinations of Scotch Fine Line Tape and frisket material for masking. Numbering and lettering on the wing, as well as the Dove logo on the tail, are painted with the benefit of stencils cut from Contac paper. Masking flash is gently rubbed away with a damp cloth and Soft Scrub. When all of the trim color has been added, clean the entire airplane with Dupont Prep-sol and then rubbing alcohol. Apply ink lines, working on one section at a time, and then add rub-ons. You are now ready for the final clear coats.

Thin 1½ qts. of Sig Lite-Coat to 45/55 dope/thinner using 70% thinner/30% Sig Retarder. Spray two coats a day (one in the morning, one in the evening) until all of the clear is applied. Let the clear "cure" for several days before you *go fly it*. Keep it out of strong sunlight for at least a week. After the finish has dried out for at least three weeks, wash the grease off, wet-sand to a matte finish and rub-out using Turtlewax white polishing compound.

The finished weight should be in the 49-52 oz. range for best performance. Before the first flight, adjust the balance point, if necessary, so that it is 2½ to 2¾ in. behind the leading edge of the wing. Check to make sure the outboard wing drops slowly when pivoting the airplane on the spinner and rear fuselage bottom. Mine trimmed out with ¾ oz. of tip weight. Lead-outs should be positioned about one-third back in the slot as a starting point.

Horsepower. The "perfect" airplane will fly like a brick if you don't have a "good" engine. What's more, you won't achieve optimum trim until you have a "great" engine. It's often too difficult to distinguish between trim problems and marginal horsepower problems, particularly on a new and unfamiliar airplane. The inexperienced Stunt flier may have a real problem, because a weak engine may run perfectly. I should know; I've had my share of them.

Once you have the basic trim settings and have pitch and roll reasonably well adjusted, there are some telltale signs you can look for to spot an inadequate engine: 1) Does the airplane fall to one side or the other at the top of the wingover? 2) Does the airplane bobble or drop the outboard wing on hard bottom inside corners, particularly in triangles and hourglasses? 3) Do you lose line tension on the top segments of the square eight? 4) Does the airplane wander off course in the overhead eights? 5) Do you lose line tension in the first loop of the cloverleaf? While all of these can be related to other problems (such as trim, the wrong prop, or flying too slowly), they are more likely related to insufficient power, particularly if the airplane was built properly.

If you are going to be a SSF (Serious Stunt Flier), I'm afraid you will have to learn something about engines. I'm also sorry to say there is not an ideal out-of-the-box engine you can buy for Stunt. The closest thing available, in my opinion, is the Supertigre .46—my recommendation to the beginner.

My frustrations with engines led me into a four-year (and continuing) study of them. I very quickly learned what made a good Stunt engine. I began experimenting. The rewards were beyond my wildest dreams. The fruit of my labor was my now-famous (infamous?) modified K&B .40s which Les McDonald used to win the last two World Championships. These engines are definitely hybrids that require extensive reworking to achieve the kind of performance I want. I am currently tinkering with the Max .40 FSR-Stunt and Max .45 FSR, both of which show great promise.

Once you have found that "great engine," make the necessary timing and combustion chamber measurements to define it. (I refer you to my article on this subject in the *PAMPA Stunt News*, first quarter, 1980.) Once you've done this, you can correct any deviations in your next engine.

A powerful engine can really make life easier, so don't neglect this all-important facet.

Let me conclude by listing my priorities for success at competition Stunt flying in order of importance: 1) a well-designed, well-built airplane; 2) a powerful engine; 3) a good turbulence-free flying site; 4) much practice; and 5) family support.

My thanks to Les McDonald for his unbelievable support, to Dave Hemstrought for his helpful coaching and Christian fellowship, to Kent Rogers who started me out on the right track, and to *Model Aviation* for the opportunity to write this article. I would be pleased to help anyone who is interested in Stunt; just drop me a note: Stan Powell, 106 Jay Circle, Moore, SC 29369. I also advise you to join PAMPA. Contact Wynn Paul, 1640 Maywick Drive, Lexington, KY 40504.

AJ-2/Berliner

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ing the summer of 1979, when Smith and Niemi reviewed a series of designs and calculations which Smith had done during the previous 10-15 years. Once a plan was agreed upon, construction drawings were started by Smith in the fall of 1979, and two months later Niemi began building while Smith continued designing and drawing (and helping on the construction). The goal: sweeping the L-B-F 500.

The fuselage was built-up from fiberglass sandwich bulkheads, with foam used to fill the spaces between. The result was shaped, contoured with templates, and then covered with glass and aramid fiber fabrics and epoxy resin, after which the foam material was removed in order to produce a monocoque fuselage shell. Eddy Clark, a talented Greenville, SC enthusiast, did a lot of the superb forming and lay-up work. Smith admits that a molded fuselage might be as much as 50 pounds lighter, but it would have involved the additional work of building a buck and female molds.

The one-piece wing was built similarly, and plugged into a slot in the bottom of the fuselage. Most of the wing in the D-tube section ahead of the full-span spar is fuel tank, each side holding 15 gallons. The flaps are electrically operated. Like the fuselage, a wing built from molds might be somewhat lighter.

The landing gear is a single-leaf, aluminum-spring type with snug-fitting fiberglass wheel pants. The engine is a fuel-injected, air-cooled Lycoming IO-360 which Smith rates at 215 hp, thanks to careful assembly and tuning. It turns a two-bladed constant-speed propeller.

After 20 months of construction, the last three months of which were of the 16-hours-a-day-seven-days-a-week variety, the AJ-2 was rolled out and flown on July 15, 1981. Plans for a methodical flight test program went out the window, as the L-B-F was only 2½ weeks off. By the time Smith left for Fond du Lac, he had put about 15 hours on the shiny new airplane and was satisfied it would meet his original design specifications, though a lot of little things had to be put off for calmer times.

When Smith and the AJ-2 got to Wisconsin, they created a sensation. Here was an airplane designed and built for a special reason: to win the Oshkosh 500. No major compromises had been made so that it would also be useful for pylon racing or touring. It was a true efficiency racer. Sitting there on the ramp at Fond du Lac Skyport, it looked like a winner from its pointy aluminum spinner to its panted tail wheel.

Rumors swarmed like lake flies from nearby Lake Winnebago. After listening to a few of the wild estimates of the AJ-2's top speed, one could not help but feel pity for its opponents, whose carefully prepared steeds suddenly looked more like plow horses.

But competitions are not won on the ramp or in the hangar. They are won in the sky. It would be up to Smith to show that his airplane was not only fast and stingy with gas, but could fly the full 500 miles without stopping. Regardless of how well-designed and built the AJ-2, a clogged fuel line or loose connection could force it out just as easily as it could interrupt the flight of some rickety old biplane.