#415

ELECTRIC HURRICANE

This airplane has nostalgia written all over it. Proportions of the Hawker Hurricane Mk-1 make it an excellent RC flier, and quiet electric power (geared Astro 15) makes it a joy to be around. Has rudder, elevator, aileron, and motor controls. While not the easiest model in the world to build, the results are well worth the effort.

■ Steve Crowe

Photos by Steve Crowe, Jr.

In flight, the Electric Hurricane is realism at its best. Only the missing pilot figure spoils the illusion that this is the full-size ship returning home victorious after a sortie.

cane that carried the load of the first eight months of air fighting in France, and it gave the Luftwaffe its first taste of defeat.

Following the collapse of France, the stage was set for the Battle of Britain, which encompassed operations from July to October in 1940. During this time, a total of 1,715 Hurricanes were flown in combat, more than the total of all other aircraf involved in the conflict. The Hurricane claimed 80% of the victories during that fateful summer. On July 1 the RAF had 29 Hurricane units and 19 Spitfire squadrons, while Fighter Command Groups 10, 11, and 12 on July 7 showed 22 Hurricane units, and only 13 equipped with Spitfires. Two months later, at the peak of battle, a total of 30 Hurricane units were complemented by 18 Spitfire units and 10 other fighter squadrons.

Statistics illustrate the high debt owed to the Hurricane during that epic battle and defense of England. In my view, the Spirit of Biggin Hill really belongs to the Hurricane, the first RAF fighter to exceed 300 mph in level flight. The Hurricane remained a first-line fighter until the end of hostilities.

WHY DOES a person want to choose a particular model to construct? Any number of things can influence this. Maybe it's the eye-pleasing lines or the paint scheme. Maybe the design has just that right look that will make it stand out from the rest and also be a good flier. It could be all of these things, plus a bit of nostalgia from the person being involved with the particular full-size aircraft somewhere in the past. My particular attachment to this wonderful old bird comes from having sat in the cockpit of one and gunning it through the skies over England in 1941 and 1942.

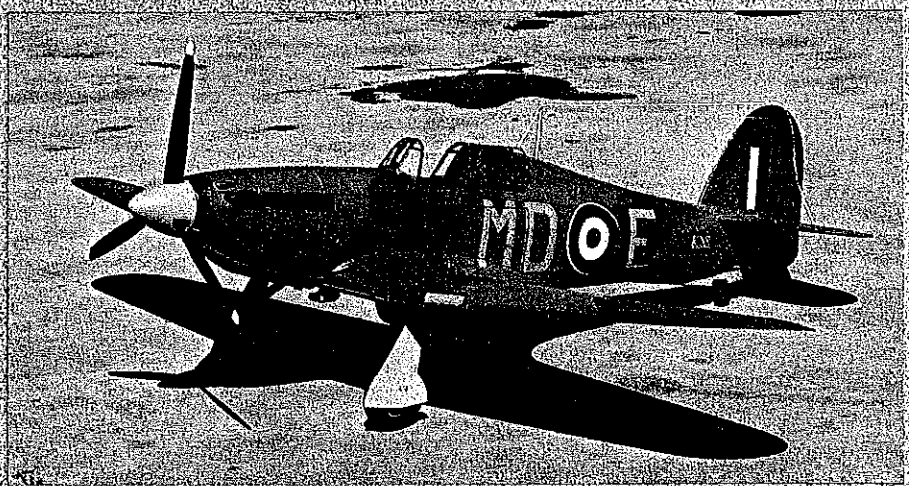
Designing and building this Hurricane was a real pleasure. I've always wanted to have a Hurricane in my stable of models, but I kept procrastinating until I saw Don Srull's Spitfire in the October 1981 Model Aviation. This was the push I needed.

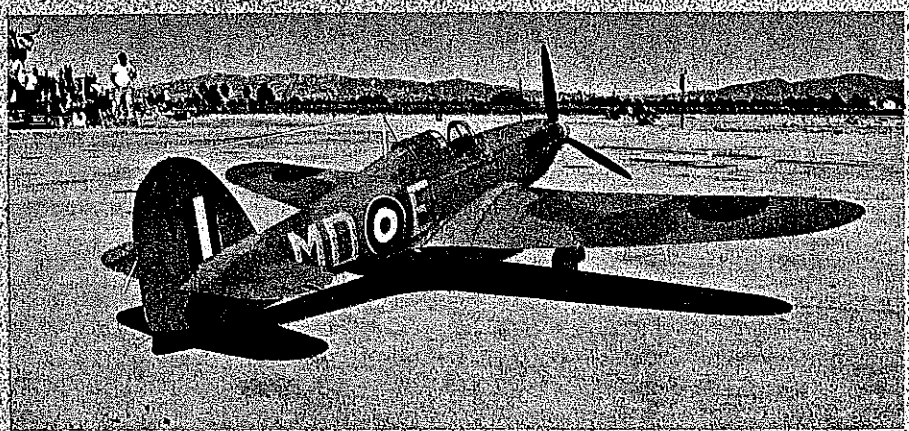
Designer/author Steve Crowe gets ready for a takeoff. The model flies as nicely as it looks. Steve is quite a guy. He was a professional pilot for 37 years—during which he served with the Royal Air Force and U.S. Air Force, was a bush pilot in Alaska, was a pilot for Texaco, flew DEW line and White Alice sites, flew for Andy Devine and Dick Probert as an instructor and charter pilot. He's now retired.

ON DECEMBER 5, 1933 a three-view drawing was submitted to the British Air Ministry Performance Section. In the following month, the design was altered to incorporate a new engine, the Rolls Royce PV-12 which was later immortalized as the Rolls Merlin. Calculations for the new monoplane were begun in March 1934. Then on January 10, 1935 Hawker received a contract to construct one high-speed monoplane Ser. No. K5083, to be built to the design submitted to the Air Ministry the previous September and to meet the requirements of Air Ministry Spec. F36/34.

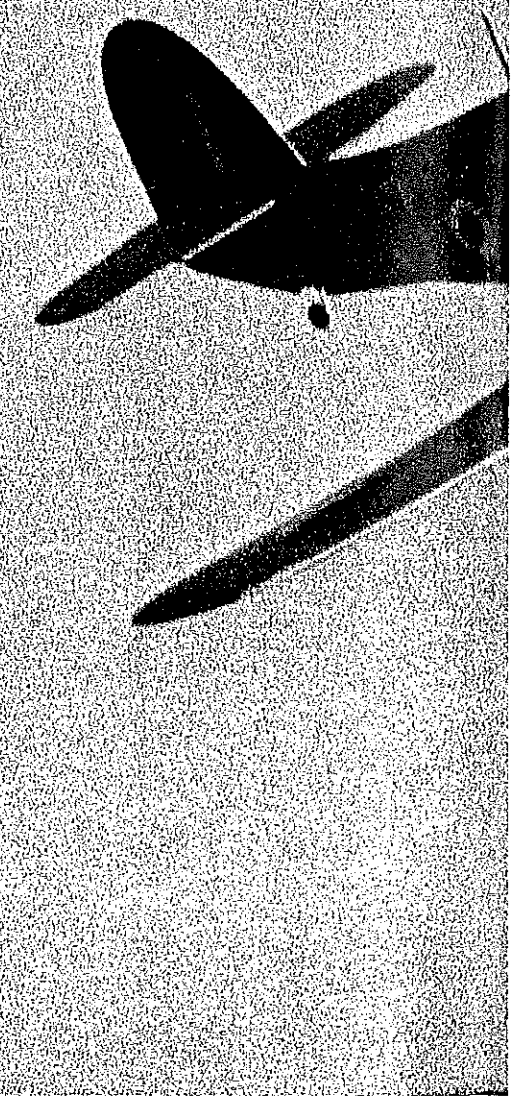
On November 6, 1935 Hawker's chief test pilot flew the first Hurricane prototype from Brooklands Aerodrome. Further test flights were conducted at Martlesham Heath in February 1936. The results were very gratifying, and on June 3, 1936 the Air Ministry placed an order with Hawker for 600 of the new fighters. On June 27, the Air Ministry officially sanctioned the name Hurricane for the new plane.

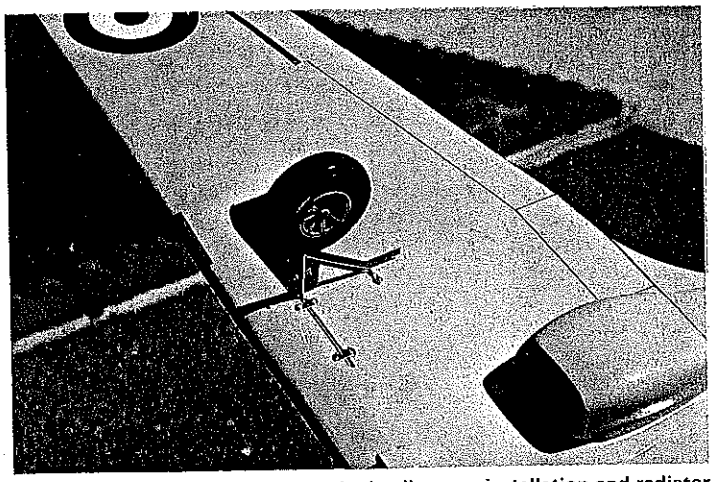
By September 3, 1939 the RAF had a total of 18 squadrons equipped with Hurricanes. That was twice as many as there were Spitfire units. It was the Hurri-



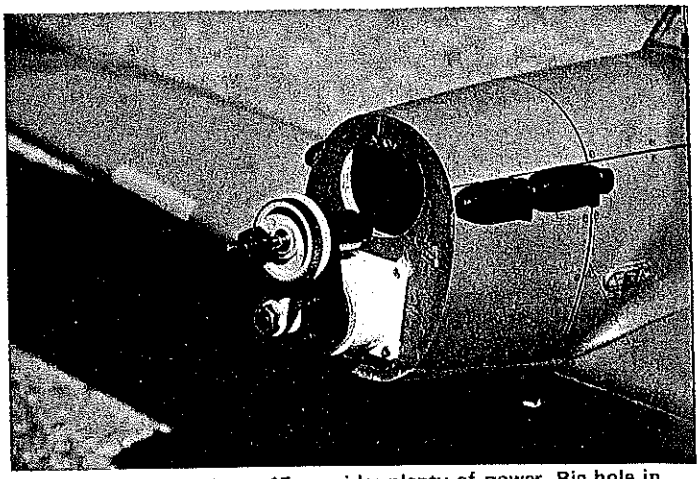


In these two pictures, it could be sitting on the tarmac waiting for action. With its thick wing, robust look, and camouflage paint scheme, it looks good from any angle. Flying surfaces were covered with MonoKote, fuselage with silk.

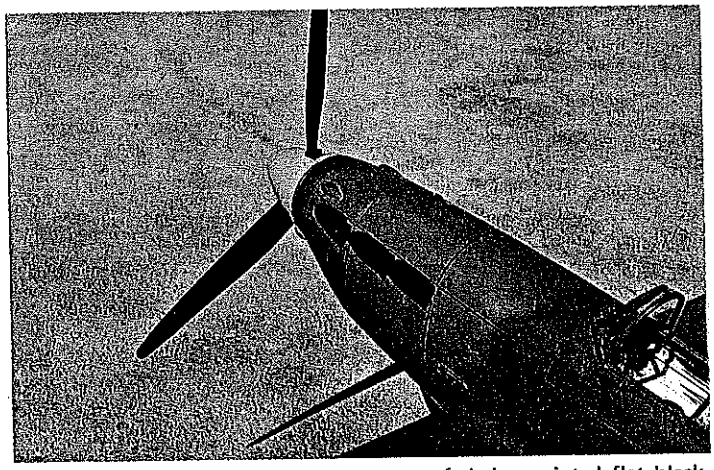




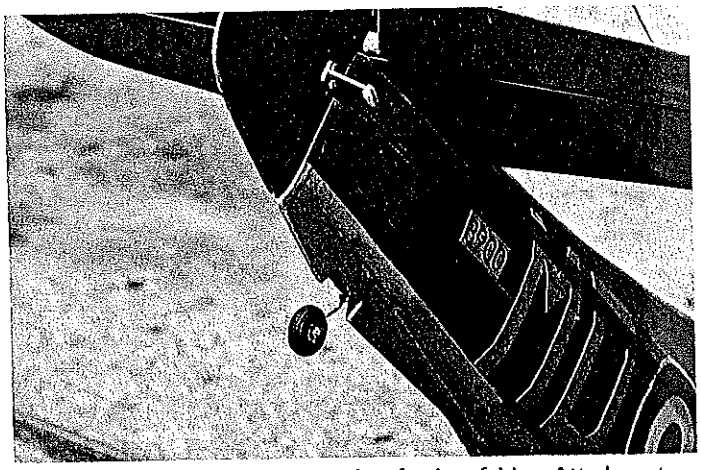
From the bottom we can see the landing gear installation and radiator that is carved from foam. Main wheels are 2¼-in.-dia. Robart.



Reduction-belt-drive Astro 15 provides plenty of power. Big hole in firewall is for cooling air which exits from the cockpit.

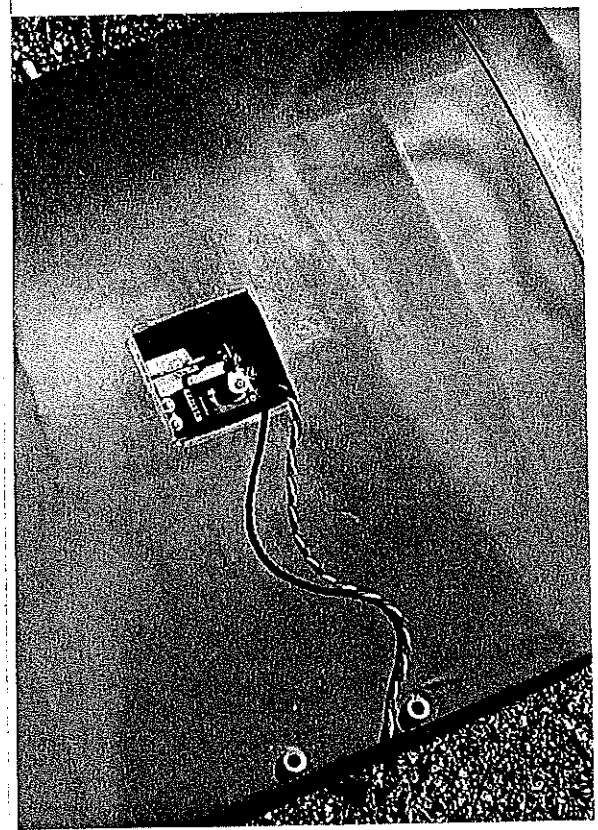


Exhaust stacks are made from scrap soft balsa, painted flat black. Panel lines add to the realism with very little weight penalty.

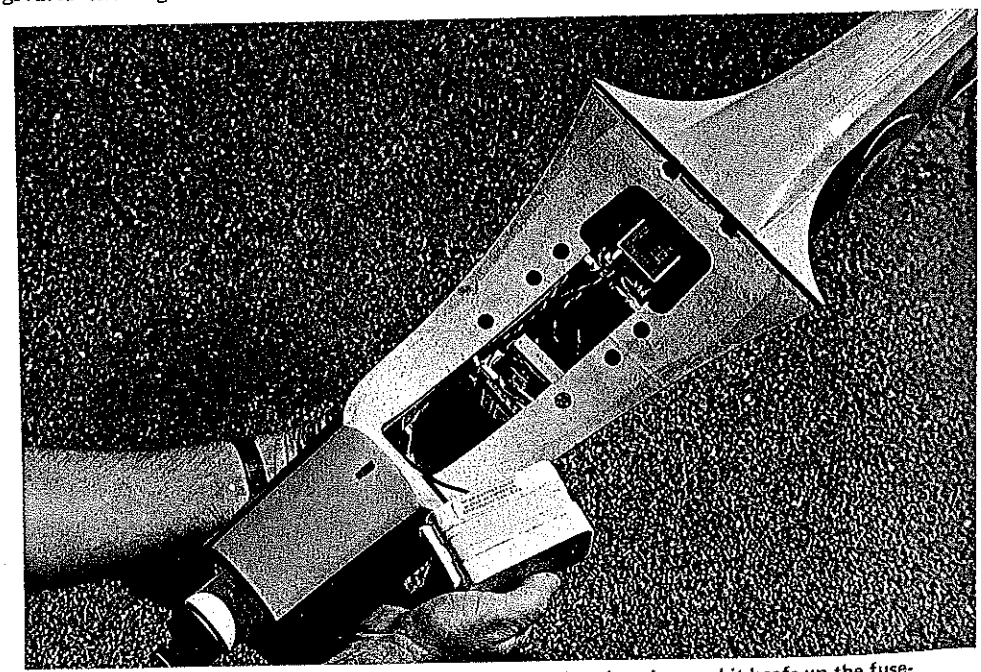


Tail wheel (1-in. Robart) is mounted to fuselage fairing. Attachment to the rudder cable makes it steerable. See details on the plan.

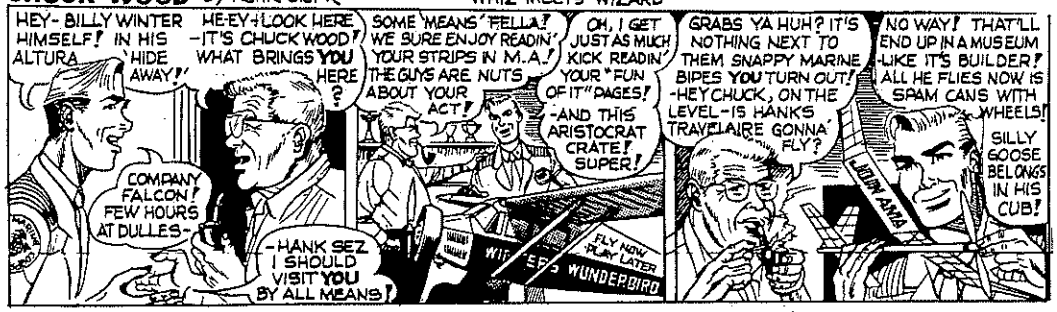
Why Electric? I'd been fooling around with a Kraft Chipmunk, and I was very impressed with the silence and smoothness of control. The more I flew it, the greater the urge became to build something larger and with more power. I was a little reluctant, in the beginning, to tackle such an Electric model, but after reading about the success of Srull's Spitfire, I threw caution to the wind and



Futaba S-20 servo mounts in the wing center section. Hardwood dowels at the trailing edge provide reinforcement for hold-downs.



Wing saddle of 1/32 ply makes a good platform for mounting the wing, and it beefs-up the fuselage. Note wing hold-down points at the rear of the platform. Holes alongside the radio compartment give access to wood screws holding the servo platform to rails. A close look will reveal a dropping resistor and three-position switch mounted to the bottom of the servo tray.


CHUCK WOOD by Hank Clark
"WHIZ MEETS WIZARD"
HEY- BILLY WINTER HIMSELF! IN HIS ALTURA 'HIDE AWAY!'
HE-EY+LOOK HERE -IT'S CHUCK WOOD! WHAT BRINGS YOU HERE?
COMPANY FALCON! FEW HOURS AT DULLES-
-HANK SEZ I SHOULD VISIT YOU BY ALL MEANS!
SOME 'MEANS' FELLA! WE SURE ENJOY READIN' YOUR STRIPS IN M.A.! THE GUYS ARE NUTS ABOUT YOUR ACT!
OH, I GET JUST AS MUCH KICK READIN' YOUR "FUN OF IT" PAGES! -AND THIS ARISTOCRAT CRATE! SUPER!
FLY NOW PLAY LATER
GRABS YA HUH? IT'S NOTHING NEXT TO THEM SNAPPY MARINE BIPES YOU TURN OUT! -HEY CHUCK, ON THE LEVEL-IS HANKS TRAVELAIRE GONNA FLY?
NO WAY! THAT'LL END UP IN A MUSEUM -LIKE IT'S BUILDER! ALL HE FLIES NOW IS SPAM CANS WITH WHEELS!
SILLY GOOSE BELONGS IN HIS CUB!

BALSA FIN BASE BLOCKS
FIVE LAMINATIONS 1/16" X 1/4" BALSA FIN AND RUDDER ONLY
5/16" X 3/8" L.E STABILIZER
1/8" X 1/2" BALSA RIBS
1/4" X 1/2" BALSA FIN AND RUDDER POSTS
3/8" BALSA T. EDGE
TAPED SPRAYED FRAMES
ALUM. TUBE IN MAST
HEAT PASSAGE HOLE
.040 BUTYRATE
1/16" RODS
AILERON SERVO IN WING
PIN
1/32" PLYWD ALSO BOW
3/32 ALUM RAILS
3/8" X 1/2 BALSA SPARS FOR STAB.
3/8" STOCK VENTRAL FAIRING
1" TAILWHEEL ON 1/16" WIRE TO DUBRO COLLARS AND STEER FROM RUDDER
3/16" SQ. BALSA DOUBLED FOR FOUR KEELS
SAND FORMERS BETWEEN STRINGERS
1/8" BALSA SHEET FORMERS F-7 TO F-10
1/8" SHEET FAIRING BACK UP
WING MOUNT BLOCKS 1/4" X 1" WITH T-NUTS
1/16" SHEET C/SECTION COVER
1/16" PLY SPAR BRACES
1/8" X 3/8" BALSA T.E. OVER 1/16" X 1" SHEET T.E. BOTTOM
1/16" SHEET OVER 1/8" AIL. SPAR
1/16" SHEET OVER 1/8" SPAR
1/4" X 3/8" BALSA TIP SECTIONS
1/8" X 1/4" BALSA SPAR TOPS AND BOTTOMS OUT TO TIPS
3/32" BALSA ALL RIBS
AILERON BELLCRANK ON 1/16" PLYWOOD
1/4" X 5/8" BALSA LEADING EDGE
DOUBLED TOP SPAR
DOUBLED SPRUCE BOTTOM SPAR TO RIB 8
3/32" BALSA WEBS
.050 PLASTIC OR PLY FAIRING
2-56 SCREWS INTO ALUM. TABS
ROBART 3 1/4" WHEELS
1/8" M. WIRE L. GEAR INTO 3/8" X 3/4" MAPLE BLOCK
1/16" PLYWOOD SADDLE
1/8" BALSA SHEET BETWEEN 1/8" SQ STRINGERS TO F 4
3/16" DOWEL WING MOUNT
1/16" PLY DIHEDRAL BRACES
1/16"
3" DUBRO SPINNER
GEARED ASTRO 15 ELECTRIC MOTOR
COOLING AIR INLET PORT
MOTOR MOUNT SLEEVE
F 1 1/8" LITE-PLY FIREWALL DOUBLED TO 3/16" BALSA

started full-steam on the Hurricane.

The end result wasn't a disappointment in any way. The ship came out a half-pound heavier than what I was shooting for, but with the amount of fixed weight I had to contend with, that wasn't too bad. I purposely went to a thick Clark Y airfoil so that, if the plane did come out a bit heavy, the wing could handle it with little or no adverse effect on the flying characteristics. Also, the prototype had a thick airfoil section, which I wanted to retain for sake of appearance.

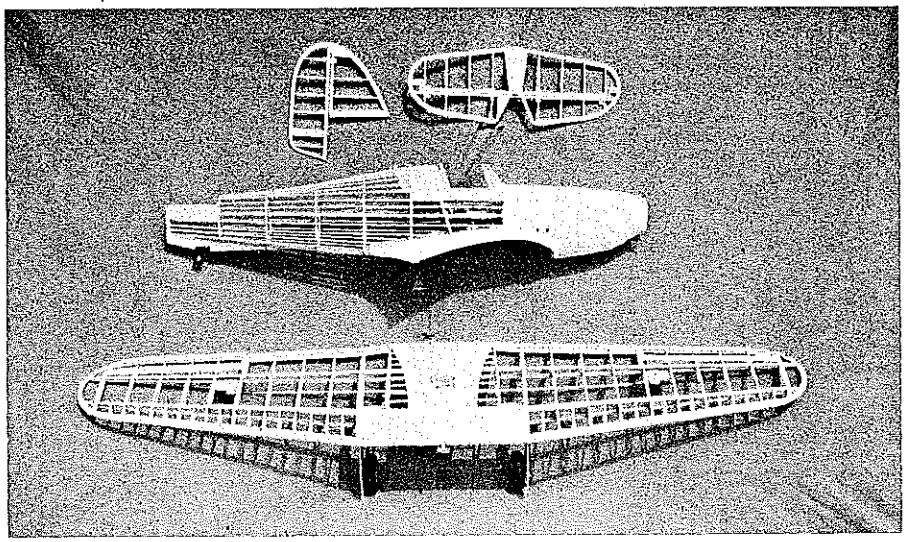
The main thing about building Electrics is to be very conscious of each element's weight. Fixed weight in the motor, motor batteries, and RC gear is going to be whatever it adds up to, and there just isn't any way around that. You need to compensate by making the structure and final finish as lightweight as possible. The fixed weight of my model was 42¾ oz. The structure, covering, paint, etc., weighed 30 oz. You can see from this that it is important to select lightweight balsa and other materials if you want your model to be really successful. (You could lower your fixed weight over mine with lighter wheels, spinner, 250 mAh flight battery, etc.; I decided to stick with the regular commercial items.)

There is just no way for me to put into words the feeling you get when you see the Hurricane take off and climb into the blue. It looks so real that you feel as if you are sitting in the cockpit.

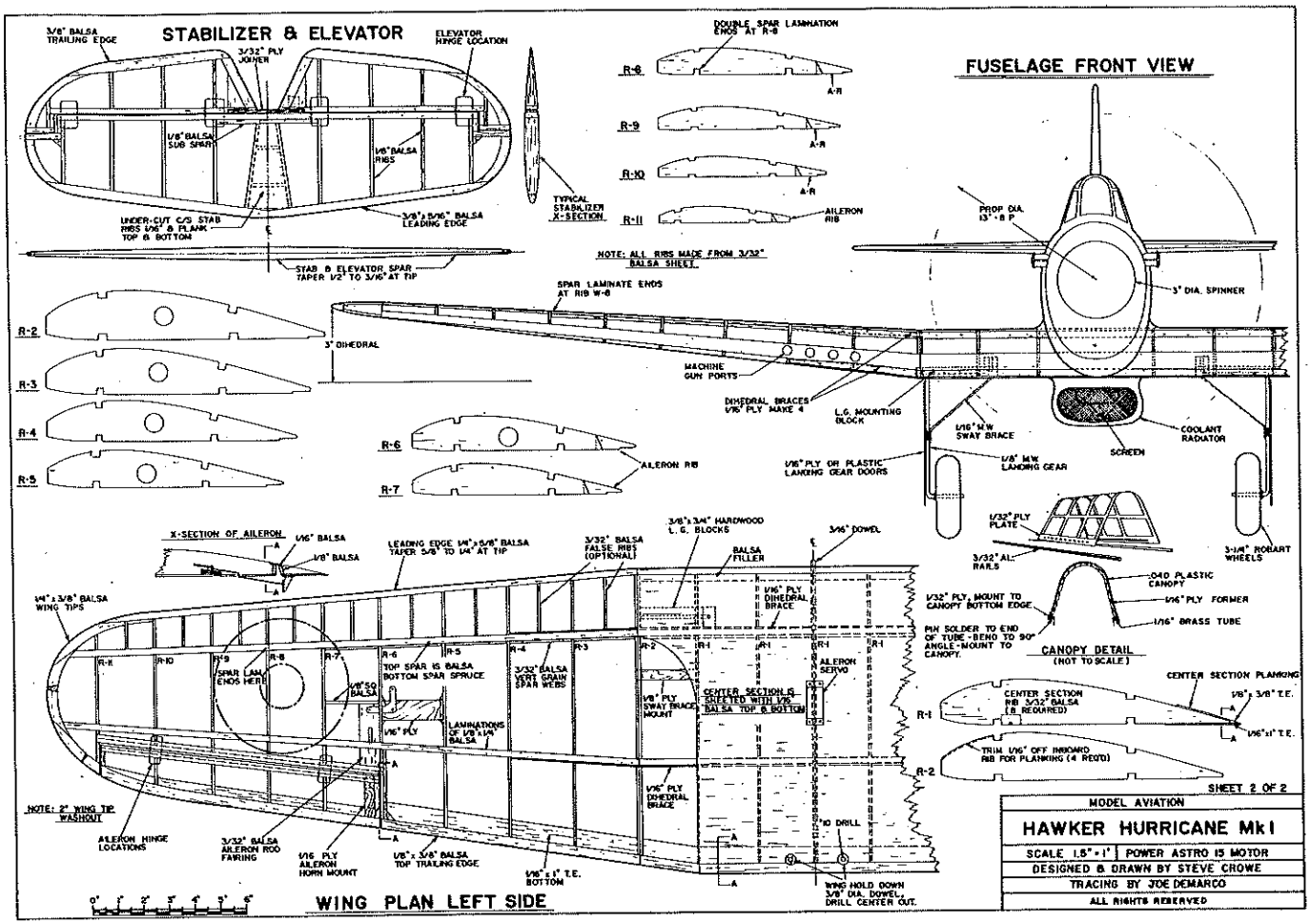
It tracks straight on takeoff. You need just a touch of rudder. Hold a little up-elevator when starting the takeoff run. As speed builds, gradually release the back pressure; after a run of about 100 ft., she will lift off as smooth as silk. Don't force her; keep the climb and turns shallow to grab some altitude.

All control response is positive and smooth, so watch out that you don't over-control. The ailerons are quite effective; they should be used with light pressures. This model flies like the real thing; get ham-handed on the controls, and you'll 'buy the farm.'

The two-position motor switch works beautifully. When you throttle back to cruise, the model just leaks off altitude gradually, so you can set up an approach that will be the envy of everyone at the field. Like all tapered low-wing aircraft, this one has a tendency to tip-stall if the angle of attack is high and the airspeed slow—*don't get too slow on landing approaches!* Keep the model flying at a normal approach attitude down to the runway, then gently flair out, cut



All of the units have been built and sanded, and the entire model is ready for covering. It's well-engineered to have the strength that is needed without an undue weight penalty.



the switch, and ease her down. This ship also makes beautiful wheel landings, so don't be afraid to grease her in tail-high.

I used the following control throws. Rudder, ½ in. left and right. Elevator, ¾ in. up and down. Ailerons, ¾ in. up, ½ in. down. Throttle Switch, forward position for high speed.

The fuselage is built-up using the half-shell method. It is lightweight and very strong when the stringers are added. Start by laying-up all the fuselage keels. When completed, lay down the keels on the fuselage side-view plan, and add the bulkheads at their respective stations. Make certain that they are all at 90 degrees to the keel. Add the side keel. Make sure that all the bulkheads are square, and glue them in place. You should now have a fuselage half-shell.

Remove from the plan, and add the bulkheads to the opposite side. Upon completion, start adding the stringers in an alternating pattern; keep sighting down the main keels and correcting as necessary to keep the fuselage true.

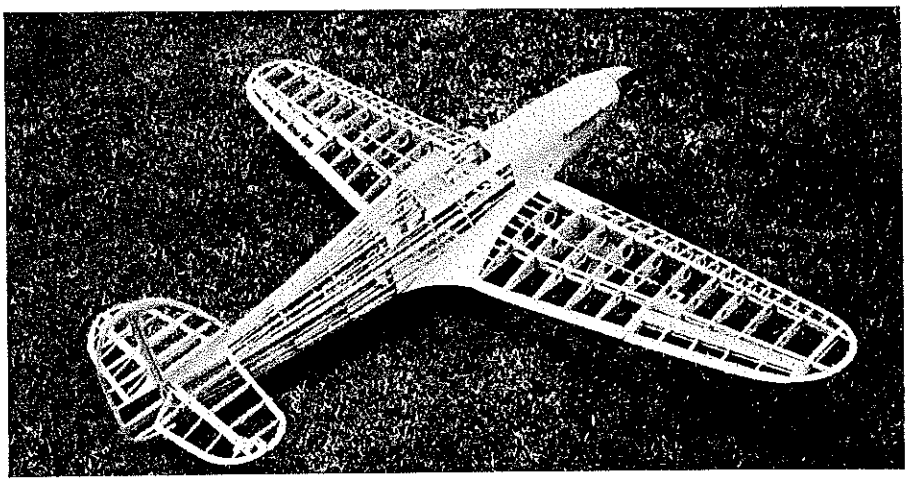
You will notice that only a few of the stringer locations are marked on the bulkhead drawings of the plans. Cutting all the stringer notches in the bulkheads in advance isn't recommended, as this is apt to produce wavy stringers. It is better to use the actual stringers as a guide. Here's how. Notch a forward bulkhead, lay the stringer in the notch, pin the stringer at its proper location at the tail post, and (using the stringer as a guide) mark all the other bulkhead notches. This method will produce a straight fuselage that will look great when it's covered.

Inlay 1/8 soft balsa between stringers on the forward section of the fuselage as called for on the plans.

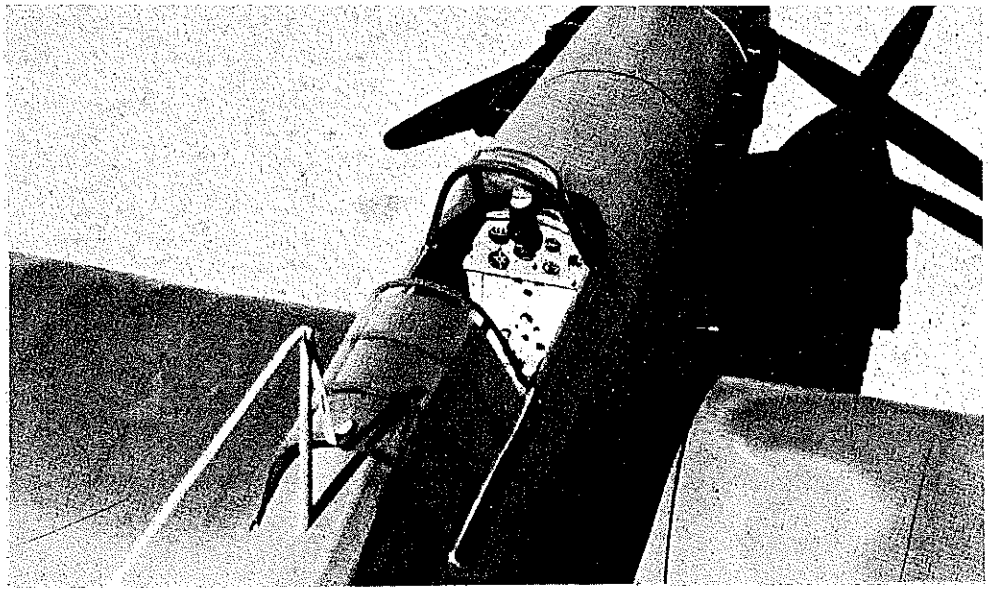
Wing fillets. I've tried many ways, but the stiff bond paper method is the best,

SPECIFICATIONS

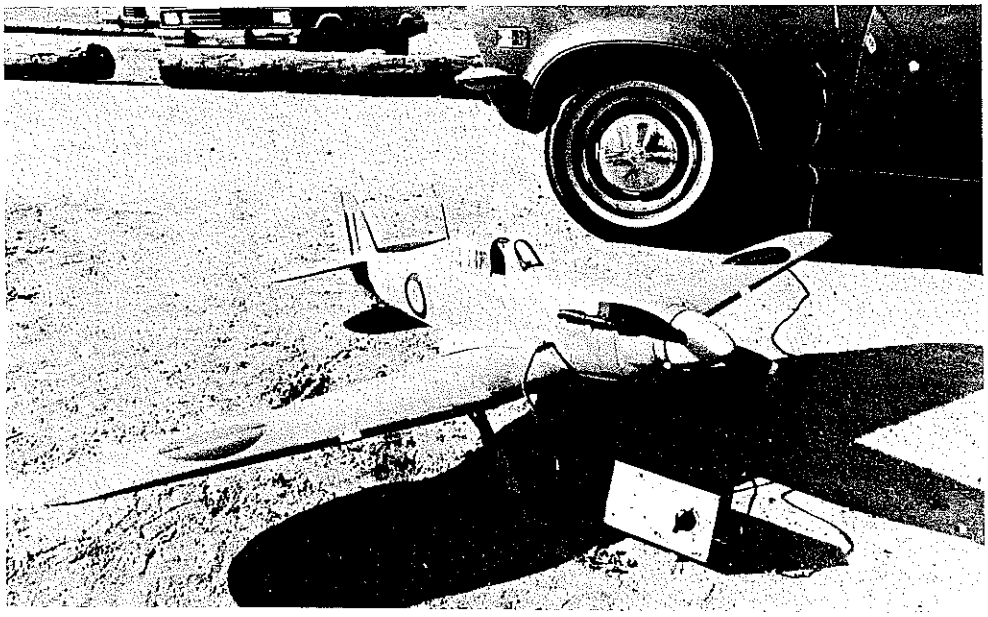
Wingspan	60 in.
Fuselage Length	48 in.
Height	15 in.
Wing Area	530 sq. in.
Wing Loading	20 oz./sq. ft.
Weight	4½ lb.
Power	Geared Astro 15
Radio	Futaba, 6 ch.
Servos	Four, Futaba S-20
Prop	13-8
Canopy	.040 butyrate plastic
Cowl	.050 ASA plastic
Main Wheels	Robart, 3¼ in.
Tail Wheel	Robart, 1 in.
Spinner	Du-Bro, 3 in.



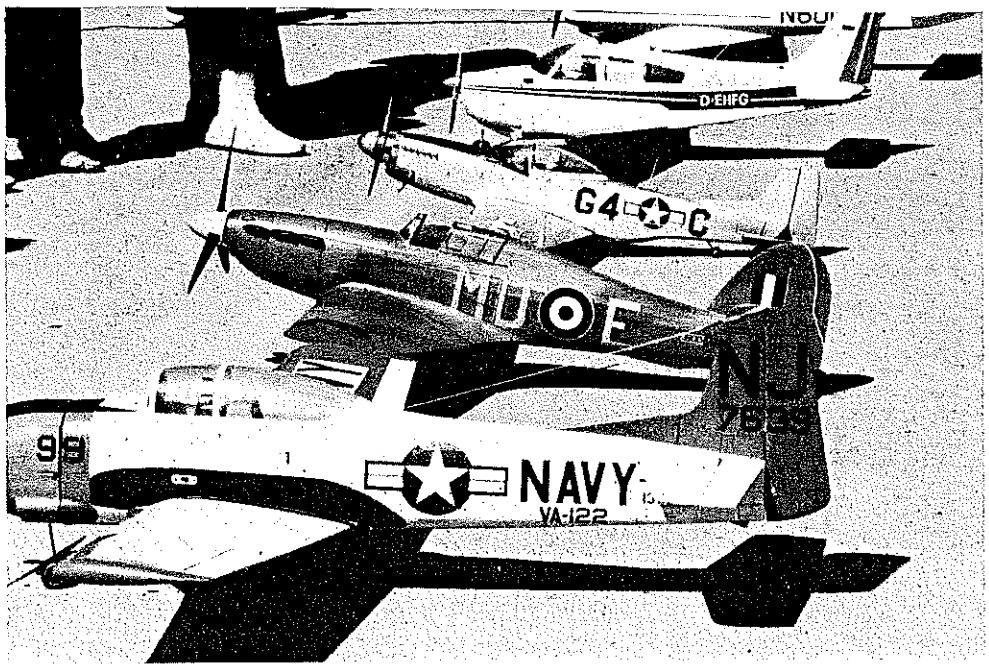
The finished and assembled framework seems too beautiful to cover—but then it gets even more beautiful when it is covered, finished, and decorated. Could pass for a huge Rubber model.



Sliding canopy mechanism is detailed on the plans. It's flown in the open position to allow a flow-through of cooling air. Instrument panel adds a nice touch of realism.



Steve puts his auto battery to use for field-charging the Astro 15's Ni-Cds for another flight. The charger plugs into the fuselage just in front of the wing; switch is just behind the plug. Two-blade flying prop is shown here; three-blader in other pics is for show.



The author's Hurricane is easy to spot on this lineup at the Valley Flyers' Scale Contest. There was too much wind that day to fly the Hurricane, but it received a lot of attention.

I think. It's lightweight, strong, and very realistic when completed. The method is purely trial-and-error. Cut out a few patterns, and lay them up against the fuselage. Cut a little at a time from the pattern until you obtain the proper fillet contour. Be sure to make up the fillet contour formers, as they will help on final installation. When the fillets are glued in place, give them a few coats of nitrate dope. This will make them tougher and provide a good base on which to paint the final finish.

You won't be able to glue on the wing fillets until the 1/32 plywood wing saddle has been installed on the fuselage. Therefore, the next step would be to build the wing assembly.

Wing. Start by laminating the wing spars from ¼ x 1/8 hard balsa and spruce. Next, cut out the dihedral joiners from 1/16 plywood; set aside until all the ribs have been cut from 3/32 balsa; make all necessary cutouts in the ribs for gear mounting blocks and lightening (aileron rods go through these holes).

Build the center section first. Lay down the spars, and position the ribs. Cut the spars at the dihedral breaks. After the ribs are glued, add the top spars and the ply dihedral joiners. The joiners will extend beyond the butt ribs approximately 5 in. (don't cut them off, as they will be glued to the spars of the outer panels).

Lay down the spars for the outer panels, and build these units, complete with ailerons. When finished, slide the panels onto the joiners. Note that the spar joiners will have to be bent to fit flush with the faces of the spars due to the taper in the outer panels. Bend them as necessary, add glue, and clamp with clothespins until dry.

Plank the center section with 1/16 sheet balsa. Be certain that the dihedral in both panels is equal. Install the aileron rods, bellcranks, and servo.

With the wing built, you can now return to the fuselage. Cut the 1/32 ply wing saddle, and fit it into the awaiting cavity. Check the fit of the saddle with the wing in place; shim the ply as necessary to obtain a good fit with the wing. Now, you can go back and complete the wing fillet. Since the fillet tapers rather sharply at the leading edge, build this portion from scrap soft balsa blocks, blending into the fuselage with 180-grit sandpaper wrapped around a 3/8-in. dowel.

Radiator. This appendage fits under the wing center section. It doesn't have any function on the model, but without it

the Hurricane would look rather naked. I tried something new for me by making the radiator from 2-lb.-density polyurethane foam. The foam is very easy to carve to shape and sand.

After final sanding, one coat of alaphatic-resin glue, thinned with water, was applied. When dry, it was sanded with 320-grit wet-or-dry paper. A layer of silkspan was applied with a second coat of the glue, followed by a slurry of water-thinned Dap vinyl paste. When this was dry, it was sanded to a smooth finish. All of this sounds heavy, but the final result really is quite light, and the radiator looks great hanging under the wing. Prepared this way, it takes a beautiful finish when painted. You could build the radiator from a balsa block, but I think the foam is better and also quicker.

Tail surfaces. My model, as shown on the plans, was constructed with tapered spars for both the horizontal and vertical tail surfaces. I started to build them flat, but upon completion I found that they just didn't look right. I built another set with the taper. It was a little more work, but I liked the end result. (I'm sure the model would fly okay with a flat stab and rudder if that is the builder's choice.)

Canopy. The original model was constructed with a sliding canopy to serve two purposes. One was to vent warm air from the fuselage. The other was to allow access to the servos which were mounted three-abreast on a ply plate along with a two-position switch for motor control.

The method I used for making the sliding canopy involved two lengths of 3/32-in. aluminum tubing for rails, mounted in the fuselage sides. They were split down the middle with a 1/16-in. slot on one side only; 1/16-in.-dia. brass tubing, mounted to the canopy section and slipped into the aluminum tubing, was used for the guides. I used pins inserted into the brass tubing, soldered and bent to a 90-deg. angle; the pins acted as mounting points for the lower edge of the canopy. The idea worked well for me, but there may be other methods that the builder would prefer.

If you use the sliding canopy, don't install it until the ship is completed. There is a small 1/32 ply former that gets glued to the front of the canopy; once it is installed, the canopy can't be removed. The canopy frame was masked and sprayed with olive drab dope before installation.

Landing gear. Using the pattern shown on the front view of the plan, bend the main gear from 1/8-in. music wire. Bend the sway braces from 1/16-in. music wire, then bind and solder the braces to

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For Fun/Winter

Continued from page 85

with proportional on rudder only, others soon after with multiple proportional controls. So a fair account of radio control would make an historical tome.

A handful of folks who had a smattering of electronics fiddled with pulse rates and pulse widths, and they mixed them both for two proportional controls. We have heard tell that Jerry Pullin on the West Coast was the real father of proportional. He got the act together, and the early full-house propo rigs popped up commercially in California like spring flowers. Who will tell his story? In the very early 50s, while on *MAN*, we asked Paul Runge what was new, and he said some guy in Virginia had a system called Galloping Ghost. That turned out to be our own AMA Executive Director John Worth, who had solved proportional elevator and rudder (simul) by mechanical means. That led to a four-part article. The linkage arms (actuator was a single infamous Victory motor) connected the rudder and elevator(s) so that position of a transmitter stick would enable these constantly threshing surfaces to average out on some desired flight path. On the ground, the plane looked and sounded like a wounded duck.

Hams concocted strange and wonderful rigs and crates. For example, Sigfried won a Nats circa 1940 with a 15-ft. giant which performed the first loop—in public, anyway. His crate had a big glassed door. When you peeked in, you saw huge gears that made you think of a colonial watermill. Fullarton cited a *MAN* article which reported an early Nats at which no flights took place one day because the pilots ran out of daylight before they could complete the tuning of their equipment.

While the Good brothers' Guff ostensibly was a rudder-only aircraft, it did have elevators! In the heading photo, you can see (through a magnifying glass) two relays through the inspection door. The second was for tiny elevators. I don't recall Walt ever making an elevator maneuver at the Nats, and I don't have the foggiest notion as to how he triggered the second escapement—unless, as some folks tried, the Goods had two receivers. This conjures up wild notions about the transmitter (two frequencies?).

(At this point, I just spoke with Walt Good by phone in Florida.) Yes, there were two receivers, tuned to opposite ends of the old Amateur Band of 50 to 56 MHz. But there were three escapements! The Big Guff also had a clapper on its spark-ignition Brown Junior, which "sort of slowed it down." The Goods had the option of flying either rudder/elevator or rudder/engine. The Guff also had a thermal-delay engine cutoff actuated by holding rudder for five seconds—which tells you a lot about the Guff's turning characteristics. The reason I had never seen the Goods use more than rudder in competition was that when one receiver acted up, they connected the better one to the rudder; that is the way they won.

In the heading photo, you'll note a small control box held in Bill Good's hand. By using three close-up lenses stacked together, I was able to read the words *Up* and *Down* adjacent to the stick. Almost completely hidden under Bill's forefinger is a button or switch. Walt says there were two, either buttons or switches, one evidently for rudder. The left hand operated rudder, the right, elevator. The desired frequency was automatically determined by movements of the controls on the tiny box.

Until the glow plug came along (Ray Arden, who flew a powered FF across Van Courtland Park in 1904—that date is precise, because I once interviewed Arden—handed out sample glow plugs at the Minneapolis Nats in 1947), everything was ignition. Before 1950, we had two sets of points on ignition engines for two speeds, but the world went glow-ignition bananas. Crates became spongy as fuel melted the nitrate dopes, so came fuel-proofers and, finally, butyrate dopes.

For years there was no way to throttle glow. A second escapement, triggered by a "quick blip" on the primary escapement, operated a clapper which choked the venturi. On idle—and few bothered—the plane blubbered along in low speed in a cloud of smoke. Then came two needle valves, one above the other. Inside the crate, a clapper adjacent to the end of an air line leading to the "low" needle would close the air line, and then both needles would pour fuel into a badly-flooded engine. Clouds of smoke and horrendous cleanups were heartbreakers.

Relay contacts quickly became dirty and/or pitted due to voltage spike sparks, and crates smashed-up or flew away as often as they made successful flights. Chet Lanzo quipped that "radio control permitted one to select the location of his crash." In 1951, I went four months without a successful flight, although we flew on every weekend but one that year. But all this is only the tip of the RC historical iceberg—and only *part* of the age of escapements.

A landmark was reached in the late Forties when Vernon McNabb's 465 hand-held outfit gained the first approval by the FCC for license-free operation. We won't go into that incredible adventure beyond saying that we flew his test units before that, leading to our own Citizen airplane in an old *MAN*.

Sensational developments take place constantly, but we can't see them. Chips and stuff, you know. We take our superb radio systems for granted.

At a DCRC Club Open House in the early 70s, the stage displayed historic RC jobs which members, including Walt Good, had developed. The end of the line was a late-mark Rudder Bug, full-house controls with relatively modern proportional (circa 1955). We'll never forget Walt looking wistfully at his high-wing Bug (he was already flying Pattern with other types) and saying, "This is what we all thought it would come to!" That was eloquent proof that the future can't be predicted by today's basic technology.

What had changed things was a Californian named Dunn who, unable during the 50s to attend the Nats, amused himself by revising the Bonner cabin Smog Hog into a low-winger—the Astro Hog. (Sig has an Astro Hog kit.) Everyone "knew" that low-wingers didn't fly.

After the Nats, deBolt had phoned us at *MAN*, and I told him to junk his cabin Pattern designs. Stunned, he murmured, "Why?"

"California has gone low-wing," we exaggerated. "But that's impossible," he retorted. Perhaps the moral is that, in order to make progress, you must watch all kinds of models.

Many years before, a very nice low-wing model had won the Wakefield Cup. Low-wing Rubber Scale models were flying. A 1943 design of mine, an Italian fighter, much improved and flown by modern techniques (by Pat Dailey) won the FAC Nats in the WW II event. (Earl Stahl's North American Apache was the best ever.) And before the war, the great "Kingfish" Sadler of Little Rock was successfully flying low-wing FFs at the Nats. Don't think: "This is is." It ain't.

(Auto pilots? Just talked with Bill Hershberger who, in early April, had the opportunity to fly a transmitter with computerized sticks developed by a fellow club member. The encoder board was replaced by the computer unit. On the face of the transmitter are numbered buttons so you can program any possible maneuver. On the side, other numbered buttons from 1 to 5 enable you to use the transmitter with as many different airplanes. Apparently one takes off and uses the sticks normally. Bill says he could not tell the difference in the sticks from the feel of his own Silver 7. Until five minutes ago, I had been talking tongue-in-cheek about the future. Bite my tongue.)

Bill Winter, 4426 Altura Ct., Fairfax, VA 22030.

Electric Hurricane/Crowe

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the main gear legs. I used wire soldering lugs on the ends of the sway braces to mount them to the ply gear braces (in

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FF Duration/Meuser

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Award for 1983. These noted individuals have contributed to the development and continuity of Free Flight model airplane activities throughout the U.S. and the world. The Society is proud to recognize their achievements.

Reginald Denny (deceased). A modeler whose designs have been widely accepted both in the 1930s and 1980s. Who can forget his Dennymite engine?

John Gard. A scientific designer of Wakefield and Nordic models. He has carried the theory of aeronautics into practical application through his designs.

Don McGovern. Editor of *Flying Models* magazine for many years. A designer of truly unique models and designer/draftsman of more model plans than almost anyone else.

John Pond. The grandfather of the "Old-Timers" activity throughout the world. He has been a pusher of Free Flight since the 1930s.

George Reich. A dedicated modeler whose desire to achieve championship status was realized fully in 1961, when he won the Wakefield Cup for the U.S.A. He developed many rubber-powered designs that have been widely mimicked by other modelers.

Lawrence Smithline. A name remembered by the oldster of today. Larry's articles on model construction appeared in the old *Flying Aces, Model Airplane News,* and *Air Trails* of yesteryear. Many of today's modelers cut their modeling teeth on Larry's designs.

Model of the Year Awards. Jim Wilson, Model of the Year Chairman for the National Free Flight Society, announces the awards for 1983:

International Classes		
F1A	Matt Gewain	Pacer 14
F1B	Alain Landeau	
F1C	Adreas Mecxner	Delfin

AMA Power		
Small	Roman Ramirez	Cargo
Large	Hal Woods	Summerwind
	Doug Galbreath	744

Other Categories		
Hand-Launched Glider	Phil Hainer Jr. Phil Hainer Sr.	Kwik Flip II
Indoor	Stan Chilton	Sweet 16 EZ-B
Unlimited Rubber	Bob White	Unlimited Unlimited
Scale	Don Srull	Santos DuMont
Special	Ed Dolby	FAI Rubber

The awardees have been invited to display and discuss their models at the NFFS Symposium to be held at the AMA Nationals in July. Drawings, photos, and stories about the models will appear in the *NFFS Symposium Report,* which will be available at the Nationals or by mail order. For further information, contact Jim Wilson, 1030 Avenue D, Redondo Beach, CA 90277.

Bob Meuser, 4200 Gregory St., Oakland, CA 94619.

Electric Hurricane/Crowe

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the wing) with small wood screws. The main gear is mounted to the gear blocks with aluminum straps and screws.

The gear fairing doors are of .050 ASA plastic. Small metal strips soldered to the gear legs hold on the gear doors by means of 2-56 screws through small holes drilled in the straps and gear doors.

The tail wheel is held on with a Du-Bro wheel collar. Study the plans. A steering arm soldered to the top collar picks up the rudder cable for steering.

The engine cowl can be carved from balsa, laid-up in fiberglass, or pulled from plastic. The cowl on my model was made from ASA plastic pulled over a wooden pattern. The cockpit canopy was made in the same way. There isn't really a lot of effort in carving a plug, so if you have access to a vacu-form machine, give it a try. Make the exhaust manifolds from scrap soft balsa; apply sanding sealer, and finish with flat black paint.

Finishing. Since I was trying to keep the model's weight low, I chose to cover mine with MonoKote. I tried to find the flat-finish type mentioned in Don Srull's Spitfire article, but I had no luck. I ended up with the glossy stuff, which I

painted with flat Pactra Formula U.

I covered the fuselage with silk. It gets around the compound curves easily, and the weight it adds is negligible; the fuselage was given four coats of nitrate dope. The final finish was a light coat of Formula U olive drab, followed by a light coat of camouflage flat tan. Before painting, I wiped the MonoKote areas with acetone to remove any oil or dirt. Decals produced by Dave Platt Models are very close to the proper size for this model.

Control rods. I used Sullivan Gold-N-Rod, cable type. These are lightweight, flexible, and can be easily positioned through the fuselage bulkheads. The cable system for moving the elevator and rudder makes a very neat installation. I like to attach the cable to the servo arms with either Du-Bro or Goldberg easy connectors. To rig the controls with this setup, all I need to do is loosen the screw on the connector and move the cable fore and aft to get the desired result.

Flying. Did you get everything lined-up properly? Do the wing tips have the correct amount of washout? Are all the control attachment points secure? Are the wheels on tight? Don't laugh. I've seen many a new ship leave a wheel rolling down the runway as it lifted off, because a pre-flight check was overlooked. It only takes one small item to destroy three or four months of work.

Check the balance point. It should fall between 25% and 30% of the wing chord. Don't fly if the ship is tail-heavy. A rearward balance point is courting a snap-roll and disaster. Be sure the CG is at the correct point.

My model was tested with a 13-in.-dia., 8-in.-pitch prop. It did very well once it was trimmed out. Later I tried a 12-8, but the 13-incher seemed to put out much more thrust. Even with the 530 sq. in. wing area, the model handles the 4½-lb. total weight with ease. During the test flights, the motor battery was closely watched. I was a bit concerned that it might heat up too much, but it seems to stay very cool.

I believe the Hurricane would really perform with one of the new Cobalt motors. Maybe I'll try one later, but for now, I'm having a ball with a straight Astro 15 and the gear unit.

I don't think you will have any regrets if you build this ship. I took my Hurricane to the Valley Flyers Contest (in California), and it stole the show. If you're looking for a fun Scale project, this one has great looks *and* flyability.

SAFE FLYING IS NO ACCIDENT

Radio Technique/Myers

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tion selectively amplifies signals between 72 and 73 MHz, but not the rest. This gives us a second stage of filtering.

Meanwhile, a *crystal-controlled oscillator* (LO) in your receiver is running at a frequency which is precisely .455 MHz above your transmitter's frequency. The oscillator's voltage at this frequency is injected into the *mixer*, along with the amplified RF voltages from the TRF section. In the mixer, every frequency present is mixed with every other frequency present (including that of the local oscillator). In the mixing, *new fre-*

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