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MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE Canada $2.75

P-38 LIGHTNING!

Build the SUPER HOTS

How To BUY A KIT

Schluter CHAMPION Helicopter

Free Poster Inside!

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71896 48120

Cover: Swift and lethal, the P-38 Lightning was a deadly weapon in the hands of many WW II fighter pilots. This P-38L is one of the four believed to be in flying condition and is owned and flown by ex-Navy fighter pilot Bill Ross of Elk Grove, Illinois. Read Budd Davisson's story of the P-38 on page 60. Budd Davisson photo.

Right: The world's lightest and most compact four-stroke production engine, the O.S. FS-20. See Peter Chinn's "Engine Review" on p. 54.

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Editorial

by DAN SANTICH

RUMORS. How many times have you heard something and believed it, even though you had no first-hand knowledge to dispute it? And how many times have you passed this rumor off as fact in conversation with a fellow modeler? I have, and I'm sure you have done it many times also. It's exactly that kind of word that gets around in this hobby and can really hurt someone, especially a manufacturer.

Such was the case with Perry Aeromotive. John Perry has been around engines all of his life, and his Perry Carburetor is one of the most widely used in the world on all different brands of engines. The engineering and development of the Perry Carburetor goes way back, but the use of it has become commonplace. It's a marvel of an achievement by a man who has been a marvel to many all his life.

In a recent article in *M.A.N.*, a reader wrote in that his "plastic" carburetor on his HB .40 "burst into several pieces in a crash." He went on to say that he couldn't find a replacement for the HB. First, according to John Perry, his carburetors don't "burst," and he defies anyone to prove that they do, even in a crash. John also explained that in a crash it's a lot better to have the carburetor break off than to destroy the front housing of the engine. I'll go along with that. (By the way, Perry also does repairs on HB engines.)

Something else about Perry carbs that has gotten around is that they dissolve in gasoline, and for this reason you can't use them on gas engines. I'll admit that I was also a believer of this rumor. Well, it's a myth. I soaked all of my Perry carbs in a jar of gasoline overnight, expecting to find black blobs of plastic in the morning. Guess what? The gas had no effect whatsoever.

John did admit that on his very first run of carbs, over ten years ago, the molds were styrene based and some residue was imbedded in the housing of the carbs, thereby dissolving when coming into contact with gasoline. John also said that a very limited amount of these carburetors were produced, but in no case will gasoline affect any of his carbs after that period—good news for those wishing to convert a glow engine to ignition, but have been afraid of doing so.

GOLDEN AGE OF R/C. Which came first, control line or R/C? Any takers on that one? Hal deBolt is authoring a new series called "The Golden Age of R/C." With it we hope to enlighten all modelers about the roots of R/C, what it was like, and how it evolved into its present form. We'll act as a backboard for reader exchange.

I enjoy doing the series "50 Years Ago This Month In *M.A.N.*" because it shows me where we've been. This hobby has come a long way, and the reason is because of you. The success of *Model Airplane News* and the hobby is a result of your personal ambition toward models, and the only time it will die is when there are no more modelers around. Let's hope that time never comes.

THIS MONTH. The P-38 Lightning was an incredible airplane; one that was feared by Axis forces in WW II. Why not broaden your historical aviation horizons by reading Budd Davisson's story on this now-venerable flying machine on page 60. A free poster of the Lightning graces our centerspread.

Not to be outdone, Lance engineering has a great almost-ready-to-fly airplane called the Bandit. Ask Ceasar Latte—it almost flew out of the box—literally. My latest offering in the construction department is called "Super Hots," and it's a sweetheart to fly. Floyd Manly's Der Jaeger bipe has all the pizazz of a scale winner.

This month's issue is packed with goodies for you to savor, contemplate, or build. The choice is up to you. If we have given you the slightest nudge toward creativeness in this hobby, then we have done our job. The rest is up to you. Good Luck. DBS

AIRWAVES

He Finds Four-Stroke Issue Timely

I have been watching the four-stroke phenomenon develop in recent months, and have begun to wonder what it's all about. Just when I'm about to resort to that old standby, "buy it and try it," along comes *M.A.N.* with a feature issue on the four-stroke. An informed choice is now possible, and *M.A.N.* is to be congratulated for presenting the information necessary for the experimenter to know more about what may turn out to be *the* major innovation in modeling since the introduction of the glowplug. Thank you!

JIM O'HAVER
Alexandria, Virginia

Growing Popularity of OT

As soon as my friends saw your Plans Directory, the orders just poured in. I am a member of SAM 35 so I chose old timer plans first. Here in England we have many kits and engines still in production from the '40s, which brings me to the subject of this letter. Do you know of anyone who might like to correspond on old timer subjects?

MARK TYRRELL
Sussex, England

Mark, you're in luck. In this issue you'll find a feature on "The Golden Age of R/C," in which Hal deBolt explores the roots of radio control. We hope you like it. DBS

Correction

On page 78 in the December '85 issue we really have a new look for the 1946 OK Super 60! Actually, the picture got crossed with that of the HB .40 R/C shown on the same page, and we regret the error.

On Four-Strokes, Budd, and the P&W R-4360 One More Time...

I wanted to let you know how much I appreciated reading your special issue on four-cycle engines. I was also pleased to see another "From the Cockpit" column by Budd Davisson, whose photographs are one of the greatest additions you ever made to this magazine. His articles are of the highest interest to me because in them I can read about the handling qualities or peculiarities of those old airplanes. I loved to read about techniques required to fly the AT-6 Texan, or feeling the power at the controls of a P-51, or again the story about snow-flying Super Cubs.

More and more WW II airplanes are being restored these days and I feel *M.A.N.* is a good place to publish flying reports on them. It would be really thrilling to know in advance how a ⅛-scale model of a Bearcat or a Spitfire shall handle in all phases of flight, and reading about it would also help us make more realistic flights.

I have one more topic to bring up: in the November issue Budd made a mistake regarding the big P&W R-4360 radial engine. This engine had 28 cylinders (not 36) in 4 rows of 7 cylinders, 56 spark plugs, and 7 magnetos. With a displacement of 4,360 cubic inches, it was rated at 2,800 hp and 4,300 hp maximum takeoff!

Thanks for putting out this outstanding magazine and keep running technical articles, along with those cover photos...

GUY SIROIS
Quebec City, Canada

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

EDITOR'S FLIGHT-LINE REVIEW

by DAN SANTICH

R.C. Alpina

Coming along at a time when the price of larger engines, and especially those of the glowplug breed, has been steadily on the rise, the Alpina is a very moderately priced gasoline engine that fits a need. It is adaptable to any model using a gasoline or large (2 cid and up) glow engine and it will pull most models weighing in the 15- to 30-pound range.

Available in two sizes, the 330ZX and 380ZX, the engines are very similar in appearance and size. Incorporated with either engine is a sturdy bulkhead mount that also contains a spring-recoil starter that requires only a half-turn to wind it up. Starting is very quick. The flywheel retains a permanent magnet that activates the coil style ignition system. Behind the flywheel and in front of the case on the crankshaft is an adjustable counterbalance for smooth operation. A Walbro pump-style carburetor is used and is equipped with a manual choke. A high quality cut-off switch is also included.

If you are looking for a new engine to power that big bird with, the Alpina is an engine well worthy of your consideration. Write to R.C. Alpina (3011 East End Ave., Chicago, IL 60411) for more information.

Repla-Tech International

Robert C. Morrison is one of the most prolific, well informed, and accurate aviation historians in this country. For years he was a writer for *Model Airplane News* and provided highlights of the latest developments in aviation in his "Frontiers" column. His business, Repla-Tech International, is one of the best sources of data on the world's aircraft. His inventory of drawings and photographs run into the thousands and there is probably no aircraft he cannot provide data on. His three-view drawings are very valuable for any scale presentation, and his photographs will complement your model in the static arena. For a catalog of his drawings and photographs, contact Repla-Tech International (48500 McKenzie Hwy., Vida, OR 97488).

Master Airscrew

One of the most used items in my workshop is the Master Airscrew Razor Plane. Believe me, once you use this tool, you'll wonder how you ever got along without it! Designed to use a special .017x1¼-inch blade, the depth of cut is adjustable to splice super thin or deep, rough cuts. The size of the Razor Plane is such that it fits in your hand nicely for a good hold, and the feel when you are cutting makes the job easy and exact. The Master Airscrew (Windsor Propeller Co., 384 Teseoni Ct., Santa Rosa, CA 95401) Razor Plane comes with a five-year warranty. ■

Each month model products will be reviewed personally by the editor. This will be a "hands on" evaluation whenever possible and these products will receive close scrutiny under actual operating conditions. These reviews do not constitute any recommended priority over an existing product of similar design or nature, but merely reflect the use of available items from your dealer or hobby shop.

FIFTY YEARS AGO...

by DAN SANTICH

MODEL AIRPLANE NEWS has always been a favorite publication for aviation enthusiasts around the world, and the year 1936 was no exception. Times were changing, at least in the United States, and modeling was fast becoming a national craze. With the ever-increasing supply of model building materials, as well as the growing popularity of gasoline engines, the hobby was going through a major change. *M.A.N.* introduced a new column, called "Gas Lines," to inform the modeler about the new trends in gasoline engines. The concept was to provide an exchange between modelers and experimenters. In that direction, *M.A.N.* started an organization called the International Gas Model Airplane Association. Membership was free. Do you know what this organization ended up as?

Robert C. Morrison, in his "On the Frontiers of Aviation" column, stated, "The year 1936 will be one of aviation's greatest years." And so it was, as *M.A.N.* told it, 50 years ago this month. ■

W.C. Hungerford holds design by Bob Knapton, which uses homemade engine. Ship flew 22 minutes on one flight.

Group of gas jobs built by model fans under tutelage of Allen Turner.

J. Trefney and his 10-foot span gas job. It has rubber ball wheels.

Cecelia Turner and gas model she used to win women's championship.

A neat biplane gas model built by Bob Miller with a span of 8 feet.

FOUR-CYCLE FORUM

by ELOY MAREZ

THE MANX! Yes, I know it's a cat, but it seems that it's also an automobile, or maybe a ball club. Anyway, the one I want to tell you about is called the Manx 250 IL and it's a *big* four-stroker from Tennessee.

The Manx is the brainchild of Bob Haskins of Aero Tech*. It's a twin-cylinder, in-line four-stroke engine of 42cc displacement. That's 2.51 cubic inches for those of you who aren't yet metricized. It is rated to swing a Zinger 20x6 prop at 1,200 to 7,500, depending on fuel and altitude. The fuel recommended is normal glow fuel, normal oil content, with preferably 10% nitromethane.

No horsepower figures are given in the instructions, in which Bob says, "I won't state it because so many manufacturers exaggerate it to outdo others. I won't get into that problem. I'll let you be the judge."

From all appearances, the Manx is built entirely from bar stock; there is no external evidence of castings. The overhead valves are exposed, as are the rocker arms and pushrods. The rear-mounted belt-driven cam mechanism is also exposed. The engine is extremely husky throughout: 17-mm main crankshaft, 7/16-inch crankpin, 5/16-inch wristpin, and 9/16-inch diameter valves with 5/32-inch stems. The prop hub is 3/8 inch, with eight smaller prop retaining screws that thread into the prop drive. No spinning off propellers with this one. The Manx 250 weighs in at 9¼ pounds, half of which must be the ball bearings—there are 13 of them. Six support the main crank, 3 are on the cam, and they are even found on the end of the rocker arms! Fuel consumption at full throttle is reported to be between 2 and 2½ ounces per minute. The instructions recommend standard long glowplugs, not idle bar. They further recommend that they be kept lit at all times to prevent the loss of a cylinder, not an uncommon problem with twins.

Obviously, this is a custom-built engine, and I'm not sure of the price and less sure of delivery times. The address of Aero Tech is given at the end of this article so you can find out all you need to know.

Spark Ignition, Pros and Cons

I'd like to begin this subject with a suggestion that we watch ourselves. I see the start of a trend, another one of those misnomers which soon become axiomatic in our hobby. In this case, I'm referring to the fact that too often we simply say "ignition" when we mean "spark ignition," ignoring the fact that ignition takes place in all internal combustion engines. The only thing that differs is what starts it!

For openers, I have a most informative letter from Chuck Smith of Chicago, Illinois (not to be confused with California's racing Chuck Smith):

"I wish it were possible to abbreviate the following harangue, but it just has to run its course. It all has to do with glow vs. spark ignition of four-cycles.

"First, I'm a dyed-in-the-wool four-stroke fan. After twenty years in the hobby, the novelty of big propeller arcs and the enhanced realism of the four-stroke sound has, for me at least, given R/C the biggest boost in interest since flying my Ford Trimotor in my first (and only) Nats back in '66.

"On the other hand, the tendency of four-strokes on glow to self-destruct is a

A new development in four-stroke twins is the Manx 250 IL.

Another unique aspect of this twin is the use of dual carburetors.

Superior workmanship and machining techniques are apparent left and above. Note man-sized rocker arms and return springs.

feature of their operation that seriously impairs their utility. It's rarely noted in print, but there's plenty of in-the-field complaining that detonation is the culprit.

"We're dosing them with fairly high nitro to spread the burn, but these higher concentrations have the same drawbacks in heat and humidity as they have for two-strokes—and it doesn't really cure the detonation problem. I went through an O.S. .61 in one season, despite conservative treatment—no over-propping, starve-off stops, and after lubes. It had simply battered itself to a premature death. And when you heard it run, it was understandable. When your ear is tuned for it, you'll hear the 'death rattle' in just about any glow-operated four-stroke in all but the most ideal atmospheric conditions. Sometimes it almost 'hides' in the other sounds, but more often than not, it's there.

"Let's face it, a four-stroke engine on glow—particularly a large lower piston-speed mill—is simply nuts. So much of the burn energy is expended before the piston reaches top dead center, that it's a wonder they run at all.

"Bill Carpenter of C.H. Electronics* might be regarded as a zealot by many modelers who would simply rather not be bothered by the facts, but there's a heck of a lot to be said for Bill's adjustable-advance spark ignition crusade. And with the installation of one of his units on an (inverted!) Enya 1.2, I've joined the campaign. I'd like to offer a less-than-authoritative theory on why the glow-detonation problem exists.

"It's pretty simple. For optimum operation, an internal combustion engine ignites its charge before TDC, so that optimum energy coincides with the beginning of the 'power stroke.' At high speed, ignition can occur from 20° to 40° before TDC for optimum performance, and right at TDC for smoothest idling.

"A two-stroke is a bit different—especially a high-speed two-stroke. It might like to light its fire even earlier for peak operation. Besides, a two-stroke is busy closing off ports for almost the first third of its 'compression stroke' (during that period, it's compressing nothing), then using another 20° to 40° bringing its charge into an ignitable mass following the cooling of inrushing new fuel. Then it 'goes off' at 50° to 70°, depending on its size and type. (My guesses on these specific values might not pass Peter Chinn's inspection, but bear with me. I bet he'd agree with the general drift.) This scenario sets pretty well at 12,000 to 18,000. But the four-stroke is running at much lower speed and it's doing it with a compression stroke that's 'buttoned up' almost at the *start* of the compression stroke. So on glow, it's firing *earlier* than the high-speed two-stroke and has lower piston speed as well. And instead of hitting peak energy around TDC, the burn is doing everything possible to resist the piston's upward travel. Inertia somehow overcomes this mess, and the engine manages to complete one more destructive, bearing-busting, heat-creating cycle of rotation.

"Terrific.

"If there's even a *hint* of truth in the foregoing, it should be reason enough to jump on the spark ignition bandwagon. And although Bill's C.H. units aren't the most elegant (tooling fancy parts is impractical with low-production stuff), and you have to clean your plugs once in a while, the installations really do the job. From its silky 0° BTDC tick-over idle, to its find-the-right-spot high end adjustment capability, the C.H. unit has turned my Enya into a smoother, cooler-running, more reliable powerplant.

"Like Bill, I've come to believe that you're only going halfway when you make the engine purchase. It becomes an

(Continued on page 24)

A few easy steps that will double the life of your engine.

Keeping Your Engine Alive and Well

by DAN SANTICH

MANY MODELERS don't seem to realize, or they seem to forget, that their engine is the most important aspect of their flying fun. Sure, you have to have a radio that is in good operating condition, but to get in the air and stay there, your engine has to perform at top efficiency.

How many times have you gone to the field after a few weeks absence, fueled up your ship, checked the controls, and headed into the sky? You do a couple of passes over the field and suddenly your engine gets sick and dies. You bring it down, fiddle with the needle valve, and take off again, only to have the same experience with a dead-stick landing.

Your engine is trying to tell you something, and if you don't pay heed to it you could be in for trouble.

Aside from fuel tank problems—split fuel line, clunk off the pickup, garbage in your filter (you *do* use one?), etc.—the problem is most likely corrosion and varnish buildup in your engine. Assuming you have properly broken in your engine (at least 30 minutes with an ABC), the most common problem of engine performance is because of improper after-flight maintenance. After every flying day, here's what you should do:

1. On the last flight, pinch off the fuel line and let the engine run dry. Immediately disconnect the fuel line from the engine when it quits, to prevent fuel from siphoning into it.
2. Completely drain your fuel tank.
3. Put a small amount of kerosene or Pacers* After Run in your fuel tank.
4. Loosen the glowplug and suck the kerosene into the engine by putting your finger over the carburetor and turning the prop over by hand a few times. Flip the prop several times to make sure all metal parts in the engine are saturated. Tighten the plug.
5. Drain any remaining kerosene from your fuel tank.

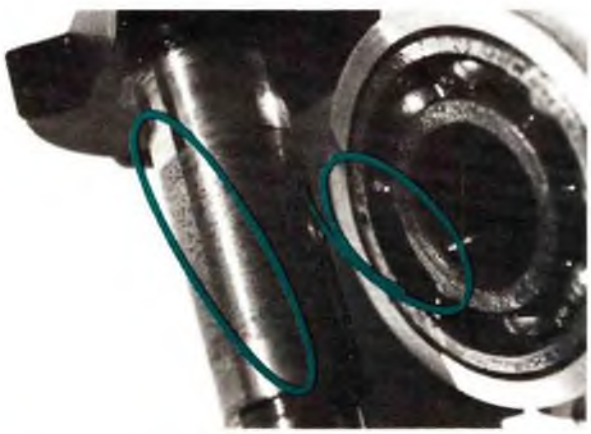
This photo taken of Enya R.120 after only five runs. Note carbon buildup.

A word of caution. Kerosene will affect some fuel lines such as silicon lines, so experiment first by placing a small piece of your fuel line in a small amount of kerosene. If it swells up or becomes discolored, switch to a neoprene-based fuel line.

If you crash (it happens!), completely disassemble your engine and wash it with kerosene and a small brush.

If you discover varnish (a brown or amber tint) on the piston or liner, make sure you clean this off with 600-grit wet-or-dry paper soaked in kerosene. Remember that any abrasive you use will affect the eventual life of the engine.

I've seen some engines that were so built-up with varnish and carbon that the piston ring slot was filled, preventing the ring from its ability to ride freely during a run. If you see a dark color on the edges of the piston near the ring slot, chances are you have varnish or carbon under the ring. The removal of a piston ring can be very hairy, so be extra careful. When you have it off, clean the slot out with a toothpick or something stiff. Never use



Following last run, engine should be run dry and then lubricated to prevent rust buildup.

an X-Acto knife or anything metal. When you re-install the ring, make sure it is positioned to line up with the retaining pin on the piston. If you don't, you'll break it the first time you try to put the piston back in the liner.

While you have the engine apart, check the bearings. Put the crankshaft in place and turn it freely with your fingers. It has a counterbalancer on one side and should always return to a position with the counterbalancer on the bottom of the crankcase. Some engines have the counterbalancer sealed off and you can't see it, however it is always located directly opposite the pin for the connecting rod.

If you feel a gritting or roughness when turning the crankshaft, chances are your bearings are either dirty or shot. Try flushing them out, and if this fails, replace them. Also check for marks on the crankshaft where the bearing location is. If you see any circular wear marks, the crank is running inside the bearing surface, which it shouldn't do. Only the ball bearings should be doing the work. If the wear is too bad, you'll need to change the crankshaft. If only a slight amount of wear is evident, you can probably get by with just a set of new bearings. The wear marks on the crankshaft are the key elements to look for. Also, if the bearings don't fit snugly in the case, they could be turning with the crankshaft or spinning in the case. If they fall out when you take the crankshaft out, chances are they are bad. If they have been spinning, you might just have to change the crankcase.

Some engines, such as the O.S. FP series, use bushings rather than ball bearings. Abnormal wear on these engines means that you should at least replace the crankcase. You can tell when they are overly worn by the amount of

Glazed piston is a result of using improper fuel mixture.

fuel coming out of the front end near the prop driver. A slight amount is normal, but if the nose of your airplane is full of fuel after every flight, change the crankcase. The metal in the case is softer than the crankshaft, so it will wear out first.

Four-stroke engines are more prone to corrosion than two-strokes. For one thing, they have more parts, and thus more area on which rust can form. Methanol, the primary fuel ingredient, attracts moisture, and the only way to displace it is with heat, kerosene, or a protective oil such as Marvel Mystery Oil, gun oil, or After Run.

Pacer's After Run is great for stopping rust and corrosion.

willing, and able to meet your needs.

End Note: For a complete "A to Z" comprehensive book on engine maintenance, overhaul, and hop-up, get yourself a copy of Harry's Handbook For Miniature Engines *by Harry Higley. The price is $10.95 and the book is available from* Model Airplane News*.

**The following are the addresses of the companies mentioned in the article:*

Pacer Technology & Resources, 1600 Dell Avenue, Campbell, CA 95008

Harry's Handbook, *c/o* M.A.N., *632 Danbury Rd., Wilton, CT 06897.* ■

To get in the air and stay there, your engine has to perform at top efficiency.

For long storage, you should flush out all your engines with kerosene, wrap them in an oily cloth and put them in a dust-free bag. When the flying season comes, you will have an engine ready,

Far left: Note accumulation of fuel residue which eventually clogs ports and jets of carburetor. Left: Buildup of deposits on needle is apparent.

Construction

Super Hots

by DAN SANTICH

Kick some tails with the new king in the fun-fly arena!

THERE IS no doubt about it, the Hots is *hot*! Midwest Products* has already sold out on their second run of kits and *M.A.N.* has sold more plans (#4841 for $6.00) for it than for any other model. Why is that? Well, the design speaks for itself. It is simple, attractive, inexpensive to build, and it flies like mad. Put all of these ingredients together and you have a winner.

The Super Hots is a direct offspring of the original Hots, which appeared in the April 1984 issue of *M.A.N.* This Super version is a larger model that will handle any engine in the .40 to .61 size range. With a .40 on it, it behaves like a real gentleman. Go to a .61 with a pipe and you have a guided missile, yet still capable of near hovering at slow speeds. This is due to the extremely thick airfoil and lightweight of the airframe. There are gobs of lift and a prop turning over at less than 1,000 rpm will keep it in the air.

For those of you who are into show-stoppers, the Super Hots will outdance anyone on the floor. You can loop it on takeoff and still do a touch-and-go on the bottom side. It will knife-edge better than most pattern ships. It will flat-spin like a falling leaf and recover instantly when you want it to. Rolls are as fast or as slow as you want. On full-throw ailerons it will do three rolls a second. Now that's quick! Throttling back is like putting on the brakes, yet it won't stall or fall off on you. The ailerons are responsive right down to zero airspeed. Snaps are very predictable and it will do them equally as well in either direction. The airplane is so responsive and predictable

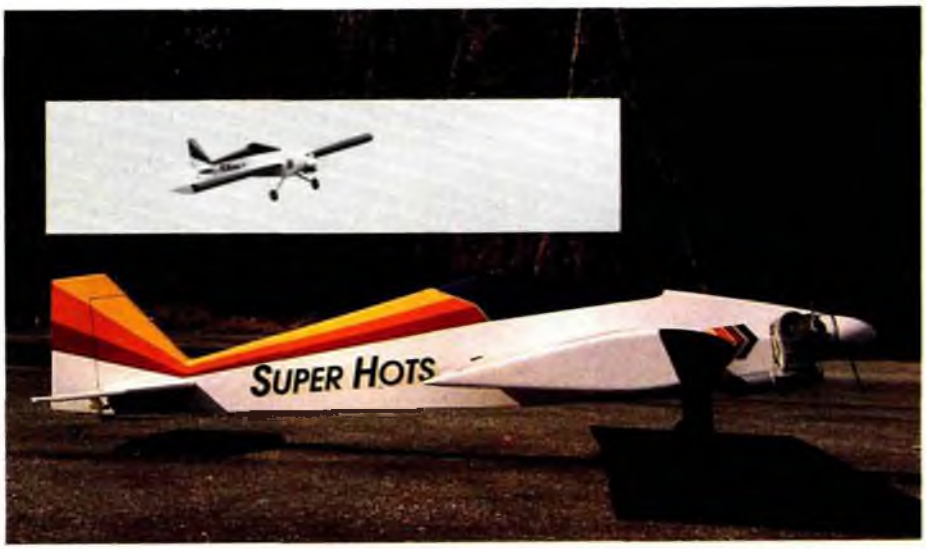
Type: Sport
Wingspan: 54 inches
Wing Area: 702 square inches
Length: 51 inches
Engine: .40-.61
Weight: 4 to 7 pounds
Channels: 4

it would even make a great pattern ship.

For the quiet bunch I feel a four-cycle would be a wonderful addition, although I haven't tried it yet. The main consideration would be the balance point, and you might have to shorten the nose in order to get it. Don't add weight to the tail unless you absolutely have to. The lighter it is, the better. Toward that end, when you pick out your material, get the lightest wood you can find. You'll notice I used ⅛-inch thick lite-ply for the fuselage sides. If you want a lighter model, you can substitute ⅛-inch thick balsa. The lite-ply adds a great amount of strength to the frame, however.

You'll also notice I used a backplate mount for the engine. I really like this method because of a number of factors. First, it is light. Second, it gives a direct force upon the fuselage. Third, it cuts down on vibration.

Another thing you'll notice is the use of two servos for the ailerons. There is room in the fuselage if you wish to use conventional strip aileron linkages; however, I've found that this setup gives zero slop and that makes it fly all the better. Slop can also induce flutter, and you know what that does. It kills nice little airplanes!



Although a one-piece airplane, the Super Hots is not ungainly.

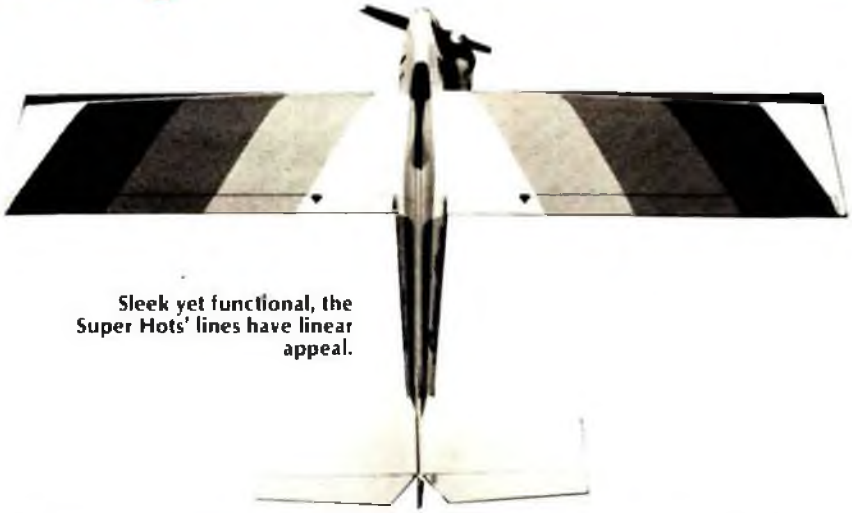
Aside from building it light, build it straight. It's no fun flying a corkscrew.

The Super Hots does not require a massive building area; anything the size of a kitchen table will do. Although it is a one-piece airplane, it isn't cumbersome or hard to transport in a small car. And when you get to the field, all eyes are going to be on you and your Super Hots.

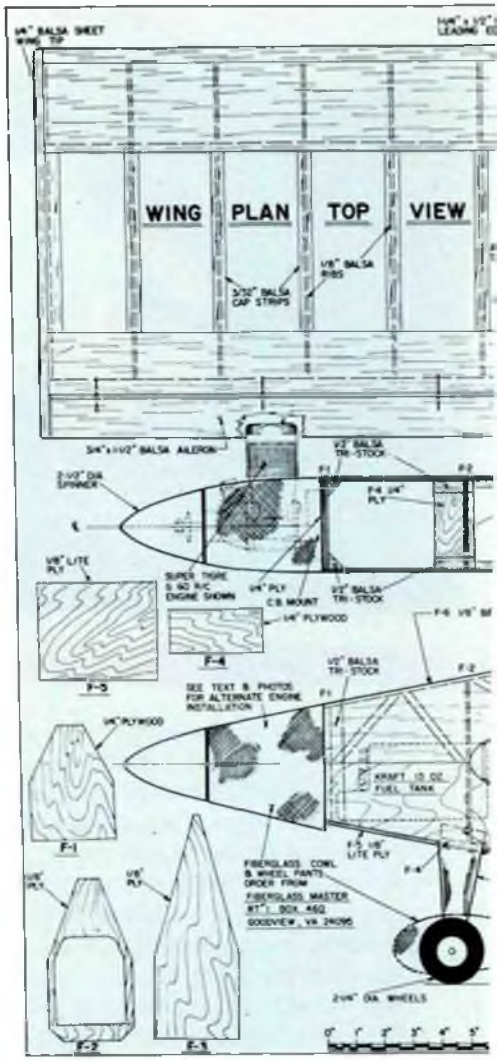
CONSTRUCTION. As I have in the past, I strongly suggest you obtain two sheets of See-Temp* pattern material. It's a translucent plastic that you simply

Shot of the radio installation from removable lower hatch shows use of dual aileron servos.

Super Hots



Sleek yet functional, the Super Hots' lines have linear appeal.



Bottom nose section. Note triangle braces to firewall.

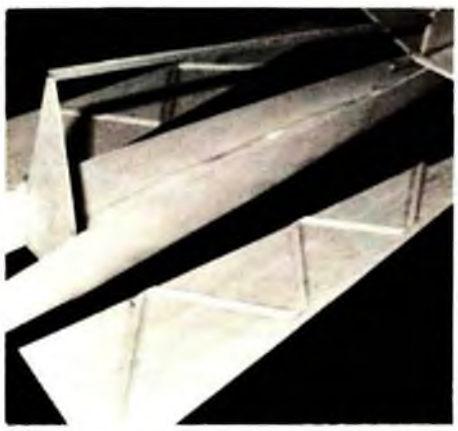
Make sure formers F1 and F2 are at right angles to fuselage sides.

lay over the plans. Draw a pattern of the part on the See-Temp and cut the pattern with a pair of scissors. Now you have a pattern that you can make hundreds of more planes from. It's great stuff!

Cut the fuselage parts out and glue bulkheads F1, F2, and F3 in place vertically on one side. Glue on the other side and add the strips and triangle braces. Drill the holes for the fuel tank tubing and the engine mounting plate. Install your fuel tank and add the front lower pieces, the turtleback, and the lower rear pieces. The stab is simple to build and is light and warp resistant. Build that and glue it in place, making sure the horizontal stab is horizontal and the fin is vertical. I always check these with a triangle.

Assemble your wing over the plans. There is nothing different or difficult about it, just make sure you get it straight. I've used a Y-harness with two servos in the wing for my setup. If you want, you can use one aileron servo in the fuselage, just like on the original Hots. It works fine also.

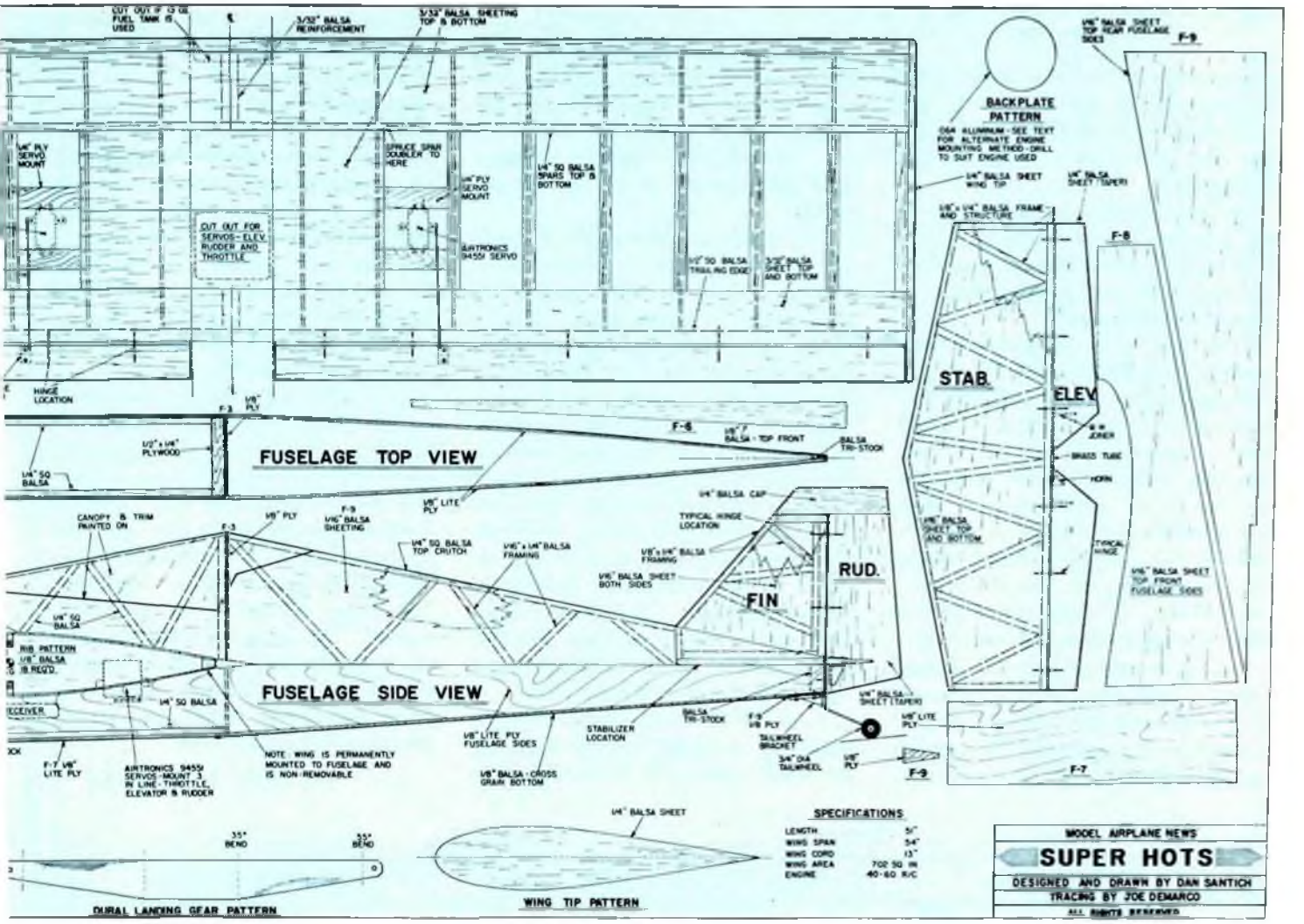
When your wing is done, mount it on the fuselage, align it, and glue it in place. Make sure that it is horizontal with the stab. Now you can add the top pieces to the fuselage, making sure before you do so that your fuel tank is installed. If you use a 6- or an 8-ounce tank, you can wait until you're done.



Reinforcement strips of 1/16-inch balsa save weight and add strength.

Rear fuselage sheeting in place is blended into lite-ply fuselage sides.

Wing is constructed in one piece with ¼ square inch spruce spar doublers and center section.



FULL-SIZE PLANS AVAILABLE...PAGES 116, 117

Sand the daylights out of it and cover the model with your favorite skin. Do your thing on the color scheme and blow everyone's mind when you take it to the flying field for the first time. The Super Hots is an attention getter.

FLYING. Make sure your controls move in the right direction and check your radio for good range. Run your engine and check it for idle. When your knees stop knocking, put it in the air. You'll soon find that the Super Hots is a dream to fly. It goes where you point it and it has no bad habits. So build the Super Hots and have some fun. That's what it's all about.

**The following are the addresses of the companies mentioned in this article:*

Midwest Products, 400 S. Indiana St., Hobart, IN 46342.

See-Temp, P.O. Box 105, Sussex, WI 53089. ■

Be sure tank is installed prior to completion of top forward fuselage section.

Individual aileron servos for slop-free setup, necessary in high-performance airplanes.

Horizontal and vertical stabs are built-up for strength, rigidity, and light weight.

4-CYCLE FORUM

(Continued from page 16)

engine when it's matched with a good coupled-advance ignition system, and we'd all be better off if we'd accept the fact that we'll have to come up with another $125.

"So how about an in-depth article on the installation and operation of the C.H. unit? I believe Bill's system could use some de-mystifying for the benefit of four-cycle enthusiasts."

I once read a description of an internal combustion engine in which it was called "a disgusting mechanical principle perfected to a fantastic degree." Chuck's letter certainly reminds me of that, especially in the case of the two-cycles that run so well and develop so much power that we don't really care how fuel-wasteful they are and, in many cases, how noisy they are. Compromises—that's what it's all about, and maybe the four-cycle engine is just another example.

On the matter of properly running engines, Chuck makes some good points. In a previous column I talked about the advisability of a proper break-in period and the importance of not over-leaning an engine. I even mentioned a "two-cycle ear," and as Chuck says, you can hear those mechanical groans "when your ear is tuned for it." Come to think of it, I'm now able to tell more about the setting of four-cycle engines in the air by the sound.

The matter of short engine life isn't one that I was aware of, at least not for the reason described. I do know about the increase in engine service requirements, but it seems that most of that is due to over-lean runs and the resulting heat buildups. Though obviously the situation as Chuck explains it, coupled with hot weather and a heavy hand on the needle, is going to require a trip back to Mr. Goodwrench sooner or later. I'm fortunate to live in California, where we fly all year long, but I have not seen or heard of any prematurely completely worn-out engines. Could it be that in spite of the timing problems they are mechanically able to withstand those "destructive, bearing-busting" runs?

Time will tell. If we modelers cannot obtain an acceptable lifespan from the four-cycle engine, why we'll simply stop buying them and that will be that. On the other hand, maybe time will prove that spark ignition is the only answer. In the meantime, Bill Carpenter and Chuck Smith are not alone in their opinions. I'd like to point back to the September 1985 *M.A.N.* and Doran Hiatt's excellent article on the use of coupled spark timing *and* the C.H. system. Also, in West Chester, Pennsylvania, we have Marty Zeller, who wrote in to tell of his experiences with spark ignition on another big one, the Kavan FK-50:

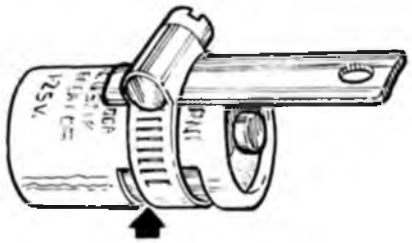
"The following tests were conducted on the FK-50 engine to determine the benefits of utilizing spark ignition vs. glow ignition. I measured static thrust and rpm for each. Fuel was Carolina-Taffinder custom mix at 2% castor and 5% nitro. Tach was Tower Hobbies digital Mini-Tach (reads to 100 rpm). The temperature on the day of the test was 65°. The spring scale used to measure was calibrated at 18 pounds known weight, which was the approximate test range anticipated. Target rpm at full throttle not to exceed 7,500.

(Continued on page 70)

HINTS & KINKS

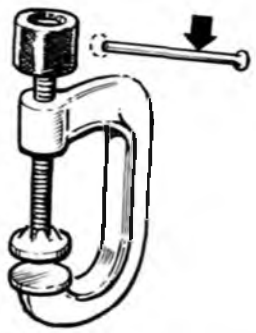
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 632 Danbury Rd., Georgetown, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

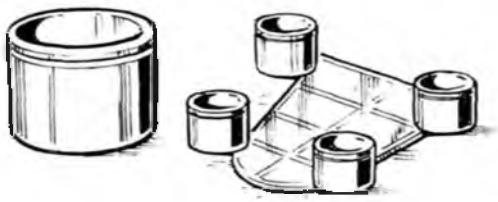


Here is an uncomplicated method of making a hang-on nickel-cadmium battery. Use a strip of metal, such as a K&S brass strip, then clamp it to a 400-mAh (or larger) battery using a small hose clip. The plastic sleeve around the battery must be cut away (see arrow) to make contact with the clamp. Drill a hole in the strip to fit over the glowplug post.

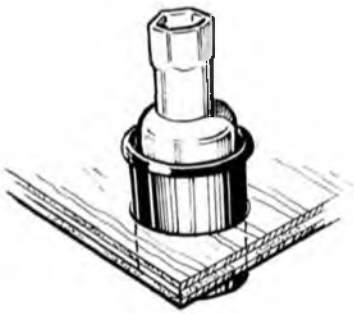
Brad Wiedel, Orleans, Nebraska



Removing the T-bar (arrowed) from your small C-clamps and force fitting a small piece of windshield washer hose to the threaded part allows the clamps to be used in confined spaces. Adequate clamping force can still be applied for hobby purposes. *Ray Stark, Rancho Cordova, California*

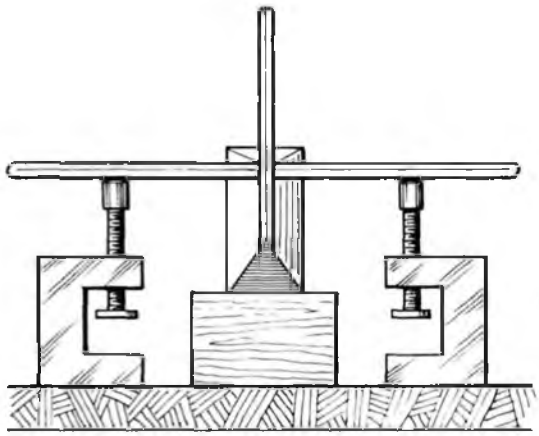


Visit your local brake shop and beg for a few worn-out brake caliper pistons. Being precision machined components, they are useful for "squaring up" fuselage sides, ribs, fins, etc., as well as being equally useful weights. Weight can be increased by melting old wheel balance weights into them. Wear goggles and gloves when doing that! *Phil Artese, Warners, New York*



Bore a hole in your flight box tray, press in a plastic 35 mm film container until it rests on the rim, then use this to conveniently store your Ni-Starter.

Steve Slabey, Eau Claire, Wisconsin



Your X-Acto clamps can also do double duty as levelling jacks when "squaring up" that new model. Use adhesive tape to hold them firmly to the bench and use them in conjunction with a bubble level.

Capt. John M. Greenland, Herrliberg, Switzerland

This method of attaching the wire to the post of a glowplug does not require solder, which is very useful for on-board batteries. Drill out a Goldberg E-Z Connector for a snug fit over the post then clamp the wire under the screw head. Clip off the pivot pin arrowed.

Ben Minor, Richmond, Virginia

Futaba P·C·M

State-of-the-art R/C technology.

by MIKE LEE

IT HAS BEEN called the "wave of the future" radio system, and it is, by every known standard, the most sophisticated radio ever. It is the Futaba* PCM. Officially designated FP-8SGAP PCM, it represents a milestone in radio system development. The PCM not only has a different method of encoding a signal, but it is by far the most feature-packed radio today.

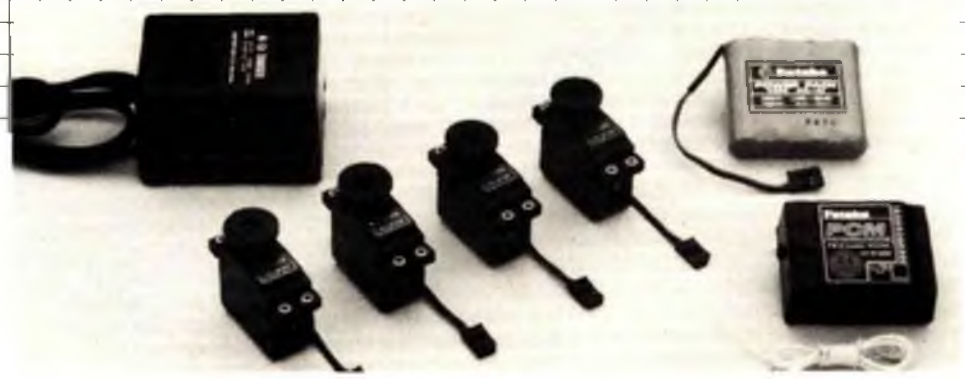
It is not my intent to explain the inner workings of the Futaba PCM, but only to highlight its main features. Keep in mind that because the PCM is full-featured and talks a different language, this doesn't mean it was meant for the competition pilot only. Let's see what it will do for the average pilot.

The Futaba uses a method of signal encoding known as pulse code. Don't confuse this with how the signal is sent. Just know that it starts with a microprocessing unit within the transmitter. This microprocessor takes all signals fed to it from the various sticks, buttons, and switches, and places them in a line of signals, similar to a freight train. This is the pulse code. A few dozen times per second, this pulse code is originated and sent down the line to the encoder section.

At the encoder section, the pulse code is placed on a Frequency Modulation (FM) type carrier and out the antenna it goes. At the receiver end, the decoder recovers the pulse code, sorts it, and, through its own microprocessor, outputs the signals to the servos where they belong. That is pulse code modulation.

What this means to you is that the microprocessor can be told to do darn near anything your little heart desires; from mixing a fancy V-tail sailplane to compensating for pitch when the flaps are put down. It means the end of manual mixers, add-on electronic mixers, Y-harnesses for dual servo use, and a host of other things that can turn your favorite project into a nightmare of wiring or linkages. But this is not the only feature the PCM offers. The PCM also offers safety.

The PCM microprocessor will transmit the signals on command, but if there is no command, it will "hold" the last input. This means that should your receiver ever fail to get the right signals, or it gets no signal at all, the receiver is programmed to hold the position of all the servos as they were when the signals were interrupted. This may not sound like very much, but many of us don't realize that most all radios do a lot of dancing in the air. They are constantly glitching while airborne, but because the glitches are so minute and quick, the pilot doesn't see them because the aircraft has not reacted to them enough to be seen. This can be proven by watching movie clips from an airborne aircraft where a flying surface can be seen. On the PCM, when the same minute glitch hits the receiver, the radio simply holds and then continues when the glitch is gone. The result is a smoother flight path and less wear on the servos.



Charger for servos, receiver battery, receiver, and transmitter comprise the Futaba PCM setup.

It continues on from the microprocessor with the addition of the "fail-safe" mode. The PCM can be programmed to move all servos to predetermined positions if a massive radio failure occurs. This can be a large glitch or failure of the transmitter altogether. In either case, the receiver will then move the servos to their "fail-safe" position and hope to ride out the storm.

Safety also abounds from the PCM in the form of audible and action-taking signals from the system. The PCM monitors its own battery supply constantly. The transmitter puts out an audible beep at a rapid rate when the transmitter battery gets low. Fair enough, but what about the receiver? It, too, has an attention-grabbing feature that should give plenty of warning to the average modeler. Upon critical voltage loss, the receiver will automatically retard the throttle servo to the ½-throttle position for 36 seconds. You can override this position by cycling the throttle fully, but it will return to ½-throttle within 36 seconds. That's plenty of time to land, if you know how to take a hint.

There are actually more features than I have room for, and there is a method to the madness of this superior radio. It was designed for the serious pilot who wants the best he can get. This is the same guy who values his planes, whether he's using a trainer for the first solo flight, or the seasoned pattern jockey who can't afford losing a contest bird right now. The PCM is insurance with features. It may not be cheap insurance, but it only takes one good airplane to get rekitted by a glitch to convince anyone that there is no substitute for a dependable radio. The PCM is meant for that pilot. It is dependable, it takes advantage of every safety feature imaginable, and it has more features than anything else currently available in the United States. It is every man's radio, if you take your hobby to heart.

It's not meant for the competition pilot only!

I'm totally impressed with the PCM. Looking for *the* radio for that new trainer, sport ship, sailplane, or pattern bird? Futaba PCM...there's no substitute.

**The following is the address of the company mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220. ■

HOW TO:

by RANDY RANDOLPH

Make A Simple Antenna Anchor

Antennas are as essential to radios as fuel is to engines. They should be arrayed away from metal and the airplane's electronic elements. The photos show a simple and very inexpensive way to anchor the loose end of the antenna to the rudder or stab.

1.

2.

1. The materials you'll need are: a straight pin, a rubber band, a small length of fuel tubing, and a pair of pliers. The rubber band from the evening newspaper is perfect.

2. Cut the head from the pin, and make a bracket by bending the pin into the shape of a flat-sided "U." The sharp end should be slightly longer than the cut end.

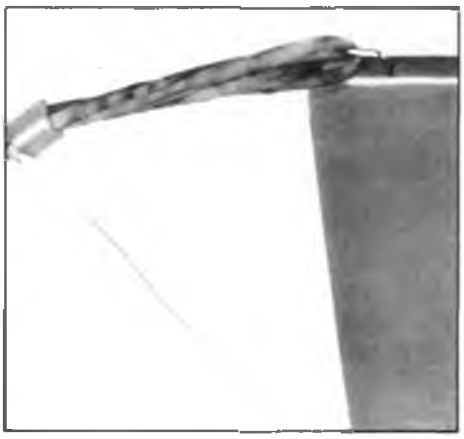
3.

4.

3. Push the sharp end of the bracket into the leading edge at the tip of the fin. The fin is the part of the rudder in front of the hinge line. Leave about a ¼-inch gap between the top of the bracket and the fin. Secure the bracket with glue.

4. Thread the rubber band halfway through the bracket and slip a piece of fuel tubing over the end of the antenna wire.

5.



6.

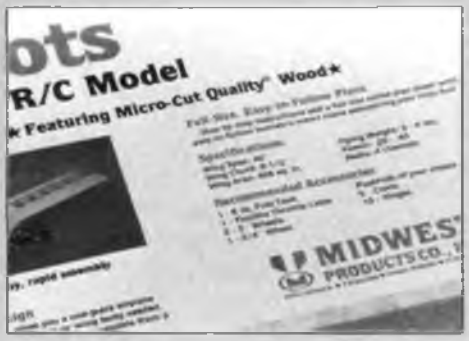
5. Run the end of the wire through both loops of the rubber band, then back through the fuel tubing. Slide the tubing down the wire and over the rubber band.

6. Take the slack out of the antenna while stretching the rubber band and slide the tubing firmly against the wire. This type of anchor holds the antenna securely, yet allows it to pull away in case of a snag.

How to Buy a Kit

What to look for in that all-important purchase.

by RANDY RANDOLPH



Top: A high quality kit will have easy-to-follow illustrated building instructions. Bottom: Box label on Midwest Hots kit gives a list of recommended accessories.

THE FIRST-TIME R/C kit buyer is at a crossroad in his modeling career. The initial purchase of an R/C model airplane can lead to one of the most rewarding of hobbies, or to a quagmire! Let's try to look at the kit selection process with a clear understanding of what is involved in construction and assembly, as well as what is available in the marketplace. I won't suggest any specific kits.

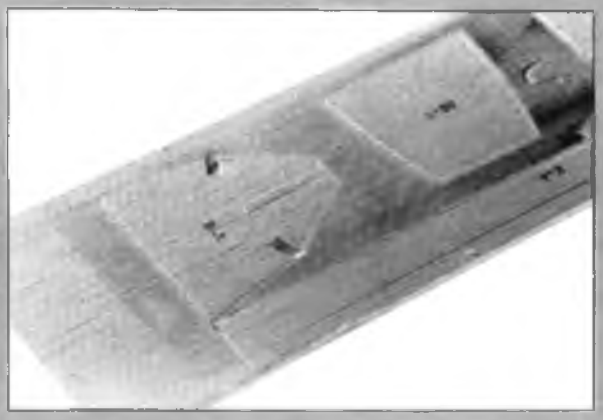
A neophyte should start with a high-wing, relatively large training airplane. Regardless of the time you have accumulated in full-scale aircraft, if you have never flown a model airplane, you are a neophyte.

It is quite embarassing to arrive at the flying field expecting to learn to fly with an airplane that no one can keep in the air. The first airplane is important—treat it as such.

The best approach for a beginner is with an RTF kit. RTF stands for "ready to fly," which is a misnomer. No model airplane can be purchased, taken to the field in the box, unloaded, and flown. The term RTF actually means that the airframe is complete and that no building is necessary, but, as it says on the box, "some assembly is required." This assembly gives important hands-on experience to those who are unfamiliar with aircraft construction and terminology.

An RTF kit will contain a completely finished fuselage, tail group, and wings. In some kits the wings come in two pieces which must be glued together at the center. Included are engine mount, landing gear and wheels, fuel tank, and the necessary hardware to join everything. The control surfaces are hinged and the pushrods necessary to connect them to the radio are provided. In fact, the only things the buyer must furnish are an engine and radio, and suggestions for both are usually included in the instructions.

The "almost ready to fly" (ARF) airplane kit is similar to the RTF, with some additional assembly necessary. These kits are also miss-named because the "almost" becomes a word with a rather wide connotation. Some ARF kits are assembled like the RTF variety, while others require more complex construction. Generally parts and hardware



Above left: An example of bad die-cutting. Note rounded corners. Above right: A good die-cut sheet shows crisp, distinct parts. Right: An example of a machine-cut and sanded rib from a high-quality kit.

packages are complete, and little or no extras are needed. The radio and engine will, of course, depend on the buyer. Kit labels and instruction sheets should be consulted for any tools or materials necessary to finish the project. The ARF could be the beginner's first choice because of a slightly lower price than the RTF. Close examination of the instructions and contents is recommended, to assure there are no construction techniques beyond the buyer's capabilities.

The pre-fabricated construction kit might be the choice for those who can read and understand plans and have good manual dexterity. Those with previous kit-building experience can go this way, but a good kit with adequate instructions can be completed by almost anyone with the desire and patience.

These kits are for airplanes that must be built rather than assembled. Flying surfaces consist of ribs, spars, and fuselages of longerons and bulkheads. Movable surfaces must be hinged and the whole structure covered with a plastic film. Fuel tanks, pushrods, covering material, wheels, etc., must be purchased separately. Generally, the more complete the kit, the more expensive it is. Eventually, all modelers build this type of kit because of the vast selection and variety. Construction should be as much fun as flying for a newcomer to be successful, and the airplane should be a trainer type and have simple lines.

There is additional support equipment that must be purchased no matter which category the beginner chooses. Starting batteries, fuel, propellers, glowplugs, wrenches, screw drivers, etc., and a way to carry them to the field are needed. The advertisements and photos in this magazine show some necessary peripheral equipment.

In the long run, one of the best advisers is the interested clerk in your local hobby shop. He knows what kits are being used by the majority of experienced hobbyists and what is most successful for beginners. He can give directions to model clubs in your area, the times of their meetings, and which offer flight instructions. After all, a successful beginning modeler will become a valuable customer. ■

One of the best modeling tools is a knowledgeable hobby dealer.

This dealer has a nice selection of engines to complement a kit purchase.

Ready-to-fly kits leave little to worry about.

RADIO CONTROL NEWS

by ART SCHROEDER

WELL, AFTER months of time broken up by a busy schedule with various projects, travel, and other interruptions, Byron's* Zero is finished and flown. And it is surely one case where "Zero" really adds up to something! My Field & Bench will follow in a few months.

Indeed, the airplane looks great—realistic and different when compared with usual WW II warbirds. It flies beautifully and performs just as one might expect of one of history's premier fighters. The kit is outstanding, posing few problems for any competent builder. The only problem—it left me wanting more. I truly enjoyed the Zero that much!

The "more" will come from a winter project in collaboration with Doss Steed on two Byron P-47s. Those who don't know Doss should be advised that he is one of the best scale men around; he did the paint work on my Zero. In fact, he is one of only a few modelers honored by display of their flyable handiwork in a major military aircraft museum. Steed's P-51 (winner of best-of-show at a WRAMs some years ago) is now housed at the Air Force Museum in Dayton, Ohio.

I had been pondering whether I wanted to do Byron's Corsair, the firm's latest release, or the older P-47. After seeing the incredible performance by Ted White with J.W. Jones' P-47 at Ida Grove last summer, I was nearly convinced. Doss gave me the final push by offering to do all painting and detailing if I did the basic assembly work on two P-47s. The pact was sealed and we're off and running.

One problem was immediately apparent. Byron's "Jug" is a "razorback" model (my personal favorite) and Doss really wanted the version sporting a bubble canopy.

Solution was relatively simple—remove the "razorback" from the existing fuselage to convert it to a D-25-RE model. Both airplanes are essentially the same except for a cut-down rear fuselage and bubble canopy with a flat windshield.

While the concept was simple, the actual change required some thought. It was not just a matter of cutting the back away since such a move would leave the fuselage with no structural integrity and all kinds of potential for basic alignment problems.

Doss handled the conversion in this fashion. The fuselage (a two-piece affair) was assembled with sheet metal screws. Two-part Sig* foam liquid was introduced into the rear of the inverted fuselage and allowed to expand and cure. This formed a foam block that became the bridge to hold everything together for cutting and fiberglassing.

After the foam had cured, Doss cut the entire razorback away with a Sabre saw. Additional foam was added to the exposed area and, after curing, was shaped to contours of the canopy "47." This was followed by a ¼-ounce fiberglass skin over the foam and an inch or so down the sides.

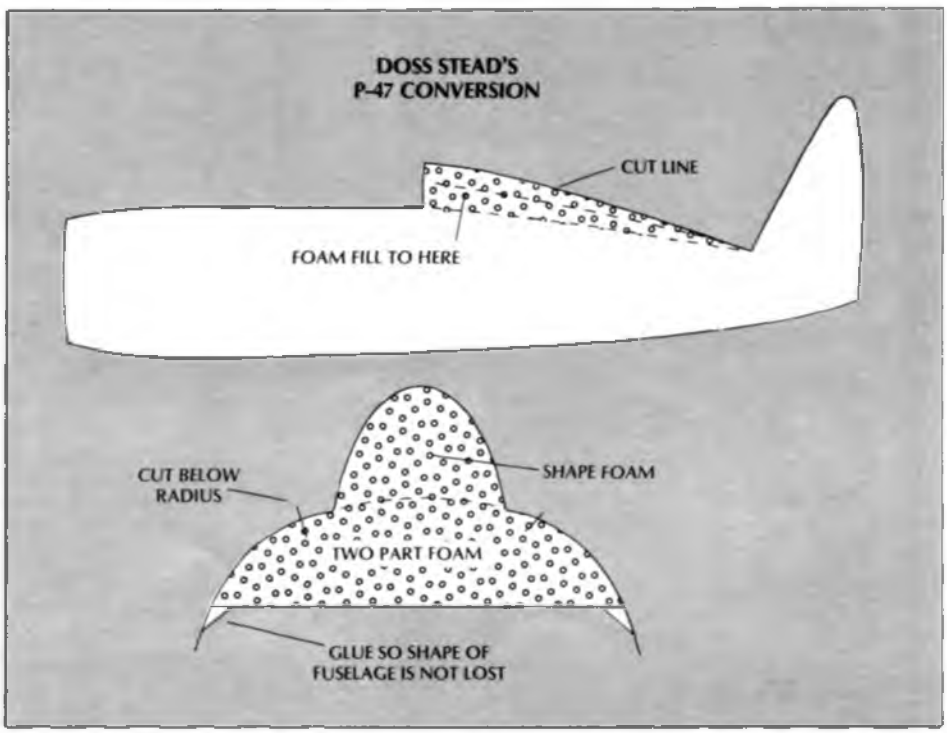
When the exterior cloth and resin had hardened, all interior foam was removed and a second fiberglass skin was added to the fuselage interior. Some glass microballoons and resin filled any low spots, followed by some finish sanding to clean things up a bit.

It all worked beautifully with absolutely no weight build-up or loss of strength.

If you're a Byron fan and want a different version of the P-47, give this procedure consideration. I'll keep you posted on this saga of two "Jugs" as the project continues. It should be a lot of fun.

Tip of the Month

I've used every kind of glue to set hinges in place; everything including cellulose glues, white glues, cyanoacrylate—what have you. All worked okay—all presented some problems. The major difficulty comes from leakage of glue



into the hinge pivot area. I've found one way to avoid this. Simply use silicone sealer for hinge fixing. The brand I've used is Duro but I believe any comparable material will work as well. This material holds as well as any other adhesive and, if it does leak into the hinge pivot, it won't bind the hinge since it is so inherently flexible. The material works well and is worth including in your bag of tricks.

More Ron Chidgey

I'd like to add a little bit to my previous discussions on Ron Chidgey.

Any pattern flier who desires a run at "world class" levels will ultimately find himself transporting his airplanes on airlines. Having done this many, many times, believe me, it's an advantage having the smallest, lightest box possible. Box size is determined by the maximum dimensions of your model and, with larger FAI designs, this can result in huge boxes that could raise eyebrows at airport check-in counters. Ron solves some of the problem by employing a plug-in, otherwise conventional, stabilizer. This reduces one dimension of the fuselage component as well as providing a relatively easy way to change stabilizer incidence (a handy thing when fine trimming a pattern bird). Ron indicated he might consider plug-in wings, which would knock a foot off the overall box length.

Chidgey's box is built of light plywood and light wooden support members to keep overall weight down. The handles are of nylon rope (the airlines prefer this over metal handles that always seem in the way). The box for Tarbaby is the absolute minimum to protect it and that's what any travelling modeler should strive for.

When travelling, Ron carries the transmitter, minimum tools, and other small items in his carry case. This transmitter case is sold by Gator R/C Products and is ideal for single- or two-stick transmitters.

Every time we got to talking in Rayskala at the Finnish FAI Judges School, Ron Chidgey had some worthwhile comments. On flying the various maneuvers,

(Continued on page 70)

The Golden

by HAL deBOLT

When making a rudder wiggle was the name of the game!

R/C modeling has come a long way since the Good brothers, Jim Walker, Hal deBolt, and a hundred unnamed dedicated modelers saw the vision and excitement of R/C. Theirs was a new era, a venture into the unknown, a proving ground not unlike the White Sands Missile Range where our space program was born.

This feature of Model Airplane News *is presented to show you how our great hobby came about, what the difficulties were, what success really meant, and some of the personalities involved. Reader input is requested and encouraged. We hope that you enjoy this and appreciate the intent, which is to give credit and acknowledgment to those people who have made the hobby what it is today.*

Let us know how you like it. *DBS*

Your typical flight-line of the '50s with then-state-of-the-art radio equipment. Those are transmitters, not field boxes.

ARE YOU a modeling "oldster"? If so, you are among the many thousands enjoying the hobby today. Are you "today's modeler" with a keen interest in the history of R/C and early-day modeling? Would you enjoy old-time R/C activities—building and flying the designs, fly-in type meets, or perhaps just watching how well some of them really did perform? This is just what the "Golden Age of R/C" is all about.

Interest in old-time R/C models, radios, engines, etc., is growing. Many of you have asked for help, information, and news, and it is to answer these needs that this series is presented.

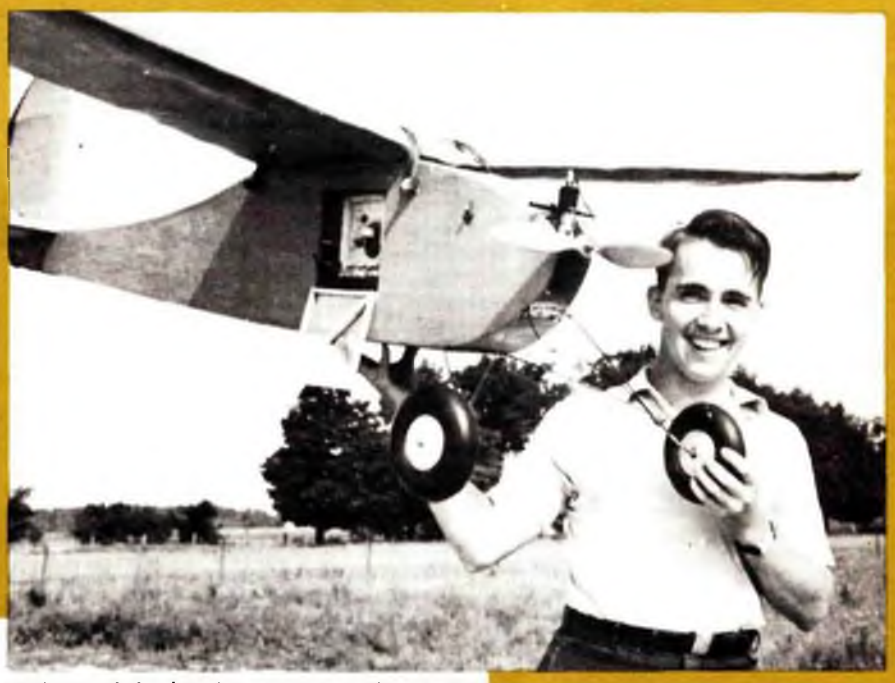
The "Golden Age of R/C" is intended to be a clearing house for old-time R/C activity. Most importantly, it is an open forum where *you* can tell the rest of us what you did back then, what you know, and what you're doing now. The intent is for all this to be low key and enjoyable.

The potential for covering this Golden Age seems excellent. Many modelers are already engaged in OT R/C to one extent or another, but remember that the success of this type of venture depends on you, so please write and send pictures (good, clear B&W glossy photos reproduce best) of *anything* related to OT R/C. It can be an idea, a bit of history, perhaps a gadget, maybe an R/C system, or best of all, a complete model. All are interesting when they are OT!

Thousands of modelers were into R/C at the very beginning. Most did not venture out of their own backyards, but what they did is historic now. There are also some prominent names from those days, people like Desoto, Seigfreid, Weiss, Lanzo, and the Good brothers from the pioneer days, and from the early days, Lorenz, McEntee, Winter, McElwee, Foxworthy, Port, Sneider, Schmidt, Rockwood, Branstner, Ritchie, Dunham, Worth—the list could go on and on. The point is that *people* created the era.

R/C modeling in the early days combined imagination with experimentation.

Age of R/C



Walt Good displays his winning smile and Big Guff, granddaddy of all R/C winners, circa 1937.

Forty years dims memories and records did not seem important then, but before it all gets lost, we have the opportunity to show modelers of this great modern sport of ours where it all came from, plus enjoying some of the models and the ability to fly them in a much better manner with our modern equipment. Remember when going home from flying without any needed repairs was something to celebrate?

An amazing result of my initial research is that I haven't been able to determine who had the first R/C model, let alone the first *successful* one! I was an early bird, but I never learned who was first. Do you know?

To lay a little groundwork for the Golden Age, let me tell you what I saw back then that eventually blossomed into R/C. Others can add to this as we go.

In those pre-war days (1935-1939) of modeling, all was free flight. We heard about R/C, of course, but, unlike today, it was all highly technical and mysterious—nothing for the average modeler who had problems enough with a simple ignition system. If you did see an R/C model, it didn't look very practical. Most of the efforts came out of the ham radio hobby with the airplane an apparent second thought.

You probably wouldn't have seen an R/C model at your local field either. If the turnout at the Nats was any indication, there were very few in the entire country. My first Nats was in 1933 at Akron, Ohio. I only saw about 6 gas engine powered models, let alone any R/C. Yet, at Lakehurst's first all-gas meet in 1935, there must have been 40 to 50 entries. At last the engines were available; a must for R/C. I understand there was an R/C event at the 1937 Nats, so progress did come quickly.

My first encounter with R/C came at a pre-war Chicago Nats. I spent some time at the R/C site, but didn't see any flights. People like Desoto, Seigfreid, and the Good brothers were tinkering with what looked like monsterous technical equipment. Seigfreid's control system appeared most complex with several geared, clockwork-like mechanisms which must have been early forms of actuators. Ben Shereshaw's twin-boom pusher RCH-1 was downright "purty" and was the talk of the meet until a radio failure crashed it. Trophies were awarded after a static demonstration, making a rudder wiggle was the name of the game!

As with almost all modeling, the war brought R/C to a near halt just as it was getting started. The war developments, however, were probably the reason R/C took off quickly after its conclusion. Many young men learned the basis of

Popularity of vintage R/C designs is shown in this replica of Chet Lanzo's RC-1 by Tom McCoy.

Developed in the early 1950s, deBolt's Live Wire Cruiser was a highly successful avenue for early radio control enthusiasts. Radio was Citizen-ship single-channel; Bonner compound escapements, Bramco throttle; and Torp .19 Greenhead for power. Ship had rudder and engine controls.

electronics in the service. I was involved in the test-flying of what probably were some of the first really successful R/C models; for example, airplanes of about Piper Cub size that carried torpedoes to targets as much as 500 miles away. The R/C pilot rode in a separate plane.

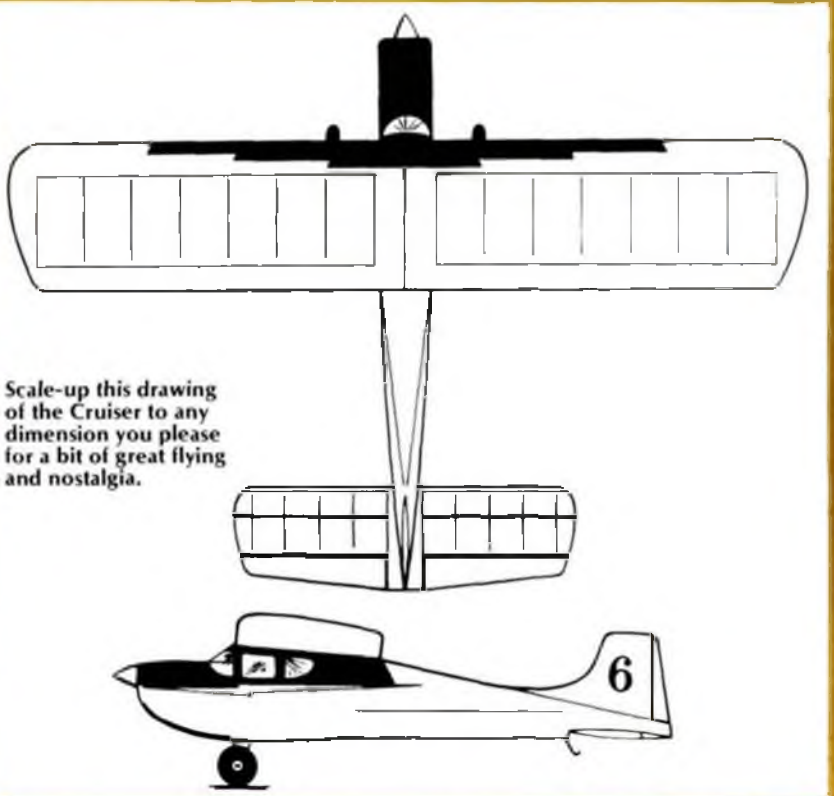
In another version, a fighter pilot "synched in" to an active drone which mimicked the fighter's flight. The controls in the fighter operated the drone's R/C. Things like this developed and proved the R/C system concepts. All the model fraternity had to do was to miniaturize them for model use. Later on, miniature duplicates became the reed systems and the Babock tone systems.

R/C did not come on strong until the FCC opened up the Citizen's Band on 27.255 MHz around 1952. There was a 6- or 7-year period when R/C remained with the ham operators. At the first post-war Nats I saw the Good brothers' winning flight. Unless you realized the meaning of a truly successful R/C flight, it wasn't very impressive. It amounted to a takeoff, a circling climb to high altitude, then some cruising, and lining up into the wind for a landing approach. The approach alone must have taken 10 minutes! Starting at what seemed like a mile high and a mile out, the big "Guff" just hung in the breeze like a glider, finally touching down in the site area. It was quite pretty to watch, but what was important to R/C was that it was a completely controlled flight at respectable distances. R/C was for real!

Most all R/C equipment was of the homemade variety until the middle of this time period. Desoto had the first company, Radio Control Headquarters, which supplied R/C products and later a radio. Berkeley Models entered the picture with what could be called the first mass-produced R/C system. This really gave R/C a shot in the arm, as it was available to all modelers and it was not difficult to run.

The Berkeley Aerotrol had a ground-based transmitter with a huge "dipole" antenna that had to be erected and kept oriented with the model during flight. Today's whip antennas came much later and hand-held transmitters were years away! The receiver had a minimum of components with only one tube, but lots of batteries were needed. The escapement actuator was rubber-band powered and probably the lightest and most reliable part of the whole system, but it also

(Continued on page 95)



Scale-up this drawing of the Cruiser to any dimension you please for a bit of great flying and nostalgia.

GIANT STEPS

by DICK PHILLIPS

AS MENTIONED in last month's column, I'll be talking about radio installations in large models. There's a good deal of material to cover, some of which may be old hat to experienced builders, but some of it may not. Hopefully, all will find something of value.

I'll discuss the actual physical installation of the radio equipment inside the larger model. There are many items that will be similar to the same installation in a smaller model and I'll skim such subjects lightly in order to concentrate on the differences between the two.

Let's take a look at the receiver installation first. It's the "heart" of the airborne radio system, of course, and it's a good idea to give it as much protection as you possibly can. Larger, gas-fueled engines usually have a noticeably greater vibration than glow engines and you'll need to isolate the receiver (and later, the servos) from that vibration.

The best way to do this is to wrap the receiver in foam. Doing so is not hard, but it's important to do it properly. We've all seen the newcomer arrive at the field with his new creation. He has usually heard the advice about wrapping a receiver in foam and he has done this. Most often, however, the inexperienced builder has used a light foam, and has wrapped his receiver tightly in it. The tighter the wrapping, the less protection is provided. The foam should have considerable resilience around the radio. If this is not the case, the protection you seek might not be there. One of my favorite ways to really protect a receiver is to take a couple of fairly large blocks of foam (larger than my receiver) and hollow them, making a space into which the receiver will fit. This can be held together by lightly wrapped rubber bands, or can actually be glued back together, forming a solid foam block, completely surrounding the receiver.

Sample antenna rig using servo hold-down as strain relief.

I normally size and shape these blocks to completely fill the area into which the receiver will be placed. The unconfined foam then provides both vibration isolation and crash protection for the receiver.

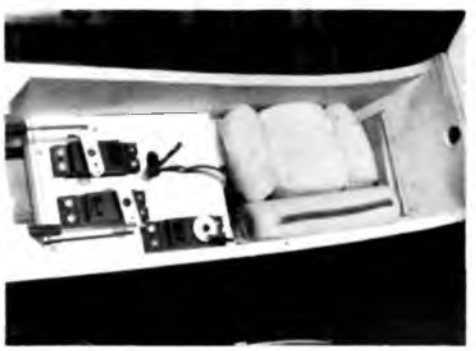
The antenna also needs some protection. There should be a strain relief inside the fuselage to protect the antenna from being pulled out of the receiver. This can be one of the small pieces of plastic often used to retain the servos in commercial trays, or can be a simple strip of plastic with the appropriate holes drilled in it. The antenna should also be protected from chaffing where it exits the fuselage. This is most easily done by using a small servo grommet wedged into a hole in the fuselage, or through the use of a short piece of inner nyrod, through which the antenna wire exits the fuselage. Due to the tuning effect of antenna length, *never* alter the length of an antenna.

Battery packs should be protected in a similar fashion. The battery cells within the pack are often either soldered, welded, or wired together, and vibration protection will prevent any of these connections from coming apart and effectively killing the power to the receiver and servos.

The nickel-cadmium cells used in batteries are themselves subject to damage from vibration, so protecting them from the "shakes" will add to their longevity. I prefer to make a foam tube, into which the battery is pushed. The fit should be snug enough so the battery won't slide out of the tube.

I then place the battery pack(s) within the model, if possible in an area where I can surround them with foam, which adds additional protection and holds them in place. This "package" of battery and receiver will fit well into a space where they help retain one another in position while still leaving them accessible for removal and service if necessary.

The mention of "packs" (plural) in the foregoing paragraph is intentional. I rarely fly anything anymore without using a redundant battery system and a pair of equal-sized battery packs. I've discussed redundant battery systems in the past so you regular readers will be aware of my thoughts on them. Suffice it to say that if you're flying a model into which you've poured significant time, loving care, and experience, the cost of adding a redundant system and an extra



Two battery packs and Rx in place. Spaces filled with foam, no room for movement.

Ace battery with redundant airborne system. Note protected batteries inside sleeve.

battery is small compared to the loss of the airplane.

Servos present quite a different problem. They must be out in the open, fairly solidly mounted, and they must be connected quite rigidly to a control surface. You don't want any lost motion (slop) to rob the controls of the movement you intend to give them.

Servos are also subject to harm from vibration and you must isolate them as much as possible. You can't go nearly as far here as with the receiver and battery packs, but you can provide some vibration isolation for the servos.

When the radio manufacturer provides a servo tray, it's usually designed to absorb and isolate vibration. So, if they are available, and can be used in your installation, do so. You'll be doing yourself a favor as they are very convenient. Don't discard the small rubber grommets that fit into the ends of the servos and that mount them to the servo tray or to your own mounting plate. These grommets are intended to assist in vibration isolation. They do permit slight movement to the servo, but this is acceptable so long as it doesn't degrade the movement provided to the control surface.

Murphy's Law says, "If something can go wrong, it will." Therefore, if you place a servo in any airplane where it can't be removed, you can count on that servo being the one which will require service. In large models, I often place a servo out in the wing, adjacent to the aileron. This is a good way to mount it, as it shortens the mechanical linkage between the servo and the aileron, cutting down on the possible slop in that linkage. There is a temptation to mount the servo and then cover the wing, leaving the servo inaccessible. Don't succumb to it. Make whatever arrangements are necessary to permit easy removal for servicing. If you do, that servo probably won't ever need any service! There's nothing wrong with that, naturally, but if it does require some corrective action, at least you'll be able to get to it with a minimum of trouble.

Receiver padded inside two foam blocks.

Homemade, slide-in servo trays, which run between a pair of rails, are one good way of doing this. The rails may be padded with sticky-backed foam stripping which will add even more to the shock- and vibration-absorbing qualities of such a mounting method. Take care to use a reasonably firm rubber here as you don't want to provide for lost motion due to using a soft foam. Try to visualize the forces that will operate on the system in flight and govern your construction tactics accordingly. As you gain experience, you'll realize what is required.

Slide-in trays are held in place when the servo access cover is replaced, but the servo is always readily available if a problem develops. Material for such trays can be any light plywood, especially if there is some flex to it (which aids in absorbing the vibration). Here again, don't neglect the use of the rubber grommets in fastening the servos to the mount.

Next month I'll take a look at the other end of the radio installation: control surface mounting, hinging, and related topics. See you then!

Dick Phillips, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

FLOATING AROUND

by JOHN SULLIVAN

Sunday morning at the lake. A winding, five-mile drive past vineyards, old barns, and orchards. The road descends and joins with tributaries under a canopy of green that breaks open at the water's edge. Excitement builds. A couple of cars are there already; more are coming.

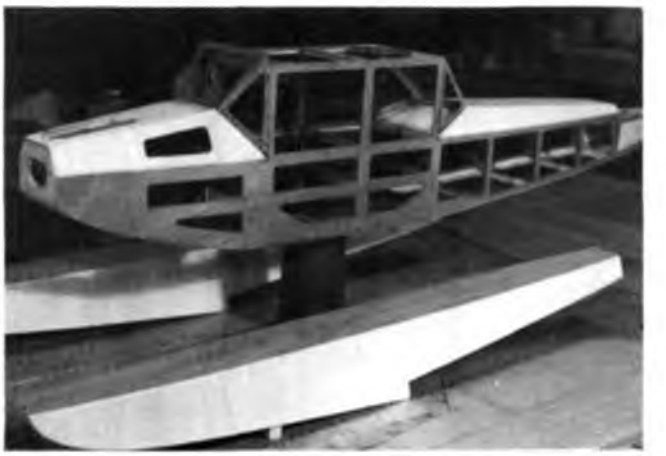
Unload the boat. Drop the oars in the locks and carry it down to the shore. Get out the planes. Mess with screw drivers and turnbuckles and aileron leads. Pour a cup of coffee from a thermos. Look out over the lake. Relish every minute. Let somebody else get going first.

A Saito four-stroke chuffs a couple times and breaks into a steady idle. The

On author's current project, top deck of floats pinned down and bulkheads secured. Note hollow balsa nose.

Almost finished. Side planking must be added and sanded fair.

Block-up fuselage and floats for accurate alignment.



yellow Taylorcraft is set in the water and pointed out through a break in the weeds. Try the controls once more. A nod from the pilot and she's away, spreading a rolling wake behind her, idling out to the buoys a couple hundred feet downwind.

The takeoff run. A little adrenalin. Quarter-throttle, a little rudder work, line it up. Half-throttle, the floats surge up in the water—the nose is high—hasn't found its wings yet. Three-quarters throttle and the Taylorcraft is on rails. The wing and the tailfeathers take over. Only the step is in the water, pounding the ripples to smithereens. Full-throttle, plenty of time to think about up elevator. Just barely lean on it, and she's off!

What a sight! How many times does the dream invade reality so that you put down the transmitter and watch the plane fly off? Where would it go? Point Arena? Coos Bay? The Willamette River? But reason prevails, and you turn it around and bring it back.

THIS MONTH'S photos are shots of my current building project. It's a ¼-scale model of a cross between a Cessna Bird Dog and a Corben Super Ace, with a Northrop Freedom Fighter tail group thrown in for good measure. The model has a Clark-Y airfoil, relatively long moments, and ample surfaces. With a projected 22-ounce wing loading for my O.S. .61 four-stroke, it should be a real Sunday flyer and possess scale-like aerobatic capabilities.

One of the new things I've tried here is the extensive use of ⅛-inch mahogany door skin plywood in the floats and fuselage. The stuff is cheap; a 4x8-foot sheet costs $8.50 plus tax, and it has nearly the stiffness of aircraft-grade birch while weighing only 20% more than poplar. The extra weight bothered me as much as the prospect of tediously cutting all those lightening holes with a scroll saw. I dislike loosening thumb screws and resetting foot pressure after about the tenth hole, so I went out and bought a two-flute carbide straight veining bit for my router. Wonder of wonders. Push the ply gently but with firm control over the spinning bit until it pops through. Run the piece over to the nearest guideline and route out the center scrap. It was possible to cut every lightening hole you see in 1½ hours, including the float bulkheads.

A note of caution is advisable here. This method can save a lot of time, but it's necessary to have a lot of respect for that bit spinning at 22,000 rpm. *Please be careful!*

Last time, I mentioned I would be discussing float design, and this model is a good place to start. One of the first concerns a modeler faces (if he doesn't have a scale subject or reference) is the size of the floats compared to the plane and its weight. It's difficult for one set of numbers such as I published with the Clear Lake float-fly report (see September 1985 *M.A.N.*, p. 44) to be all things to all models. A model with a 7-foot wingspan can easily weigh as little as 10 pounds or as much as 20, but the Clear Lake numbers do an adequate job.

The fuselage length on this model is 57 inches. Using the Clear Lake numbers, I came up with a float 46 inches long with a 4½-inch high by 5½-inch wide section at the step. The floats were built first, and looked huge until they were matched up with the fuselage. The components are ⅛-inch mahogany ply deck, bulkheads, and forward step, with balsa nose and stern blocks along with 3/32-inch balsa sheeting on the sides and aft of the step. I added ¼x1¼x6-inch redwood strongbacks at the strut points and I will glass the balsa sheeting with 2-ounce cloth. This is a robust design, but one that will last the lifetime of the airframe and be well worth the effort.

A few notes should be added here. If you use the Clear Lake numbers, you'll find that the volumetric efficiency, or flotation, rises faster than the weights generally associated with larger models. I chose to leave the numbers alone and take the extra flotation. If you choose to scratch-build, you'll learn that much of the larger float's bulk can be concealed with carefully faired lines and an ample slope on the float sides. Playing around with the lines is an education in itself. It makes you appreciative of the genius of a man like Nat Heraschoff who designed the first America's Cup racers with their long, elegant shear lines and graceful tumblehome sterns.

The second set of photos are of an old *Model Airplane News* design by Don Carkhuff called the Arrow Sport (plan #340, plans $8, exploded view $3.50, both $9.50).

The plane is being converted to floats by George Graff of St. Helena, California. George is a recent convert to float flying, and has built and flown models since he was a kid. He had flown the Arrow for 7 years, rebuilt it after four crashes, and basically retired the airplane intact about a year ago.

Then George was bitten by the float bug. His first project was a successful Buzzard Bombshell conversion, and since nobody can stand to have just one

FLOATING AROUND

float plane, he began to look around his basement for another candidate. Enter the Arrow Sport. The point here is that with the addition of floats, an old but proven plane can still put a gleam in your eye.

Arrow Sport's floats completed. Note plywood insert.

Close-up of strut blocks, spreader bars yet to be added.

George's floats are 38½ inches long with a 4x5⅛-inch wide section at the step. He designed the floats a little wider to carry the airframe weight which had grown to 5¼ pounds after seven years of fuel soaking and repairs. The floats have a light ply deck but the balance of the construction was done with 3/32-inch and ⅛-inch balsa to offset the extra weight he had in the airframe. Ready to cover, and including the ⅛-inch wire gear, the floats weighed 2½ pounds. When you consider that you're taking off a set of landing gear that weigh over 1 pound, you can see that the weight increase isn't that bad. Ready to fly, the plane should have a 24-ounce wing loading with a K&B .60 for power.

Next time I'll publish some photos of George's completed plane, along with shots of some other float projects. Cast off the lines, I'm taking off!

John Sullivan, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

Construction

Der Jaeger has become a classic in biplanes, and this great model is no exception.

DER JAEGER

by FLOYD MANLY

WELL, *Model Airplane News* has to take direct credit for this design. In the November 1984 issue they ran a page titled "Planes Worth Modeling," with four-views of the Der Jaeger that just begged to be built. Because I am a bipe nut and I had recently seen a ¼-scale Der Jaeger that I liked, I was hooked!

The four-views were helpful in laying out my plans and I came up with a wingspan of 48 inches, or approximately ⅛-scale. I figured that a Fox* .40 I had on hand would fill the power requirements.

Before I get into the building sequence, there are a few construction features I'd like to talk about. I built up the cowl by carving a piece of white foam to shape, then painting it with a water-based Latex before applying the glass and resin. I then hogged out the foam and washed the cowl with gasoline—outside in the open air, of course!

The motor mount/tank box is designed to allow adjustment of over ½ inch to fit your favorite engine. A Semco Pitts Jr. muffler fits nicely.

I used aileron servos in each wing because it is the easiest way of having four ailerons operating in sync. This also assures that the ailerons are in positive alignment with their respective wings during every pre-flight. Having an extra servo as a backup doesn't hurt either.

The wings are almost industry-standard D-tube construction; extreme rigidity at a minimum cost in weight. Rib spacing is scale and their shape is fully symmetrical like a Skybolt or a Pitts. Wire landing gear is shown because I couldn't find a suitable bent aluminum one. The fairings are easy to build for scale points, but can be left off for

Type: Sport Scale
Wingspan: 48 inches
Wing Area: 707 square inches
Engine: .40 to .50 two-cycle
.46 to .61 four-cycle
Channels: 4

Manly's Der Jaeger exhibits good building techniques for an excellent flying model.

FULL-SIZE PLANS AVAILABLE...PAGES 116, 117

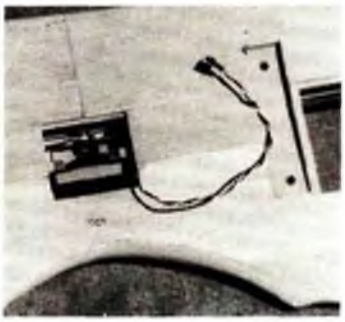
sport flying. The peculiar cabane attachment results in perfectly aligned wings at all times. All interplane struts are cosmetic only and the Der Jaeger will fly without them, but a bipe doesn't look right without all that garbage hanging out. Anyway, I wanted a plane that was *quick*, not necessarily fast.

Back at the tail I added flying wires—again, just for cosmetic reasons—by punching holes in the surfaces and stringing heavy black thread. Cyanoacrylate glue holds them in place and stiffens the wires.

CONSTRUCTION. Protect your plans with waxed paper. I used cyanoacrylate throughout, except as noted on the plans.

Build two identical fuselage sides including the tail post and wing saddles. Cut the ¼-inch ply firewall from the plans pattern. Before cutting the motor mount/tank box, attach the motor to the mount, then measure exactly from the back of the mount to the back of the spinner you intend to use. This measurement will determine how long the tank box needs to be. Trial-fit the box into the hole in the firewall; you'll want a snug fit.

Nose cowling block is built-up. Note dummy engine.



Aileron servo is mounted in top wing.

I put her through the paces and she high-stepped all the way.

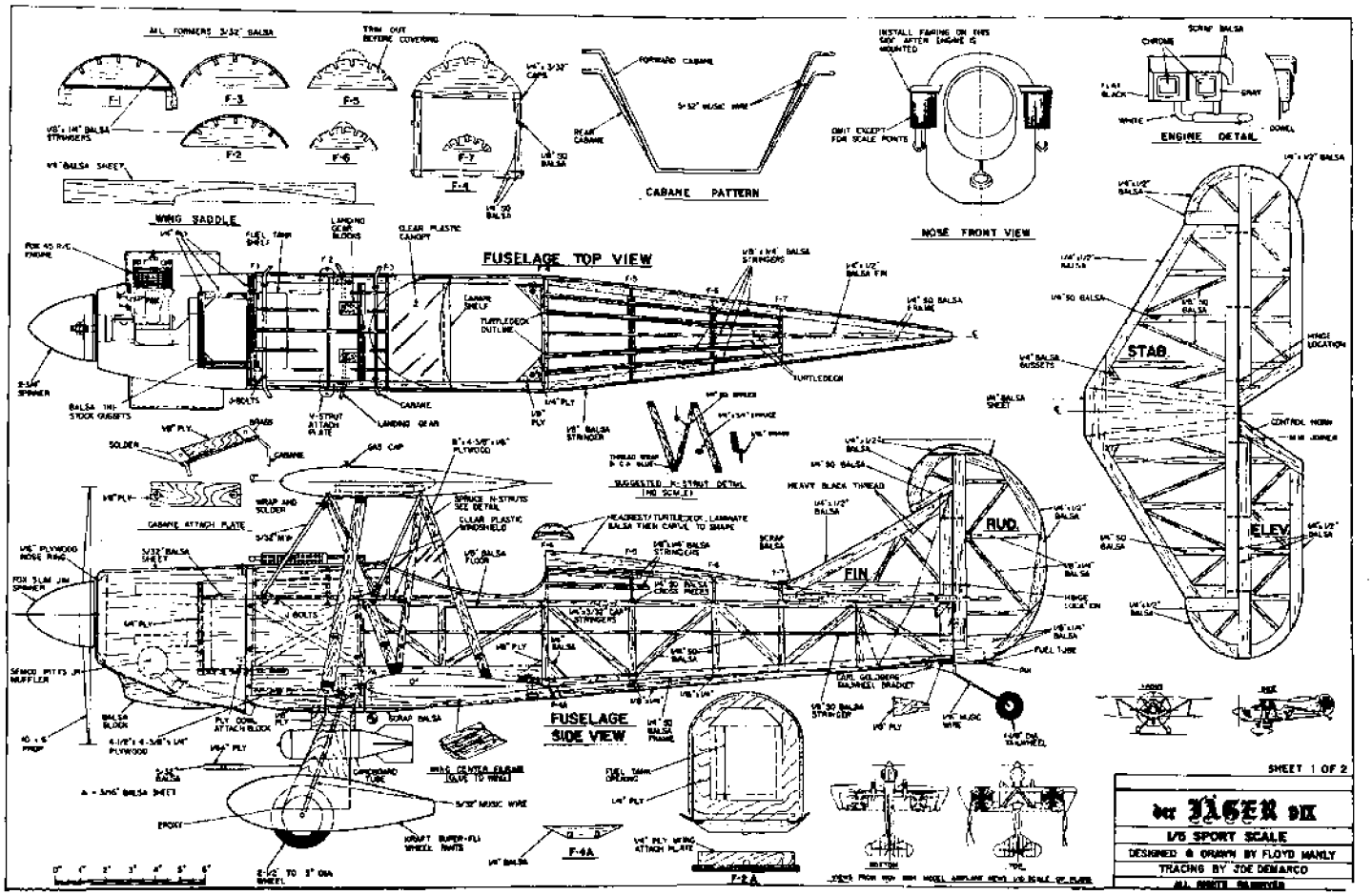
Glue the 3/16-inch balsa sides to their frames, one left and one right, of course. Then pin or weigh down the fuselage, inverted, over the edge of your bench so the firewall is butted against the bench. Check for alignment and attach the firewall to the sides with thick glue. Add the gussets.

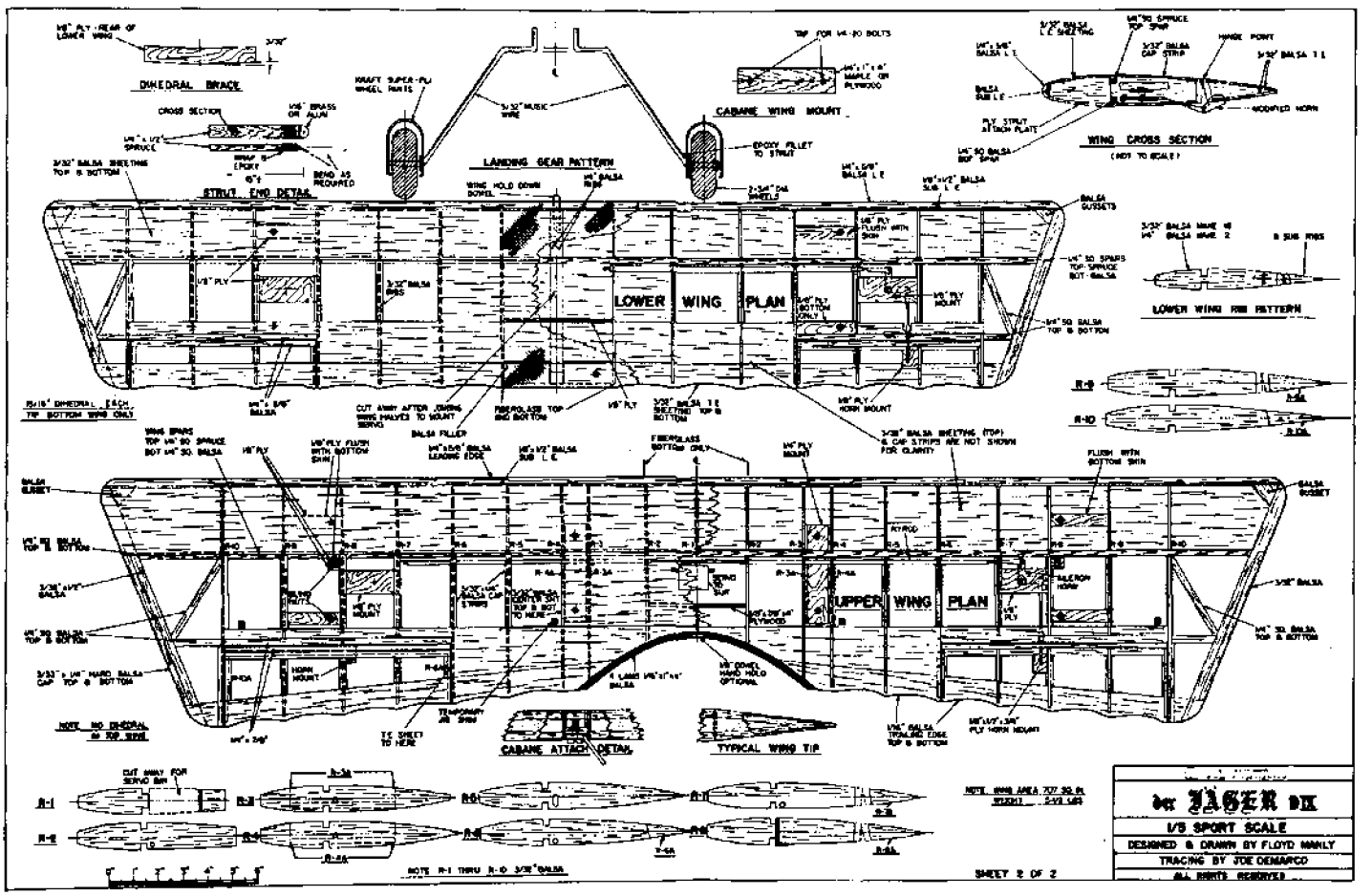
Cut the cabane plate, slip it under the inverted fuselage, and glue it to the firewall and fuselage side stringers. Leave the landing gear plate off for now. *(Continued on page 98)*

Distinct and unique wheelpants and skirts.

Cabane setup on Der Jaeger is simple and strong.

Aileron hookup requires no-slop linkage.


FUSELAGE TOP VIEW
FUSELAGE SIDE VIEW
CABANE PATTERN
ENGINE DETAIL
NOSE FRONT VIEW
WING SADDLE
STAB.
ELEV.
RUD.
FIN
SHEET 1 OF 2
der JÄGER DX
1/5 SPORT SCALE
DESIGNED & DRAWN BY FLOYD MANLY
TRACING BY JOE DEMARCO


DIHEDRAL BRACE
CABANE WING MOUNT
WING CROSS SECTION
LANDING GEAR PATTERN
STRUT END DETAIL
LOWER WING PLAN
UPPER WING PLAN
LOWER WING RIB PATTERN
CABANE ATTACH DETAIL
TYPICAL WING TIP
SHEET 2 OF 2
der JÄGER DX
1/5 SPORT SCALE
DESIGNED & DRAWN BY FLOYD MANLY
TRACING BY JOE DEMARCO

ABOUT THOSE ENGINES

by JOE WAGNER

PRACTICALLY ALL the mail I've received so far in response to this column has been about old-time engines. This puzzled me for a while, because obviously there are many more of the recently-made engines in existence and in use than of the early types. However, a bit of thought has given me what I'm sure is the answer. Old-time motors have much more "personality" than the newer ones.

That isn't really surprising. It holds true of other things as well: modern aircraft are thought of as "Spam Cans," but everybody loves Piper Cubs and biplanes; an antique car such as a Model T Ford or a boat-tail Auburn will draw a crowd of people who wouldn't look twice at a brand-new Plymouth or Chevy. What's the reason? It can't be the age factor alone, or even the unusual appearance. Rarity seems to make little difference either.

My idea is that the attraction of the old machinery comes largely from its having been designed and made by *individuals*, rather than soul-less corporations. The Bunch engines, for example (Gwin Aero, Mighty Midget, Tiger Aero, Speedway) all bear the unmistakable touch of Danner Bunch's personal creativity. The Brown motors show Bill Brown's genius for design. Even engines produced in large quantities, as the various Ohlssons were, can still somehow convey the individuality of the man behind their creation—Irwin Ohlsson.

On the other hand, motors such as the Wensen .36 (a postwar copy of the Baby Cyclone), the Pierce .29 (a Forster imitation), or the Cameron .23 (similar to the Ohlsson) don't seem to arouse much enthusiasm among any but avid engine collectors. They're rare, they performed all right, but they simply don't have that magic aura. Copies seldom do, I suppose.

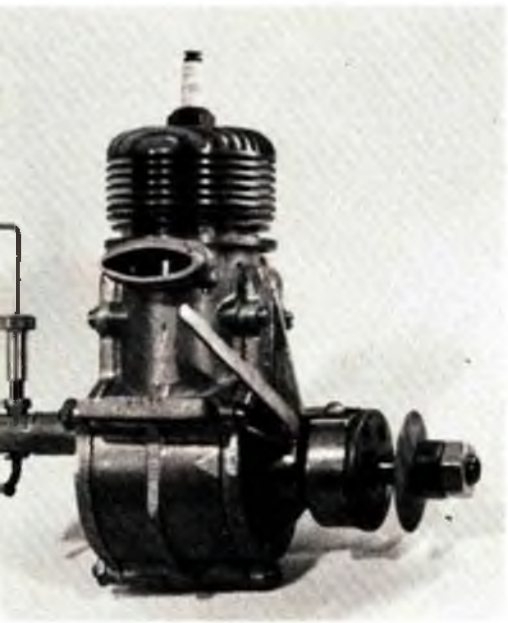
A lot of the individuality that shows in the multitude of older model engine designs stems from the fact that up until, say, 25 years ago, a man could go into the model engine business with little more than a garage workshop. The famous Orwick line of motors, for instance, started out in a home shop. Henry Orwick even had to bake the green paint on his crankcases in his wife's kitchen oven. Later on, of course, he got financial backing enough to expand his facilities. But the engines that made him renowned were originally produced with incredibly limited machinery.

Or take the Elfs. For years their designer-manufacturer, Dan Calkins, built his celebrated motors—singles, twins, fours, and even six-cylinder models—in a small workshop with just a lathe or two, a couple of drill presses, and a honing machine.

These elementary facilities forced engine designers to use a lot of ingenuity. They made up in cleverness for what they lacked in equipment. Of course, not everything worked out. Some promising model motors, such as the 1938 Willard .19 (the first rear-rotary-valve model engine) died a quick death because of casting quality problems. In the 1930s, aluminum casting techniques were still in their infancy, and model engine makers who used castings had to depend utterly upon the capabilities of the foundries to whom they subcontracted their casting work. Other than that, the success of a model engine design seemed to hang upon the skills and intelligence of its originator. He was nearly always the man responsible for most of the manufacturing, too. He didn't just sit in his

A Veco "31" circa 1953, this version made while columnist Wagner was Veco chief engineer.

1946 Ohlsson 23, one of the truly classic model motors.



The Fleetwind .60 from 1946. This one modified to use an Arden .19 needle valve.

office issuing memos or reading quality control reports. He was on the shop floor, running a lathe, or trimming flash from castings, or fitting cylinders to pistons. Or he could have been out at the flying field, test-flying his product to see how it held up in service.

As important as anything else in explaining the distinct "personalities" of old-time engines is the fact that the men who built them were true model builders and fliers. They were creative people rather than businessmen. They were in the model engine game not so much to make money (although they certainly hoped to) as to express their creativity in tangible form.

That brings up a topic that's puzzled many collectors of old model motors. Why do so many non-standard versions of old engines turn up? For example, some years ago three model engine collectors got together with me to compare some R-B Specials. This was an engine designed and built by R.B. Steele (formerly with Cannon Motors). It was made in Ohio from 1946 to 1950. A powerful and highly-competitive motor for its time, it wasn't quite a match for the West Coast's McCoy .29 or the K&B Torpedo. Anyway, at the meeting I mentioned, the four of us had six specimens of the R-B Special. We wanted to see if any of them were the little-known R-B-C model—that is, .36 cubic inch displacement instead of the R-B's normal .29.

We were thunderstruck to find that no two of the engines had the same displacement! They looked alike externally, but when we miked their bores and strokes we discovered that they ranged from .275 cubic inch to .393. We rechecked our figures, came up with the same answers, and then were forced to the only possible conclusion: these motors were hand-fitted, and could have any displacement the maker felt like producing. Maybe some of them were purposely built oversize, to give an extra "edge" in competition. But there was absolutely nothing to stop R.B. Steele, or any other engine manufacturer, from changing any part of any motor, in any way he wanted to. They were his own design, products of his own company, and he could do just as he liked with them.

Later on, other oddball motors turned up. I had a Bunch Mighty Midget with a displacement close to .60 instead of the usual .45. A comparison of six Madewell "Mites" built between 1939 and 1941 showed that no two were alike. Even postwar engines can vary—hardly any of the Johnson glow engines measure up to their advertised displacement, and a Veco .29 TCC could be anything from a .27 to a .33. It was very easy to make an oversize piston, hone out a stock cylinder to fit it, and come up with a "miracle motor" for a factory flier or a favorite customer. I know that we did this routinely at Veco in the early 1950s and that Duro-Matic (makers of the McCoy engine line) did the same. I'm pretty sure

(Continued on page 107)

WATTS UP?

by BOB SLIFF

DO YOU like to have fun? Were you in Hatfield, Pennsylvania, on September 21 and 22? If not, you and I both missed a great event. Fortunately, Ken Stinson, manager of the Keystone R/C Club Electric Fly was kind enough to tell me about it. Keep in mind that this is really the premier electric get-together on a par with the annual Astro Flite Championships here on the West Coast. Here's Ken's report:

"The weather this year was no less than perfect on both days. Temperatures were in the mid-70s with mild humidity. There was little or no wind, which boded well for the thermaling gliders. Hawks frequently visited, pointing out the thermals with their natural soaring equipment. They even seemed to welcome the MonoKoted chargers into their thermals.

"This year the site was again well outfitted. Featured were eight field charging units consisting of 12-volt car batteries kept at peak with 110-volt power supplies. In addition, full conveniences were offered in the form of sun canopies and a refreshment/consession stand.

"Attendance was very good, with 60 contestants from 23 states and Canada. Fifty-four registered on Saturday and 35 of these came back on Sunday. Six new faces showed on Sunday, bringing the total up to 41. We estimated that we had over 100 spectators each day, some from as far away as Florida—one gentleman returned again this year from Texas, just to watch!

Charles Sylvia's Cobalt 25 powered Tigermoth spanned 47 inches, weighed 86 ounces.

"The format for the 'Fly' was very leisurely and informal. There were no rounds and no pressure, just charge and fly. Clean, quiet fun was the menu for the weekend. KRC members were busy, though, judging the best looking airplane, most aerobatic airplane, and longest flight time. The key here is that all of the judging went on without the pilots being aware of it.

"This year's event really proved that electric has come into its own. Every type of model could be seen: Old Timers, Gliders, Scale, and Pattern. The nearest official count was 121 aircraft for the weekend. In size they varied from an 11-ounce, 160-square inch, 29-inch wingspan to an Open class 112-ounce glider with a 110-inch span and a 1,750-square inch wing area. All in all, many of the models were gliders, probably owing to their building ease and electric conversion. There were also a good number of Old Timers, scale models, and aerobatic/pattern planes.

"Here is a representative listing of types and designs: Gliders—Olympic 650, Sagitta, Wander 72, Astro Challenger, Electra Glide II, Gentle Lady, and Paragon. Old Timers—Buzzard Bombshell, Playboy, and Viking. Scale—Astro Porterfield, Citabria, Piper Cub, OMAC I, Supermarine Spitfire, B-24 Liberator, and DeHavilland Comet. Aerobatics—Wasp, Lightning, Hummingbird, Warlock 05, and Vindicator. Sport—LeCrate, Spectra, Schoolboy, Sky Knight, and Etude. I know there were others, but this should give you an idea of the spread. All of the models present were very high quality, and all of them flew well—there wasn't a marginal flyer on the field.

"If there was one individual flier who stood out, it was Keith Shaw. He brought four remarkable planes, a flying wing he calls the Banshee, a pattern plane called the Coulumbia (after the coulomb, the name for the quantity of electricity produced by one ampere in one second), a Supermarine Spitfire MKIA and, as the *piece de resistance*, a beautiful, all black

Bob and Robbie Rumsey flew scratch-built Citabria with geared Astro 05.

deHavilland Comet.

"Each of these planes flew extremely well. The Comet performed high-speed passes and 4-point rolls. It even caught and rode thermal lift along with the local hawk brigade. It did all of this at 7½ pounds while powered by two Keller 25/12s (it's a twin, you know) on twenty-four 1.2-Ah cells. It spanned 88 inches and even sported retracts. It was a crowd-quieting experience. The Spitfire, at 5½ pounds, performed flawlessly. It used a Geared Astro 40 Cobalt on eighteen 1.2-Ah cells and retracts. The Banshee flying wing (named from the crying howl it makes on a high-speed pass) made runs at over 100 mph, and it looked like something out of a high-tech James Bond thriller. His Coulumbia was impressively smooth and responsive.

"One other highlight was Woody Blan-

(Continued on page 108)

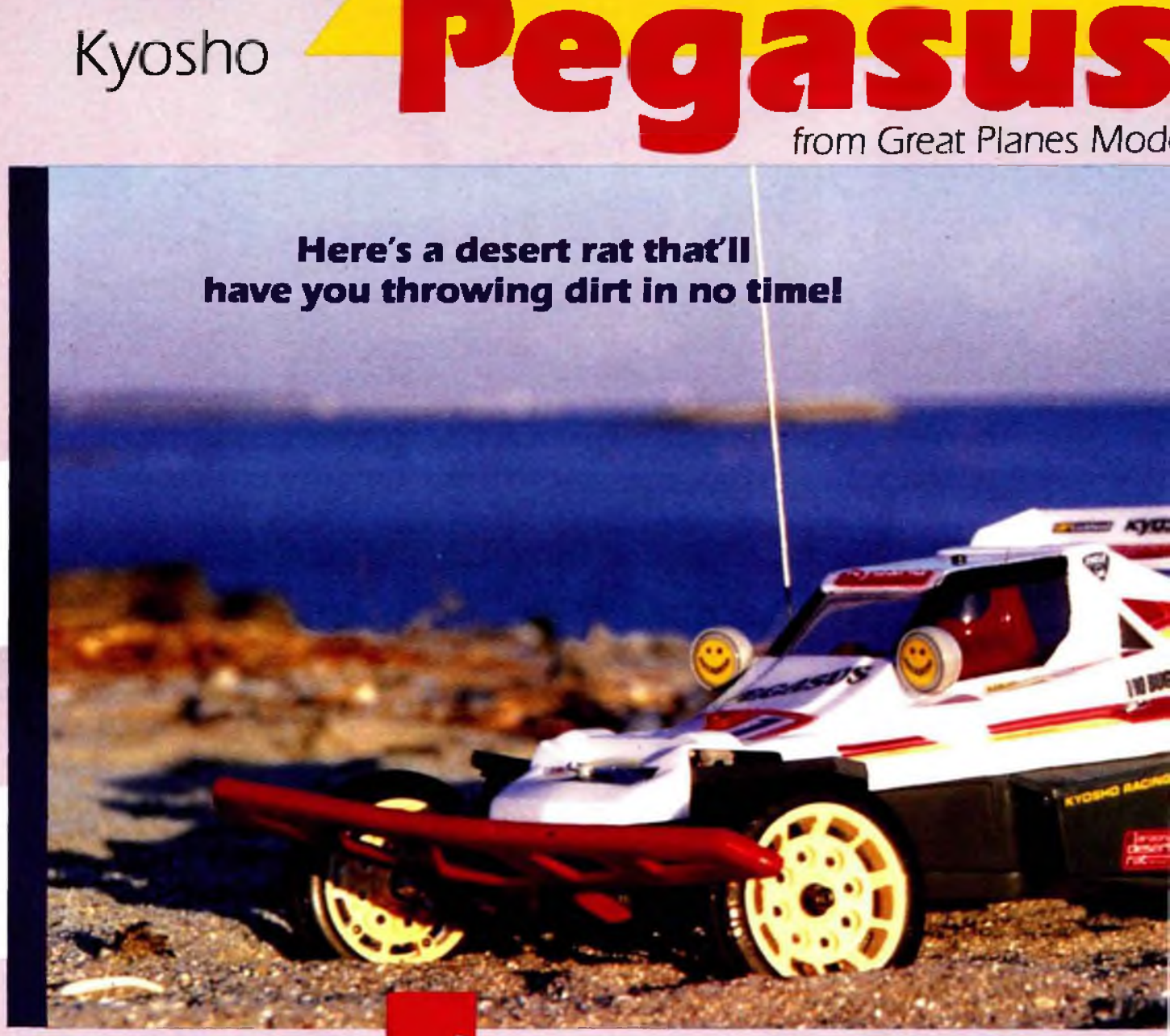
Bill Kubiak with his original Timothy Two, 66-inch wingspan and weight of 38 ounces.

Road & Bench Review

Kyosho Pegasus

from Great Planes Mod

Here's a desert rat that'll have you throwing dirt in no time!



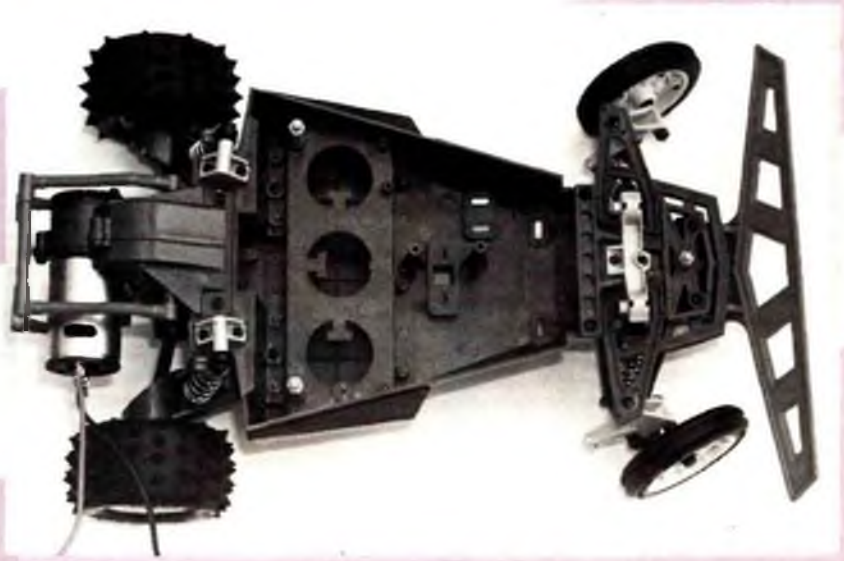
by STEVE POND

WHEN YOU begin your search for your first R/C car, a name you will come across quite often is Kyosho. Kyosho, through Great Planes Model Distributors*, offers a wide variety of R/C cars and accessories. One of the latest items from Kyosho's line of goodies is the Pegasus. It's an all new 1/10-scale off-road racer that has been designed for easy, trouble-free construction and performance, which makes this a very suitable kit for the beginner.

THE KIT. This kit includes all necessary parts and accessories for assembly, with the exception of the radio and a battery. The chassis is made of strong ABS high-impact plastic and has a Lexan body which fits tightly over it. The Pegasus gets its power from a strong Mabuchi 540S motor that is included in the kit. The car also features double-wishbone front suspension, swing-arm rear suspension, friction-type shock absorbers, true gear-type differential, pneumatic rubber tires, and lightweight ABS three-piece racing wheels.

Distributors

photos by LOUIS V. DeFRANCESCO, JR.



Top: The Kyosho Pegasus doing what it does best, throwing dirt! Middle: High-impact ABS plastic chassis provided plenty of durability. Bottom: Radio transmission was supplied by Astro II radio.

Tools included with the kit are a 1.5-mm hex key and some grease. You will have to supply a Phillips-head screw driver, 5- and 7-mm nut drivers or socket wrenches, scissors, an awl or 3- and 4-mm drills, a wire cutter, an X-Acto knife, and a good cyanocrylate glue. All of the fasteners in this kit are measured metrically so if you have any trouble identifying them, the illustrations on the left side of the page are actual size.

CONSTRUCTION. The first step in construction is to assemble the gear box or differential. I can't stress enough how important it is to use a good amount of grease on the differential because most of the parts are made of plastic. If you run out of the grease supplied with the kit, which you most likely will, petroleum jelley is a perfect substitute. The assembly is well illustrated in the instruction manual and should pose no problems.

The next step is to connect the rear frame or rear bumper to the differential, which protects the motor and differential from rear-end collisions. Then this assembly is bolted to the chassis box. Put the chassis aside for now and proceed to the assembly of the shock absorbers.

(Continued on page 100)

Engine Review

O.S. FS-20 FOUR-CYCLE

by PETER CHINN

SPECIFICATIONS

Type: Single-cylinder glowplug-ignition four-stroke-cycle with pushrod operated overhead valves. Twin ball-bearing crankshaft. Throttle type carburetor with choke control.
Checked Weight: 263 grams (9.28 oz) including choke valve assembly
Displacement: 3.563cc (0.2174 cu in.)
Bore: 18.0 mm (0.7087 in.)
Stroke: 14.0 mm (0.5512 in.)
Stroke/Bore Ratio: 0.778:1
Nominal Compression Ratio: 7.2:1
Performance Data—as tested:
Power Output, gross: 0.31 bhp at 12,500 rpm
Torque, gross: 28 oz-in. at 9,000 rpm
Equivalent b.m.e.p.: 101 lb/sq in.
Specific Output, gross: 1.43 bhp/cu in.
Power/Weight Ratio: 0.54 bhp/lb
Manufacturer: O.S. Engines Mfg. Co. Ltd., Osaka 546, Japan.
U.S. Distributor: Great Planes Model Distributors Company, P.O. Box 4021, Champaign, IL 61820.

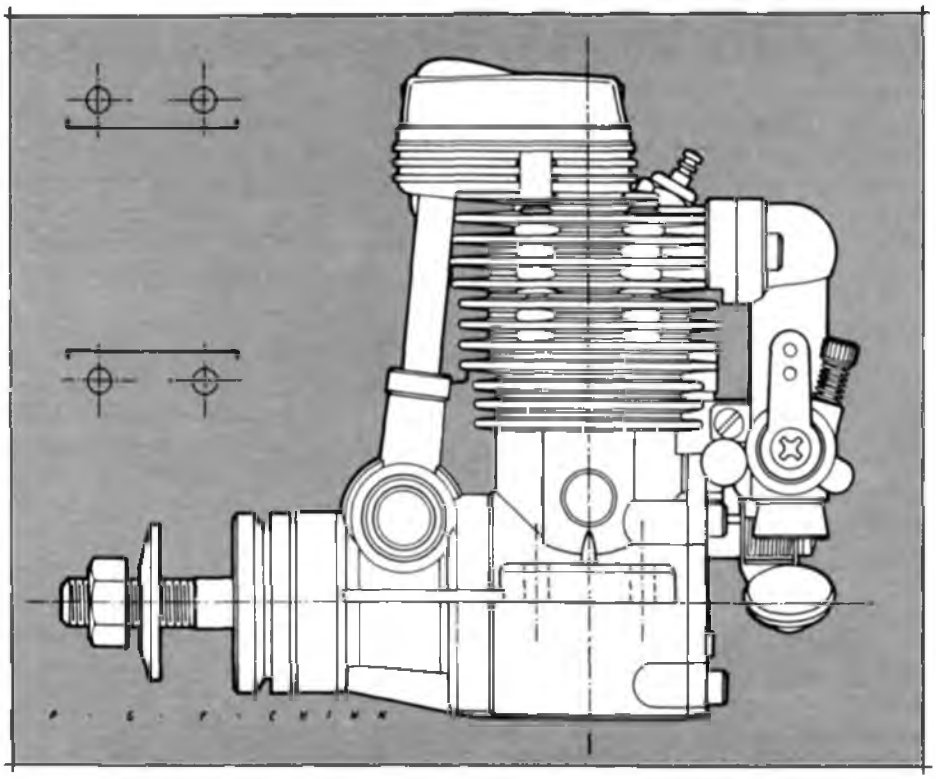
New O.S. FS-20 is the world's lightest (9.3 oz) and most compact production four-cycle engine.

DESPITE the undoubted attractions of giant-scale models and the big engines needed to power them, few modelers remain unmoved at the sight of an unexpectedly *small* engine.

Historically, the most memorable demonstration of the fascination that small engines hold was the overwhelming success of sub-miniature glowplug motors in the late 1940s and early '50s. When John Brodbeck took time out from building K&B Torpedo .29s to introduce the tiny "Infant Torpedo" .020, at the end of 1948, K&B was, in his own words, "made." Within a week of the engine's announcement, orders were received that oversubscribed the factory's initial 10,000-unit production run twenty-five times and, in less than a year, K&B distributorships had more than quadrupled. As other manufacturers followed with their own baby engines, sales of such motors rapidly overtook those of all other sizes combined and a new official contest class called "Half-A" was established.

All this, of course, took place long before radio-control (then in its infancy) had begun to create a new and accelerating demand for medium and large sized motors culminating, thirty years later, in today's vast selection of engines of all sizes and types—now including four-strokes as well as two-strokes—with displacements

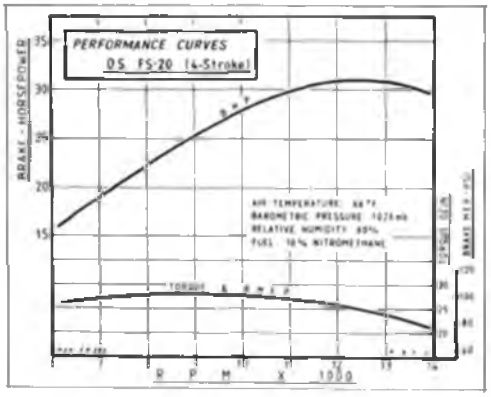
FS-20 has excellent power output for its size. Button in front of throttle arm is for operating choke valve.



up to sixty times those of the Half-A class midgets.

Understandably, in view of their greater complexity and extra cost, most four-strokes have been in the medium, large and very large displacement sizes. People have become used to seeing .60, .90 and 1.20 size four-strokes, and .40 four-strokes have been regarded as the "small" end of the market.

Not surprisingly, therefore, when it became known that the pioneer Japanese four-stroke manufacturer, O.S. Engines, would be introducing a four-stroke motor only half the size of their previous smallest model, a great deal of interest was aroused worldwide. Model builders badgered hobby shops for news, the shops harried their distributors for early deliveries and the distributors and importers pleaded with the factory. Model designers began drawing up new aircraft before they had even seen the engine and one enterprising British magazine (*Radio Modeller*) contrived to publish plans for two models, a sportster and an aerobatic job, exactly in time to coincide with the first appearance of FS-20s on dealers' shelves.



So, what's the score on the FS-20? First, let us set the record straight by saying that, so far as actual piston displacement is concerned, the O.S. is not the first "20" size four-stroke to reach the market. Three years ago, the Austrian Hirtenberger company introduced their first four-stroke engine in the shape of the HP VT-21 rotary-valve motor and this, too, was greeted with great interest, though perhaps not with the widespread curiosity aroused by the FS-20. It seems that the mere fact that the FS-20 is, to all outward appearances, at least, a scaled-down version of the FS-40, complete with the traditional four-stroke engine's poppet-valves, rockers and camshaft, is an added attraction. The FS-20 also looks smaller than the VT-21 although, in truth, its overall length and height are much the same. Its low stroke/bore ratio, however, means a narrower crankcase and an appreciably reduced bearer spacing and it is also nearly 20 percent lighter than the Austrian engine.

The FS-20's design, as we have already hinted, is quite closely related to that of the FS-40. Let's have a closer look.

MAIN CASTING. As with the FS-40, this includes the crankcase, full-length finned cylinder block, main bearing housing and camshaft housing in a single high-quality aluminum alloy pressure casting.

CRANKSHAFT & BEARINGS. An extremely robust component for a four-stroke engine of this displacement, the one-piece crankshaft has the same journal diameters as those of the FS-40, i.e., 12 mm main and 8 mm outer. As on other O.S. cross-camshaft engines, instead of having a separate spiral gear on the crankshaft to drive the camshaft gear, the helical teeth are actually formed in the shaft itself, just ahead of the main journal. The crankweb carries a 5 mm o.d. crankpin and the web flanks are cut away each side of the pin for counterbalancing.

The shaft runs in a 12x24 mm 10-ball steel-caged ball journal bearing at the rear and an 8x19 mm 7-ball steel caged shielded bearing at the front. The shaft terminates in a standard ¼-28 UNF thread for the prop nut and carries a machined aluminum alloy prop driver keyed to a flat on the shaft.

Construction is to usual high O.S. standards. Main casting, backplate, carburetor, and choke valve parts shown.

O.S. FS-20 FOUR-CYCLE

Cylinder-head with integral rocker-box base, rockers, rocker-cover, Type F plug, head gasket, valve parts, and exhaust pipe.

Sturdy crankshaft and conrod with camshaft, pushrods and covers, cam followers, camshaft end-thrust balls, cylinder liner, piston, wristpin.

Close-up of combustion chamber side of head showing FS-20's significantly larger valves and valve throats, and offset glowplug location.

CAMSHAFT & BEARINGS. The only concession made to the FS-20's small size is its use of porous bronze bushes to support the camshaft instead of the ball-journal camshaft bearings employed by all other O.S. four-strokes. Bronze bearings are, of course, perfectly adequate for this purpose—most other makes, in fact, use them for much larger and more expensive engines. When used with spiral gearing, however, caged ball journal bearings have the advantage of being able to act as thrust bearings as well in order to accommodate the end thrust imposed by this type of gearing. Therefore, to provide for such thrust and maintain gear alignment, the FS-20's camshaft is fitted with a floating 3 mm dia. hardened steel ball at each end.

As in the other O.S. cross-camshaft engines, the FS-20's camshaft has its inlet and exhaust cams disposed either side of the spiral toothed timing wheel. The cams, enjoying the benefit of continued O.S. research since the FS-40 was conceived, feature different inlet and exhaust profiles. Both cams are of the round flank type but the inlet cam has a larger nose radius and higher lift (1.8 mm instead of 1.5 mm) than the exhaust valve. The effect of this is to open the inlet valve more rapidly and to hold it open wider for a longer period, thereby allowing a heavier weight of fuel/air mixture to enter the cylinder for greater power.

CYLINDER LINER & PISTON ASSEMBLY. Instead of being produced from a permanent mold casting, the FS-20 piston is machined from bar stock. It has a short (14 mm) skirt length which is cut away front and rear and is equipped with a single conventional compression ring. The cylinder liner has a wall thickness of 1.2 mm and is axially located in the usual way by a flange at the top. The connecting-rod is machined from high duty aluminum alloy with bronze bushes at both ends and two oil holes at the lower end. The rod is 27 mm between

(Continued on page 92)

THE P-38

Launching in a Lightning

by BUDD DAVISSON

"THIS ISN'T really happening!" The entire scene was happening to somebody else. It had to be. Yet, all around me was airplane. And engines. And lots and lots of noise. This was no place for a rag leg pilot who felt more at home in Citabrias and Cubs. Still, there was no mistaking those two angry Allisons on each side of me, and the blur of the props coming within inches of the fuselage in front of me couldn't be ignored. Yep, this was definitely a P-38 and I was definitely alone. I was about as alone as a pilot gets. And pretty close to being as scared as a pilot gets...and I was still on the ground with about a mile of concrete in front of me.

I reluctantly rocked my feet backward, letting my toes off the brakes and

P-38 Lightning was one of the most identifiable airplanes of WW II and packed a tank-power punch in its nose. M.A.N. file photos.

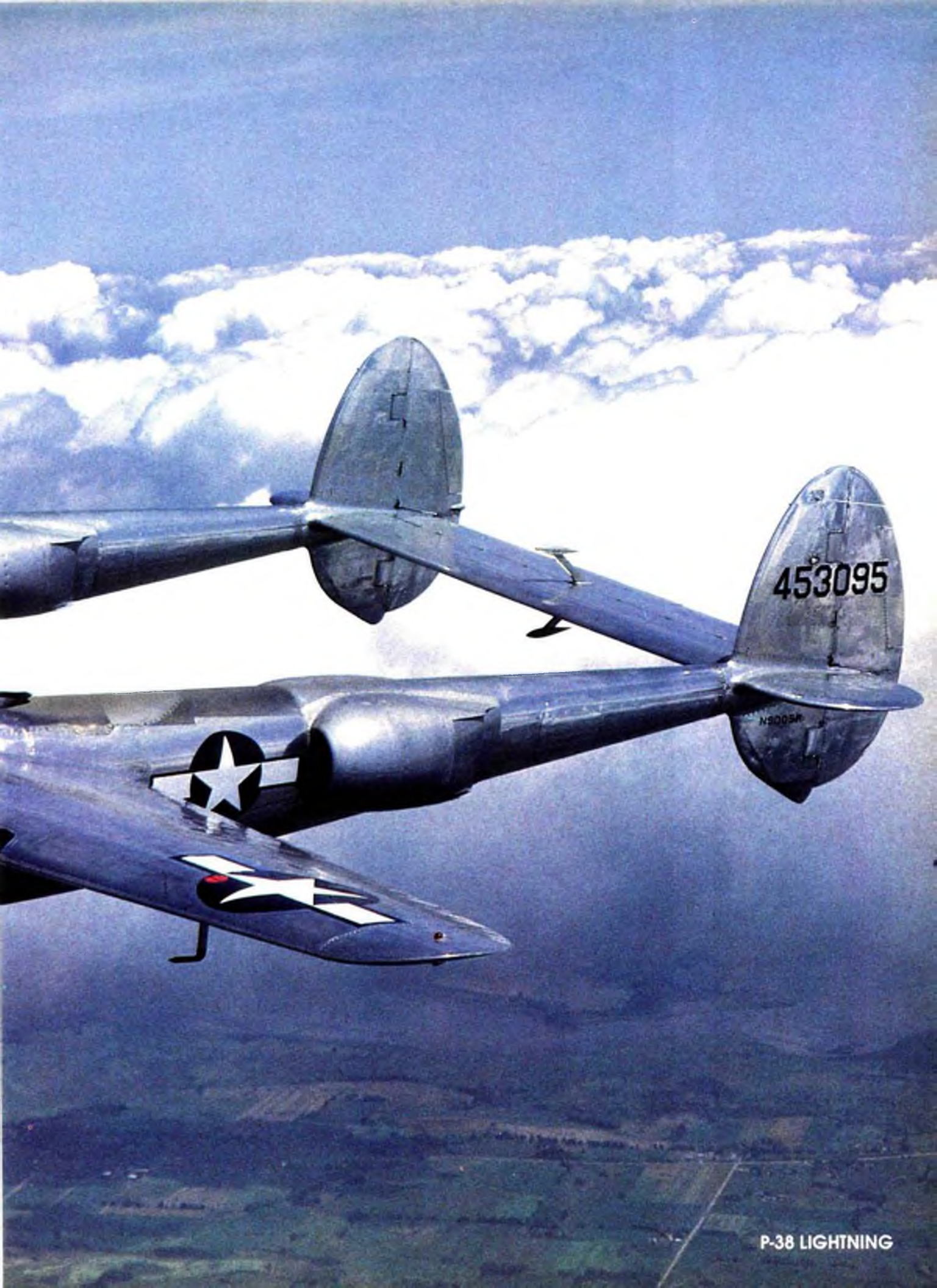
the airplane started coasting forward. Then, I tightened my grip on the two relatively tiny throttles under my left hand and started inching them forward. The stripe in the middle of the taxiway became my pole star and I fixated on it, determined not to let the nose move one way or the other. This was easier said than done because the Lightning has no nose wheel steering—it's either brakes or differential power. And I hate the brakes. They are incredibly sensitive and even the slightest touch causes them to grab and then the long stroke nose gear compresses. Then, it rebounds and you look like a grasshopper escaping from a brush fire. That was me taxiing out. The nose bobbed up and down on the taxiway like one of those plastic birds perched on a glass of water. I wasn't going to let that happen on this, my first takeoff in a Lightning.

As the noise built up, the nose tried turning just a little. Not from torque, since there wasn't any because the props turn different directions, so any tendency for those big Curtiss electric fans to twist the airplane sideways was cancelled out. So, a little extra throttle on the inside of the turn straightened things out again. Huh! That was easy enough.

As with any airplane, there's a right and a wrong way to get it in the air, and with a tricycle gear, the right way is to pick the nose wheel off and let the airplane run on the mains until it's off the ground. On the P-38 that's another thing I was told was easier to talk about than do. Since the airplane has so much weight, it also has tons of inertia. So, when you ask the nose to come up, it hesitates. So you ask it a little harder. Then the inertia is overcome and the airplane leaps into the air. This is also caused by the fact that the airplane is accelerating all the time and the tail gets more effective by the second. There are lots of hangar tales about P-38s on first flights leaping into the air at

(Continued on page 68)

MODEL AIRPLANE NEWS Photo by Budd Davisson



P-38 LIGHTNING

color photos by LOUIS V. DeFRANCESCO JR.

Schluter Champion from Miniature Aircraft

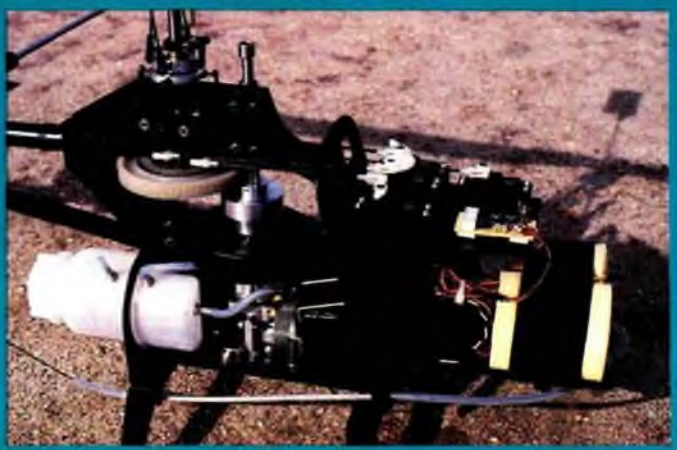
From the fertile mind of Dieter Schluter comes his greatest technological achievement yet.

by DAVID TROST

IN 1978, Dieter Schluter introduced the Heli-Boy, a machine which marked the beginning of Schluter's strong influence on the R/C helicopter industry. The Heli-Boy was flown to several AMA National championship firsts and was reportedly one of the first helicopters to be successfully flown inverted.

In 1983, he introduced the Superior, which was flown by Cliff Hiatt to first place in both the 1984 AMA and FAI national championships. Then, combining elements from the Superior and the Heli-Boy, he created the Heli-Star, a competitively priced machine with "Ferrari" performance.

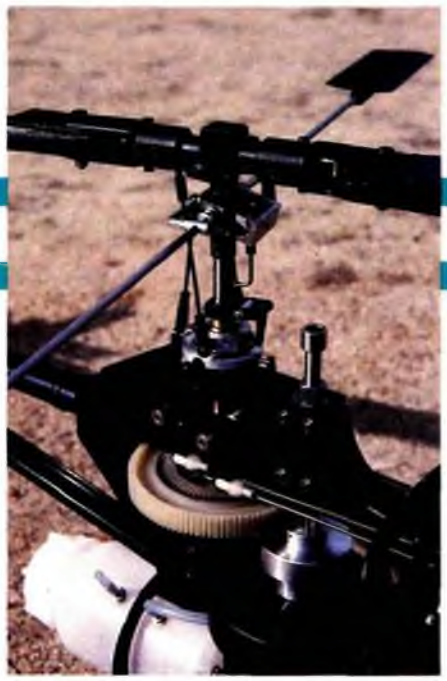
Dieter's latest effort is the Champion, and, like those mentioned above, it's available from Miniature Aircraft*. The Champion is a blending of the best



Type: Competition Aerobatic
Engine: Webra .61
Rotor Diameter: 55.5 inches
Weight: 10 pou.
Channels: 5

components of Dieter's previous machines along with some new ones. It features a completely redesigned rotor head utilizing a one-piece blade axle suspended in the head tube by O-rings for dampening. The flybar is located beneath the main blades, allowing shorter control rod lengths, thereby minimizing rod flex. The swashplate is also new. It features three-point suspension with two inputs for pitch and one for roll. It's also smaller and lighter than Schluter's previous designs. The pitch input utilizes a push-pull scheme from the servo for greater reliability and precise control. Collective pitch is provided by a sliding shaft ring similar to the Superior. The backbone of the Champion consists of two flat, hardened aluminum side frames joined with U-shaped spacers. The engine mounts, cooling fan, clutch, drive/autorotation system, tailboom support, tailfin, and tail rotor are the same as those in the Superior and the Heli-Star. The Champion's rotor blades utilize the same airfoil as the Superior, but are slightly longer. The tailboom is also longer to accommodate the increased rotor diameter.

THE KIT. Building the Champion was a sheer delight. All the parts aligned perfectly without any fitting required. The instructions consist of a 12-page manual and two sheets (three sides) of accurate line drawings illustrating each construction step. Assembly is organized into 17 numbered steps. All of the parts used in each step are individually bagged, including the nuts and bolts. The instructions are written with the assumption that the modeler already knows how to build and set up a model helicopter, so a novice builder should seek the help of someone with experience. The building sequence should be strictly followed, as outlined in the manual. Access to some of the tank and landing gear mounting bolts becomes impossible if suggested sequence is not followed.



Rotor head and drive gearing are unique to the Champion.

Assembly is continued with the mainshaft and collective pitch control transfer system installation. Make sure that all the parts move freely. Take care not to warp the mainframe when tightening down the shaft bearings.

I used the Schluter Webra .61 Speed engine for this review. The engine is available in both ring and ABC versions and I used the ABC version. The engine has had many modifications from the stock configuration to make it more suitable for helicopter use. It has a reinforced crankshaft with an oil groove.

Hover is rock steady with positive transition to forward flight.

CONSTRUCTION. Construction begins with the mainframe and landing gear. The fuel tank is prepared and installed next. I recommend that the clunk be soldered to the pickup tube because it has only been pressed on and could loosen with time. The tank fits into the circular opening of a metal plate which serves both as the tank mount and the cross bracing for the landing gear. The tank is held in place by a bolt passed through one of the main frame cross supports.

The ABC version has had the piston reworked so that the fit is not so tight, facilitating easy starting. The TN carburetor has had the throttle lever repositioned to allow proper linkage adjustment. The engine has a machined aluminum heatsink head and comes with Schluter's fan hub premounted and aligned to tight tolerances. Having the fan hub already mounted and zeroed made setting up the clutch runout much easier since most of the work was already done. I installed a

(Continued on page 101)

Field & Bench Review

Lance **BANDIT**

Type: Giant sport
Wingspan: 82 inches
Wing Area: 1,658 square inches
Engine: Quadra
Weight: 20 pounds
Channels: 4

"Ready-To-Fly was never so wild!"

Above: Cockpit view shows servo layout. Below: The Bandit is a docile flyer.

by CEASAR LATTE

LANCE WISE of Lance Machining and Manufacturing* has added a new creation to the wonderful world of R/C: the Bandit. The Bandit is perfect for those who would like to fly something big, but don't have the time to build a conventional "balsa stick" airplane.

With a symmetrical airfoil, constant-chord wing, and huge tailfeathers, the Bandit is light on the controls. It has a wingspan of 82 inches and a wing chord of 19 inches for a total of 1,658 square inches. My Bandit has a total weight of 20 pounds complete with Quadra, Futaba* radio, and Don Harris' smoke muffler and electric injection system for the best smoke ever.

THE KIT. The kit comes in two large boxes and the packaging is excellent. Everything is arranged to minimize any chance of damage in shipment.

The airplane structure is a unique assemblage of balsa, plywood, hardwood, foam, and Lexan. The structure of the fuselage is a foam core covered with pre-formed, pre-painted Lexan. The Lexan is painted on the inside, creating a lasting, beautiful aircraft. The Bandit comes in white or yellow.

The assembly process is simply a matter of a few very easy steps. Lance also provides an easy-to-follow instruction booklet.

CONSTRUCTION. To complete the fuselage, construct the motor mount box using balsa and lite-ply. Epoxy the landing gear block. This is all done with 30-minute epoxy and it's the only construction required!

The rest is simply trimming the Lexan pieces to fit. The stab is pre-covered and already slotted for the hinges. Mount your stab, fin, main gear, tailwheel, and tips (molded) and the fuselage is done.

The wings are even easier. Add the wing tips, ailerons, and plywood butt plates, and install your servos.

The wing attachment is fast and easy. Full-length aluminum spars are already built into the wing. Inside the fuselage are aluminum fuselage receptacles. A

(Continued on page 91)

THE P-38

(Continued from page 61)

J model P-38 side-view shows a unique profile, unusual unto itself. Pitch of propeller on port engine indicates clockwise rotation. M.A.N. file photo.

impossible nose attitudes. I didn't want that to be me.

As we, the P-38 and I, rocketed down the runway, my earlier fear was overcome by fascination. The entire experience was taking place in slow motion. Not only in my mind, but in real life, as well. I had expected the raging, angry acceleration of a P-51, but what I was seeing was the well-mannered cruising of a Buick. I had plenty of time to think, not just react. So, at about 100 mph, I gingerly tugged on the yoke (38s have control wheels, not sticks). As the nose started up, I picked a point on the horizon and stopped the nose right there. As soon as I did that, the acceleration demanded I relax a bit on the wheel, or the nose would have kept climbing. I concentrated on the intersection of the horizon on the nose like it was a rifle sight, knowing if I kept the nose at that shallow, but nose up attitude, it would fly off by itself, if I wanted.

I knew that at that weight below about 120 mph the airplane wouldn't fly on one engine. With one engine dead and the other very much alive, the 1,450 horses on the one side would twist the airplane around and there wouldn't be a thing I could do. Speed was the only answer. So, I let it run until 125 mph was on the clock. Then a gentle tug was all it took to put me and about 15,000 pounds of airplane in the air.

The handbook made a big deal out of raising the gear and as I reached for the handle I remembered the warning about keeping the ailerons centered until the gear was up and locked. It seems they hadn't quite gotten the hang of designing hydraulic systems when they did the "L" model P-38s. The P-38Ls were the first with hydraulically boosted ailerons but they were connected to the same pressure system as the landing gear. So, when you raised or lowered the gear, it took pressure away from the ailerons but that pressure returned with a bang, when the gear locked into position. So, if you moved an aileron while the gear was in transit, when it locked up or down, the airplane would suddenly jerk one way or the other. And it did! I had moved the wheel just a fraction of an inch, still, when the gear locked up, the airplane jumped.

Then, I had to take care of a really serious problem—the noise. On the ground, the engines had been relatively quiet because the exhaust feeds through

Named "Old Nosey" and "Swordfish" by research engineers, this converted P-38 exceeded 525 mph using wing sections. M.A.N. file photo.

After it was over, I realized the P-38 had been a pussycat to fly!

the turbochargers which quiets it down and ducts it out the rear. But as soon as I had full power on and was off the ground, it was obvious I was in real trouble. Like a dummy, I wasn't wearing a helmet or headset and there was a high-pitched scream in the cockpit that was causing me severe pain. It was such a bad noise that I found myself twisting my head trying to get away from it. Glancing around, I noticed an old headset lying in the radio rack behind me. Loosening the seat belt, I squirmed around until I could get a hand on the headset. The second I had those electronic ear muffs on my head, the airplane became an entirely different machine. This one I liked.

By the time I got the sound effects problem under control, I was roaring away from the airport at 180 mph, with my nose pointed up. Now I could put my mind to seeing what was going on. I brought the power back to a climb setting, doing my best to get the props synched at the rpm called for on the power settings. On any airplane with constant speed props, you set the rpm with the prop control, not the throttles. All the throttles do are to change the amount of power you are feeding into the props, but the props hold the rpm you set them at, no matter what you do. On a twin, the real challenge is getting the props set at exactly the same rpm. And you know if they aren't matched, because they set up this harmonic "beat" between them that gets slower the closer the rpms get, until they sing exactly the same note when turning the same rpm. When 2,800 horses start arguing among themselves about props not being in synchronization, the "beat" they set up can be heard for miles around.

At altitude, I began to feel the airplane out. In most airplanes, this means racking it around and working your way into slow rolls, loops, and other exotic foolishness. In this airplane, that is exactly what it would have been—foolish. I was so far over my head in terms of talent and experience that there was no way I was going to get myself in deeper by trying things I shouldn't. But I did have to find out how the airplane did, and didn't fly, if I was going to get this thing back on the ground.

The first thing I did was bring one engine back to about 20 inches of manifold pressure, simulating an engine-out situation. As the throttle came back, the rudder on the side of the good engine kept working its way down, as I brought the nose up and bled off speed. Some masochistic side of me wanted to see how the airplane behaved when it approached single engine minimum control speed. Somewhere down around 110 mph, it started slewing sideways, even though I had my foot dead about the floor in the opposite direction. Bringing the engine back into the game straightened things out immediately. Keep that thrust balanced and everything is fine. Let it get out of balance and you'd better keep your wits about you.

For someone schooled in little airplanes (read: airplanes smaller than the average house), running around north Texas in a P-38 is a real gas! In the first place, the controls are smooth and relatively light and, even though the airplane is big, it's fairly quick to respond. Sure, it doesn't feel quite as nimble as a Mustang or a Bearcat, but, in the hands of guys like Dick Bong and Tommy McGuire, America's leading WW II Aces, the machine really knew how to fight.

Successful Lightning pilots knew they had to chose their fights. They had to fight on their terms, not the enemies'. So, they worked the high ground, where the Allison's turbos gave the airplane the power its opponents lacked. They also learned to dive on their prey, counting on their unbelievable ability to dive to give them the advantage of both surprise and the speed to run away to fight again. Another part of the reason the enemy called the Lightning the "Forked-Tail Devil" was the six 50-calibers in the nose, which concentrated a water hose of lead that could literally saw any airplane in half in a fraction of a second. You only found yourself in a P-38's sights once. Only once.

There is nothing quite as exhilarating as flying a new high-performance airplane for the first time, especially when it's as historic as the P-38. But every flight has one concentrated period of anxiety called the "landing." It's in making that first landing that many adrenalin glands wear out from pumping overtime and certainly mine were getting a workout. Things started falling apart when I tried to slow the airplane down to the 160-mph gear speed. I had to have that speed to put the gear out or the gear doors could be damaged. Only problem was, the airplane didn't want to slow down! Power against the stops, it just kept on sailing along at 180 mph and I couldn't keep the power that low for long or the engines would cool too much. So, I screwed around for ten minutes trying combinations of climbs, glides, and turns until I finally got 165 mph. Then I tired of the game and threw the handle down.

(Continued on page 90)

Touching down at a hastily prepared runway in France, this P-38 was part of the U.S. armada used to bridge the Nazi offensive. M.A.N. file photo.

4-CYCLE FORUM

(Continued from page 24)

"The test results: Zinger 20x6-10, glow—rpm 6,700, thrust 17 pounds; Zinger 20x6-10, spark—rpm 6,900, thrust 19 pounds; EWH 20x8, glow—rpm 7,300, thrust 18 pounds; EWH 20x8, spark—rpm 7,500, thrust 20 pounds.

"Ignition adds approximately 200 rpm to the top end. I could gain approximately 100 rpm on Zinger props by rounding off the tips like the tips on Top Flite Super M props."

I think the above speaks for itself, though this is a good time to tell FK-50 fans that a new lightweight, low-battery drain, retard-at-idle, spark ignition system is on the way from the Kavan company in West Germany. It should be available about the time you read this—I'll let you know.

As for getting the most from your props with a few customizing touches, the best work on this subject in recent years was Pappy deBolt's article "Propeller Power," which appeared in the April 1983 *M.A.N.* It's worth digging back for...

'Til next month, happy flying.

Eloy Marez, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

C.H. Electronics, Inc., Box 1732, Riverton, WY 82501.

Manx 250 H. Engine, c/o Aero Tech, Inc., Rt. 1, Box 120, Castalian Springs, TN 37031. ■

R/C NEWS

(Continued from page 34)

Ron's following comments stuck in my mind:

"Always snap away from the judges—it looks better and altitude changes are less obvious.

"The inside snap in the Avalanche appears better to the judges' eyes. However, use the snap direction that fits your airplane best.

"The corners in the six-sided loop are all 60°; a common mistake is to make the first one less than that which sharpens the following corners and makes the maneuver appear unbalanced.

"When a mistake is made in any maneuver, the smoother the correction the lower will be the downgrade.

"Balanced or symmetrical maneuvers score the highest points; this is particularly important in the Top Hat where the rolls must be in exactly the same place on each leg.

"Entry and exit straight flight remains important in FAI pattern, even though the time and distance is restricted in the frame *(One of the reasons why a somewhat slower airplane helps in FAI—AFS)*."

And finally, on the four-stroke engines. Ron Chidgey is an obvious fan of the 120 four-stroke—he feels they are the ideal powerplant choice for Turnaround flying. He feels at least two hours of

(Continued on page 90)

color photos by LOUIS V. DeFRANCESCO JR.

The Model Airplane News Aero Picnic

by ART SCHROEDER

JUST ONE half-hour to go in this contest and, even at this late hour, only 2 points separate first from third place. It has been a tough day, with places shifting almost by the flight. Competitors are exhausted as are the "judges." What are we watching, a world championship event? No—it's *Model Airplane News*' Aero Picnic—and it carries the same intensity and pressure of any world class event.

Aero Picnic competitors must try for a two-minute flight. From lift-off to landing, a two-minute (or 120-point) flight is the objective. It sounds easy, but achieving the objective was a bit more elusive. Not one of the nearly 100 fliers achieved a perfect flight, although some came very close.

This year's Aero Picnic was held at Anthony Wayne Recreation Center at Bear Mountain State Park (New York). Once again, the affair was directed by Joe Beshar with able help from modelers in the New York-New Jersey area. The two-minute flight objective was approached with the intensity of a Tournament of Champions or a World Championship pattern event. It all sounds so easy, but not one of those entered actually hit 120 seconds. Even so, as a competitive event, the Aero Picnic seems ideally suited to any modeler—low pressure and a well-defined, clock-timed objective.

When all was over, everyone seemed happy with the day's flying and competition. F. McGoldrick of Morrisville, Pennsylvania, won the Open event, while R. Teseo won the Junior event.

The real virtue of *M.A.N.*'s Aero Picnic is that fliers who don't normally compete, give it a try. Hopefully, some go on to regular contest events.

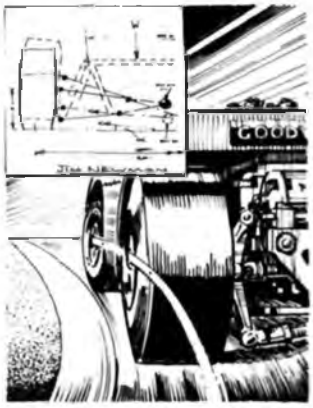
Virtually any airplane flown with R/C can compete at the Aero Picnic. As it turned out, this year's event drew everything from OT free flight to sport airplanes to scale aircraft. There is no other event in this world that draws a greater diversity of airplane types.

It's a lot of fun and I hope you'll be there for next year's running.

Model Airplane News wishes to thank Joe Beshar for all his work, his administrative team, and all those manufacturers who donated prizes, for making this such an enjoyable afternoon for so many R/C fliers. ■

Above left: It is difficult to decide whether one should fly this airplane or salute it. Modelers were representative of the sport type of aircraft at M.A.N. Aero Picnic. Above right: Nearly 100 modelers from six states attended the 1985 version of M.A.N.'s Aero Picnic at Bear Mountain State Park in New York.

Left: Age was no barrier to effective performance, as many of the competitors were teenagers. Right: Chris Chianelli, M.A.N.'s resident muscian and all-around nice guy, relaxes after another bad flight.



INSIDE TRACK

by MIKE LEE

RECENTLY I attended a local car race and was happily watching the action when a young driver walked up and asked, "Mike, how do you win races?" I thought about it for a bit and then I remembered the way things *really* are on the race track.

In the normal race situation, the biggest thing to remember is that you are not really racing anyone on the track. The drivers are pitted against the clock, and the winner is determined by the highest number of laps within the given time, which is usually 4 minutes.

On the other hand, you are racing against the other drivers as they try to make laps in less time, but the main idea is for you to concentrate on driving.

Let's look at a particular driving situation. On the track are 6 cars; the flag drops to start the race, you start, and you find yourself in third place. If you really want to beat the other two guys, forget about them! Don't worry about them being in front of you. The more you think about the other cars, the less you can think about your own car. Therefore, you won't concentrate on driving and the result is that you may blow or roll a turn and you'll end up farther behind.

Race against nobody, just time. If you concentrate on doing laps and you can keep your mind on the track, the result will be more laps completed in less time. Don't worry about the other guys, because if they are looking to gun you down, chances are they'll be the ones who will blow the turn or roll it, not you. It's hard to concentrate on laps only. But, believe me, it works. Try it next time.

Having the "right stuff" comes next. I see a lot of guys at the race track with some pretty exotic cars and equipment. These buggers are so highly modified that you can't tell what they started out as. Trick motors, trick chassis, trick everything. The only thing not so trick is the driver.

I find that nine out of ten times the driver attempts to buy his way into the winner's circle with a super-duper car and really didn't do his homework, namely driving! All the tricks in the world wouldn't put you any closer to the winner's circle if you didn't drive right and if your car wasn't dependable. More often than not, the tricks take a dive, putting the car out for the race and the driver in the pits, fuming over the DNF (did not finish).

You have to stay with a dependable car, one that is going to carry you through the heats and be in good shape for the finals. I talked about how to drive the races but you need to keep your car *in* the races. My own experience has shown that my stock Associated RC10, on 7 cells and an Associated off-road stock motor, is hard to beat. My trophy case proves it. In eight races, the car only failed to finish in the money once—and I'm generally a model airplane pilot, not a model race car driver.

Keep the car maintained and in good repair. Replace anything that looks like an accident waiting to happen. My policy is, "When in doubt, throw it out." You'll find the car becomes trouble-free and will start bringing you into the winner's circle.

Take note of the above, apply it to your driving style, and I'll bet it works for you. Race only the clock, keep the car dependable, and maintain it well. Don't worry about tricks, unless you really need them and you know that they work.

Now for some shop talk. I haven't mentioned batteries in this column, so let me do that now.

For the electric car bunch, the nickel-cadmium battery is an absolute blessing. Try and imagine your pocketbook after having to buy a new set of regular batteries every time you want to run the car! I don't claim to be an expert on this subject, but I can offer a few hints to help you get the most out of a set of batteries.

Generally, when you receive batteries fresh from the factory, they need charging. In order to insure that the batteries will reach their maximum capacity, they should be slow-charged overnight. This allows the batteries to absorb the electricity from the charger at a slow rate. The slower rate makes up for those batteries that might have a bit of residual charge from the factory versus other batteries that don't. Slow-charging tops off all the batteries safely.

Leisure Electronics AC/DC home field charger explained in text.

A good investment for battery charging is an AC/DC charger. This unit allows charging from any 12-volt source or from a wall socket at home. Normally, this charger also has a slow-charge mode which will trickle-charge the batteries at a safe rate overnight. Another feature this charger has is a discharge circuit.

Now that the battery is topped off, slap it into your favorite car and off you go. The battery will actually get better the first few times you use it. This is because most batteries have a slight break-in period. The individual cells gain their maximum capacity through the charge/discharge cycles and within a short time the whole pack delivers consistent performance.

Then one day the battery bites the dust a bit earlier than usual. Same old track and same old conditions, but you find your car has quit running about a minute

too soon. This is a classic case of memory.

Nickel-cadmium batteries have a habit of remembering just how much energy you put into the pack, and just how much energy you took out of it. Consequently, the battery pack thinks that the power you used before for all your driving was enough to get you by, and so the memory takes over. Now the power you used before is all you're going to get, and it gets a little shorter every time you use the battery. There is a cure.

To eliminate memory, the battery must be given a deep discharge. That means running the battery all the way down to nothing. If you have a voltmeter, you can watch the power decline while you discharge the battery. If not, the easiest way to do it is to run your car until it stops. Pick the car up and run up the throttle. The motor will begin running again, but obviously not enough to propel the car. That's all right. Just hold the car up and let it run until the motor takes all the power out of the battery. When it finally quits, the battery will be deep discharged.

Another method of deep discharging has to do with the AC/DC type charger I mentioned before. By placing the battery on the charger in the discharge mode, you can run the pack all the way down to zero automatically. Since most AC/DC chargers have a meter on their face, you can watch the voltage drop during the discharge.

At this time you shouldn't recharge the battery; instead let it rest. Discharging a battery causes a fast chemical reaction to take place. The result is electricity and heat. With heat, there is pressure. By letting the battery cool off, you increase its ability to take on a full charge and be ready for a full heat of racing. This is something you should always practice. Never attempt to recharge a warm battery. It won't accept as much power as it would if it were cool.

(Continued on page 110)

OFFSHORE

by JOHN OIAN

"GEE, THOSE BOATS are neat, how much do they cost?" This is a question often heard at the boat races. The answers I've heard go from close to absurd. Unfortunately, there are two types of answers that tend to discourage new participants. The first is the brag, "My rig must have cost at least a million and a half," and the second is the underestimate, "Why this hobby is really inexpensive, you can get a complete setup for a couple hundred bucks."

The truth lies somewhere in between. In the interest of clarification, I dug through a bunch of catalogs and worked out the costs of several representative classes. The costs used are all manufacturer's retail. I'm well aware that a lot of these items can be purchased at a discount from some mail-order suppliers, but in all fairness, I chose the actual retail costs. Except as noted, costs are an average for reasonable, fast equipment.

I'll start with the basic support setup. The following is what I consider to be the minimum to get you going without having to borrow a lot of equipment from your friends: motorcycle battery and charger, $35; electric starter, $50; power panel, $30; glowplug clip, $4; glowplug wrench, $3; 1 gallon of 30%-40% fuel, $25; hand-crank fuel pump, $11; and retrieval ball (cheap zebco reel with a tennis ball on the end of the line), $12. Total cost of starting equipment, $170. If you want a custom starting stand, electric fuel pump, etc., the cost will be more.

Now let's get down to boats. The best and cheapest way for a beginner to start is with a .21 outboard tunnel boat. With the outboard, almost all drive-line problems are eliminated. In some cases, the boats are merely bolt-together kits, which allow the newcomer to get his boat in the water quickly.

As for radios, there are some real inexpensive ones on the market, but keep in mind that your boat is really going to test the mettle of most radios and especially the servos, so I can only recommend a set with good high-torque servos. Most two-channel sets (they're what you need for a boat) come set up to use dry alkaline type batteries. The cost is initially cheaper, but after a while, the cost of these batteries can add up. You might want to consider a set with rechargeable batteries.

The cost of the radio will be between $100 and $150, so for the sake of discussion I'll say $130. The motor will be the K&B .21 outboard for $130. This choice is easy; it's the only one available. For the hull you can buy a wood kit for approximately $85 including glue, or a glass hull for $120. Miscellaneous hard-

Typical of fantastic boats available is this gaggle of beauties. They're more than $1.98.

ware (cable, tank, and prop) will add another $25. Epoxy paint for your new creation will run another $20 or so. That makes a total of $390 for the wood hull and $425 for the glass version.

Another option in this class—which I feel is a very good one—is the MRP* Mach I complete kit. This kit includes an engine, radio, paint, and a prop. Your boat is in the water in no time. The Mach I complete kit is $142, so the total comes to $429.

Now compare the total—equipment ($170) plus boat ($429) equals $599—with the "couple hundred dollars" which is usually bandied about. With careful discount shopping you can get the total down by $150 or so, but nowhere near the low totals I sometimes hear.

In the .40 size boats, both deep Vees and hydros come out pretty close, with a wood kit plus glue being approximately $75 to $80. A K&B 7.5 inboard is $137. Hardware kits run approximately $80 with the motor mount, tank, prop, and starting belt adding another $23; $130 for guidance and $25 for paint makes a total of $475. The same combo in glass would run about $555 for the deep Vee and a little higher for a glass hydro.

In the ⅛-scale hydro category, a wood kit plus glue is $135; $260 for a marine .65; $80 for hardware; $27 for a prop motor mount and miscellaneous hardware; $130 for the radio; and $40-plus for paint. The total comes to $672. For a fiberglass version, add $75 to $100.

Relatively simple powerboats offer extreme excitement for the money.

For those with big bank accounts, big aspirations, or both, there is the twin engine F or X hydro. A hull kit plus glue can run up to $265; a pair of racing .65s will add another $520. Running hardware can add up to $150; props, starting belts, motor mounts, and tanks, etc., come to about $60; a three-channel radio (the third channel for mixture control) with heavy-duty servos will add another $170. Throw in $50 worth of paint and you get a total of $1,215. Definitely not for the faint-hearted.

Comparative cost for fun on the water is not that different from airplanes.

While you are recovering from that last blast, take a look at a class of boats that is rapidly growing in popularity and is truly inexpensive—electrics. Some very good and complete boat/motor/battery combos (Robbe* and MRP) can be had for under $140. Some even come with a charging cord. All you have to add is the radio. Starting equipment consists of the battery charge cord, or if you want to get exotic, you can get an automatic charger for under $80. This puts you in the water for under $380 maximum. Not a bad way to go, and fuel is really cheap!

The good news out of all this is that quite a lot of good, used equipment can be purchased at substantial savings, and though the costs stated here seem high, keep in mind that they are all full retail. With careful shopping you can find some pretty hefty discounts on a lot of the items.

See you next month.

John Olan, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Model Racing Products, 18676 142nd Ave. NE, Woodinville, WA 98072.

Robbe, 180 Township Line Rd., Belle Mead, NJ 08502. ■

SOARING NEWS

by JIM GRAY

LSF REQUIREMENTS. Many of us are working our way through the LSF levels and have already submitted the paperwork for the various tasks. There are, however, some of us who are just becoming interested in the League of Silent Flight, and we need to know more about the requirements: where to send the papers, what is required, and so forth. Well, we're in luck. I received a letter from LSF President H. Warren Plohr and he has answered many of the questions asked by aspirants:

"Aspirant applicants do not have to go through the two-step process you mention. It isn't necessary to mail away *first* for an Aspirant Form in order to mail away *again* for a Level I form. The Bylaws don't require use of an Aspirant Application Form obtained from Mundelein, Illinois (LSF Headquarters). A hand-written, signed statement using the words spelled out in the Bylaws will suffice. People use the form supplied by Headquarters for convenience.

"Easier yet, I suggest that soaring clubs print and distribute forms; either of their own creation, or photocopies of existing forms. However, clubs can obtain copies of forms from Mundelein by mail. A contribution of $1 in U.S. or Canadian funds to help defray postage and for an envelope would be appreciated.

"On the subject of LSF communications via club newsletters, I have the following comments. We are required by the Bylaws to communicate with the membership three times every two years—first, to issue a call for nominations for executive officers; second, to send out election ballots; and third, to announce election results. With each of these mailings we try to add other information, including LSF Tournament announcements. This wouldn't be possible through club newsletters, and we couldn't contact *every* member as specified by the Bylaws.

"Yes, communication at other times could be done through newsletters. All we need is a list of clubs and something to communicate. You suggest a survey of members for their interests, attitudes, desired LSF directions, etc. I've had one experience with an LSF survey. What I learned is that I'm not smart enough to formulate a survey questionnaire.

"I've found that I can find out much about interests/directions/attitudes from letters I receive (like yours), and discussions during face-to-face meetings. However, your suggestion that soaring clubs could provide a consensus of their interests/attitudes could be implemented. Any club with a soaring interest could have a meeting of LSF members (and non-members) to discuss their ideas and have their club secretary submit a consensus in writing to LSF. Such a document will be reviewed by the Executive Board and responded to.

"Please allay your fears of a Level VI proposal. That has been firmly turned down by the last decade of LSF officers. The membership has full control over this, too!

"Since most of your fellow fliers are attacking LSF Level V, you may be interested in LSF's answer to the four most asked questions about the Soaring Accomplishments Program:

"1. You *can* complete a Duration task on the same flight that you complete a Goal and Return task.

"2. The straight-line distance for the Goal and Return task can be described as follows: using a map of the flying area, draw a circle with a radius corresponding to the Level requirements (10 km for Level V) using the launch site as the center. Any point on the circumference of the circle is the goal distance from the launch site. Most Goal and Return flights follow a zig-zag path, both on the ground as well as in the air, and thereby cover much more than the straight-line distance. Such is the task!

"3. At contests with multiple events, you can consider your competitive position in each event *or* all events combined. Level V aspirants usually calculate their position including all events in order to have a twenty-entry contest. A high-score, overall-win is a much-coveted Level V win! Counting their position in each event is how the lower LSF Level competitors get more than one contest in a day. It is *not* considered acceptable to calculate your competitive position based on a selected group of events fewer than *all* of the events. It is each event, or all combined.

"4. Postal competitions do not count as LSF competitions."

What is the League of Silent Flight? It is an organization of more than 5,000 members who have dedicated themselves to a soaring accomplishments program. Membership in LSF must be earned, it cannot be purchased. There are no dues. To become a member, certain basic tasks must be performed and witnessed. Upon completion of the basic tasks, new members are given numbers which are theirs forever. As the pilot becomes more proficient, higher levels of accomplishment are attained until the zenith of Level V is reached. Of the over 5,000 members from around the world who belong to the League of Silent Flight, 42 have achieved Level V (as of July 18, 1985). Their names are included here for your interest, along with the date Level V was achieved and the LSF number of each Level V member.

What do you have to do? What are the requirements? What are the achievements that must be reached? Here, in a nutshell, are the answers:

Thermal Duration—Level I, 5 minutes; Level II, 15 minutes; Level III, 30 minutes; Level IV, 1 hour; Level V, 2 hours.

Slope Duration (up through Level IV a second thermal flight may be flown in lieu of slope flight)—Level I, 15 minutes; Level II, 1 hour; Level III, 2 hours; Level IV, 4 hours; Level V, 8 hours.

Spot Landings—Level I, five at 3 meters or less (9.84 feet); Level II, ten at 1.5 meters or less (4.92 feet).

Goal and Return Level I, none; Level II, none; Level III, 1 km (0.62 mile); Level IV, 2 km (1.24 miles); Level

(Continued on page 109)

LSF Level V Members

1. John Baxter	0024	July 3,1975
2. Steve Work	0571	Dec. 15,1975
3. Fred Weaver	0571	Sept 17,1976
4. Neil Nolte	0586	May 30,1977
5. Marvin Qualls	1639	Feb. 19,1978
6. John Newman	1632	Aug. 17,1978
7. Don Harris	0810	Aug. 27,1978
8. Chris Adams	0348	Oct. 15,1978
9. Tom Christian	0074	June 24,1979
10. Dwight Holley	2259	July 8,1979
11. Howard Sears	0294	July 12,1979
12. Ken Bates	0604	Aug. 26,1979
13. Paul Wedeking	2540	Nov. 4,1979
14. Craig Foxgord	0882	Jan. 27,1980
15. Pat Flinn	2160	Aug. 8,1980
16. Jack Hiner	0383	Oct. 12,1980
17. Kieth Kindrick	1693	May 17,1981
18. Gerald Zeigenfuse	0944	June 13,1981
19. Don Clark	0082	June 28,1981
20. Don Goughnour	0595	June 28,1981
21. Jim Porter	0194	July 12,1981
22. Don Paterson	1365	Aug. 23,1981
23. William Meleske	1227	March 4,1982
24. Otto Heithecker	0170	July 4,1982
25. James Bohmer	1460	Aug. 8,1982
26. Warren Plohr	0334	Aug. 8,1982
27. Robert Steele	0800	Aug. 15,1982
28. Walt Good	0063	Mar. 22,1983
19. Mike Reagan	0173	July 3,1983
30. Bob Robinson	0402	Aug. 14,1983
31. John Huphreys	3064	Sept. 3,1983
32. Larry Jolly	3579	Nov. 16,1983
33. Stanley Watson	2542	Feb. 19,1984
34. Bob Champine	3128	May 15,1984
35. Chuck Beeman	0293	June 10,1984
36. John Hoover	0592	July 8, 1984
37. Mike Kozumplik	2497	July 22,1984
38. Cal Posthuma	2997	Aug. 11,1984
39. Tim McDow	2764	Sept.22,1984
40. Earle Latimer	3119	June 30,1985
41. Terry Edmonds	0463	July 14,1985
42. Dale Harber	1880	July 18,1985

CONTROL TOWER

by CHARLIE KENNEY

THIS MONTH I have another group of products to review from the recent trade shows. The first is a unique small vacuum from Mini-Vac*. It consists of the vacuum body which measures 1¼ inches in diameter and is 5¼ inches long. It is powered by a 9-volt alkaline battery and really cranks.

To install the battery, remove the end cap by twisting it 90°. Carefully pull the battery clip out of the tube, snap the clip onto the new battery, and insert it into the tube, bottom end first, so the battery clip is facing the opening. Re-install the end cap. In addition, there are two brushes and two wands. Both wands are 4 inches long and ¼ inch in diameter; one is straight and the other is curved. The brushes consist of a ⅝-inch diameter round brush and a 1¼-inch oval brush. Both brushes are made from ultra-soft Canadian pony hair.

The Mini-Vac uses a 9-volt alkaline battery and has many attachments.

A vacuum bag is provided, which is attached by screwing it into the body connection. To empty the bag, open the velcro flap at the end of the bag, remove the debris, and refasten. The fan chamber can be exposed by removing the vacuum blower head by twisting it counterclockwise, exposing the turbine blades. This may be required if any large particles are jammed in the turbine blades.

The Mini-Vac can also be run from an AC source by means of a 300-mA, 9-volt AC/DC adapter that can be plugged

The Mini-Vac has many uses in the shop.

into a jack provided on the side of the Mini-Vac body. This AC/DC converter can be obtained as an additional accessory for $10. Mini-Vac cautions that wet surfaces should not be vacuumed.

What can you use it for? So far, I've used it to clean the lenses on my cameras before photo sessions. It's also great for cleaning plastic scale airplane models and would be great, I'm sure, for ship or railroad models. It can also be used to keep various electronic equipment clean, such as power supplies and chargers.

The next items are made by McDaniel R/C*. The first is the familiar "AC to DC" charger for the Ni-Starter and Tork-Starter. This unit plugs into an AC receptacle and converts 115 volts AC to 1.5 volts DC. The DC output is capable of delivering 125 mA. The unique charging end fits either a Ni-Starter or a Tork-Starter simply by inserting it and twisting it until it locks.

The second unit is also a charger for the Ni-Starter and Tork-Starter, but operates from a 12-volt source, such as an automobile battery. Simply plug the unit into your automobile cigarette lighter receptacle and you're ready to go. One caution; there is a large series dropping resistor that gets very hot during the charging cycle so don't touch it or lay it on a plastic dashboard or rubber floor mats. The maximum charge rate is 1.2 amps at 1.5 volts and the maximum charging time should be limited to about 45 minutes.

The third McDaniel unit is a Field System Charger, again using a 12-volt DC source such as your car. However, it will charge your complete radio set. The system charger was designed for those of us who forget to charge battery packs before flying. Now you can charge your transmitter and receiver on the way to your flying field, and be ready to fly when you get there. The system charger will charge a 9.6-volt transmitter pack at 150 mAh, and a 4.8-volt receiver pack at 250 mAh. You can use it to top off your charge, replace the charge you've used while in a contest, or charge the radio system you forgot to charge the night before.

Caution: Be sure to time the charges. You can damage your batteries by overcharging. *Never* fast-charge longer than 90 minutes on a 500-mA pack or 5 hours on a 1,200-mA pack; 30 to 45 minutes should be long enough on 250-mA packs.

Note: Most systems never fully discharge, so if you flew a total of five 10-minute flights, you have used about half the charge on a normal 500-mA flight pack. Only charge long enough to replace the charge used. A few minutes overcharge won't hurt, but a long overcharge will surely shorten the life of your cells. Be careful!

photos by SUE KENNEY

McDaniel R/C chargers come in all sizes, all shapes. See text for details.

The charger can be ordered with plugs for your particular system. The unit I received, model no. McD R/C 05, is supplied without plugs. You can obtain extra plugs for your radio system and install them on the system charger. Trans-

mitters: The black wire with red tracer is positive (9.6-volt input). The other black wire is negative. Receiver: The black wire with silver tracer is positive (4.8-volt input) and the other black wire is negative.

The McDaniel System Charger features are: fuse protected (2A), diode protected (prevents reverse charging), LED charging indicators, and approximate charging times. These are the recommended times: transmitter 500-mA cells, 3 hours; receiver 500-mA cells, 90 minutes; 1,200-mA cells, 4 hours; and 250-mA cells, 45 minutes.

Next are a bunch of goodies from Sonic-Tronics*. These include Super-Flex hinges in two sizes; large and regular. The manufacturer recommends that both the large and the regular hinges be flexed many times before installation. The more they are flexed, the better they work.

New goodies from Sonic-Tronics. See text.

Another Sonic-Tronics winner is the Magna Tray. This is a small magnetic tray which measures 3 inches by 4 inches and is a godsend when disassembling small parts from R/C engines or any equipment where you want to keep track of parts. The magnetic action keeps all ferrous parts "glued" to the tray. I've also found it helpful when I spill a container of steel pins. The Magna Tray picks them right up and you can knock them back into their containers.

Last but not least is a series of Glo-Devil plugs for four-cycle engines. Currently available are four-cycle plugs for all Enya and Saito four-strokers, as well as O.S. Max.

The last topic is the fabulous line of nickel cadmium batteries from SR Batteries*. I recently saw Larry Sribnick, the genial mentor of SR, and I requested a number of batteries that I needed to get a few radio systems back on the air. This entailed obtaining transmitter batteries for a Series 79 Kraft Transmitter, as well as several airborne battery packs for my Kraft receivers. Thanks to SR, these batteries are already in place in transmitters and receivers. However, SR had a large auxiliary transmitter battery pack (900-mAh) which caught my attention. I am an avid glider pilot and the idea of almost doubling my transmitter battery

SR Batteries has a battery just for you. See text.

capacity was intriguing. I recognize that this may not be important to every reader and perhaps only to the glider pilots. However, there is another application for a 900-mAh battery pack; the new PCM transmitters.

The Futaba PCM, for example, consumes almost double the power of a conventional transmitter and consequently has about half the useful transmitting time in between charging. As such, the auxiliary battery pack might be just what the doctor ordered. To use the 900-mAh auxiliary battery pack, you will probably have to mount it on the outside of the transmitter, either on the bottom, the side, or somewhere on the back. The unit itself is usually too large to substitute for the existing battery pack because it has almost twice the capacity. The 900-mAh pack weighs 12 ounces and measures 4¾x1½x1½ inches. As such, a convenient spot must be found for your own particular installation. Since I fly single-stick transmitters almost exclusively, I chose to mount the auxiliary battery pack on the lower back of my Kraft KPT7CS transmitter.

SR transmitter 900-mAh battery pack serves as auxiliary power unit.

In order to do this, I removed the transmitter battery pack and, using a template provided by SR, drilled three holes in the transmitter back cover; two holes for the 6-32x¼-inch sheet metal screws and one ⅛-inch diameter hole to clear the battery cable and connector to the interior of the transmitter. Needless to say, the old transmitter battery should be removed and the new battery either spliced to the existing battery leads or joined by means of a Deans 3-pin polarized connector. Prior to reassembling the back to the transmitter, be careful to tape or suitably protect the battery wire where it passes through the rear of the transmitter case to prevent chaffing. After the replacement is complete, the battery should be suitably charged prior to using. Remember, if you're using the standard charger that came with your radio, it will take about twice as long to get a full charge on the 900-mAh pack as compared to a 500-mAh pack. I have flown my Super Monterey for well over three hours flying time (approximately eight flights) and have not had to worry about recharging my transmitter. Needless to say, I was pushing it with my receiver batteries, but I was only using two servos.

An additional note about SR: they have one of the finest selections of custom-made batteries available today. I'm sure many of you are familiar with their hotline (516-286-0079) and the courteous treatment and great trouble-shooting you can receive. I've been pleased with the batteries I've obtained from SR.

See you next month by the "control tower."

Charlie Kenney, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Mini-Vac, Inc., P.O. Box 3981, Glendale, CA 91201.

McDaniel R/C, 12421 Ransom Dr., Glenn Dale, MD 20769.

Sonic-Tronics, 7865 Mill Rd., Elkins Park, PA 19177.

SR Batteries, Inc., Box 287, Bellport, NY 11713. ■

PRODUCT NEWS

BYRON GLASAIR

Byron Originals' all new 30% scale Glasair is a replica of the Stoddard-Hamilton popular composite homebuilt and offers all the performance and excitement of its full-scale counterpart. Fiberglass fuselage, cowl, and wheelpants assure a strong, lightweight construction. The Glasair features Byron's exclusive plug-in wings. By simply loosening two socket head screws in each wing panel, the wing separates from the fuselage. Even flap and aileron linkages automatically disconnect when the wing is removed. The Glasair has been test-flown with a standard Quadra 35 and is very responsive through 4-point rolls, Cuban Eights, reverse Cuban Eights, Hammerheads and more. For a detailed information pack, send $2 or for a full-line catalog, send $3 to Byron Originals (P.O. Box 279, Ida Grove, IA, 51445; 712-364-3165.)

HEAT GUN

One thousand watts of hot power are yours with the Heat Gun from Texxon Precision Products (P.O. Box 420496, Miami, FL 33242). It features a wide nozzle, On/Off neon lamp, adjustable air intake, and a Hot/Cool/Off switch. For fabric or plastic coverings, the Heat Gun is lightweight, asbestos-free, and has a long-life motor.

NEW COWLS

T&D Fiberglass Specialties (30925 Block, Garden City, MI 48135; 313-421-6358) announces the latest addition to their line of fiberglass cowls. Back row, left to right: 10½-inch diameter by 10-inch round cowl (Super Stearman), Air Tech's "Fun Fly," Ziroli's Corsair with cowl lines and flaps molded in. Front row, left to right: "Ol Bluenose," Carl Goldberg's "Anniversary J-3" with cowl lines molded in and lengthened for a four-cycle engine, 5½-inch diameter by 4-inch round cowl, "Air Cabin," "Cracker Jack." Send $1 for a complete catalog.

TEXXON FUEL

Texxon Precision Products (P.O. Box 420496, Miami, FL 33242) has the finest fuel made. Available in 11 nitro blends, it is made with quality ingredients and is precision blended with special additives. It comes in two distinct grades, Super Sport Fuel and Turbo-X Pro-Fuel. For all ½A .049 to .09 engines, there is ½A Turbo-X Pro-Fuel.

POSI-CURE

Sheldon's Hobby Shop (3157 Alum Rock Ave., San Jose, CA 95127; 800-228-3237 out-of-state; 408-251-0789 in California; *orders only*) introduces Fast Cure and Gap-Filling formulas in 1- and 2-ounce sizes at 50% off the list price. These products are a must for all modelers.

WINNER SERIES RADIOS

The Winner Series of JR Pistol Grip two-channel radios is now available from Circus Hobbies (3132 S. Highland Dr., Las Vegas, NV 89109; 1-800-782-0022). Compact and lightweight, the Winner Series 2 radio is designed primarily for the R/C car enthusiast with additional applications for the R/C boat hobbyist as well. It is available in 27 MHz frequencies now and it is anticipated that 75 MHz land frequencies will soon be available. It features servo reversing, end point adjustment for both channels, continuously adjustable steering rate, adjustable steering wheel tension, and an easily removed crystal for frequency changes. The Winner Series 2 is available at a special introductory price of $89.95 (down from $154.95) from Circus Hobbies.

KYOSHO OPTIMA 4WD

No "hopping-up" is necessary with the new 1/10-scale Kyosho Optima 4WD. Without any modification, this car from Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820) has what it takes to be a consistent race winner. Its sophisticated suspension system; efficient, enclosed, chain-drive mechanism; durable components; and extremely low overall weight put it in an elite class of electric 4WD off-road racers. The Optima's outstanding double-wishbone, four-wheel independent suspension system is comprised of lightweight, super-strong, glass-filled 66EX nylon parts. Oil-filled shocks are featured on all four wheels, enabling it to absorb jumps of one foot or more with no rebound or loss of control. The Optima's strong aluminum ladder-type chassis and virtually indestructible front bumper are built to endure strenuous competition!

NUTS AND BOLTS

Lightweight Fasteners (10158 Stagg St., Sun Valley, CA 91352) is proud to announce their new modeler catalog. In it you'll find a large assortment of specialized fasteners, tools, and model accessories. Some of the screws, nuts, and bolts offered are top quality colored aluminum, stainless steel, titanium, and plastics. Many of these products reduce weight while adding beauty and realism. Lightweight Fasteners will ship one item or a thousand items, and if they can't stock what you need, they'll manufacture it to your specifications. A catalog is $1.

PERFECT PAINT

Cheveron Hobby Products (P.O. Box 2480, Sandusky, OH 44870; 419-627-1877) is taking the guesswork out of paint selection by putting an actual paint chip on every can of Perfect Paint. The glossy colors are computer-matched to MonoKote and many camouflage colors are computer-matched to the Federal Standards. Perfect Paint will cover all dopes, epoxies, metals, fiberglass, styrofoam, and plastic with a smooth, hard, mar-resistant surface that will not crack or chip. It is extremely fuel-proof, virtually odorless, will not blush, has excellent flow properties, and uses non-toxic pigment.

EAGLE 370

MVK (Precision Model Products, P.O. Box 637, Lemont, IL 60439; 312-257-7548) introduces the Eagle 370, one of the most innovative and well-engineered twin cylinder engines ever produced. With a CDI integral spark advance/retard ignition system, this engine provides effortless starting and mid-range to full power without the usual balkiness associated with pre-set timing. Idle is so enhanced by the retard system that sub-1,000 idle is the rule, not the exception. Weight is 4.5 pounds, displacement 3.7 cubic inches (60 cc), compression ratio is 11:1 and useful rpm are 900 to 9,000-plus.

1986 R/C SYSTEMS

Astro/Polk's (346 Bergen Ave., Jersey City, NJ 07304; 1-800-225-POLK) introduces three R/C radio systems for 1986: the Aristo/Hitech 4,000 4-channel R/C system ($64.95), Aristo/Hitech 302PX 2-channel Pistol-Grip R/C System ($69.95) and the Aristo/Hitech 6-channel R/C system ($109.95). For more information write to Aristo/Polk's.

CESSNA SKYHAWK 172

MRC (2500 Woodbridge Ave., Edison, NJ 08817) is proud to introduce the Acoms Cessna Skyhawk 172 electric airplane. MRC has pushed the state-of-the-art in electric airplanes with the Acoms Cessna 172 kit. This semi-scale kit is made of tough, finely-molded styrofoam with plywood reinforcements for low weight and high strength. With a wingspan of 43.3 inches, a wing area of 263.4 square inches, and a fuselage length of 30.3 inches, the 172 only weighs 31.7 ounces. The secret to its light weight is a Mabuchi RS-380 motor putting its power through a 3:1 gear reduction box turning a 9x4 prop. This kit is a great beginning model for first-time electric pilots. More experienced pilots can add a 4-channel R/C system and a miniature receiver battery, and buy the optional A-502 Relay Motor Control which plugs into the Acoms R/C system receiver for switching the motor On and Off during flight, increasing the flight duration.

R/C NEWS

(Continued from page 70)

break-in are required before the big four-strokes can develop full power and the absolutely stable operation I witnessed on his Enya R.120. Two hours gives the more numerous moving parts of a four-stroke (over a two-cycle engine) a chance to bed-in; particularly the valve train. A four-stroke should not be flown out of the box as is so often the case with two-cycle engines. On top of that, a two-hour break-in gives the owner a chance to learn the little tricks of his particular mill.

Chidgey feels many fliers are using pitches too low for the 120 four-strokes. He flies a 14x11 D&W propeller and this seems to work well keeping revs at a safe level for the engine. One thing to keep in mind, according to Ron, is that four-stroke engines do not unload in the air as much as two-cycle engines and can be propped on the ground for something near the expected airborne rpm.

One thing I noted about Ron's engine operation was that he wasn't constantly tweaking the needle for that last 100 rpm; a deadly practice with four-strokes. Except for his initial run-up at Rayskala, Ron didn't touch the valve, a testimony to his faith in his engine and the engine's consistency. By the way, Chidgey runs Cool Power fuel with 15% nitro and 14% oil.

Ron does not use the choke arrangement on the Enya, indeed it is not accessible since he did not install the actuating arm. The reason is found in his concern that in the heat of a competition start, the choke might be left in the choke position. More importantly, the choke is simply not needed when an electric starter is used as Ron advocates. Even in cold weather (and it was positively chilly at Rayskala) a four-stroke will, with an electric starter, draw in fuel and fire fine with no choking.

Ron had employed an O.S. carb on his earlier Enya 120 but he feels the newer "R" version functions fine with its standard carburetor.

That's it for this month.

Art Schroeder, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Sig Mfg. Co., Montezuma, IA 50171. ■

FROM THE COCKPIT

(Continued from page 69)

The airplane I was flying didn't have the intermediate maneuvering flap position of 15°. If it had, I wouldn't have had to fight it that hard to get down to gear speed.

Talk about surprises! The second the gear went down, I found myself squeezing those throttles forward trying to hold altitude. Soon, just to hold altitude at 140 mph, I was carrying almost as much power as I had been using to cruise at 250 mph. Also, the airplane was all too happy to fall toward the ground if I eased the power back. The problem was that the P-38, as opposed to nearly every

other fighter of WW II, had gear doors that stayed open when the gear was down. They didn't close up behind the gear legs and heal the open wounds that are the gear wells. The result is that, with the gear down, what had been a sexy, aerodynamically clean machine was suddenly a clod of dirt attached to a tumbleweed.

The next fight came on final. Since the flaps go from nothing to something like 40° in one giant step, the trim change is enormous. Or at least it felt that way to a neophyte. I found myself wheeling in trim like crazy to keep up with it, all the while jockeying the throttles to maintain altitude. To make matters worse, when slow and dirty, you are carrying a huge handful of power, which is no big deal. Unless you have to change settings. In this particular airplane, the throttles weren't set right and bringing them forward together brought the engines up an inch or two of manifold pressure apart. That meant I had several hundred more horses on one side than the other and the nose slewed back and forth accordingly. This was definitely no place for a low-time multi-engine pilot like me. Especially if something really went wrong, but nothing did.

As the runway came up to meet me, I gently brought the nose up, at the same time closing the throttles. The airplane obediently planted its main gear on the concrete and I once again fixated on the nose, holding it off until the airplane slowed and I lowered it slowly.

After the flight was over, and I had time to reflect on it, I realized the P-38 was a pussy cat to fly, compared to a Mustang. It was really a gentleman's airplane. It was extremely comfortable with great visibility and handled on the runway like it was on rails. In the air, it was as stable as your front yard (assuming you don't live in Southern California), and went out of its way to give you plenty of time to do everything — unless something went wrong and you lost an engine at the wrong time.

Since it took 15 to 20 seconds to fully feather the Curtiss electric props, it's obvious that an engine failure on takeoff could lead to some really exciting chapters in your life, all of which would be passing before your eyes in seconds. If it happened on a fully-fueled 38 with a load of ammo and bombs on board, you'd better be Flash Gordon in the reflex department or you aren't going to make it.

To legally fly airplanes that weigh more than 12,500 pounds, the FAA requires you to be tested and they issue a type-rating for that specific type of airplane. At the bottom of my pilot's license is a tiny little line that reads "L-P-38." It doesn't earn me many jobs as a P-38 driver, but it sure is neat for settling arguments at cocktail parties. ■

LANCE BANDIT

(Continued from page 66)

"floating" tie-bar stays in the fuselage with a 10-24 socket-head screw to hold the wing in place. When these are tightened, the wings are on to stay. It's strong, simple, and clean.

The completed airframe, minus engine and radio, only weighs 14 pounds. Virtually any of the gasoline engines will work. I used the standard Quadra 35, which worked very well.

I used a Futaba 7-channel radio. The Bandit uses 6 or 7 servos, depending on whether or not you use a smoke system. There's one servo for each wing panel, one servo for each elevator half, and one servo each for rudder, throttle, and smoke. I used all standard S28 Futaba servos and an SR 1,200-mA square battery pack.

FLYING. The Bandit takes only five minutes to assemble once you get to the flying field.

I filled both the fuel and smoke tanks, and primed the Quadra. I let it warm up a few seconds, then taxied out to the runway.

The Bandit tracked straight down the 200-foot runway and was airborne about halfway down.

I made one pass over the field and was ready to trim, but it didn't need trimming. She was flying straight and level right off the building board.

Then it was time to see what she could do. Flying the Bandit is like flying a giant pattern ship. It does rolls, spins, loops, Cuban eights, and even a Split-S. That's not to say how well the Bandit flies inverted!

When I added smoke to these maneuvers, everyone at the field stopped what they were doing to watch the Bandit fly.

Don't let the Bandit hold you up. Run out and buy one today and enjoy flying a giant model in no time. Lance has another winner on their hands.

**The following are the addresses of the companies mentioned in this article:*

Lance Machining and Manufacturing, P.O. Box 626, West Jordan, UT 84084.

Futaba Corporation of America, 555 West Victoria St., Compton, CA 90220. ■

ENGINE REVIEW

(Continued from page 56)

centers, equal to 1.93 times stroke, which is quite generous and thereby avoids excessive rod angularity and piston side thrust. This is used in conjunction with a high placed wristpin to avoid an increase in overall engine height. The wristpin is tubular, 4 mm o.d., full-floating and fitted with plastic (probably PTFE) pads. Complete with ring and wristpin, the piston weighs a modest 5.5 grams. The rod checks out at 2.8 grams.

CYLINDER HEAD & ROCKER BOX. The head is a fairly complex aluminum pressure casting that also includes the base of the rocker box and has the usual phosphor-bronze valve seats and guides. The combustion chamber shape is theoretically more efficient than the discoid pattern of the FS-40, being similar to the modified shallow bathtub shape used by other recent O.S. four-strokes. The glowplug is inclined and offset toward the exhaust valve in the approved manner (theoretically to help control detonation) and the adoption of a low stroke/bore ratio has enabled very large valves and ports to be used for improved breathing. Valve throats are 7.2 mm diameter, the inlet port is 5.0 mm diameter and the exhaust port 4.8 mm diameter. The compression-ratio is quite moderate at approximately 7.2:1. The head gasket is of 0.2 mm (0.008 in.) soft aluminum and the head is secured to the main casting with four 2.5 mm socket head cap screws.

The rocker box is fitted with a neat pressure cast cover with blisters for

rocker clearance and a polished finish. It is secured to the head with socket head cap screws fore and aft.

VALVES AND VALVE TIMING. The valves have 8.0 mm diameter heads, 30 mm diameter stems and are 18.9 mm long. The method of anchoring the valve spring to the valve stem is the same as for the other O.S. four-strokes: a steel valve-cap held in place by a horseshoe shaped retainer which engages a groove in the valve stem and is, itself, locked in place by a recess in the cap.

According to our measurements, valve timing is as follows: inlet opens 65 degrees BTDC, inlet closes 53 degrees ABDC; exhaust opens 65 degrees BBDC, exhaust closes 28 degrees ATDC. Thus, the inlet period is a sporty 298 degrees, the exhaust period 25 degrees less and the valve overlap 93 degrees. Valve lift is also uncommonly generous for such a small engine, due to the combination of the cam lifts previously mentioned and the rocker ratio as explained in the next paragraph.

ROCKER ASSEMBLY. Without access to factory drawings, it is invariably a little tricky to determine (with model four-strokes in general and especially with the really small ones) the designer's precisely intended rocker ratio but, by dint of some careful wielding of micrometer and vernier caliper, it was established that the FS-20's rockers multiply cam lift in a proportion of approximately 41:29 at the valves. In other words, after allowing for normal valve lash, exhaust valve lift is over 2.0 mm and inlet valve lift at least 2.45 mm.

The hardened cast-steel rockers pivot smoothly on a hardened rocker shaft firmly secured to the base of the rocker box. They have the usual screw adjusters for setting valve clearances.

CAM FOLLOWERS & PUSHRODS. The hardened and ground steel cam followers are 10 mm long and 5 mm diameter and operate directly in the camshaft housing material. The hardened steel pushrods are 2 mm diameter x 37 mm long and are enclosed in 4.5 mm o.d. stainless steel tube covers. The tubes have flanges at both ends by which they are located between the camshaft housing and projecting underside of the rocker box with O-rings at both ends.

CARBURETOR/INLET-PIPE & EXHAUST PIPE. As on the FS-40, the carburetor body and inlet pipe are pressure diecast in one piece and attached to the cylinder-head via a diamond-shaped flange with two 2.5 mm socket head cap screws. In fact, the same casting (now with the addition of a lug that braces it to a special lug on the back of the cylinder case) is used for both engines.

The carb is of the orthodox barrel throttle type with an airbleed screw for adjusting the low-speed mixture and a stop screw for setting the idling speed. An adjustable nylon throttle-arm is fastened to the finely ground steel throttle barrel. The choke size is 4.0 mm diameter which, after allowing for the jet tube, gives an effective choke area of 7.9 sq mm. (This compares with a 4.4 mm choke—10 sq mm—for the FS-40.)

The exhaust pipe is made of 6 mm o.d. stainless steel tube, flared where it enters the cylinder head, to which it is secured with a blued steel gland nut.

CHOKE VALVE ASSEMBLY. The FS-20 has a specially modified crankcase backplate to which a new and very simple-to-use intake choking device is fitted. The backplate has a drilled lug on

each side through which a transverse 1.6 mm steel rod is passed. Between the two lugs, the rod is linked to the choke valve which is spring-loaded to the open position. The rod is fitted with a button on the left-hand side. Rod length can be varied so that the button can be sited just outside the engine cowl. Thus, pressing the button with one finger, while holding the nose of the model steady for starting, enables the intake to be choked in one easy movement and automatically released again.

PERFORMANCE. Statistics, gathered over many years of testing model four-stroke-cycle engines, have indicated a general pattern linking piston displacement to brake mean effective pressure and to specific power output. This has shown that small engines develop lower b.m.e.p., compared with large ones—in other words, the torque produced by a small engine is less, even after taking into account its smaller displacement. As a consequence, the small engine usually produces a lower peak output relative to its size.

To illustrate this, let us take, as examples, the largest and smallest single-cylinder four-strokes previously tested for the "Engine Review" series. The largest (1.2 cu in.) recorded a maximum torque of 195 oz-in. and a peak power output of 1.76 bhp, while the smallest (3.5cc) delivered 23 oz-in. and 0.24 bhp. In specific terms, these figures represent b.m.e.p. levels of 126 lb/sq in. for the big engine and just under 86 lb/sq in. for the small one; while specific power outputs were, respectively, 1.44 bhp/cu in. and 1.13 bhp/cu in.

Of course, time marches on and these figures will be exceeded. Indeed they already have been. In a future issue of *M.A.N.* we will be publishing a test of a newer large four-stroke that exceeds 130 lb/sq in. b.m.e.p. and develops over 1.70 bhp/cu in. And, at the other end of the size scale, the subject of our present report, the FS-20, substantially exceeds small four-stroke levels with a b.m.e.p. of 101 lb/sq in. and a specific output of 1.43 bhp/cu in.

It is interesting to note that the latter figure is quite a bit better than the performance recorded four years ago for the then-new O.S. FS-40 (1.15 bhp/cu in. derived from a peak output of just under 0.46 bhp) and it is clear that most of this improvement comes from the FS-20's more highly developed valve gear, as previously described.

For the FS-20, the factory recommends a fuel containing 20 percent castor-oil and between 5 and 15 percent nitromethane. This qualified the use of our standard 10 percent nitro four-stroke test fuel and, on this fuel, a maximum torque of 28 oz-in. was recorded at around 9,000 rpm and a peak output of 0.31 bhp at 12,500 rpm was determined. For the record, the manufacturer's nominal power rating for the FS-20 is 0.30 bhp at 12,000 rpm.

Suitable prop sizes suggested in the maker's instruction leaflet are 9x5, 9x6 and 10x5. These, depending on make and type, will, in fact, keep the engine turning in the most useful rpm range, i.e., between the peak of the torque curve and just below the peak of the power curve in level flight. The FS-20 is, however, capable of turning a much wider range of prop sizes without protest. We checked a total of twenty-eight different props on the engine. Speeds achieved with examples of these included 7,600 rpm on an 11x4 Power Prop, 8,050 rpm on a 10x6 Zinger, 8,750 on a 10x5 Top Flite, 9,450

on a 9x6 Zinger, 9,700 on a 9x6 Power Prop, 9,900 on a 10x4 Top Flite, 10,400 on a 10x4 Zinger, 10,100 on a 9x5 Zinger, 10,300 on a 9x5 Top Flite, 11,100 on an 8½x6 Zinger, 11,250 on a 9x4 Zinger and 11,800 on a 9x4 Power Prop.

As the curves show, the FS-20 was run up to nearly 14,000 rpm on smaller loads, but there would be no point in propping the engine for more than about 11,500 rpm static as it would then run up to beyond the bhp peak in level flight and even farther beyond in a dive.

The FS-20 comes complete with a large 4-page comprehensive instruction sheet that includes much of value to the newcomer to four-strokes. Being aimed at beginners as well as at existing four-stroke owners, the FS-20, it is reasonable to suppose, would be easy to hand start. So it is, but experienced four-stroke operators may be forgiven for thinking, on first acquaintance, that it is not.

The reason for this is that most four-stroke owners have learned to be sparing when priming the cylinder for fear of an hydraulic lock or a kickback. In fact, the FS-20 likes to be quite wet for hand starting. We found that the FS-20 could be treated more like a two-stroke: it did not hydraulic easily and did not backfire or kick its prop off. Especially when the engine is brand new, a little extra fuel in the cylinder when hand-starting is all to the good.

The new owner should not, therefore, think he knows better than to follow the maker's instructions. Four good flips of the prop with the throttle wide open and the choke valve fully closed, followed by two or three more flips with the choke open are required, before energising the glowplug, to get the engine going. If the engine does not fire, the cause (as the trouble-shooting chart in the instructions confirms) is more likely to be due to insufficient prime than to too much—always assuming that there is an adequate "glow" at the plug.

Needless to say, a quick start is always available when using an electric starter.

The overall running qualities of the FS-20 were good. No tendency to detonate was detected at any time. If the engine was overleaned, it simply cut out and there was never any occasion on which the prop was kicked loose. The throttle worked well and safe idling at between 2,400 and 2,600 rpm was obtained on all but the smallest and lightest props.

In all, a very practical small four-stroke, well able to compete with popular two-strokes of similar size and weight, but with much more acceptable noise levels, even without a muffler.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

GOLDEN AGE

(Continued from page 38)

required batteries. Obviously you were limited to only one control and with all the required batteries the airborne weight was very high. The toy-like Aerotrol got many modelers interested and started in R/C, and most had enough success to want to continue.

I was deeply involved with C/L at this time and I soon had the desire to get rid of the lines and see the full flying potential, if only reliable R/C were available. I was able to take the plunge into R/C with Aerotrol equipment—about the same time that CB created the R/C explosion—and I never reverted to C/L again. I'll break off this saga at this point, to await some more input from you readers, so the most exciting history is yet to come.

Tom McCoy of Sterling Heights, Michigan, provided the photo of his replica RC-1 design. The RC-1 is legal for SAM R/C assist F/F and Tom has been doing quite well with it in competition.

I also found a drawing of the Live Wire Cruiser. It's hard to believe it was dated 1954! Thousands of kits of this model were produced, making it one of the popular designs of the day. It was a large plane, even by today's standards, with 775 square inches of area, yet the normal recommended power was one of those ancient .19 engines—pathetic compared to today's Schnuerle powerhouses. The clue to the admirable performance was the light weight of 4 or 5 pounds, including the heavy-weight R/C equipment.

The Cruiser's heyday was at the peak of single-channel flying and into the beginning of multi-channel flying. It made an ideal transitional design because with its size, it was easily capable of handling the new, heavy reed systems.

The first multi-channel systems provided rudder, elevator, and engine control, offering the first "real" maneuvering.

Please note how modern the appearance is. If the Cruiser were sitting on one of today's flight lines, it would be easy to walk right by without realizing that it was 33 years old! This supports Bill Winter's contention that many of the granddaddy designs would fit neatly into today's sport scene. When you want a new sport flyer, why not make it an old timer and kill two birds with one stone?

I provided this piece as an example of the type of information and activity the OT R/C movement is based on. Those already involved have their own versions, so please take pen in hand and let me know what you know—and don't forget to search for that first R/C!

Hal "Pappy" deBolt, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

DER JAEGER

(Continued from page 47)

Add the ¼-inch ply wing dowel plate, and glue to the wing saddle. This will assure true, square sides. Cut and glue the bottom cross braces, as you pull and align the tail together. Use a pair of Perma-Grit sanding sticks back-to-back (or folded sandpaper) at the tailpost to shape the stringers and the post to the proper bevel. Align and glue the posts together. Cut the ⅛-inch ply tailwheel plate and use thick cyanoacrylate glue. Flip the fuselage over and add the top rear cross braces. Each should be cut exactly the same size as its bottom mate.

Use hard balsa for the ⅛x⅛-inch side stringers. Start at the front end and glue each side alternately, working toward the tail while making sure the overall alignment is still true. Add the ¼x⅛-inch stringers to the top and bottom edges in the same way. Then add the aft bottom stringers.

The top turtledeck will take some sanding and fitting, but will finish up the aft fuselage. Don't glue it in place until the fuselage is covered.

The last thing to do before the wings are completed is to glue the bottom wing attaching blocks and their gussets.

Note: It will be easier to work on the top wing cabanes if the front formers F1A, F2A, and F3A and their stringers are left off for now. The best sequence is to complete both wings before continuing, so skip that part of the construction, then pick up here later.

Seat the bottom wing, checking for skew on overall alignment and for firm seating. Measure for, or use an incidence meter to make sure you have 0° incidence in relation to the fuselage thrust line. Drill, tap, and install the wing bolts. Bend the wire cabanes per the drawing outlines and attach to the ply shelf with J-bolts.

Make up the top wing mounting plates and install on top of the cabanes. Bolt the wing to the cabane and check for alignment, incidence, and fore/aft position in relation to the bottom wing. Make the Z-bend braces, then wrap each end to the cabanes with copper wire. Solder their bottom ends to the cabanes, then check the wing placement again before soldering their top ends.

Recheck all wing alignments again. This is the most important check you can make; a bipe will not fly right when its wings are not true.

Make a pair of V-struts approximately the same length shown on the plans. Wrap and epoxy the top attaching plates only, leaving the bottom plates as slip-fits until checking the relation of the top and bottom wings again. Make all necessary adjustments to the cabanes! Don't use the V-struts to push or pull the wing for alignment.

The interplanes are the last set of struts to make. These are mainly cosmetic, but be sure they don't induce a warp in your panels. Now that the cabanes are in their final positions, add the top fuselage formers and sheeting. Trial-fit the ¼-inch ply landing gear plate. Cut and glue the landing gear blocks to former F2. Drill holes for the landing gear wire, fit the gear and attach with J-hooks. Glue the landing gear plate in place. Fit, carve, and epoxy the balsa chin plate over the landing gear plate. Except for the tailfeathers, this should finish up major construction.

The top wing has no dihedral, and is easiest to build upside down over the plans because all of its attaching plates and cutouts are on the bottom. Cut out all the ribs in pairs. Do not cut the ailerons loose yet. Just notch them for cutting later.

Cut the ¼x¼-inch spruce and balsa spars to length between outboard ribs. Cut the leading edge and sub-leading edge to length from wing tip to wing tip. Cut the leading edge sheets to length between outboard ribs. Pin down the top leading edge sheet over the plans and glue the spruce spar to it. Pin down a ¼x¼-inch jig stick over the index marks on the plans.

Place each rib over the spar to rest on the jig strip and glue them to the spar only. *Do not glue to the leading edge sheet yet.* Glue the previously assembled leading edge to each rib, taking care that the ribs are square with the spar and centered on the ribs. Glue the bottom balsa spar to all the ribs.

Glue the bottom leading edge sheet to the leading edge and sub-leading edge. Soften the wood for bending by brushing water on its outside surface, then carefully bend it down to be glued to the balsa spar. Glue the rear sheet from the center rib to the outboard rib. This will cover the aileron hinge area to be cut loose later. Note on the plans that these are actually two pieces of balsa. Outline the center section cut out, curved portion of the wing with a French or flexible curve. Trim and sand it to shape after the top sheeting is added.

Complete the center sheeting, then cut through the sheet and the balsa spar carefully to add the cabane wing fixtures. Drill and tap them for the attaching bolts when the wing is ready to be fitted to the cabanes. Add the bottom cap strips to stiffen the wing sufficiently enough to turn it over for work to be completed on the top side.

After installing all the top sheeting and cap strips, the wing will be stiff enough to flip-flop it around as you need to add the strut attaching plates and bellcrank brackets. Mark the ailerons and cut them out with an X-Acto knife and saw, *after* completing both wing tips.

Make a suitable cutout and brackets for your servo. Add the pushrods and bellcranks, then do the final sanding on the scalloped trailing edge. These are the final steps for the top wing.

Build the bottom wing in the same sequence as the top wing, however, build it in two halves with shorter pieces of material because of its dihedral.

I've tried to make the plans self-supporting, but in every best-laid plan, something is always missing. After studying them for a couple of hours for omitted details, I gave up and decided to go flying.

FLYING. I peaked the Fox .40 to just above the four-stroke burble, and was ready to go. Advancing the throttle slowly, it rolled out about 10 feet and nosed over! Two more attempts at scale-like takeoffs resulted in the same embarassing thunk! The wheelpants and medium short grass just wouldn't let her build up enough speed for elevator control.

When people standing around started talking to each other behind their hands, there was nothing else I could do but get her in the air right away. I used a midget racer start by hitting full throttle then pushing her out as hard as I could. For

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KYOSHO PEGASUS

(Continued from page 53)

Once this is complete, you're ready to move on to the installation of the rear swing-arms. Before you screw the swing-arms to the chassis, put half-shafts in place, as they will not fit after the swing-arm has been installed. Now you have completed the rear suspension.

Next flip the car over and attach the battery compartment cover and put the radio in place. Assemble the servo saver according to the directions and attach it to the servo horn. Now mount the speed controller to the chassis. I found the supports for the controller to be a little weak, causing inaccurate speed control. To correct this problem I used a section of pencil and two pieces of double-sided tape. By putting a piece of tape on each end of the piece of pencil and placing it under the controller near the ceramic resistor, you will give the controller enough support and still allow it to be removed if need be.

Next mount the servos, radio receiver, and battery holder, followed by assembling the front end and mounting the front shocks. Once this is complete, install the front spindles, which simply snap in place. Next mount the front bumper.

Kyosho racing battery pack provided ample juice.

With the steering linkage in place, install the front end to the chassis. The front end is held on by using four self-tapping screws. Steps 18 and 19 are tips that Kyosho offers on adjusting steering and speed control linkage. Follow these simple steps and you should have no problems in this department.

Complete steps 20 through 23 and you're ready to paint the body. With a Lexan body, it is advisable to use a polycarbonate paint because of its flexible properties. Enamels and other paints crack on impact. Painting the body on the Pegasus is an easy task compared to most other cars because you only have to apply one color as opposed to three or four. All other striping and lettering is supplied with the decal kit, which I thought was a great idea. Once this task is complete, you're ready to put the Pegasus to the test.

After charging the battery pack with my Kyosho charger and checking the Astro II radio (both available from Great Planes) it was off to my favorite test track—the beach!

New polycarbonate paint from MRC made painting the Lexan body a breeze.

PERFORMANCE. I was really surprised at how fast this car goes. Even though it is an entry-level car, with the assistance of the Mabuchi 540S and a heavy throttle finger, I'll bet you'd be right along side any comparably priced car. As I leaned on the throttle, the rear tires began to bite down deep into the sand and threw a rooster tail 2 feet long.

Continuing down the beach, I figured it was time to test the car's handling ability. As I pitched the stick from side to side, the dune buggy-like front tires carved a deep path in the sand as the rear tires continued to belch endless amounts of sand from beneath them. As for the suspension, it is also up on a par with the rest of the car and could handle some really rough terrain.

In summation, the Kyosho Pegasus is a fast-building and great-performing car at a reasonable price. The Pegasus makes the ideal "entry-level" car since you can learn the basics of car building and radio installations, plus tear up some dirt with the best of 'em!

The following is the address of the company mentioned in this article:

Great Planes Model Dist., P.O. Box 4021, Champaign, IL 61820. ■

DER JAEGER

about 10 seconds she resembled a drunken bumble bee, but she was flying!

I have to brag that the trim was almost right on. I put her through the paces and she high-stepped all the way. She did everything I had expected of her—snap rolls, inverted flight, knife-edges, and spins. Throttling back for slow flight, she coasted around nose-high, steady as a rock, except for a tendency to yaw. Earlier, during the loops, I noticed that she wouldn't hold a line over the top, but I blamed it on the strong winds. Later investigation and discussion revealed that the left ailerons weren't aligned. Two turns on the bottom clevis solved the problem.

The landing was an attention-getter. The Der Jaeger is a "dirty" aircraft in that it has a lot of wires, struts, pants and a bomb to slow it down. You have to come in under power with the nose up, or dive her to the numbers if you're dead-stick. She slows down real quick! The first landing ended the way the first takeoff attempts started, only in reverse. A beautiful flare, an almost three-point touchdown, a nice roll out, and a nose-over just before the tail was ready to drop. Thank you for glass props.

I had proved that she would fly; quite well from the remarks overheard, so I didn't push my luck with high-power slow-speed takeoffs anymore. That would be begging for a snap roll. Later flights from a paved runway were so scale-like that they sent tingles up the spines of all gathered bipe nuts!

**The following is the address of the company mentioned in this article:*

Fox Mfg. Co., 5305 Towson Ave., Fort Smith, AZ 72901. ■

SCHLUTER CHAMP

(Continued from page 65)

Head Lock Remote on one of the engine mounting bolts to allow starting with the cabin in place. The fan shroud is the same nice unit found in the Superior. It consists of two interlocking molded pieces and a vacuum-formed extension which is trimmed to fit the engine and bolted to one half of the shroud. The extension should be at least ¼ inch from the engine or it will melt.

Construction continues with the tail-boom, and tail rotor gearbox, which are identical to the Superior.

The only real building involved in the Champion is the assembly of the radio mounting platform, which is made up of two plywood trays mounted on a laminated centerpost. It is easiest to cut the openings for the gyro and the servos before assembling the platform. Hardwood risers might need to be added, depending on the servos used. Adjust the vertical position of the servo with the risers so that the pushrods can run as straight as possible to their respective bellcranks without hitting each other.

The rotor head was easily completed since most of the unit comes factory-assembled. My kit was missing one of the collars that keep the flybar centered. I used a 5/32-inch wheel collar since it fit perfectly on the 4 mm rod. I contacted Walt Schoonard of Miniature Aircraft about the error and he told me that a batch of Champion kits were missing the collar but that the problem has since been corrected. If you're missing the collar from your kit, call Walt and he will send you one, or use a 5/32-inch wheel collar as I did.

The tail rotor blades are molded plastic and only need balancing. The main blades are of the standard hardwood and balsa laminate and must be covered and balanced.

The cabin is made up of two clear vacuum-formed halves which need to be trimmed and joined together. Cyanoacrylate glue works well, and I recommend reinforcing the areas of high stress, such as the seams and the hold-down posts. I painted the cabin, stabilizer, and tail fin with RustOleum blue and finished it with MonoKote trim sheet and decals.

I used a Circus JR Century VII helicopter radio with NES 401 servos, which installed easily, as did a Kraft* gyro. This radio is nice because it has all the necessary mixing functions, plus several handy features such as hover trim adjust and an invert switch. The weight of the finished machine was exactly 10 pounds.

Final setup is probably the most important step in producing a model that flies well. The cyclic and tail rotor adjust-

ments are straightforward. One thing to note is that the push-pull control for the pitch will bind at the ends of travel if the servo output arm is straight. The operation is much smoother if a round output is used and the holes are drilled about ⅛ inch in front of the output shaft.

The collective pitch should be initially set up as shown on the plans. Recommended end points were -4° to +7° with 2.5° at hover. I settled on -3° to +7° with +3° at hover. The throttle should be set up so that 50% carburetor opening is just at over ⅓ stick and 60% is at ½ stick. It's important to have enough throttle to maintain rotor speed at low stick settings, or landing approaches will be sloppy at best, since the rotor will have to be accelerated when flaring. Maintaining rotor speed on approaches is important on all helicopters, because they are less tolerant to low rotor speed. This is because Schluter machines have a higher rotor mass to reaccelerate during the transition back to hover, which takes time, producing a momentary decrease in control response.

FLYING. Now we come to the fun part. Initially I had trouble with the engine. I could not get it running so I called Walt Schoonard to get his advice. He suggested that I screw the carburetor spray bar in one more turn. This placed the tip in just past the mid-point of the venturi. The engine then ran but I could not get a good midrange and a steady idle. The midrange was too rich while the idle was too lean. Adding muffler pressure solved the problem by allowing me to lean out the midrange with the high-

speed needle and richen up the idle with the low-speed needle.

Initial flight testing of the Champion was done on a rainy November day in Baltimore, Maryland. I really didn't like flying in the rain but I had driven down from Connecticut to let my friends Bob Harris and Dr. Stan Blum try the machine. Between the two of them, they have about 18 years of helicopter experience. They both were very impressed by the Champion's flight characteristics.

Hover is rock steady, with a positive transition to forward flight. Rolls can be performed in barely four lengths of the machine while in forward flight. Loops are impressive with their centers only about a foot behind the tail rotor. The Champion still has a very positive vertical performance at half stick that Schluter machines are known for, and its tail rotor response is brisk. As with all Schluter machines, the rotor head is tunable to suit any individual's flying style. Using stock control paddles with the balancing weights all the way out, control response is quick with good stability and aerobatic performance. The weights can be moved closer to the rotor hub to increase control response, but stability is sacrificed. The control response can also be slowed down for the beginner by cutting down the control paddles. Walt told me that by adding Kalt control paddles, majestic 200-foot diameter loops are possible.

All things considered, the Champion is a fantastic machine. Schluter has taken the best points from his previous designs and added some new ones, creating a great machine that will do anything a pilot can dream up. Walt said that the Champion will do clean Immelmanns and has even been looped during an autorotation. The Champion mechanics are also available separately for scale projects. Schluter currently has kits for the Bell Long Ranger III and the BK 117 which utilize the Champion mechanics. Three- and four-blade rotor heads are also available.

In conclusion, the Champion is the best machine Dieter has produced to date. I expect to routinely see the Champion in the winner's circle next season.

**The following are the addresses of the companies mentioned in this article:*

Miniature Aircraft, Inc., 2594 N. Orange Blossom Trail, Orlando, FL 32804.

Circus Hobbies, 3132 S. Highland Dr., Las Vegas, NV 89109.

Kraft Systems, 450 W. California Ave., Vista, CA 92083. ■

ABOUT ENGINES

(Continued from page 49)

that we weren't the only "displacement stretchers" in the model engine business!

Perhaps it was quirks such as these that contributed to the "character" of the old-time motors. We see little of it in today's powerplants, because they are made on expensive, sophisticated machines that don't take kindly to individual variations. They're set up to make *a lot* of parts exactly the same—it's far cheaper that way.

Of course, this is a benefit to us model fliers. We no longer need to break in our engines for three to six hours, as was commonly specified for pre-war engines. We don't have to fiddle with a stack of flimsy round gaskets trying to find a combination that will align the cylinder properly when we reassemble a motor after cleaning, as we had to do with Browns, Bunch engines, and Hurlemans. And when we buy more than one motor of a kind we can be almost certain that they'll all run pretty much alike, instead of ranging all over the performance curve like, say, a group of Atwood Champs was likely to do.

By the way, the first mass-produced model engine that was fitted precisely enough to require little running-in was the 1946 Fleetwind .60. Although it was a lapped-piston type, its pistons and cylinders were ground to size so perfectly that no hand-fitting was necessary. Any piston would fit any cylinder equally well, a manufacturing feat not duplicated until Roy Cox came out with the Space Bug .049 in 1952.

The Fleetwind wasn't a commercial success, however. It was basically a sound design, but it suffered from several minor flaws. There were too many screws and too many gaskets. The twin fore-and-aft bypasses were excessively narrow and restricted gas flow badly, and the timer tended to be finicky to adjust. The immediate postwar years saw a number of quality .60-size model engines: Ohlssons, Super Cykes, Hornets, Atwood Champions, McCoys, and Orwicks. "Off-brand" types such as the Fleetwind (and the Orr, Bungay, Pacemaker, Thunderbird, and Ken) had no real chance in the marketplace against these. Nevertheless, the Fleetwind was a real milestone in model engine development, and deserves to be remembered.

One further thing worthy of mention about model engine manufacture in the "good old days" is the philosophy of the factory management. That made a world of difference! Consider the quality of

engines such as the Thor, Rogers, Judco, and Genie compared to that of Forsters and Ohlssons. All these engines were mass-produced with the basic motive of turning a profit. Still the Forster brothers never lost sight of the fact that their products were supposed to be *usable*, largely by inexperienced young people. Neither did Irwin Ohlsson or his partner Harry Rice. On the other hand, Clifford Rogers (the man behind the Syncro-Rogers-Genie-Thor-Buzz line of "engines") seemed to go for the financial part of the picture. That accounts for the difference between a Thor and an Ohlsson .23, all right!

Then there were a few engine makers who were absolute fanatics about quality. Mel Anderson's big Spitfire shows what undeviating attention to excellence can do. Ray Arden's revolutionary products are another good example. Neither Mel nor Ray made a great deal of money out of their creativity with model engines. Still, what they accomplished will never be forgotten in the model airplane world.

Joe Wagner, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

WATTS UP?

(Continued from page 50)

chard's 86-inch span 4½-pound four-motor B-24 Liberator. It seems that Woody flew one in the big war, so he did it up in his old squadron markings. It even flew like the original—slow and lumbering. Woody powered it with four Astro 035 motors using the standard Astro 020/035 2.5 to 1 belt reduction drives. He used three-bladed 8x6 props and six 2.4-Ah cells for the pack.

"The 'longest-flight-of-the-day-wins' event was the premier offering. This was flown each day with each pilot being allowed two officially-timed flights in order to get the longest one. This basically eliminated any problems with tie-breakers, with rounds or heats, and with timed motor runs. In doing this, each contestant qualified for the daily finals. Qualification was determined by the highest time on a particular radio frequency. Then, later in the afternoon, each of the 11 or 12 qualifying pilots lined up diagonally across the field, planes and transmitters in hand. A check for cross modulation interference among radios was made, and if there were no problems (and there weren't any), the pilots were given the signal for a simultaneous launch—yes, all at once. This worked well, to the delighted 'ooohs' and 'aaahs' of the spectators.

"The resulting winners took their fame in stride. Bill Meleske (only a Level V glider pilot) won the Last Down on Saturday, taking home the $50 reward. He achieved this stunning victory with an Astro Challenger (*M.A.N.* plan #6851 for $10) powered by a Geared Astro 15 Cobalt motor on ten 800-mAh Sanyo cells turning a Geist 13-inch folding prop. His Challenger had an all-up weight of 48 ounces and routinely recorded 20- to 30-minute flights. "In second place was Brian Bailie, also flying an Astro Challenger. On Sunday John Bailie (Brian's Dad) took away the $50 award flying a geared Astro 15 Cobolt-powered Astro Challenger. It used nine 1.2-Ah Sanyo cells and a Geist 13-inch folding prop. It weighed 46 ounces. Second was Ken Stinson flying a Bob Kopski designed Spectra using the small 400-square inch Sport wing. It was a remarkable achievement.

"At the close of each day the awards were given out to the humble winners. I think each one really enjoyed having their names announced over the PA system.

"The results over the two days are as follows: Saturday—Best in Scale, Keith

Shaw/Comet; Most Innovative Design, Keith Shaw/Banshee; Most Acrobatic, Dave Verhaghe/Hummingbird; Best Looking, Keith Shaw/Comet; Longest Flight, Dick Allen/47.48 minutes; Last Man Down Flyoff, Bill Meleske. Sunday—Best of Show, Keith Shaw/Comet; Furthest Traveled, Tom Brown/Oceanside, California; Most Aerobatic, Tony Fiori/Warlock 05; Best Looking, John Mountjoy/Aerofly; Longest Flight, Brian Bailie/44.32 minutes; Last Man Down Flyoff, John Bailie.

"Finally, thanks must go to the wonderful members of the KRC club. They put on a great contest."

If you missed this event, get out your calendar and reserve the September time frame. Get there any way you can.

Electric Model Designs

I'd like to be one of the first to announce the advent of a new company, Electric Model Design*, headed by Jim Zarembski. As most of you electric fliers know, Jim has been writing about and designing electric models for a number of years. You can count on him knowing his stuff. His company, EMD, is now offering four kits; they are the Electra Glide II, the Thermic Traveller (both are gliders), the Lightning (an aerobatic sport model), and the Sky Knight (a sport trainer). All of these kits are of excellent quality, featuring precision machine-cut and sanded balsa, spruce and ply. In addition, he is offering, for the travelling modeler, a travelling case that will carry either the Thermic Traveller or the Lightning. For more information, write for Jim's brochure. Try one, I think you'll like it. Just tell Jim that Bob Sliff of *Model Airplane News* sent you.

Bob Sliff, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Electric Model Design, 39 W. Alexis Rd., Toledo, OH 43612; 419-726-2012. ■

SOARING NEWS

(Continued from page 83)

V, 10 km (6.21 miles).

Competition Requirements Level I, none; Level II, 1 place or 3,000 points with a minimum of 5 contestants; Level III, 2 places or 4,500 points (10 contestants minimum); Level IV, 1 win and 2 places or 6,000 points (15 contestants minimum); Level V, 3 wins and 12,000 points (20 contestants minimum).

A minimum of six contests are required.

Witnesses are required, one of whom must be an LSF member, for all Level Tasks. For advanced levels, two witnesses are required. Both must be LSF members. For exact details and all of the requirements, plus a form that you can use for your own achievements, write to LSF*.

Where do I stand on all this? I've been flying R/C sailplanes since 1973. I hold LSF Level II and have completed Level III thermal and slope duration flights, but have met only half of the contest requirements. I still have the Goal and Return flight to make. As you can see, the LSF requires that you be a capable and well-rounded pilot, accomplished in all phases of soaring. As you would expect, the higher you go, the harder it gets—as it should. When you wear your LSF badge and display the insignia on your sailplane wing, it is a symbol of what you have earned and you can be proud of it, since it is recognized by all LSF members as uniquely your own—done by the sweat of your brow, your determination, and your desire to succeed. No small feat that. Where do *you* stand?

See you next month, troops. Let's go

SOARING NEWS

for it. Okay?

Jim Gray, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the organization mentioned in this article:*

League of Silent Flight, P.O. Box 647, Mundelein, IL 60060. ■

INSIDE TRACK

(Continued from page 75)

One last note: never let a battery get hot while it's charging. When it begins to get warm, it means the battery is at full electrical capacity and any excess charge will have to be spilled over. Spillover comes in the form of heat. A good, fast charger can fry a battery into oblivion from just a couple of minutes of overcharging. If you have a charger with a meter on it, learn to read it according to the directions. If it doesn't have a meter, 15 minutes is the limit for a 6-cell battery. A 7-cell pack should not be charged more than 25 minutes. No matter what you do, keep an eye and a sensitive hand on your precious batteries. Feel the battery every couple of minutes. If there's a slight increase in temperature, it is probably charged.

That's all for this month. I've been having a ball with the Cox Progress four-wheel drive/four-wheel steering off-road car. It has placed two out of two times so far! I'm also wringing out the latest version of the Associated RC12i road car. Talk about a trick machine out of the box!

The racing is hot all winter long, so get out and get some — and keep her in tune.

Mike Lee, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, Ct 06897. ■

Club of the Month

There is something special about North Carolina. Friendly people, great food, beautiful landscapes, fresh clean air, and the Winston-Salem Radio Control Club. This club believes in keeping the membership active, and the new club president Steve Gillespie has no trouble doing so as long as Charlie Spear gets the word out in the club's newsletter, *Prop-Wash*.

One of the club's favorite annual events is the Jim Thrift Annual Fun-Fly. Modelers came from all over to participate in this two-day affair, not only because of the competition, but also because of the great hospitality and friendship that prevail. The entire club membership turns out, usually with their families, to make the Jim Thrift Fun-Fly a combination of modelers getting together for some great flying, youngsters enjoying their own glider event, and some of the best food you've ever eaten.

Also on the club's list of annual activities is a well attended pattern contest, which this year logged a total of 228 flights in two days, a club barbecue held on Saturday evening of the contest, and great prizes for the winners.

Model Airplane News is pleased to award two free one-year subscriptions to this club for their outstanding efforts, which are to be given by them to their deserving junior members.

Congratulations!

Each month M.A.N. will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). M.A.N. will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletters to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to: Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

The mystery aircraft pictured in our December 1985 issue was built by All-American Aircraft of Long Beach, California, in 1945 and was named the "Ensign." Having a top speed of 125 mph and a landing speed of 50 mph, this 85-hp Continental-powered aircraft was introduced with a list price of under $3,000. It was of all-metal construction and spanned 33 feet with a fuselage length of 20 feet, 9 inches.

Congratulations to Bill Gohsman of Sequim, Washington, for correctly identifying this aircraft. Other correct entries were received from F.D. Wolfe, Barry Baxter, Ed Childress, Daniel Wolverton, Frank Beatty, Gene Corson, and many others.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail. If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLASSIFIED

SCALE DOCUMENTATION; PLAN ENLARGING. Photo packs, three-views, cut-aways for 1,500 aircraft. Plans for Giant, Precision, S. O Scale. Catalog, 25 pages $3.00. SASE enlarging prices only. SPPS, 3209 Madison Ave., Greensboro, NC 27403.

R/C SCALE PLANS: Curtiss P6E, Stinson SR9, others, ⅛-scale $22.50, ¼-scale $35.50. Catalog $1.00. Richard Barron, 11506 Ohio Ave., Youngtown, AZ 85363.

SEMI-KITS FABRICATED from your plans. Parts cut from balsa, bass, pine, maple, and plywood. Custom wood sizes cut from your specs. Send SASE for quotes. Model Wood Specialties, 4209 24th St., Kenosha, WI 53142.

LIGHTWEIGHT ALUMINUM NUTS AND SCREWS. Also large selection of stainless steel, nylon, titanium and colored aluminum fasteners. Catalog $1.00. Samples, sticker, catalog $4.75. List preferable sizes. Lightweight Fasteners, 10158 Stagg St., Sun Valley, CA 91352.

IMPORTED DIESELS: A-M, Aurora, D-C, E.D., M.V.V.S., K-Mills, Enya, P.A.W., Taplin, & ZOM Standard & R/C .036-.49. Aero & Marine, Sport, Vintage & Contest. Send $1.00 for catalog. Carlson Engine Imports, 814 E. Marconi, Phoenix, AZ 85022.

MORTON M-5 ENGINE complete with metal prop and mount. New condition, best offer. Hale Wallace, 779 Ottawa Dr., Rock Hill, SC 29730.

WANTED: BENTERT receiver, actuator, working; name price. Wm. J. Schenker, Box 1277, Zillah, WA 98953; 509-829-6055.

AIR TRAILS: three 1948, six 1949, eleven 1950. All $100. James Fry, 25801 Lakeshore #69, Euclid, OH 44132.

C/L DC-6 B-36 kits, six new Enya 19s all purchased Japan 1955. Best offer, write Paul Giguere, 96 Richmond Dr., Manchester, CT 06040.

FLYING ACES MAGAZINE wanted by private collector. Ole Oleson, 217 Aries Cir., Reno, NV 89511.

FLORIDA VACATION RENTAL: R/C World, Orlando, two or three bedroom fully-furnished condo available weekly or monthly. Pool, tennis, and R/C flying field. Call 305-281-8788 or write P.O. Box 560846, Orlando, FL 32856.

WANTED: Andrews X-Ray model kits, will pay cash. Jim Robertson, 35 Stonecrest, St. Joseph, MO 64506; 816-279-1127.

AIRBORNE GLOWPLUG POWER CONTROLLER: Fully variable by any spare channel (flaps). Two-ounce unit starts single twins from "C" NICD(s), pulsed. SASE: Power-Troll, 1230 NW Edgewood, Corvallis, OR 97330.

RAZOR BLADES: single-edge industrial quality, super sharp. 100 $4.25, 200 $8.50, 300 $12.50, 500 $20.50, 1,000 $40.50; add 10% postage west of the Mississippi. Cobbie's Gifts, Box 2, Deal, NJ 07723; 201-922-9898.

1930-1950 model magazines for sale. Low price, $1.00 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

THE BEST OF WYLAM, BOOK IV: Don't miss this W.A. Wylam classic. *Book IV* covers "The Stinson Story" and "The Curtiss Family." Book is $5.00, plus $1.75 for UPS shipment. *M.A.N.*, 632 Danbury Rd., Wilton, CT 06897.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

SCALE MODELS BY WYLAM: Another classic by W.A. Wylam, this volume is a companion piece to the *Best of Wylam*. It covers the Consolidated A-11 through the Wright Whirlwind engine. Book is $5.00, plus $1.75 for UPS shipment. *M.A.N.*, 632 Danbury Rd., Wilton, CT 06897.

VIDEO ON COVERING: *Model Airplane News* presents an hour-long, professionally produced, instructional video cassette on envelope covering by Dick Phillips. For beginner or expert, regardless of plane size. Ideal for clubs and hobby shops too! Each cassette is $39.95 (specify VHS or BETA), plus $1.75 postage and handling (foreign and Canadian orders, add $3.00). *M.A.N.*, 632 Danbury Rd., Wilton, CT 06897.

CAUDRON ¼-SCALE PLANS: rolled, postpaid, $22.50. SASE for info. Airmasters, 20026 Frazier, Rocky River, OH 44116.

CARBON FIBER, INDUSTRIAL PRICES: One- and two-ply unidirectional laminates, tapes, and ribbons. Kevlar woven tapes. ½-ounce glass fabric. For sales sheet, send SASE to Aerospace Composite Products, Dept. M, 28 Crosswood Rd., Farmington, CT 06032.

PRIVATE COLLECTION: Hundreds of aviation magazines for sale: *Popular Aviation, Model Airplane News, Wings, Air Power, Air Trails, Airforce*, and many others. Inventoried 1932-1960. All in excellent condition. Send $2 for list. Wm. C. Fort Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 40 pages, precision cast timers, original cylinders, point sets, drive washers, tanks, for O&R, GHQ, Bantams, Mortons, O.K., others. Large catalog $2.00 pp. Chris Rosshach, RD 1, Queensboro Manor, Gloversville, NY 12078.

HARDWARE AND SOCKET HEAD CAP SCREWS, all sizes, super low prices. SASE for complete list. Example 6-32x1" only $3.84 per hundred. Lane Distributing, P.O. Box 42A, Netcong, NJ 07857.

Send ad and payment to: Classifieds, *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

Non-commercial classified ads (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each.

Commercial classified ads (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.). Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number.

Closing date for either type of ad is the 15th of the third preceding month (for example, January 15th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run.

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