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THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

VOLUME 14 1977 NUMBER 9

R/C MODELER

FEATURES

THIS MONTH'S COVER:

Lorna Jacobs of the "Hallelujah Hollywood" Show in Las Vegas, strikes a classic pose in front of Scenic Airlines Tour plane. She is displaying Joe Bridi's latest — the UFO, featured this month on page 40. Ektachrome transparency by Bill Root.

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EPTEMBER

From The SHOP

DON DEWEY

Normally, I don't devote this column to a single product unless it is rather revolutionary in concept and has distinct advantages we feel would be of benefit to the majority of our readers. Such was the case when we introduced you to Hot Stuff, the first cyanoacrylate adhesive formualted especially for model building, and produced by Satellite City, 9486 Sandusky Ave., Arleta, California 91331. This type of adhesive, while not an answer to every problem of adhesion, virtually created a revolution in construction technique since it provided an instant bond that was stronger than the material to be joined, with a substantial weight savings over conventional glues. Since the cyanoacrylate family is a large one, numbering in the hundreds for variety, and within the family are many different degrees of quality for each given member, it is no surprise that there are now numerous different cyanoacrylate adhesives on the market. These differ in viscosity, cure time, and in many other ways. However, as a point of interest, distributor sales figures around the country still show that Hot Stuff has continued to be the top selling adhesive of this type. When we asked "why", modelers and hobby dealers alike replied, simply, that they could trust Hot Stuff and that the manufacturer had never played tricks on them with quality and quantity. In other words, the quality control is such that one bottle is exactly like another from the standpoint of bond time, shelf life, and uniform fluid content.

During the past two years, Satellite City has been involved in continuous experimentation and testing in order to improve on the original Hot Stuff, as well as conducting experiments with cyanoacrylates in general. Now they have come up with an improvement to their product that is almost as revolutionary as the original concept of using cyanoacrylate adhesives for model aircraft construction.

The new item is Satellite City's Hot Stuff Blue Line instant adhesive. And, as you read this column, if you detect a good deal of enthusiasm about this product, you should see the other staff members of RCM who have had the opportunity to test the pre-production samples! First of all, this is a *visible* instant adhesive. Designed to be used with plywood, balsa, spruce, pine, nylon, rubber, metals, most plastics, and ceramics and you can *see* each drop bond. You can see it bond because the material itself is *blue*.

Stop and think about the possible advantages of an adhesive that retains all of the qualities of the original Hot Stuff, yet gives a visible reference as to whether or not the materials to be joined have, in fact, been bonded together. Seeing *each drop* allows you to put Blue Line *exactly* where you intend it to be and to dispense *only* the needed amount. Because of this, *less* adhesive is used than conventional cyanoacrylates, resulting in less waste and a better bond. Cyanoacrylate adhesives are not inexpensive, and one of the major problems in obtaining a good bond was in

using an excess amount of the material. On a tight fitting joint, the less adhesive used, the better the joint. When you can *see* the amount that you have used, it is obvious that you will use less and thus waste less material and obtain a better bond.

In addition, *accidental* bonds, such as adhering a project to the work surface or locking up control hinges, are virtually eliminated since you can see exactly where the adhesive is going.

Another major advantage in this new material comes when you have to laminate large flat surfaces where bonding of the entire part is necessary. This can be accomplished with greater speed and accuracy by using this visible adhesive. Once Blue Line is applied, it is so obvious that a second glance isn't needed to insure that enough has been applied, giving the builder more time to align mating surfaces and make contact before the adhesive is absorbed. As an exam-

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Cunningham On RC

CHUCK CUNNINGHAM

It appears from the mail that I have been receiving for the past several years, that there is an ever-growing use of radio controlled models in business and industry. And, with this growth, there seems to be an increasing desire on the part of non-RC'ers to use RC aircraft for some type of research or other scientific inquiry. Some time back, I presented three views and dimensions for the "Big Lifter". This aircraft was designed to carry a large payload, and a number of modelers have written to tell me about their version of their "Big Lifters" and what it would do on the subject of short field take-off and landing and how much payload it would haul around.

Now comes a letter from Lawrence Malinconico asking for help in another scientific adventure:

Dear Mr. Cunningham:

I am a graduate student in geology at Dartmouth College. My field of interest is volcanoes, specifically volcanic gases. What I am interested in doing is collecting gas samples from the volcano plume.

I understand that you have been involved with collecting gas from smoke stacks with RC airplanes, and I thought that some of the techniques that you used would be applicable to my situation. If you have any information or thoughts on this I would appreciate it. The major problems are devising a collection system (that also does not get exhaust from the plane itself), and landing – we will be in rugged terrain.

I am a complete novice in the field of RC so would appreciate any information that you could supply.

Sincerely,
Lawrence L. Malinconico
Dartmouth College
Hanover, New Hampshire 03755
Department of Earth Sciences

There are several reasons for printing this letter along with Lawrence's address. First, I have not had any experience in collecting gases with RC aircraft, but have received several letters in the past from those who were collecting air pollutants, etc., from the air. I hope that some of you may see this column and will correspond with Lawrence, as I can't be of any help to him along this line. Second, what he is asking for in the way of aircraft can't be solved by any of today's existing kits or the Big Lifter, but does present some interesting problems that can be solved.

Take a look at these problems: First, uncontaminated collection device. Okay, mount the collection device in the nose of the aircraft, and put the engine on top of the wing in a pusher configuration. This does two things — it keeps the exhaust away from the collecting area, and also keeps the prop somewhat away from harm. Second, payload. How much collecting is needed, and how much fuel is required to get the aircraft where it needs to go? In other words, how close to the plume of the volcano can you get? Third, the real problem, most volcanoes that I have ever read about weren't located next to any airfield, highway, close mowed grassy field, or an RC flying site. For some strange reason they are located out in the boonies. How do you get the blasted thing into the air and back down on the ground again — and in one piece?

You can see that Larry's letter might conjure up engineering and experimentation costs that could range from ten to twenty thousand bucks. A ramp take-off with a propulsion assist, possibly a skid mounted on a ramp fired off with a type of rocket propellant; or, perhaps, even a slingshot set-up using bungee cord would get the aircraft into the air. When it's time to get back down, perhaps a parachute could be utilized. But this would create its own problem of drifting away into trees, or off of the side of a mountain, or something thrilling like that. Some type of vertical descent would be better. Maybe large flaps that could be depressed to allow the aircraft to "back" down to a landing. And, then, to top all of this off, you would need a competent RC flier to get, and keep, the aircraft in the air and in flying condition. The structure of the aircraft would have to be foam and plywood for the fuselage and wings, but with the thought always in mind that the weight must be kept low since, quite often, this aircraft would be working at higher than normal altitudes.

If any of you readers have solved these problems, write to Lawrence and perhaps you two can get together to make another first in RC — the collecting of information from an active volcano.

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The June 20, 1977, issue of "Business Week" has an interesting article about a toy that may change the future of toys. It is a voice controlled miniature Volkswagen van put out by Imaginetics International, Inc. Actually the steering mechanism is operated in sequence, left, straight, right, and stop, in response to sounds — sounds rather than the words "left", "right", etc. - - - just like the old escapement controls of our almost pre-historic RC flying. To go left, and then go left again, you would have to go through a number of grunts until you got to left sequence again. This brings back vague memories of sometime in the forties, I think, of some pictures of the late Jim Walker flying a glider that was commanded by voice controls. It, too, was no doubt worked in sequence like the miniature van. At any rate, guys, here's a new toy to play with for Christmas, unless some smart guy hollers out a command when you're trying to zig and he makes it zag.

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In response to another column in the past — this time on safety — I have received a lot of mail detailing several safety ideas that I missed passing along. One of the most interesting, and easily duplicated boo-boos, was mentioned by Jimmy Laird, writing from radio station KBWD in Brownwood, Texas. It seems that Jimmy has run afoul of nicad batteries coming into contact with a ball of steel wool in a drawer of this workbench. Fortunately, Jimmy found the two before the sparks really started to fly, but the steel wool was glowing red hot and could have set the workbench on fire in short order. Several modelers have found out the hard (and hot) way what happens when a small glow plug starter battery gets shorted out by keys or change in your pocket, and burns a hole in your pants or your leg. The heat generated by a shorted nicad battery is tremendous, and can do a great deal of damage, so always protect the live ends of the battery leads. Keep them from coming into contact with anything and you'll be a lot safer.

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Each season sees a new influx of people into this hobby/sport, and nowhere is this more evident than when you spend a bit of Saturday time leaning on the counter of the local hobby emporium. Beginners, or "want-to-beginners" of all ages wander in asking for help and how to get started. An ever

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Engine Clinic

CLARENCE LEE

Although by the time you read this column it will be midsummer and the flying season will be at its height, at the time of this writing (end of May), the flying season is just getting into full swing. This, in turn, means engine and engine related problems and the mail load increases considerably. I can't possibly run every letter received, but I do read every letter addressed to me personally. I pick those for publication that are a problem shared by others, or ones I consider would be of interest to the readers. So, for the next few months, I will be devoting the column mainly to answering letters in order to keep up with the load; unless of course, some startling new product comes on the market that justifies a report. I do have an article in the forming stages on Irwin Ohlsson, one of the largest old time engine manufacturers of all times, and the very first engine he ever made. Possibly we may run this as a separate article, rather than a part of Engine Clinic within the next month or so.

From time to time, we have run several letters related to the validity of static thrust tests. As regular readers of the column know, I place little value on such findings. Ray Dehn wrote a letter in support of static thrust tests which I am sure many readers will be interested in.

Dear Mr. Lee,

Since my article on the Staggerwing Beechcraft appeared in the December 1975 issue of RCM, several letters have been published in your column with regard to the validity, if any, of the static pull tests I described prior to attempting to actually fly the aircraft. You, of course, replied kindly and courteously, that there was very little, if any, validity to this procedure.

My reasons and/or rationale for doing what I did was deleted from the article (by me), along with about a dozen or so other detailed discussions and, still, the article was excessively long. So, if I may, I would like to explain.

I have flown many scale-type biplanes including Fokkers, Nieuports, Stearmans, Wacos and the like. In fact, I seem to be one of the people who is usually asked to make that first flight on this style aircraft when they appear on our local scene from time to time. When confronted with this situation, i.e., a tail-dragger biplane with unknown ground handling characteristics, I want that airplane to literally "jump" out of the blocks, to get on its "step", if you will, just as quickly as possible because then I know I can control it. Getting the airplane IN the air is my primary concern and this is where maximum static thrust is helpful.

First, I wanted some idea of the static thrust vs. rpm characteristic as it was affected by prop selection when working in conjunction with a large radial cowl. The 13/6 prop was clearly superior. Following these tests as described in the article, I went through many additional sequences of "drag racing" the Staggerwing up and down some 350 feet of driveway and, again, the 13/6 prop proved to be the best choice.

So this was my place to begin – and nothing more. It was, I admit, a purely empirical conclusion, not a very scientific one, but it worked. The airplane came off very quickly and I had it where I wanted it – in the air! Although the same prop performed well in flight, I cannot claim a detailed study except to state that a 12/6 did not seem to work as well. In that the 2" scale Staggerwing flys rather realistically (scale-like speeds), perhaps there may be some small correlation between flight and static conditions. Certainly I would expect static tests of, say, a pylon aircraft to be worse than useless.

Mr. Lee, thank you. Your column is a must for me each month and I appreciate your past forbearance with this small matter.

Ray Dehn

I would like to comment that getting off the ground and into the air could prove disasterous if flying speed was too close to the stalling speed of the aircraft. In Ray's case, he was using 6" pitch props which would give good air speed, however, someone else might assume that a 4" pitch prop would be even better due to a very high ground static thrust. A little calculation shows that a 4" pitch propeller turning 12,000 rpm would give a theoretical airspeed of 45 mph, discounting any slippage. A large wing area, low wing loading airplane would perform at this speed, however, a small wing area, high wing loading airplane would leap into the air — stall and usually snap roll — and be back to kit form. Using 6" pitch props, as Ray did, he had more of a safety margin in air speed. It is doubtful that there are any .60's around that would swing a 13/6 much over 10,500, but even at that rpm, the airspeed with 100% prop efficiency figures out to 60 mph. So, anyway guys, if you are going to place some value on static thrust tests, be sure and figure out the theoretical air speed for the pitch propeller you are using before putting the aircraft into the air.

Many of you fellows out there have older model Super Tigres with excessive free porting, i.e., with the piston at top center, the piston skirt uncovers the front of the exhaust port and this, in turn, allows exhaust gas to be drawn back into the engine at idle if an exhaust baffle or restrictive muffler is used. Ed Gerhardt has come up with a modification to help this problem. Just be very careful when applying the epoxy to be sure the piston is completely closing off the exhaust port, otherwise you are going to have epoxy in the cylinder or crankcase.

Dear Clarence,

With reference to your letter-reply to Bill Apt, regarding the free porting on the Super Tigre, there is a way to change this using epoxy compounds.

I first read about this in a British publication a long time ago and, subsequently, successfully used it on a ST 23. It ran much better with the muffler and had a good idle.

Briefly, the piston is positioned so as to close the exhaust port and locked in this position by taping the prop to the cylinder. The exhaust port is meticulously cleaned with alcohol, MEK or similar solvent.

Then the interior of the exhaust stack is scraped to bright metal to give the epoxy a good bonding surface. In my case, I added a small screw for additional bonding.

Carefully remove all foreign matter, then apply a release agent to only the exposed surface of the piston. This can be grease or one of the proprietary silicone compounds.

Next, mix and apply Devcon Plastic

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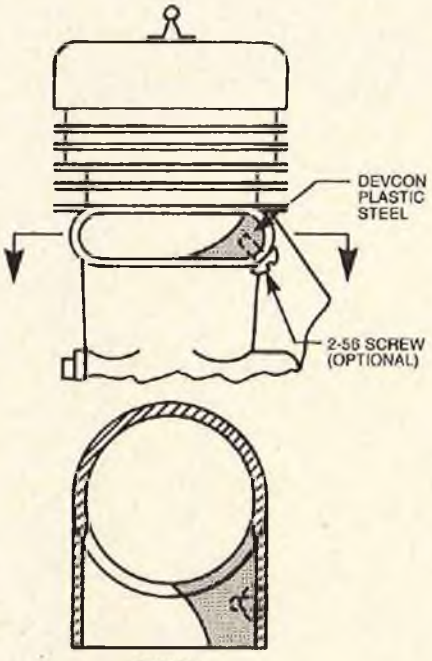
Steel – putty type – to the area to be blanked off. 24 hours later, the engine is ready to run.

Of course, the cylinder sleeve will no longer be removable unless the epoxy is removed too.

Try it. The engine is no good as is!

Ed Gerhardt



SECTION

Dear Sir,

I have two problems I hope you can help me with.

First, I can't find a suitable engine mount to mount my K & B .61 w/pump on an Ugly Stick. Do you know of any manufacturer who makes a one piece aluminum mount for the .61 w/pump? C.B. has a "long version", but it is too wide.

I bought a C.B. standard .60 mount. What I plan to do is mill out slots large enough so that the fuel line does not pinch against the sides. The only problem I anticipate is not being able to adjust the pump with the engine running. Is this important for proper operation of the engine?

Alternately, I might want to convert my engine to run without the pump. Need I purchase the flow-thru type muffler, in addition to a standard backplate and Perry carb.?

Second, I bought a Veco .45 twelve years ago and did not use it until recently. After 1/2 gallon of Superfuel on the bench, I tried to fly it on a 5¼ pound Strikemaster. But, even with a 10/6 prop and very rich setting, the engine would seize. So I sent it off to be hand lapped. The engine now runs very well, with one exception, it is now extremely difficult to start by hand. To start it, I must flood it (i.e., give it a very healthy prime) and then flip the prop for 5 minutes – on the average. The engine will start readily if I borrow my friend's electric starter.

If it didn't run so well, I would have thought that the engine was worn out. It feels as if it has lost a lot of its compression and the con-rod hole is enlarged.

Is hard starting typical of the Veco .45 once it is well broken-in? Or, is my engine worn out? If it is the latter case, how much would you charge to restore it (parts, hand lapping, etc.)?

Sincerely,
Rocky Young
Ann Arbor, Michigan

There are several manufacturers making aluminum mounts for the K & B .61 pumper. Prather Products has one available that the engine will fit without any alteration. Some of the other makes do require a little file work for the fuel lines to clear, but this is no big problem. You can easily modify the C.B. mount that you already have.

There is no reason why the Perry pump has to be adjusted with the engine running. Once the pump is set, it can be forgotten. This is one unnecessary problem many fellows are having — thinking they have to play with the pressure adjustment all the time like it was the needle valve. (See the February 1976 Engine Clinic.) The pump pressure is used to "fine tune" the mid-range mixture only. If the mid-range is too rich, you

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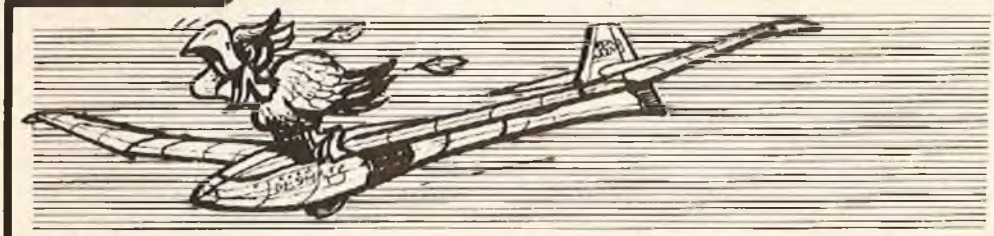
Soaring AL KINDRICK



With a large number of new newsletters coming in, the Soaring sport/hobby seems to be growing fast. New soaring clubs are being formed and new and different flying sites are being discovered.

Let me pass on to you — the newly formed clubs — what the Southern California flyers have done. I am directly quoting Rick Norwood, the director of the Southern California Soaring Clubs.

What is $(SC)^2$? It is the Southern California Soaring Clubs, and it got its initial start in January 1974 under the guidance of Mike Fox. The prime purpose behind its conception was to put on large contests throughout the year with a minimum of driving distance. Why? Because back in early 1974 the gas crunch was on and the necessity to reduce driving time was very important. The concept was received very well and has been continued since then.

Who is $(SC)^2$? $(SC)^2$ is made up of nine soaring clubs: San Fernando Valley Silent Fliers (SFVSV), Soaring Union of Los Angeles (SULA), Pacific Soaring Association (PSA), Pasadena Soaring Society (PSS), Harbor Soaring Society (HSS), Torrey Pines Gulls (TPG), Silent Wings Soaring Association (SWSA), Model Aviation Radio Kontrol Society (MARKS).

How does $(SC)^2$ work? Clubs who belong to $(SC)^2$ who desire to hold a contest are assigned a month in which to hold their contest, usually there are 7 contests throughout the year. There is a standardized entry fee of $3.50 per contestant. $2.50 of which goes to the club hosting the contest, $1.00 to $(SC)^2$ to be used for operating expenses, raffle prizes and year-end awards.

How is the year-end champion determined? Each contest has a raw score of 3,000 points. Then the entire contest is normalized to 1,000 points. A cumulative total of the normalized scores is used for year-end championship points. A contestant's best five out of the seven contests are counted.

What does the championship prove? The most obvious is that the person who wins the championship has flown the most consistently throughout the year. In 1976, the top three finishers flew the same plane; they flew unmodified manufactured kits; all three planes were high aspect ratio planes; they each have a loading of 7.2 oz./sq. ft., and have a thickness percentage of 9% to 9.5%.

Silent Wings Soaring Association of the $(SC)^2$ San Dimas.

Pilots meeting of May, 1977 $(SC)^2$ contest in Carson. Each contest averages 80 to 100 pilots.

The top ten fliers from the $(SC)^2$ organization are all well-known fliers who have made their nitch in the sailplane fraternity.

Craig Foxgord	**Albatross**
Peter Parszik	**Javelin II**
Rick Norwood	**Javelin II**
Jim Tomblin	**Windrifter**
Don Edberg	**Aquila**
Rick Pearson	**Windrifter**
Scott Miller	**SD 100**
Terry Koplen	**Windrifter**
John Brown	**Windrifter**
Lorin Blewett	**Windrifter**

At press time, two new clubs will be coming into the $(SC)^2$ organization, one in the Hemet area and the other from Indian Wells.

This is a good way to go, especially for a new club, since it helps it to grow and adds to the club's individual club contests and outings.

Craig (Legs) Foxgord with Albatross. High point winner for $(SC)^2$ flying clubs.

•

C.L. Scholefield, manager of the battery business department of the General Electric Company, has released a new nickel cadmium battery pack of 1400 mah. It weighs 7 ounces, is 1⅞" square and 1¾" high. It is center tapped for 2.4 volts with full capacity of 4.8 volts. The charging rate of this "Super Pack" is recommended at 100 MAH for 20 hours. This seems like a good way to go for

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For Old Time's Sake

RANDY CARMAN

If at First You Don't Succeed...

May 15th certainly was a georgeus day for a contest! Joe Beshar couldn't have picked a nicer day for the Second Annual Old Timer Bash with R/C Assist according to the Beshar rules. We traveled to Lakehurst Naval Air Station for the occasion. The turnout was deceiving — the majority of those in attendance were spectators — reminiscent of last year's Bash. However, ten gallant souls tried their hands at flying under Joe's rules: rudder assist during powered climb, hands off the transmitter during pre-flight, and timing to cease when the transmitter is used to bring the plane back to the field. An official flight had to land within a prescribed area.

The morning was, as usual, the best time to fly. If you're unfamiliar with Lakehurst, the wind normally begins to pick up during the afternoon. Typically, the wind did start gusting after lunch. Even so, it didn't hamper many from getting in their flights.

Joe Beshar showed off his Toledo trophy winner at his 2nd Annual Bash. Any wonder the Brooklyn Dodger brought home the hardware?

A few tragedies occurred at the meet. Jack Van Dusen lost his Old Timer in the woods surrounding the field and was unsuccessful in his search. However, he did not come back empty handed — in his wanderings, he managed to find Joe Beshar's electric plane which Joe had lost earlier in the day. There's something about those pine barrens — the trees appear to jump out and grab anything that flies by. There must be a multitude of airplanes hidden amongst their bowers.

Don Lamkin had a most unfortunate accident. His Powerhouse wings collapsed during the powered climb and the plane plummeted into the runway, full bore! A Powerhouse can be rebuilt, but not the engine that powered it — an irreplaceable Forster .99! The impact was so forceful that it drove the shaft through the back plate of the engine. Don looked like he was ready for a breakdown! "Please write a nice obituary for my Forster," he mumbled to us. This cer-

tainly points up the desirability of conversion engines.

We noticed quite a few "hairy" takeoffs during the day. Disallowing elevator control really smarts. And finding the delicate balance between power and attitude is a real art. Even old "sparkers" could have benefitted from the elevator controls.

Well, by three o'clock the flying had ceased and we awaited the stragglers in the woods to return for the awards ceremony. By four all had retuned and those with the right to any successive flights waived the privilege. Joe dished up the trophies to third place:

Class A

1st Place, Andy Anderson with a grand total of 171 points; 2nd Place, Fred Koval with a score of 97; 3rd Place, Woody Woodman with 56 points.

Class B

1st Place, Woody Woodman (the only entrant in Class B — that's one way to insure some hardware!)

Class C

1st Place, Al Schwankert with an impressive score of 834 points; 2nd Place, Larry Fair with 640 points; 3rd Place, Eugene Brown with a total of 284 points.

It was a fun day for fliers and spectators alike, even if we did have to nurse a slight sunburn.

Andy Anderson gives Woody Woodman a help with his Class A Zipper. It didn't stick.

Woody Woodman gears up for the Champs! He tested his honkin' McCoy .60 in a Playboy Sr. Looks like he's ready.

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Mail Bag

We recently received two letters from the modeling community. One came by way of Japan from Larry Hoffman, an American businessman who has been living there for twenty years. Larry writes a monthly column, "RC Jockey", for a local Japanese hobby magazine and what a process! He writes in English, has the article translated into Japanese, and then submits it to the editor. Wonder if anything ever gets lost in the translation?

Larry reports that there is "virtually no antique plane activity" in Japan. "If any exists it is restricted to a few scale buffs who are digging up old designs from old plans collections. There certainly isn't anything like SAM in this country!!" Well, Larry, (here comes the pitch) — how 'bout generating some interest through your column. We're sure SAM would welcome some new members or even another chapter!

Another letter came from Diane Diebert of Sunnymead, California, who expressed the feminine viewpoint of R/C flying. Diane and her hubby are really into helicopters and do most of their flying at Elsinore. She's apparently the only female flier there and is looking for more gals to join her.

We know the feeling of being the only female at the field. When we started in the hobby we, too, were alone. But do not despair — the ranks are growing! More gals are showing up to learn, and if not learn, at least to help out in the "pits". Just being there to see the "thrill of victory and the agony of defeat" promotes a better understanding for some wives/

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WHEN INDEED?

A Guest Editorial By W.J. Cranston

For God's sake RC'ers, when are we going to learn we're not playing with toys?

When one of the nation's top flyers is struck with an R/C "toy"; when the man standing next to this flyer is hospitalized by having the dubious honor of stopping the remains of this R/C "toy"; when one of our club members succeeds in stopping an R/C "toy" with a chair after having crashed through a tent at a local contest; then fellow RC'ers, **I submit to you we're not playing with toys.**

A crash of a miniature aircraft occurs causing damage. Radio failure? (of course not, **my** radio is reliable). Pilot error? (never, I'm an expert who has pencils without erasers). Structural failure? (impossible, I use epoxy). No matter how you cut it, **reasons don't justify the result.** (This reminds me of the bandit, about to be hung, asking the hangman to loosen the knot!!)

Let's digress back to the "classroom" days of physics and review some of the basic laws of motion and energy.

Work: Product of force times distance, in mechanics expressed in foot-pounds.

Energy: The capability of doing work generally expressed in foot-pounds. Energy possessed by motion is Kinetic or actual Energy; energy possessed by position is Potential Energy.

Velocity: Distance divided by time expressed in feet per second (fps).

Mass: Weight of a body divided by the acceleration due to gravity or:

$$\text{Mass} = \frac{\text{weight}}{32.16}$$

Foot-Pounds: Amount of Energy required to move a one pound body a distance of one foot. Therefore, Energy = $1/2\ MV^2 = \frac{WV^2}{2g} = \frac{WV^2}{64.32}$

Where W = weight in pounds; V = velocity in fps; E = energy in ft. lbs.

If we consider energy generated by a falling body only, acted upon by gravity only:

$$\text{Energy} = SW$$

Where S = distance in feet a body has fallen through; W = weight in pounds.

Now let's plug in some typical values for our miniature aircraft "toy" in flight.

Speed = 60 mph = 88 fps; Weight = 7 lbs.

$$\text{Energy} = \frac{7 \text{ lbs.} \times 88^2 \text{ fps}}{64.32} = \frac{7 \times 7744}{64.32} = \frac{54208}{64.32}$$

= 842 ft. lbs. (assuming level flight only.)

Further, our basic laws of physics tells us the force of a blow is equal to energy in foot pounds divided by the amount of penetration, hence:

$$\text{Force in ft./lbs.} = \frac{\text{Energy}}{\text{distance}} = \frac{E}{D}$$

Where E = energy in foot-pounds and D = distance in feet the object is penetrated (or moved)

Now, let us assume our miniature aircraft "toy" crashes into the terra-firma at a velocity of 60 mph and digs a two inch deep grave marker:

$$\text{Force} = \frac{842 \text{ ft. lbs.}}{.166 \text{ ft.}} = 5054 \text{ lbs.}$$

Thus our miniature aircraft "toy" has performed 842 ft. lbs of work, as this energy is expended in a distance of .166 feet, the average force of the blow is 5054 pounds!

Sure I've neglected the energy of our miniature aircraft "toy" generated by gravity in addition to level flight energy, but does a force of 500 lbs, or 5000 lbs or 50,000 lbs **really** make any difference if you are the "crash-ee" in place of the "crash-er"!

Ernest Gahn, in his remarkable book about aviation, *"Fate is the Hunter"*, poses some intriguing questions: "What

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ARMCHAIR ACE

BY HOBIE STEELE

How to write . . . How to what? How to write, that's what. Most everybody can write. It's basic in today's world. You learn to read and write in the first grade, right? Wrong. The kind of writing I'm talking about is the sort of stuff that makes people like you and me read it. Stuff like Armchair Ace, Sunday Flier, Cunningham on RC, and how to build some sort of pesky, grotesque R/C insect Dick Tichenor dreams (nightmares) up. In short, material from knowledgeable, experienced writers.

Dedication and perseverance are essential. I always wanted to write in the worst way. Some say I was imminently successful — I do write in the worst way.

As simple and routine as even my stuff may seem, it actually ain't easy. Now I'm no Ernest Hemingway or Richard Bach, but, if you read enough of their stuff, you'd find Hemingway and Bach ain't always Ernest or Richard either. Compare *Jonathan Livingstone Seagull* with any of Bach's other works, or *Old Man and the Sea* with other Hemingway stuff, for example.

Copy like this column isn't that difficult, either. Of course, you've got to start with something to say. If you've got a new or unusual airplane design, like Dick, or know all the weird formulas about downwind turns, like Ken, or have an absolute genius for making astoundingly complex subjects like aeromodel design astonishing simple, like Chuck, you've got something to say. You might even have something to say if you're just an average modeler like me who has belonged to, and gained experience from, some above average AMA clubs over a period of years; clubs like ARCS, RD/RC, RC/NC, DC/RC and MARKS (and there are oodles more above average clubs where you can gain experience from modelers who are experts in their field).

At any rate, let's assume you've spent a number of years gaining vast (or half vast) experience in a given aspect of aeromodeling. Now, how can you share this knowledge with the world?

You could write a book like Fred Marks or publish fun aircraft designs like Ken Willard, or all sorts of other good stuff. It's all in how it goes together.

Take an original aircraft design, for example. Beginning with a good design - - - your ship which is prettier, easier to build, flies better, or generally differs from hundreds of other good designs, may be the basis of a potentially marketable article. To get the piece sold, you must create a salable product. The product includes plans, photos, and a construction article.

Plans are very time-consuming and you should be a skilled draftsman or figure on spending a good part of your revenue from the proposed article for someone to handle the drawing and lettering. Good sharp pencil drawings are usually acceptable since RCM and most other magazines will trace it in ink to their requirements. Try to "idiot-proof" your plans with clear markings of what-goes-where, including doublers, gussets, sheeting, fuel tanks, pushrods, and the like. Show your plan to an inexperienced modeler and improve it to answer his questions. You might also go over your design with a couple of experienced modelers to see if there may be an easier or neater way to accomplish the desired final results.

Now you need photographs, not snapshots, but 8 x 10 (or 5 x 7) eagle-sharp, contrasty prints; showing construction, radio installation, flying, etc., and acceptable photographs don't come from box cameras and drug store processing. Reproduction in a magazine requires top quality prints. By the time the picture gets on the magazine page, it will have gone through 5 "generations", losing a bit of resolution each time. For this reason, it's essential to start with top quality optics and knowledgeable techniques — from first shot through enlargement, all the way to the magazine printer. If you don't have the capability to produce super-sharp shots, hire a professional, because no magazine will consider inferior pictures unless they want your project so badly that they will make a ship up and shoot it themselves. Don't forget plenty of color transparencies of the finished bird with uncluttered backgrounds and "warm" colors. 35mm is okay, but 2¼ or larger transparencies are better.

In some instances, a line drawing or cartoon like John Chapis' work accompanying this column, can add a lot to the package you're producing. Use whatever you need to produce a complete, professional article requiring a minimum of effort on the part of the editors to get it into shape for publication.

Each photograph should be numbered in the margin (never on the back and never write on a piece of paper on top of a photo). Then cutlines (or captions) can be typed on a piece of plain paper and numbered to correspond to the numbered pix.

Now to the hard part: the copy. Copy (not words or verbage) is where many of us fall down. You can't write like you think or talk. You must write like a writer and there's no shortcut or quick way.

My grades in school weren't all that hot, but I could usually write an "A" theme or termpaper - - - *if* someone corrected my spelling (it's bad even today and I've tried all brands of typewriters). I'd had a good deal of English, including creative writing in school, but this still didn't make me a professional writer, even though I became one. One what, somebody asked! Anyhow, I suppose it happened because I wanted it to happen and persevered.

As an advertising account executive (newspaper ad peddler), I was given two tickets to a boat show in Washington, D.C., some years ago, and asked to write a report on it. When I presented it to the editor, he said he'd decided to put it under my byline. What an ego trip! Before publication, he suggested using a column format and "Notes on Boats" was born (very little market for model airplane stuff in a country weekly newspaper). As my experience progressed, learning from the editor's comments, I began writing in the model field and then worked on some publications for AMA. Editorial comments by *Model Aviation's* Carl Wheeley and his assistant, gave me more writing education than all the schooling I had ever had. You can learn more from a pro like Carl, than from all the writing courses in the world. Incidentally, many of my early pieces in most publications were edited so severely that I hardly recognized "my" work. It hurt, but I gritted my teeth and finally, my stuff didn't change much from mailing the pieces off to their appearance on the printed page.

I personally subscribe to the KISS method of writing: Keep It Simple Stupid! Although I've known editors who

memorize the dictionary daily, I'd prefer that most anyone reading my stuff can understand what I'm saying without constantly referring to a reference book because of Agnewesque pseudo-sophistication. In short: Eschew Obfuscation!

Don't ever use more words than necessary, but don't leave out anything essential. On the other hand, don't leave a single phrase or word in just because you wrote it. I learned a lot by writing torpedo maintenance manuals for the Navy because everything must be perfectly clear; in proper order with all detail, but no superfluities. Think about every step in making your airplane and write it down. Be sure your article has a beginning, a middle, and an end (many don't). Try not to begin with a question such as: "Have you ever wanted an exciting, sport biplane that's easy to build, fun to fly, and looks like a real antique?" If your reader's answer is "no" then there goes the rest of your work. Try beginning with a hook like: "The EarlyBird wasn't designed just to have something to fly - - - it was conceived to fill a need for an exciting sport biplane that could be used as a trainer, yet be fully aerobatic and look snappy enough to turn a few heads at the local flying site — a plane guaranteed not to rust, bust, collect dust, or run down hill sideways!" Your readers may not finish the article, but at least your opening isn't a question which can be answered "no".

Read every word in *RCM* each month and emulate the writers you like. Steal secrets like using dashes - - or semicolons if they fit to make a complex sentence easier to read; get it? Read fiction. Novelists make a good living using words properly and you can learn from their techniques. Finally, put your copy aside for a day or two, then re-read it - - aloud. You'll be surprised how different it sounds when it gets "cold".

Take your time in re-writing and work until it's perfect, then re-work it again. Show your work to your wife (or somebody else's wife) to see if it makes sense to them. Remember you can't do it quick and do it right, too.

Whether you write in longhand (as I do) or type your masterpiece, there's a final form most editors prefer. Your name (as you want the byline), address, phone number, and number of words (rounded off to the nearest 100) goes in the top right-hand corner. Move down to about one-half the front page and center your title in capitals (caps). Below that can go the "blurb" if you like (although editors usually supply one). Then begin your double-spaced copy with narrow margins set at 40 spaces (The sentence "Double space your copy and type this wide" has about 40 spaces). Allow about 1" for left-hand margin. This fits most magazine's formats and allows suffi-

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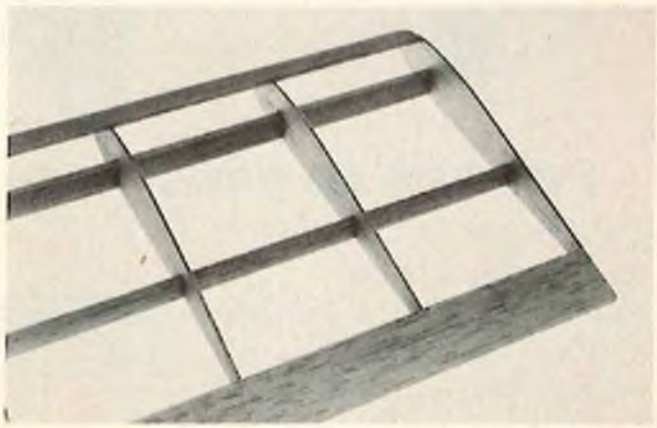
RCM WORKSHOP

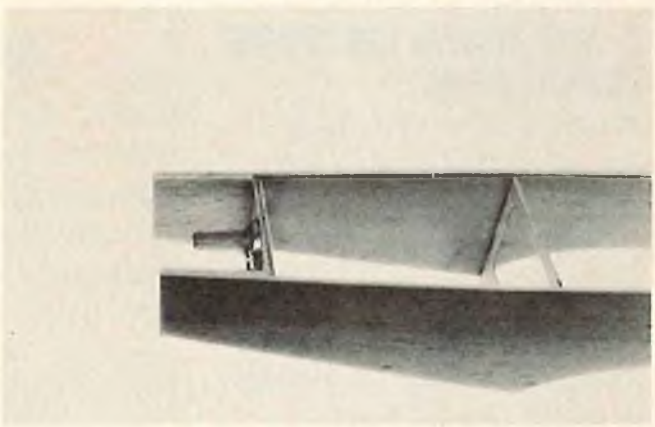
By Fred Reese

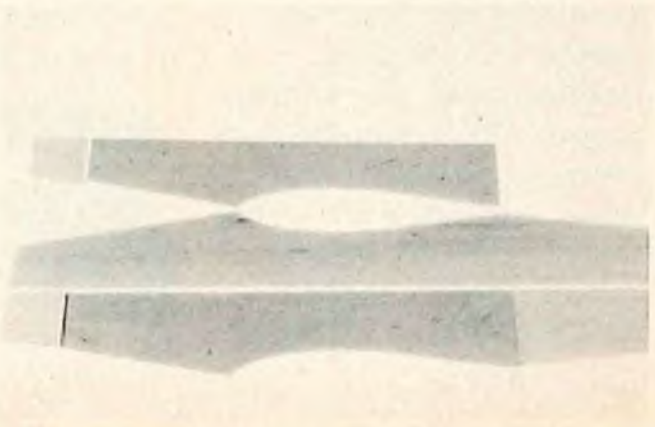
(1) General construction of wood to wood joints such as wings, fuselages, etc., are done best with the liquid "white" glues such as Wilhold, Wilhold Aliphatic, or Titebond. There are many different brands of this type of glue and all work well producing joints stronger than the wood itself, provided the pieces being joined fit reasonably well. Also shown in this photograph is Hot Stuff representing the cyanoacrylate instant set adhesives. I do not recommend cyanoacrylates for use by children as it will bond skin to skin, or wood to skin, instantly. Fingers that are glued together can be separated with acetone, or natural skin oils will cause separation in a couple of days. Cyanoacrylates require more precise fitting joints as they will not span a gap. However, gaps can be filled with baking soda producing a strong joint in less than 10 seconds.

(2) Firewalls, major fuselage bulkheads, stab-to-fuselage, landing gear mounts, wing dihedral joints, and other joints that will receive great stress should be glued with epoxy. Epoxy glues are two part mixes, one being the resin and the other the hardener. There are fast setting epoxies such as Devcon 5-Minute, Zip 5-Minute, Sig, NHP and Hobbypoxy 5-Minute and 15-Minute (Formula I). The fast set epoxy glues are the most convenient because of their speed, but are slightly more brittle than the slower setting types. Hobbypoxy Formula II has a 45 minute set time which gives more time to get things positioned, is economical and useful, when using glass cloth to add strength, as it is more fluid. Most epoxies become more fluid if warmed, however, the set time is faster. Epoxies are useful as they will bridge gaps and form their own fillets, increasing the bonding area which strengthens the joint.

(3) When joining large flat surfaces, such as doublers, you should not use products that contain water as they may cause warps unless clamped until completely dry. For this reason, contact cement or epoxies are usually used for doublers. Contact cement is brushed on both surfaces to be joined and allowed to dry, usually about 5 minutes. The two parts are then positioned and pressed together. Once joined, these joints are permanent and cannot be easily separated to adjust. Epoxies can be used and are excellent for this purpose, however, care must be taken not to use too much glue as epoxy is heavy. Epoxies do allow the parts to be shifted before the glue sets. □

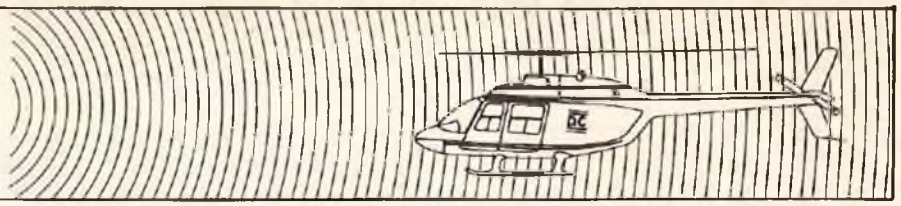






HOVER

By Don Chapman



Starting with this Hover column, we are going to try to understand the basis of the radio controlled helicopter and the helicopter pilot. Yes, the pilot as well, because he is as much a part of why the helicopter flies as the machine itself.

The first thing you have to realize is the fact that "airplanes want to fly, helicopters don't." The pilot, therefore, has to understand this fact and be prepared to be persistant and tenacious enough to learn what has to be done to successfully fly a radio controlled helicopter.

So, let's start with the pilot. It is human nature for an individual to want to be successful at what he attempts, as well as the desire to look successful while he is in the process of trying. Let's say, for example, you've been flying a radio controlled airplane. You have progressed to the point where you can take-off, fly left turns, right turns, loops, rolls, and even make a good landing right where you wanted to land. To some degree you are an "expert." You're not ready for the Masters Tournament, perhaps, but you're a lot further ahead of the guy who has just put his hand on the transmitter stick for the first time. You feel proud of your accomplishments as well you should. But how long have you been flying and practicing before you could get to this point? It probably required several months of practicing, after a first flight, which was more than likely handled by one of the helpful fliers at the local field. In fact, to trim out that ship, the local instructor may have even used a buddy box with you in order to get you started in the right direction. On the other hand, there may not be another helicopter pilot anywhere near you, so that means you will have to teach yourself.

With regard to the airplane, it always goes forward - - - and *that* you can take to the bank. If you give it right, it goes right. If you give it left, it goes left. And up is up, and down is down, while low throttle means a descent in glide. But, in all cases, it always goes forward and it *wants to fly*. And, while it's flying, you're learning how the controls feel and what they do in response to your command. Perhaps you're over-controlling at first, but the aircraft is still flying and it is always going forward.

The helicopter, on the other hand, is a totally different animal. First, you must remember it *doesn't want to fly*. You have to fly it 100% of the time. This means you can't "feel out" how the controls react while it is flying since you have to learn to fly it first. In other words, it's trying to do eight different things all at the same time. And that's where the hard part comes in - - - *you* have to learn to do eight different things all at the same time, too. But it really isn't that hard, you didn't learn on the first flight on your fixed wing aircraft either, did you?

Before we get too far along with flying, let's do some basic set-up on the machine first. The best helicopter pilot in the world can't fly a machine if it's not set up correctly.

ABOUT THE AUTHOR

Don Chapman (N107E), RCM's new Contributing Editor for the Hover column, started modeling at the age of eight. Don thrives on anything that is a challenge and was National Champion in 1/32 scale model car racing. Later he entered full scale drag racing for five years, setting 36 national records. At one time he held sixteen national records concurrently, and was never beat in a class run locally or nationally.

Don started flying helicopters in May of 1974 with a Du-Bro Hughes 300 with a O & R engine and Kraft single stick radio. Three weeks later Don achieved Grade Level I in the NRCHA. Two months following that he placed second in Novice at the NRCHA Nationals and, in September of the same year, he finished first in Novice at the Michigan Whirlybirds Helicopter Meet. In the same month he achieved Grade Level II.

In October 1974, Don placed third in Expert at the Canadian Helicopter Nationals and achieved Grade Level III during the same month. At the 1975 NRCHA Nationals, Chapman finished third in Expert. At the 1976 NRCHA Nationals he placed second in the Expert Class and in August of 1976 he became the first NRCHA member to achieve Grade Level IV.

Don Chapman is always striving to make the machine better, looking for perfection as a goal. His motto is, simply, "If you understand how something works, when it doesn't perform properly, then you'll know what to do to fix it."

We welcome Don Chapman as the newest Contributing Editor to R/C Modeler Magazine.

There are two basic things to remember about a helicopter and these items apply to any type of chopper you may have and they are:

(1) Everything in a helicopter must be either 90% or exactly parallel to each other. Figures 1 and 2 illustrate this point.

(2) The rotor blades, both main rotor and tail rotor, must be balanced as closely as possible.

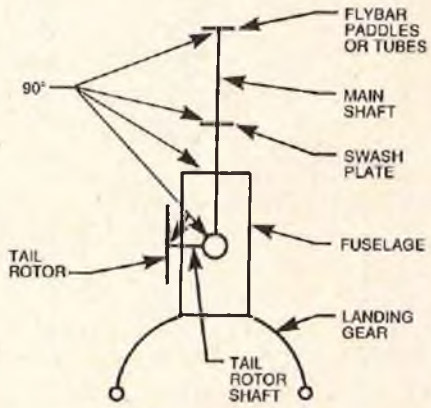


FIGURE 1

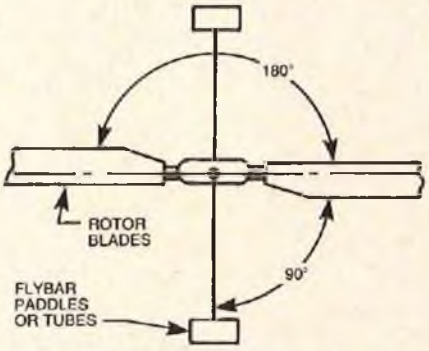


FIGURE 2

You will notice that, in Figure 1, we show some 90° related components. Turn the receiver and transmitter on with your trims set at neutral. Adjust the swash plate so that it is 90° to the main shaft by adjusting the pushrods on the front of the swash plate as well as on the side. Once it is 90° to the main shaft, install the rotor head and, with the blades parallel to the boom, adjust the pushrod going to the head to set the paddles, or tubes, so they are 90° to the main shaft. This should give you a basic set-up for the head and cyclic controls. The tail rotor shaft should also be 90° to the main shaft. Figure 2 shows two more places to check for 90°, or parallel, condition.

Buy yourself an aluminum yardstick for about $1.00-$1.50 to help you set up the machine — it will prove to be one of the most useful tools you can buy. Using it as shown in Figure 3, you can set the static coning angle, the lead lag of the main rotor blades, and also the teeter setting. Use the yardstick on edge and hold it along side of the head and check one main blade so that it is parallel with it. If it is swept forward (lead) or swept

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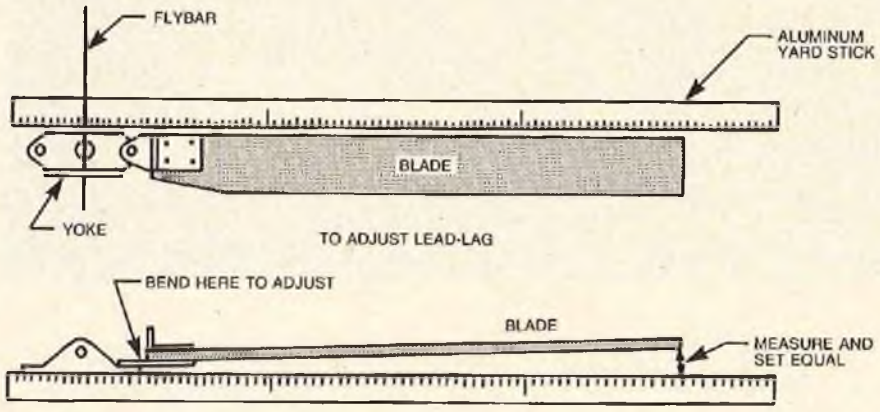
backward (lag), adjust until it is parallel. Do the same with the other blade. Both blades should be exactly 180°, or parallel with each other.

Now take the yardstick, on edge again, under the head yoke out under the main blade and set the static coning angle. Measure from the tip of the blade down to the yardstick. Set both blades the same distance.

Now, use the yardstick to measure from the tail boom up to the tip of one main rotor blade. Note the measurement and rotate the head 180° and check the other blade. Adjust as necessary. This may vary from one type of machine to the other. Balancing the main rotor blade is a story in itself but one basic way is shown in Figure 4. Use MonoKote trim or straight pins to correct the balance.



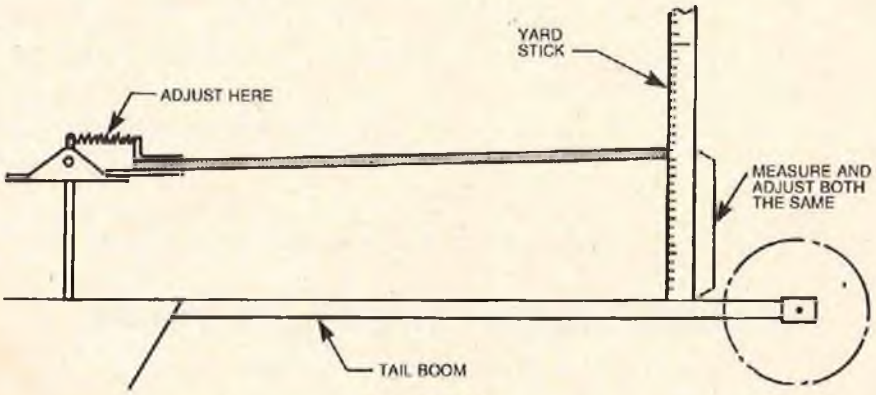


FIGURE 3

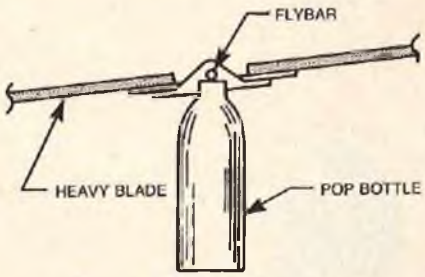


FIGURE 4

Figure 5 illustrates the method for balancing the tail rotor blades. Take both blades and put a piece of brass tubing through the mounting holes and balance

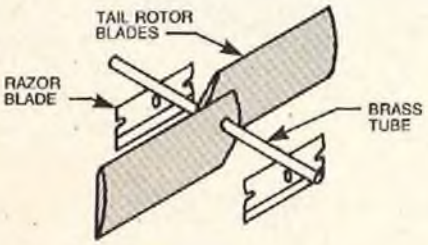


FIGURE 5

the assembly on razor blades using straight pins or cut off pieces of straight pins to correct the balance.

Now we are ready to start the machine. Obtain a long length of 2" x 4" hardwood from the local lumber yard or, in the case of the smaller machines, a couple of elastic cords with hooks on both ends, and securely tie down the machine. Start the engine and run it up slowly and note the tracking of the blades. If you are using, for example, white rotor blades, one with a red tip, you'll probably notice either the white or red blade is higher. Adjust the pitch in one blade until they look as one blade while running. This is also a good time to adjust the needle valve to obtain maximum power. Once these adjustments have been made, strap on the training gear of your choice, and let's have a go at it.

Anybody — and I mean *anybody* — who lifts-off a helicopter for the first time, looks like a total uncoordinated idiot and, in addition, he feels exactly the same way! Nobody likes to look and feel that way, especially in front of fellow RC'ers. That's why a lot of people won't even try helicopters. But you have to learn to fly it first before you can fly. It's not any harder than learning to fly an airplane — it's just *different*.

First, fly off of a surface that lets the machine "skate" around. Black top is good but usually is much too dirty. Try a heavy plastic tarp on the grass. Give yourself a 6 foot square and then make yourself a promise to stay inside that square. The idea is to learn how to control the machine without breaking it. Lift it up gently, 3 to 6 inches, and try to keep it in the square. If it goes outside the designated area, start over again. Discipline yourself to do this and you will save yourself a lot of frustration. If you practice this, soon you will be hovering. And it will be *controlled* hovering and you will be, to some degree, an "expert". You're not ready for Grade Level IV, perhaps, but you're a lot further ahead than someone who has never tried it. Once you've had the machine hovering for fifteen seconds, you'll realize how much fun helicopters can be. When you can hover for one to two minutes, you are ready to go through Grade Level I. (You did join the NRCHA didn't you?)

Now that we've determined that the pilot must accept the fact he has to start at the bottom and work his way up the learning ladder, get your machine going and start enjoying what I feel is the most challenging and enjoyable aspect of this sport and hobby of radio control.

There aren't nearly as many helicopter pilots as there are fixed wing pilots and advice and help aren't as easily obtained. This Hover column will try to bridge the gap to help fill in the grey areas of knowledge to get as many of you flying as successfully as possible. Don't be bashful about asking questions. Most of the time I begin a question prefaced with - - - "I suppose this is a dumb question, but - - -". There is no such thing as a "dumb question". What *is* dumb is when you don't know and you don't ask and you end up breaking up your machine. You can share in my experience as well as the experience of others simply by asking.

You've all seen the airplane at the field that looks like a pile of junk that someone has just thrown together, but it still flies. Perhaps it doesn't fly superbly, but at least it stays airborne. This is not the case with helicopters. They have to be right — totally right — or they *won't fly*. Remember, helicopters don't want to fly - - - I can't repeat this often enough. The best helicopter pilot in the world can't fly if the machine is not set up properly. Follow the instructions with the kit, then if you have any questions, *ask*.

By the time you read this the AMA

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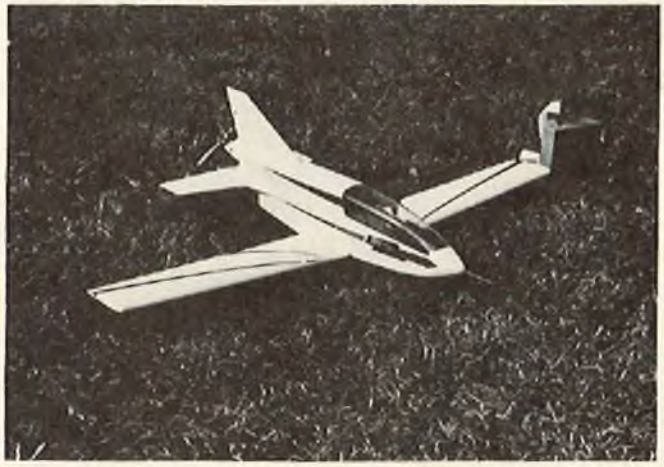
RCM PRODUCT TEST

MH Manufacturing
BD 5½



IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts	●				
Plans		●				Parts Match to Plans			NA		
Written Instructions			●			Overall Parts Fit	●				
Quality of Hardwood		●				Ease of Assembly	●				
Quality of Fiberglass			NA			Fidelity to Scale			●		
Other Materials		●				Flight Performance		●			
Accessories	●					Overall Appeal	●				
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

The BD5½ is a semi-scale model produced by MH Manufacturing. The fuselage construction is a basic box of sheet balsa reinforced with triangular stock. The tail pieces are sheet balsa and the wing is constructed from three pieces of Ace molded foam wing material with a 1/8" x 1/2" spar running full span on the bottom wing surface.

Due to the depth of the fuselage at the tail, as well as the pusher configuration, it is necessary to split the rear of the fuselage sides with an X-Acto knife in order to join the rear of the sides at the bottom, while leaving the top spread enough to accomodate the firewall and tank. We found a tendency for the slice at the rear to expand forward as the wood split. This was overcome by making the slice, then putting a couple of drops of Hot Stuff at the end of the slice prior to pulling the sides together.

Also due to the pusher engine, routing the antenna in the normal "over-the-rudder" fashion would result in the antenna promptly chopped off by the prop! We recommend that the antenna be run out through the wing saddle and along the leading and into the wing. The short tail moment also dictates the use of minimum elevator throw. After discussion with the designer, we set our's at 3/16" up and down with ailerons at 1/4" up and down.

The plans suggest a one or two ounce tank but we would recommend the use of a one ounce only to keep the tail as light as possible. Be sure and balance the BD5½ with the fuel tank filled.

We feel that the plans and instuctions should include the side and top view of the nose block, as well as some suggestion as to how to hold the canopy down, as well as the recom-

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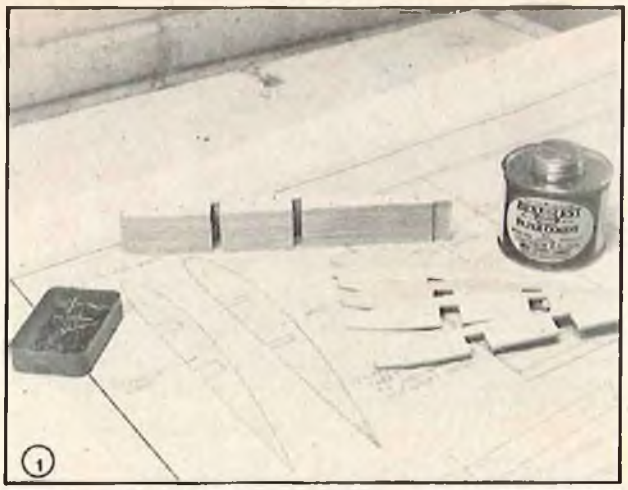
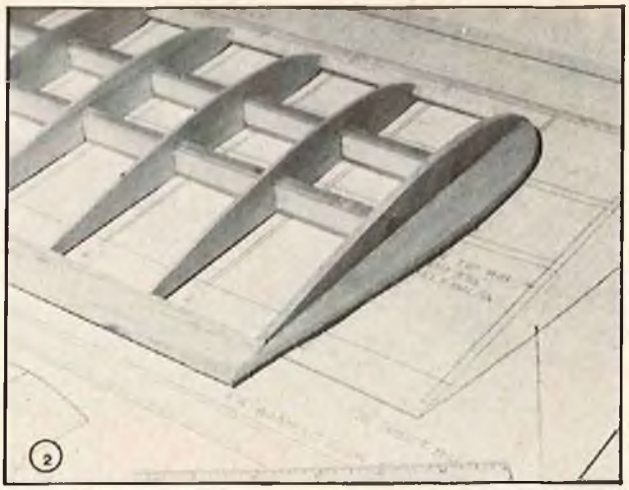
SPECIFICATIONS

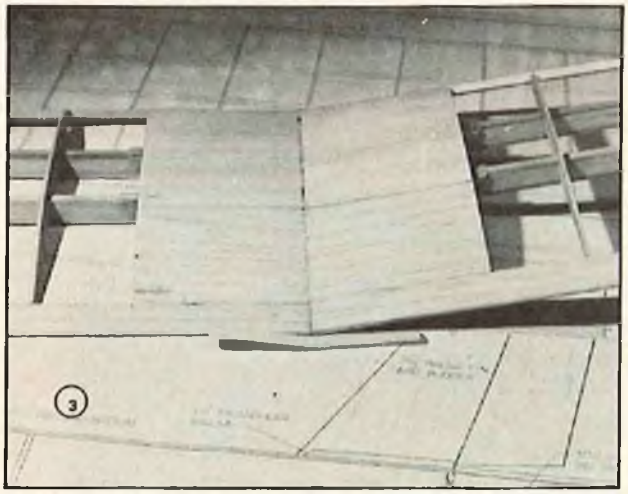
Name BD5½
Aircraft Type ..... Semi-Scale Sport
Manufactured By ..... MH Manufacturing
2623 Honolulu Avenue
Montrose, California 91020
Mfg. Suggested Retail Price $32.95
Available From ..... Both Mfg. & Retail
Mfg. Recommended Usage ..... Sport/Stand-Off Scale
Wing Span ..... 43 Inches
Wing Chord ..... 4¾" (Avg.)
Total Wing Area ..... 205 Square Inches
Fuselage Length ..... 25¾ Inches
Radio Compartment Dimensions ..... (L) 8¾" x (W) 2¼" x (H) 2⅜"
Wing Location ..... Low Wing
Airfoil ..... Semi-Symmetrical
Wing Planform ..... Swept T.E.
Dihedral (each tip) ..... 2⅜"
Stabilizer Span ..... 13⅞ Inches
Stabilizer Chord (incl. elev.) ..... 4⅜" (Avg.)
Total Stab Area ..... 60.7 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Mid-Fuselage
Vertical Fin Height ..... 4 Inches
Vertical Fin Width (incl. rud.) ..... 5⅛" (Avg.)
Mfg. Rec. Engine Range ..... .049-.051
Mfg. Rec. Fuel Tank Size ..... 1-2 oz.
Landing Gear ..... Tricycle
Recommended No. Of Channels 2
Rec. Control Functions ..... Elevator & Ailerons
Basic Materials Used In Construction:
Fuselage ..... Balsa & Ply
Wing ..... Foam & Balsa
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... horns, hinges, clevises, threaded rod
Gold'N-Rod, aileron horns, plastic canopy, wire, bolts
Plan Size ..... 28" x 33½" (1 sheet)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... No
Construction Photos ..... No
Kit Includes ..... Shaped Parts
Mfg. Rec. Flying Weight ..... 21 oz.
Wing loading based on rec. flying wt. ..... 13.1 oz./sq. ft.

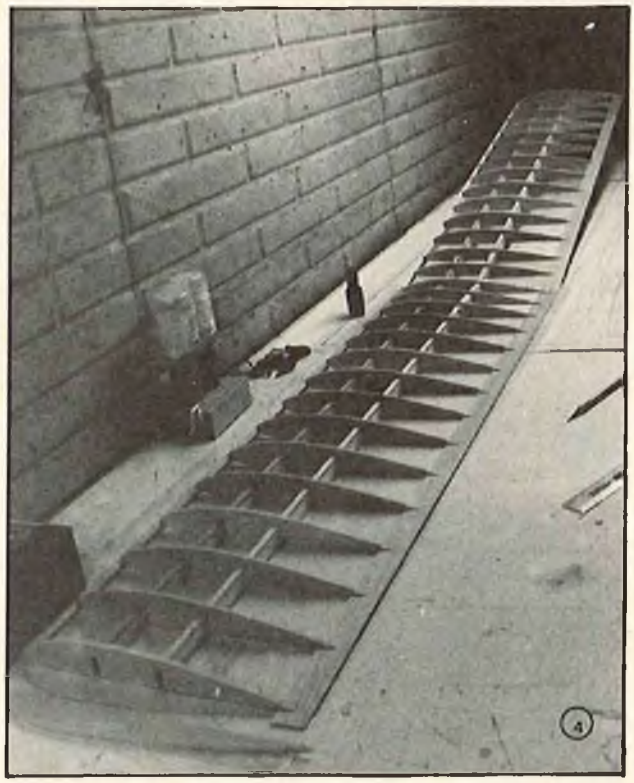
RCM PROTOTYPE

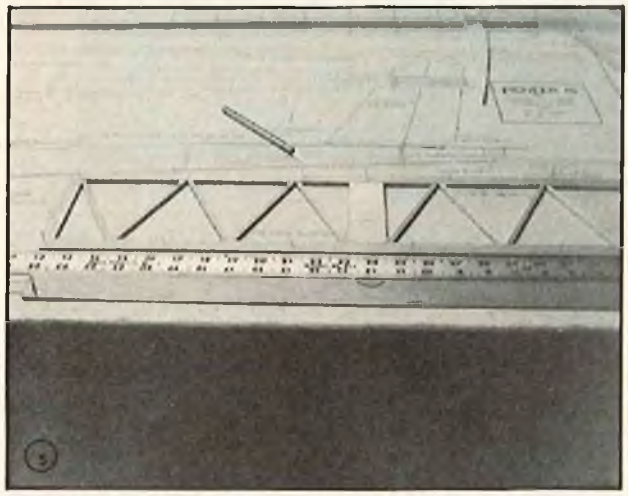
Weight, Ready To Fly ..... 23 Ounces
Wing Loading ..... 14.4 oz./sq. ft.
Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... T.D. .049
Muffler Used ..... No
Radio Used ..... RS
Tank Size Used ..... 1 Oz.

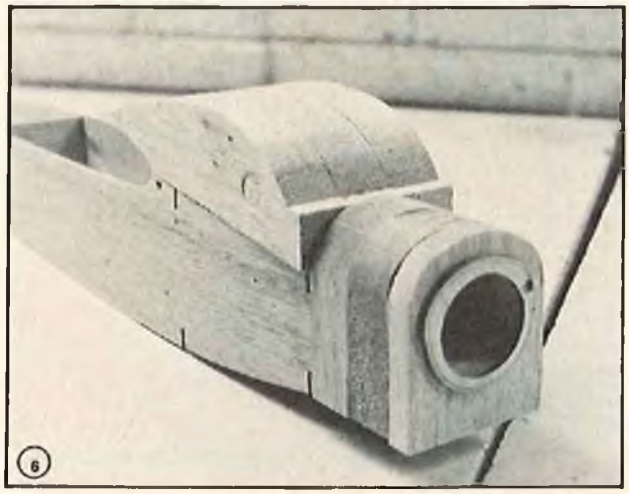






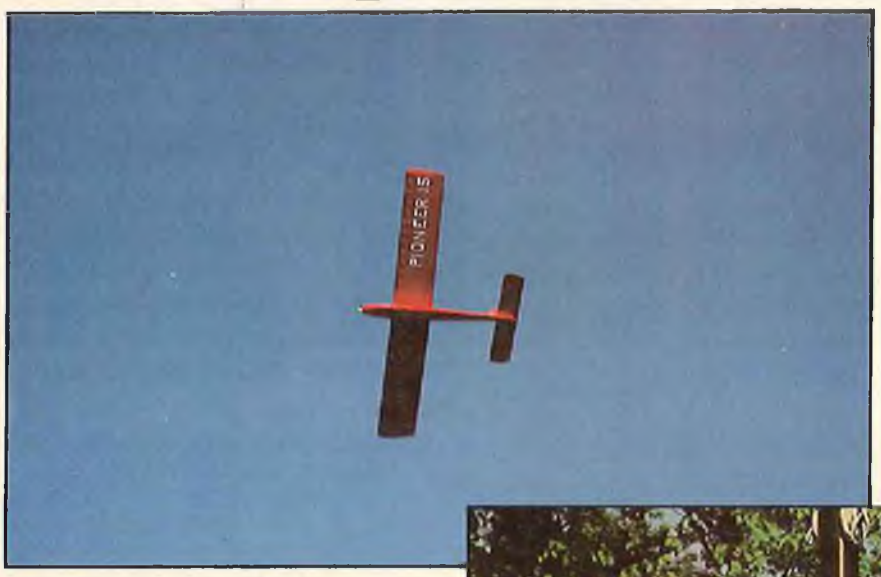






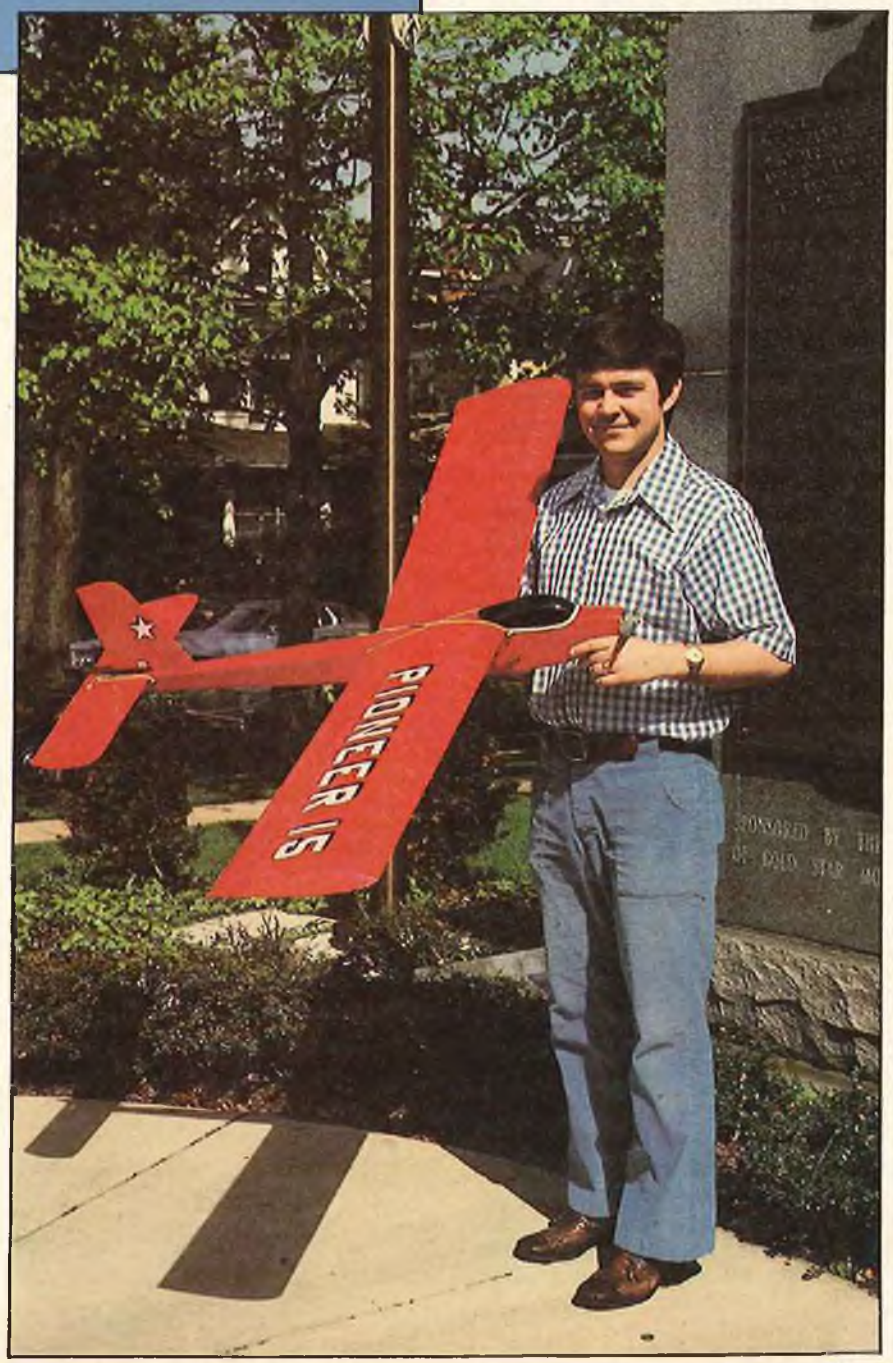
(1) With your full size set of RCM plans for the Pioneer 15 in place on the workbench, you can start by cutting out the wing ribs. (2) Close-up of wing tip and laminated spar construction. This spar construction provides a really rugged wing. (3) Center section of wing is sheeted and trailing edge reinforcement added. (4) A long shot of the semi-completed wing on the author's workbench. (5) Constructing the stab and elevator. (6) A shot of the nose and cabin area before shaping.

PIONEER 15



A 74" span, Astro 15 powered sailplane that utilizes the full potential of electric power, combining the best of soaring with silent powered flight.

Photos By Susan Dougherty



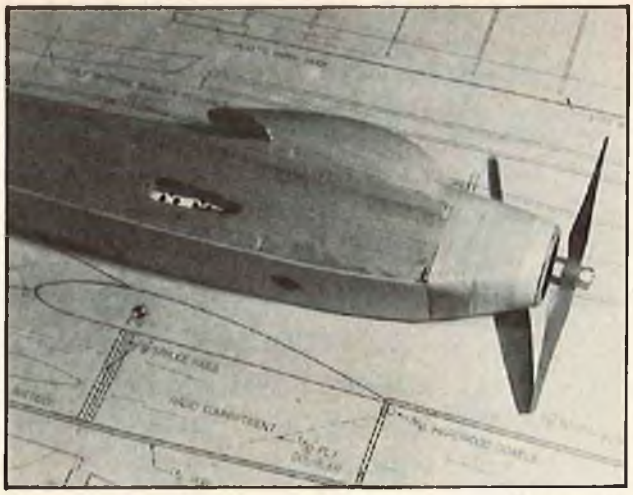
By James V. Zarembski

The Pioneer 15 is an electric powered sailplane designed for the sport flyer. The model is built around the fabulous Astro 15 electric motor system. Using a Cox gray 8/4 prop, the Pioneer will quickly climb to thermalling altitude from even the most confined flying sites. Because it is electric the noise problem associated with gas models is nonexistent. This brings the possibility of flying in areas now not open to conventional glow powered RC models which might also be too small for high start or winch.

Once Pioneer 15 is flown up to 800 feet (in about 80 seconds), you simply shut off the motor and begin to soar. From the time the prop is stopped by the unique prop stop system, incorporated in the design, until the moment you land, the Pioneer 15 reacts like a high performance RC sailplane. Like any sailplane, flight duration is a function of the lift conditions and the pilot's soaring ability. The Pioneer 15 will not let the thermal chaser down. It will circle upward on the slightest puff of lift. If, however, you fail to find the big thermal the first time up, the nature of the electric powered sailplane allows you to turn the motor back on and climb back up to altitude. You get a second chance - - - .

The average duration of the Pioneer 15 with the Astro 15 system is between 10 and 15 minutes in still air conditions depending on the ready-to-fly weight of the model. Twice my Pioneer has surpassed 45 minutes in the warm thermals of an Ohio summer morning. Thirty minute flights are not uncommon.

Landing is no problem. The Pioneer 15 can be slowed to a walking pace and gently brought to a stop on the grass of



The nose and cabin section after shaping. Note cooling vents.

A look inside shows the prop stop arrangement as described in text.

your flying site without even wrinkling MonoKote. If, however, you fly from a rocky, or otherwise treacherous, flying field, a single rubber or metal skid should be added.

Once on the ground a full recharging of the motor battery can be obtained in 15 short minutes. By all means use the Astro Flight charger because the 15 minute shut off timer will save your precious batteries from being ruined by overcharging.

Another advantage of electric power is that the model can be disassembled quickly and you can be on your way home (or to the model shop) without reeling in a high start and without degreasing your model as would be required with a sailplane or glow powered sport planes.

DESIGN EVOLUTION

During 1975 and 1976 it became apparent after the success of the Electroglide 62 (August 1975 RCM), the Astro Flight Fournier RF4, and several of my own designs, that a truly high performance RC sailplane could be developed for electric assisted launches. After talking to Bob Boucher at Astro Flight, it became evident that the Astro 15 motor system has the best power-to-weight ratio of any of the electric systems currently available. Thus, the Astro 15 was chosen as the foundation around which the Pioneer 15 was designed.

Using the 57 ounce weight of my Fournier RF4 as an example of the weight of an Astro 15 powered model, it was determined that the Pioneer 15 could be built to a design weight of 50 ounces including a 3 channel radio installation. To assure soaring capability, a wing area of 730 square inches was chosen to yield a design wing loading of 9.9 ounces/foot. The key to the light weight of this model is a strong light airframe and the use of a 5 volt voltage regulator to convert power from the motor battery for the use of the RC units.

The NACA 4412 section was chosen for the wing ribs. Since the wing is built without leading edge sheeting, the MonoKote shrinks between the ribs giving approximately a 9%-10% wing thickness. This is the key to the use of this thick airfoil for wing ribs of electric models. In a twin powered model in 1975 the leading edge was sheeted, resulting in a slow flying, high drag, poor performing model. The original wing of the Pioneer 15 had the wing ribs so closely spaced that it also evidenced less-than-desirable performance. In three subsequent models the spacing of the ribs was altered to empirically lead to the rib spacing used in the Pioneer 15. With this wing you can expect a fast powerful climb and a relaxed leisurely glide. It is quite a combination designed into a simple wing structure.

The stabilizer and rudder assemblies are typical of many RC sailplane models. The stabilizer can be rubber banded, attached with nylon bolts, or epoxied in place. I use rubber bands to allow for disassembly, but you can take you choice.

The fuselage incorporates a shoulder mounted wing for stability and uses tried and proven techniques for ease of construction and strength. The nose block and canopy are laminated from 1" balsa and carved to shape. This results in strong yet light construction for the nose area of the Pioneer 15.

The fuselage formers C, D, and F, are cut from 1/8" poplar plywood using notches to assure perfect alignment of the fuselage. This simple step saves a great deal of construction time and virtually guarantees a straight fuselage.

The prop stop, used in conjunction with the wiring diagram shown in the full size plan, allows the prop to be stopped horizontally to reduce drag during the glide and to prevent broken props. This feature actually saves 3 ounces of weight which would be necessary if a single wheel landing gear was used.

The two capacitors are each soldered to the motor leads and then are both soldered to the same small length of

PIONEER 15
Designed By: James V. Zarembski

TYPE AIRCRAFT
Electric Powered Sailplane
WINGSPAN
74 Inches
WING CHORD
10 Inches
TOTAL WING AREA
730 Square Inches
WING LOCATION
Shoulder
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
3⅝ Inches
O.A. FUSELAGE LENGTH
40⅝ Inches
RADIO COMPARTMENT AREA
(L) 7" X (W) 2-11/16" X (H) 2½"
STABILIZER SPAN
24⅝ Inches
STABILIZER CHORD (Incl. elev.)
5-7/16"
STABILIZER AREA
130 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
8 Inches
VERTICAL FIN WIDTH (Incl. rudder)
4¾" (Avg.)
REC. ENGINE SIZE
Astro 15 Electric
PROP SIZE
Cox 8/4 Gray
LANDING GEAR
Skid
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rudder & Elevator
Motor On-Off Prop Stop
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa, Ply & Spruce
Empennage	Balsa
Wt. Ready-To-Fly	50 Oz
Wing Loading	9.86 Oz/Sq. Ft.

wire. The wire is, in turn, attached to the motor by wrapping the end of it to one of the motor end plate screws. This is to ground the capacitors to the motor frame. The resistor is mounted in the area ahead of the switch on the electrical deck.

To operate the system the Astro Flight switch is turned from 'charge' to 'fly' mode. The RC unit is now powered. When the motor servo is turned to the "on" position, two things happen. First, the prop stop NyRod is retracted. Second, when the bellcrank is at the end of its stroke, it actuates the switch starting the motor.

At the desired altitude, back off the power slightly to stop the motor power. The dynamic brake circuit will then slow the prop to a few hundred rpm's. At this point the prop stop NyRod can be used by moving the motor control to full off.

Without the dynamic braking circuit the prop would continue to revolve at a high rpm due to airflow over it and would cut the NyRod. The idea of stopping a prop was first tried by my friend De-Wayne Evans about three years ago. However, it was not made practical until Bob Boucher suggested that the dynamic brake circuit should be used in conjunction with this idea.

CONSTRUCTION

The first step I use is to cut out all of the components to, in essence, prepare a kit for Pioneer 15. I might suggest that you purchase two sets of plans — one for construction and one to be cut up for parts templates. It may seem like a lot of money for cut-out paper templates, but it will save a great deal of time in fabricating of the parts. I cut out all the part outlines 1/4" to 1/2" oversize and rubber cement these portions of the blueline print to the required balsa or plywood sheet. I let this dry an hour or so and then use a Dremel saw to cut out the part to the exact outline of the blueline. In the case of fuselage sides, wing and stab tips, and wing ribs, I stack the number of sheets required over one another and pin them together for cutting. Use about 20 pins for the fuselage sides and make sure your jig saw blade is perpendicular to the table bed. You always get identical fuselage sides this way. Incidentally, while the fuselage sides are pinned, drill the holes for the wing and stab hold-down dowels.

The 6 center ribs can be cut at one time. However, you should use two stack cuts of 12 ribs each to produce the 24 main ribs required. Once you see the ease of parts production using these methods, you'll understand why I use constant chord wings. Plywood parts such as the dihedral brace can be stack cut also. Use small brads instead of pins to hold the stack together.

Wing:

Use aliphatic resin to join the 1/8" x 1/4" spruce spar caps to the 1/4" x 1/2" balsa spar cores. When dry, bevel the center of the four sections and epoxy the 1/8" plywood dihedral braces in place to yield the two spars required. You must make sure that both spars have the same dihedral angle. Note that the spars are completed before assembly of the wing halves.

Start with the right panel. Pin down the trailing edge and the 3/16" tip rib. Move the spars in position and install the sheeting under the center section. Add the ribs using aliphatic resin and complete this portion of the wing construction by adding the leading edge. After this dries, remove the pins and build the other panel. When dry, remove from the board and add the wing tips and center top sheeting. Sand smooth, MonoKote, and add 1/4" washout to each top. Use acyanoacrylate cement to fasten the plastic paper hook (used in report binders — get it from a school supply company or drug store) and the wing is complete.

Stab:

Simply cut the 3/16" square strips to size and assemble with the cut-out parts using aliphatic resin. Sand to shape, cover, and assemble the elevators to the stab using 6 nylon hinges of your choice.

Fuselage:

First laminate the nose piece and the canopy from 1" light sheet balsa. While this is drying, add the 1/32" plywood fuselage doubler to the front of each fuselage side and the 3/32" balsa doubler to the rear of the fuselage. I use 5 minute epoxy for this to get a quick smooth strong bond of the plywood doublers. Simply mix a small batch of epoxy and spread evenly over the fuselage area. Remove most of the epoxy and push the 1/32" plywood doubler in place on the fuselage holding it in place with several pins. Use a Dremel jig saw or a razor knife to cut the notches for the fuselage formers in the 1/32" plywood after the epoxy has set up.

Next epoxy formers C, D, and F, to the two fuselage sides. When the epoxy is set, add the nose section, the canopy, formers G and H, and the tail block. Select and cut to shape a length of poplar plywood to form the forward fuselage bottom. Cut a hole in this piece for a motor exhaust cooling exit. Cement it in place along with the 1/8" balsa fuselage top and bottom. Make sure you add the pushrods to the tail feathers before you add the fuselage top.

Use an X-acto #26 blade to carve the canopy and nose piece. When satisfied, sand the fuselage complete for finishing. I used MonoKote on the entire fuselage except the canopy which was surfaced with two coats of finishing resin and spray painted with one coat of Testors PLA plastic model enamel — gloss black.

To complete the fuselage, drill the hole for the prop stop rod, add the wing hold-down dowels, and either fabricate two balsa vents of at least 1/2" square area for cooling, or purchase two vacuum formed inlets from Astro Flight for 49 cents per pair plus 50 cents postage.

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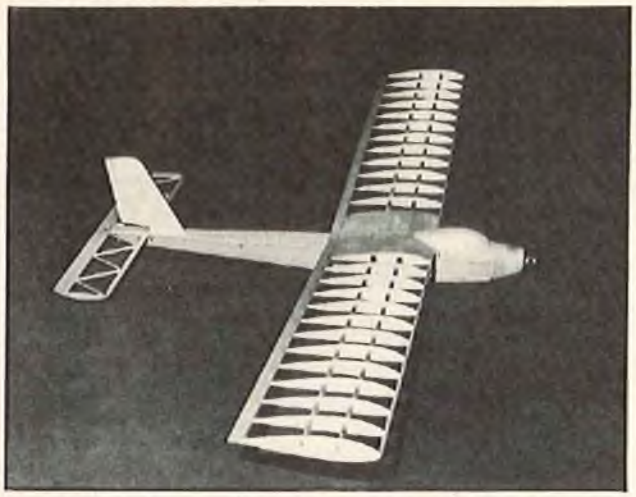
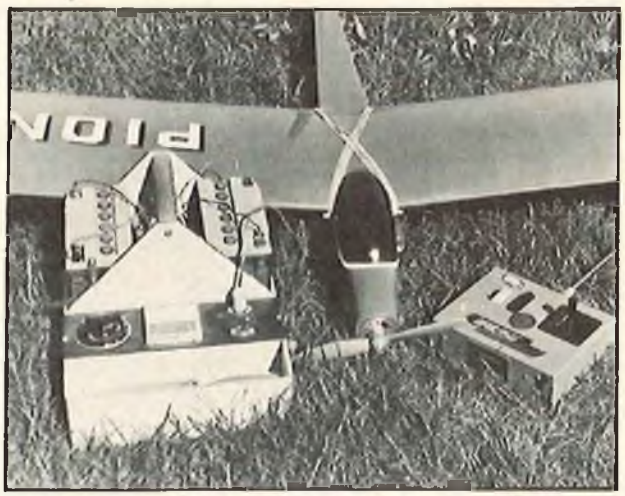
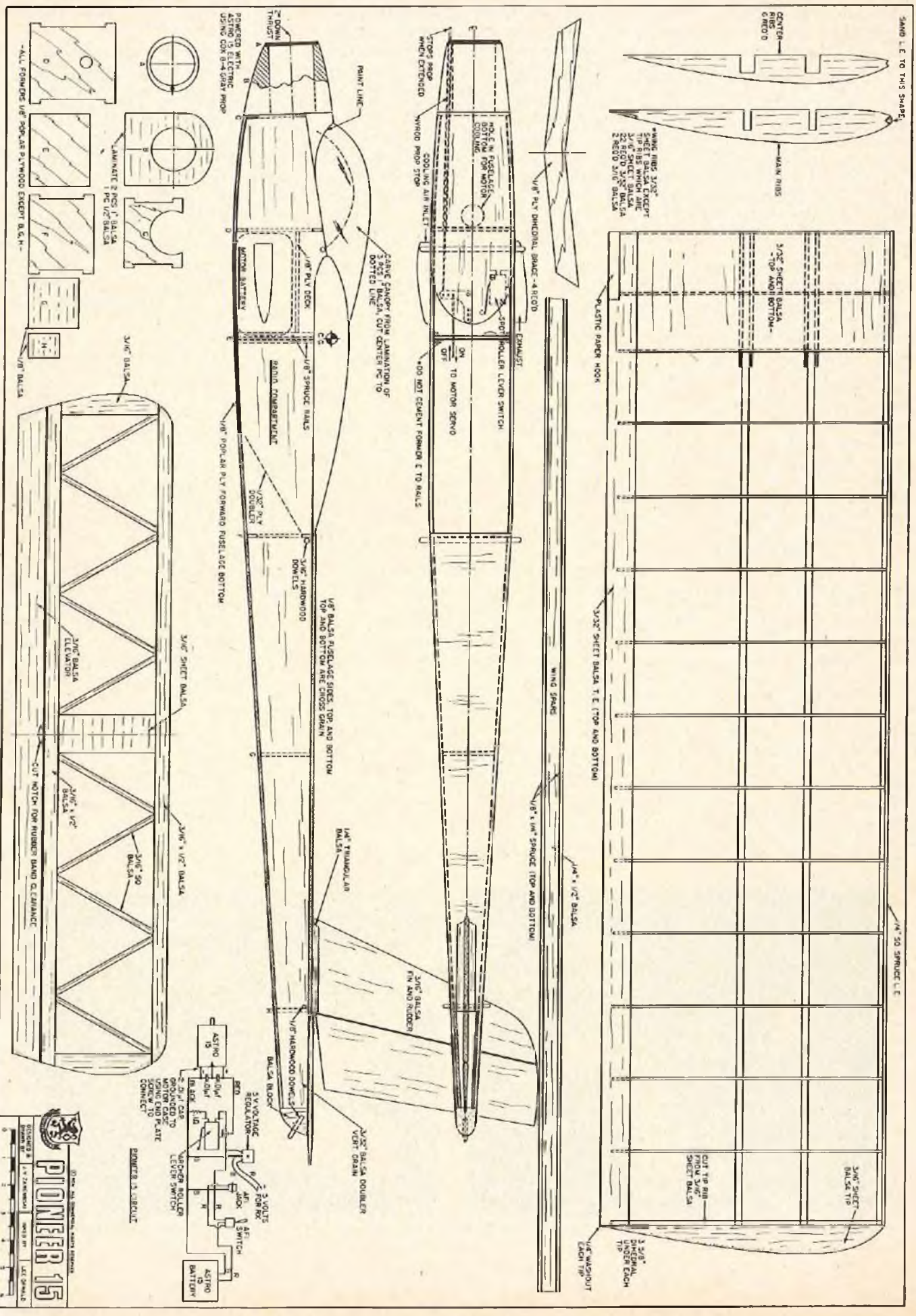


The Pioneer 15 - - - all framed up and ready for covering.



The whole package – sailplane, radio, and Astro rapid charger.

FULL SIZE PLANS AVAILABLE — SEE PAGE 189



RCM PRODUCT TEST

House Of Balsa
P-39 AIRACOBRA

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts		●			
Plans		●				Parts Match to Plans		●			
Written Instructions	●					Overall Parts Fit		●			
Quality of Hardwood		●				Ease of Assembly		●			
Quality of Fiberglass			NA			Fidelity to Scale		●			
Other Materials		●				Flight Performance	●				
Accessories			●			Overall Appeal	●				
Die-Cutting		●									

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

The P-39 Airacobra is a 1/2A Sport, Stand-Off Scale aircraft designed by Fred Reese and manufactured by House of Balsa. Designed for .049-.051 cubic inch engines and two channel operation, the P-39 is not recommended for the rank beginner.

The basic materials used in the construction are conventional balsa and plywood, while the hardware list includes formed landing gears, aileron bellcranks, brass tubing, small metal clips and sheet metal screws. All parts are die-cut, except for balsa block wing tips. The semi-symmetrical wing is built-up in the conventional manner on a flat surface.

Several outstanding features in the kit include: a plastic fuselage top with integral canopy and airscoop, built-up as an assembly and glued in place saving considerable time for the builder. The engine mount, when screwed in place, retains the nose gear. Provisions are ready-made in the main fuselage bulkhead to retain the airborne switch. The two machine guns mounted in the nose section are functionally used as fuel fill and vent lines. A forward hatch on the bottom of the fuselage makes engine and fuel tank accessible for quick inspection.

In general, the kit went together quite well, using the excellent instruction manual provided. However, we would like to suggest a few simple modifications. We felt it was necessary to add a small triangular gusset at both wing tips where the trailing edge joins the wing tip block. The trailing edge becomes very thin at this point and needs reinforcement. Also, 1/8" x 1/8" support blocks were added to give the aileron hinges extra support.

The wing structure was given a coat of Balsarite and covered with MonoKote, while the fuselage and tailplane were fiberglassed with 3/4 ounce cloth and Hobbypoxy II glue, using the toilet tissue method. This finishing method was discussed briefly by Bob Wallace (author of Samurai article, February

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SPECIFICATIONS

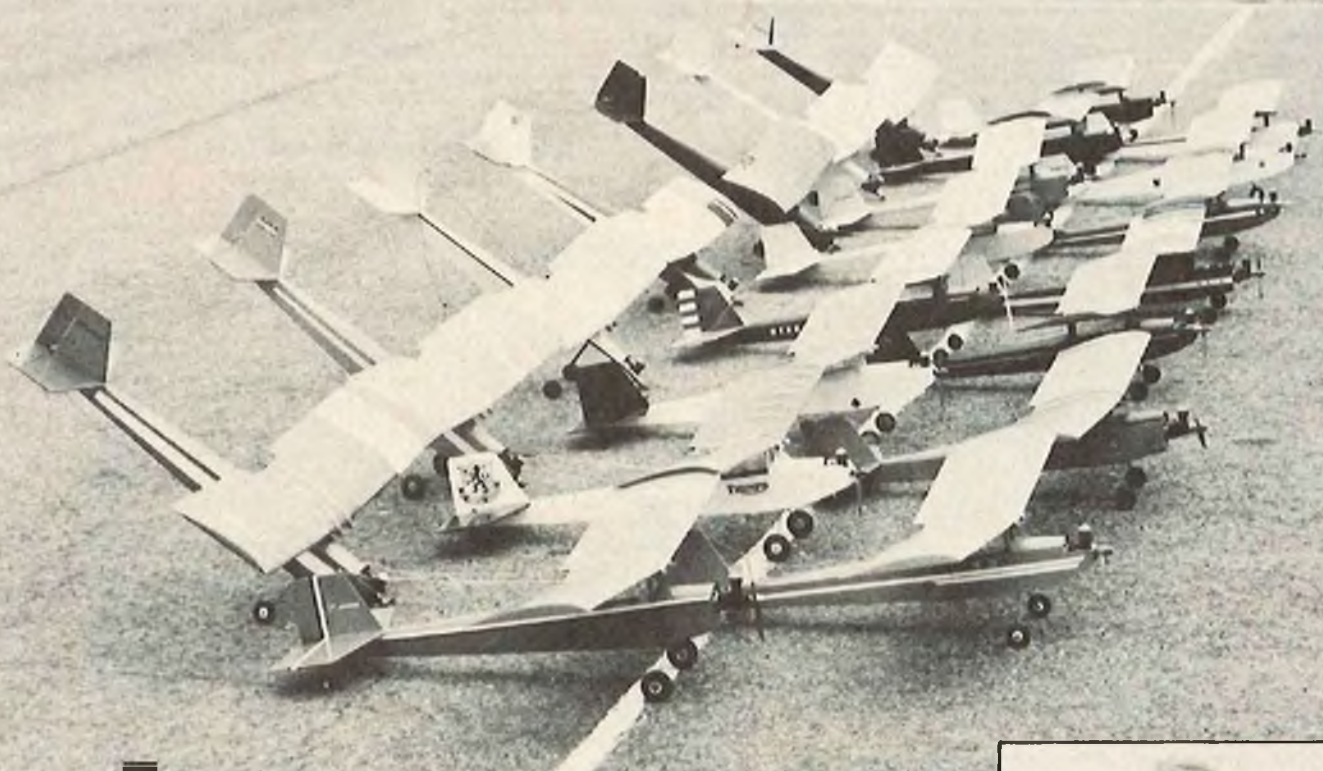
Name	P-39 Airacobra
Aircraft Type	Military
Manufactured By	House Of Balsa 2814 East 56th Way Long Beach, California 90805
Mfg. Suggested Retail Price	$24.95
Available From	Mfg. & Retail Outlets
Mfg. Recommended Usage	Sport/Stand-Off Scale
Wing Span	36 Inches
Wing Chord	6" (Avg.)
Total Wing Area	216 Square Inches
Fuselage Length	28.5 Inches
Radio Compartment Dimensions	(L) 7¾" x (W) 2-1/16" x (H) 2⅛"
Wing Location	Low Wing
Airfoil	Semi-Symmetrical
Wing Planform	Double Taper
Dihedral	1½ Inches
Stabilizer Span	13½ Inches
Stabilizer Chord (incl. elev.)	3" (Avg.)
Total Stab Area	40.5 sq. in. (incl. elev.)
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	3½ Inches
Vertical Fin Width (incl. rud.)	4½" (Max)
Mfg. Rec. Engine Range	.049-.051
Recommended Fuel Tank Size	1-2 Oz.
Landing Gear	Tricycle
Rec. Number of Channels	2
Recommended Control Functions	Elevator & Ailerons
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Plastic
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	25" x 38" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (23 pages)
Construction Photos	Yes
Kit Includes	Die-Cut Parts
Mfg. Rec. Flying Weight	22-28 Ozs.
Wing loading based on rec. flying wt.	14.6 — 18.6 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	24 Ounces
Wing Loading	16.0 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Not Given
Muffler Used	No
Radio Used	Not Given
Tank Size Used	2 Ounce

Q-TEE CHALLENGE RACE OR BUMBLEBEE NATIONALS

BY HENRY ARANCE



It was all Gary's fault.

Gary Moline has the habit of going around with the big wheels of the California model world, shooting his mouth off about our club being *The Best* and *The Greatest* in anything concerning Q-Tees. When he said that we've had fantastic times, he meant we were having fun — he didn't mean we were fast. Or, did he?

I don't know. The fact is that probably the guys at RCM got to the point of being tempted to fly a Q-Tee through his mouth, and *The Challenge* began to take shape.

There never was a set of rules written down. The basics were well established though. First, a team from RCM would come to the American Model Airport Association field at Chino to race the dickens out of a team of locals. Second, he who tooketh the matter too seriously was to be disqualified and his model shot through the head.

The not-so-basics were agreed upon. Like, non-modified Q-Tees with non-modified engines with integral fuel tank, unmodified props and fuel supplied by the organization. Five laps around two pylons that were apart, "like from here to there". Thirty seconds to start, but if you took another minute that was okay; just launch and chase them.

Ah, and don't forget to get good weather, food, refreshments, a relief station, and please keep in mind that this is *team* work. See that your buddy gets his points too; don't be a "prima donna" or you don't get nothing, either! The RCM group must have had some intelligence work done and realized that their chances were kind of slim, because they made an allegiance with the Cox people to reinforce their ranks. Cox, of all people! After all we have done for them . . . They even got some "soldier of fortune" named Joe Bridi to fight their battle. Gad! I though that we were to take things not too seriously!

Finally, Sunday May 22 was here. Joe Leal and a few chosen helpers got the field manicured the week before. Don Bellows set up the cardboard pylons and the score board. The ladies set-up the food and drinks and we were ready to take entries. No fee — just your name,

Contest Director: Don Bellows.

Lee Renaud showing where the wing goes to this cracker jack team of Bridi, Kidd, Kindrick and Pearson.

Starting line launching Finesse, notice far co-pilot gives that extra ounce of oomph. Chaffey Shepherd, starter.

The determined look of fierce competition. Pilots Bridi and Ken McSpadden.

Gary Moline, instigator of this Q-Tee madness, shows some of the merchandise prizes.

Thirty second starting time underway, the small electric starters are a must for this type of competition.

Results of two aircraft attempting to fly in the same airspace. Executed by Bridi and Ken McSpadden.

frequency, AMA, FCC, and the side of the fence you were on. The tally showed twelve locals against nine challengers — and here we got the first bomb. Upon seeing that, on the challenging camp there were names like Cliff Weirick, Lee Renaud, Joe Bridi, Dick Kidd, etc., Gary Moline deserted our team — "to make things more even," he said. Fink.

The matrix was prepared so we had two guys from each team flying in each heat. The wind sock — courtesy of Ted's Hobby Shop, thank you — hung straight down. No wind — good. The sky was overcast. No sun to blind you in the turn — good. So what were we waiting for? Call the first heat!

And, then, the real fun began. You could see that the hands of some old pros were just as shaky as those of rank beginners.

Surprisingly the 30 second start worked just fine. Healthy un-relieved engines and the availability of good batteries and electric starters for everybody were a strong factor. Anyhow, we saw

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SPIRIT OF
'76
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who have been able to hang in there successfully over the years. First there was the Kaos; a pattern ship which, as far as we know, has been unsurpassed in pattern contest wins since it was first flown. And it can still be found flying in Class A successfully in many pattern contests. Then, when other pattern aircraft began to sprout retracts, and change-overs made in the Class D and FAI patterns, the Kaos became less competitive. Then came the Super Kaos; a cleaner, faster plane with retracts that flew the revised AMA-FAI pattern better. Contest wins proved the point.

More changes in the AMA-FAI pattern, coupled with the availability of pumps, created new demands on pattern aircraft. To meet these new challenges, the Dirty Birdy hatched to begin its history of contest wins for Joe and many other pattern fliers.

Now we present Joe's latest, the UFO.

UFO

JOE BRIDI, ONE OF THE WORLD'S FINEST PATTERN FLIERS, COMES UP WITH HIS BEST DESIGN EVER FOR AMA AND FAI COMPETITION

BY BEN STRASSER

COLOR PHOTOS BY BILL ROOT

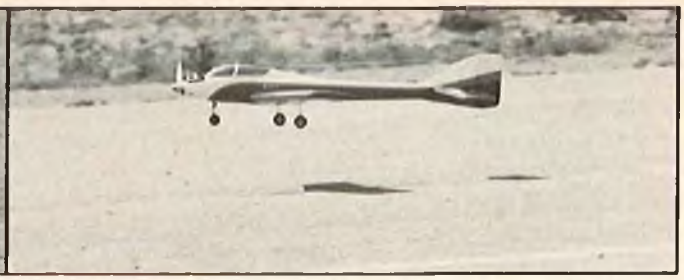
It has been interesting to watch the evolution of pattern R/C aircraft over recent years. The changes we can all recall by flipping through the pages of some old RCM magazines were brought about for more than appearance reasons alone. Though looks do undoubtedly play a part, there are several other more significant factors which have stimulated the on-going modifications we've seen. For example, probably one of the most easily remembered was the emergence of reliable proportional RC equipment. As a result, the airplanes no longer needed as much built-in stability so the maneuvers could be flown more accurately. And, proportional control of the surfaces made flying much smoother and more predictable. New, more powerful engines made it possible for the planes to fly faster. Then retracts made it possible to build cleaner pattern aircraft and designs were modified to take advantage of this new development. Effective fuel pumps increased the power of our engines and the airplanes flew at still greater speeds.

While pattern pilots have become more and more adept at making their planes respond in unbelievable ways, they have also continued to experiment with the design of their airplanes to take advantage of a new development or to try out a new idea about what might make this or that maneuver go better. Changes made in search of that elusive edge that hopefully will add a few points to their scores at contest time.

It's interesting to note that all of these factors seem to be kept in motion by re-occurring changes in the AMA-FAI contest pattern. New aircraft designs fly the pattern better and/or the pilots just get better at it. Changes are made in the pattern to make the contests more challenging. Then new designs are created to fly the new pattern and the pilots do the job better. Changes are made in the pattern, and on and on.

Joe Bridi's birds have evolved as have the aircraft of any of the pattern pilots

While at first glance this RC pattern aircraft seems to bear a very strong resemblance to the Dirty Birdy, several significant design changes underscore the fact that looks are only skin deep; this is really a new flying machine. Taking advantage of a pumper, retracts, and a tuned pipe, the UFO uses a swept-back wing and stabilizer for better roll characteristics. The stab is thicker to increase the drag at the back end to make the tail more stable in some of those near-stall maneuvers. Anhedral is used at the stab to keep it out of much of the



wing turbulence for better control at lower speeds. The deeper fuselage makes retract installation easier. The increased side area at some critical points along the fuselage and larger fin and rudder help out in knife-edge flight. The thicker wing cross section — shades of the Kaos — makes for better constant speed flight in those big loops and diving maneuvers — and the longer fuselage offers increased stability. The UFO makes its debut to join the unending quest for perfection.

BUILDING NOTES

We're presenting the building notes for the UFO based on a couple of assumptions. First, because the aircraft is designed for the contest-minded pattern flier, we've assumed that the builder has already had experience in building and flying this kind of RC aircraft. It's a high performance model airplane designed to do a job; fly the AMA-FAI pattern. And it does that well! A second assumption we've made is that all of the wood parts are ready — that is, all of the pieces like the wing and stab ribs, bulkheads, fin, rudder pieces, elevator halves, and such, have already been cut out. Incidentally, the stick-on templates available from RCM will save you loads of time. We cut up some plans and stuck the pieces to the wood with rubber glue.

Getting back to the wood, you will probably find it hard to locate some of the sizes called out on the plans. Joe cuts his own wood and you may have to do the same, or substitute. We solved most of our problems by buying balsa pieces of the proper thickness and then ripping them to the correct width, or vise versa. The only real difficulty we encountered was the 3/8" triangular stringers that run down the sides of the fuselage top block. Since the fuselage sides butt glue to them, the edge to which the fuselage sides butt glue must be 3/16" wide, not a sharp point. (See the front view of bulkhead #3 on the plans.) Cut the point off of one edge of the triangular stock and it's no longer 3/8" triangular stock! We just substituted 3/8" square stock for the stringers to save a lot of fooling around. If you decide to do the same, the ends of the aft top block cross brace will have to be cut square to mate with the square stringers.

UFO
Designed By: Joe Bridi

TYPE AIRCRAFT
AMA-FAI Competition & Sport
WINGSPAN
65¼ Inches
WING CHORD
16¾" (Avg.)
TOTAL WING AREA
692 Square Inches
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Swept L.E.
DIHEDRAL, EACH TIP
1½ Inches
O.A. FUSELAGE LENGTH
58¾ Inches
RADIO COMPARTMENT AREA
(L) 13" X (W) 3" X (H) 2⅝"
STABILIZER SPAN
26¼ Inches
STABILIZER CHORD (Incl. elev.)
7½" (Avg.)
STABILIZER AREA
298 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
9¾" (incl. sub fin)
VERTICAL FIN WIDTH (Incl. rudder)
10" (Avg.)
REC. ENGINE SIZE
.61 Cu. In. (10 c.c.)
FUEL TANK SIZE
14-16 Ounce
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4 (5 w/retracts)
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply & Hardwood
Wing ..... Balsa, Ply & Hardwood
Empennage ..... Balsa
Weight Ready-To-Fly ..... 136 Oz.
Wing Loading ..... 21.7 Oz/Sq. Ft.
(includes wing & stab area)

The Fuselage:

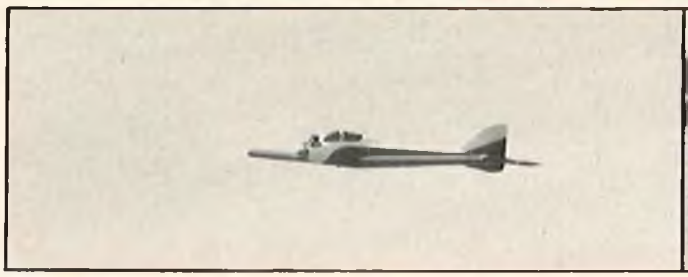
Glue the fore and aft fuselage side pieces together using 5-minute epoxy. Add the 1/16" ply doubler. The doubler will be 1/4" short of the bottom to allow for the 1/4" triangular stringer.

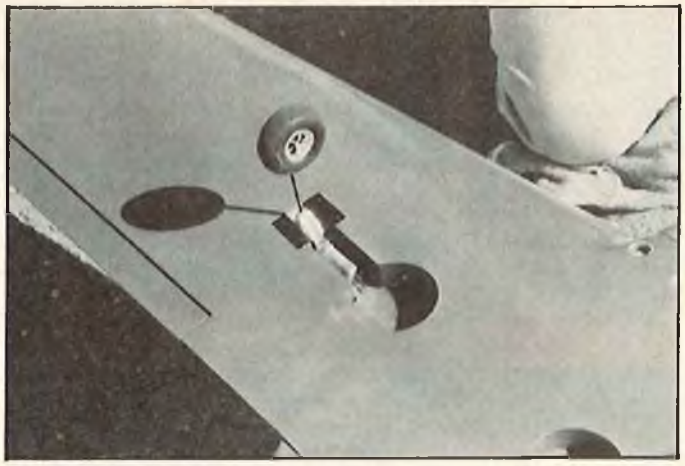
While the glue sets up, draw a top-to-bottom centerline on the back of bulkheads #1 and #3 down the length of the bottom side of the fuselage top block pieces and down the center of the fuel tank compartment top block. Draw a line across the top block at the location of the aft end of the fuel tank compartment top block, at the location of the cross braces in the servo compartment, and aft of station #3. Mark the location of bulkheads #2 and #3 on the inside of the fuselage sides.

With epoxy along the butt glue joint between the fore and aft fuselage top block pieces, pin them down on your building board with the centerline side up. Relieve the 3/8" balsa fuel tank compartment top block as necessary for your fuel tank. Work carefully or you may end up with a hole in the top of your fuselage when you sand it to shape. Glue the fuel tank compartment top block in place using epoxy adhesive.

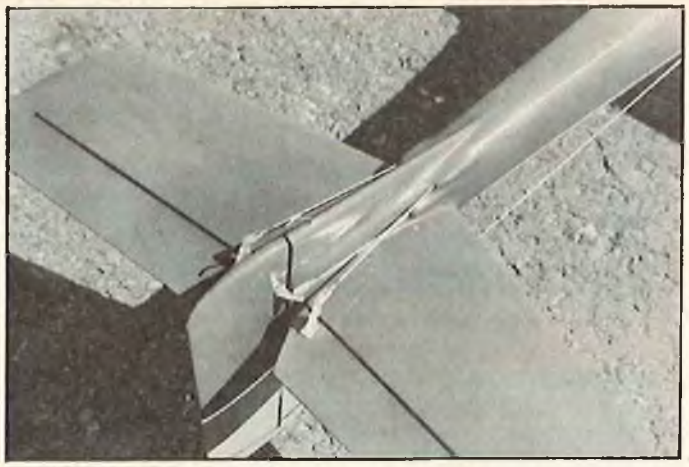
Cut the 3/8" top block stringers to length. Relieve the inside aft ends as necessary and glue them in place. Before the adhesive sets up, add the cross braces in the area of the servo compartment, at station #3, and aft of station #3. Add bulkhead #2 and bulkhead #3, upside down, of course.

Working on the inside of the fuselage sides, glue the 1/4" triangular stringers in place. Relieve the back ends, as necessary, to allow the fuselage sides to glue together at the tail. Add the





Bottom view of wing showing Rhom-Air retracts.



Bottom view of empennage showing dual elevator pushrods –allows precise trim adjustments.

1/4" x 1/4" balsa vertical support brace to each fuselage side aft of station #3.

Now to begin gluing the fuselage sides in place. Note that the fuselage sides are glued in place in two operations. First, the area from bulkhead #2 to the tail is glued down. Then, after some wood pieces are glued to the nose, the forward fuselage sides are glued in place.

Glue the fuselage sides onto the 3/8" stringers from the location of bulkhead #2 to the tail. Glue and clamp the sides to bulkheads #2 and #3 and at the tail. Add the 1/4" triangular stock along the back of both sides of bulkhead #2 and a the cross brace that overlaps the top block glue joint. Add the 1/4" balsa brace between the bottom of the fuselage sides aft of station #3. Then add the 1/4" balsa fuselage bottom.

Now to get all of the nose pieces glued in place. Cut and glue a 9⅝" long piece of 5/8" triangular stock onto each side of the top block in the area of the fuel tank compartment from the front of bulkhead #2 into the engine compartment. These pieces should be glued only to bulkhead #2 and the top block at this time. Use bulkhead #1 as a guide to get the correct spacing of these pieces at the front end. Relieve them in the area of the fuel tank cut-out.

Next, prepare an engine mount rail alignment template. This piece is used to locate the rear of the engine mount rails so they will be level to each other and at the proper angle to provide 2° of down thrust. Use a carpenter's square to mark a scrap piece of 1/8" sheet balsa to a rectangle 3/4" high by 3⅛" wide. Cut out the template and pin it to the front of bulkhead #2 so it rests on the 5/8" triangular stock.

Now you're ready to glue bulkhead #1 and the engine mount rails in place. First, though, decide whether you are going to use retracts or fixed gear. Drill the necessary holes in the bulkhead and install the blind nuts.

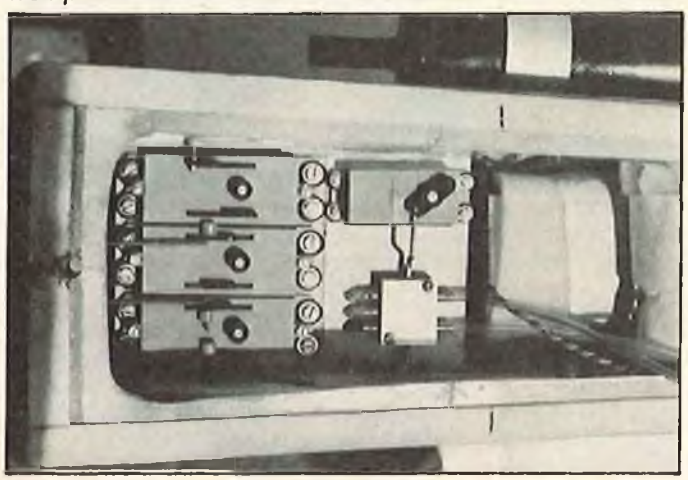
Put the hardwood engine mount rails in place into the notches in bulkhead #1. The aft end of the rails should be flat with the front of bulkhead #2 and rest on the alignment template. To find the proper location of bulkhead #1, use the two balsa fuel tank compartment bottom side blocks cut out to overlap the side of bulkhead #2 as a guide. The front of bulkhead #1 should be flush with the front of these side blocks. When bulkhead #1 is properly located, mark its location on the top block and the engine mount rails.

Use epoxy to glue bulkhead #1 and the engine mount rails in place. The rails glue to bulkhead #1 and bulkhead #2. Clamp the rails to the fuselage sides and to bulkhead #1. Remove the template. Make sure that bulkhead #1 aligns with the center line on the top block. Double check the spacing with the bottom side blocks before the adhesive sets up.

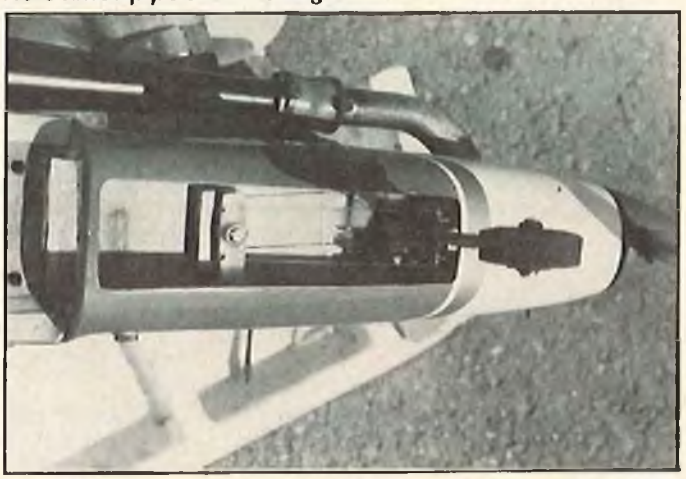
Epoxy the front of the fuselage sides to the top block, to the hardwood engine mounts, to the 5/8" triangular stock, and to bulkhead #1. Clamp the sides to the engine mount rails and to bulkhead #1 to assure a good bond. Add the 1/4" triangular stock pieces along the top and bottom of the engine mount rails. We ran them the entire length of the fuel tank compartment rather than short pieces as shown on the plans.

Before you glue the fuel tank compartment bottom side blocks in place, the inside top corner of each block will have to be relieved for wing dowel clearance. Note also that the bottom of these blocks should be cut to a straight line between bulkheads #1 and #2. Install the side blocks. Coat the inside of the fuel tank compartment with resin. Do

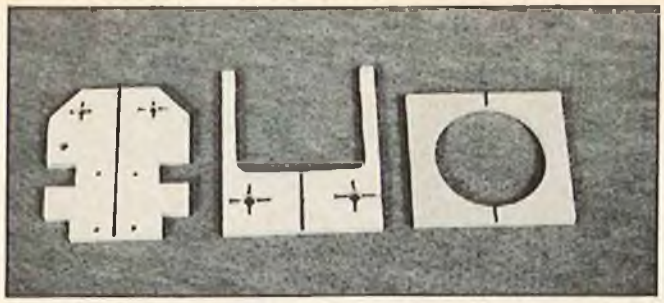
Well-placed servo installation with actuator valve for retracts.



Rhom-Air nose gear showing tiller arm & steering cables. Note tuned pipe on Joe's original.

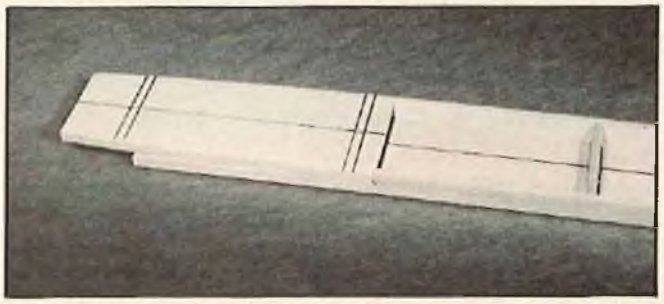


Fuselage side showing wing and stab cut-outs.

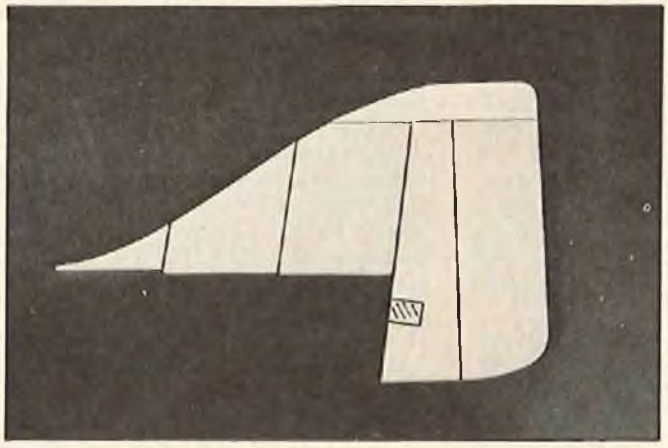


Bulkheads 1, 2, and 3.

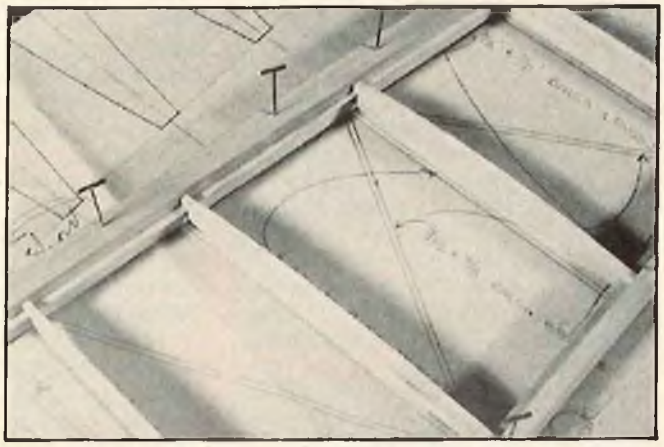
Balsa side block showing cut-out for bulkhead 2.



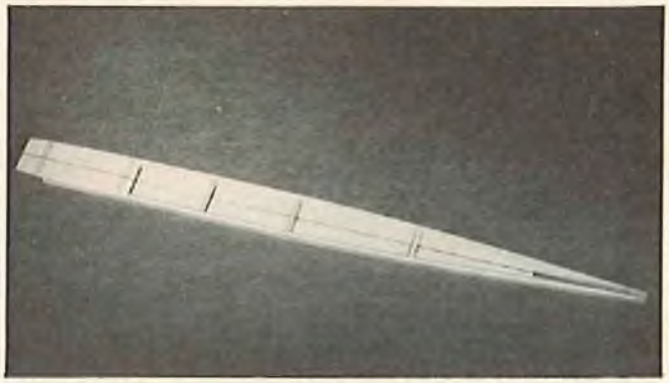
Fuselage top block with engine compartment top block in place.



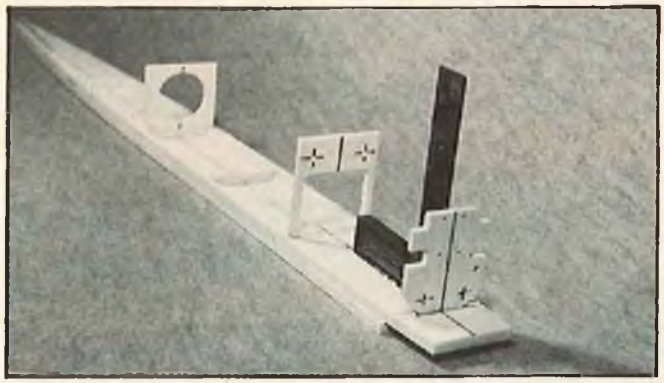
Fin and rudder pieces.



Stab showing leading and trailing edge notched for rib support spar.



The fuselage top block showing the stringers, cross braces, and fuel compartment top block glued in place. Note the top block centerline.



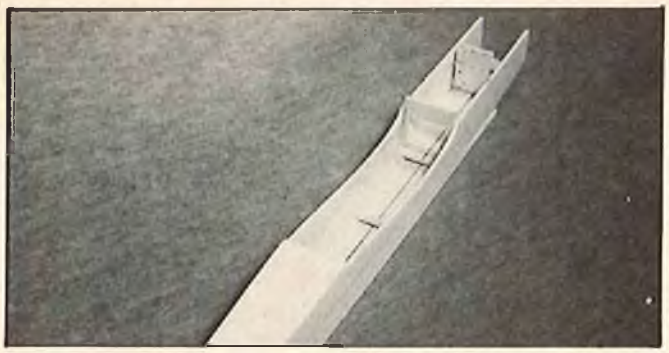
The bulkheads glued in place on the top block. Note that the end of bulkhead #1 with the angle cuts is oriented toward the fuel compartment top block.

not, however, get any resin in the areas that will glue to the fuel tank compartment bottom block.

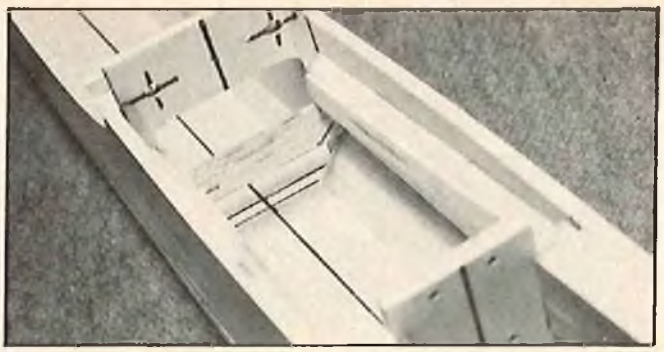
After the resin has set up, install the nose gear bearing and the outer tubing for the nose gear linkage and throttle linkage. Mark and cut the 1" nose gear spring clearance hole in the bottom of the 5/8" balsa fuel tank compartment bottom block. Glue the bottom block in place.

Before the rest of the wood is glued in the nose, the engine mounting screw blind nuts should be installed in the rails. To mark the screw holes, while at the same time assuring a good fit for the spinner back plate; first make a rough duplicate of the 1/16" ply spinner ring out of a piece of 1/16" balsa sheet scrap. This will be used as a spacer.

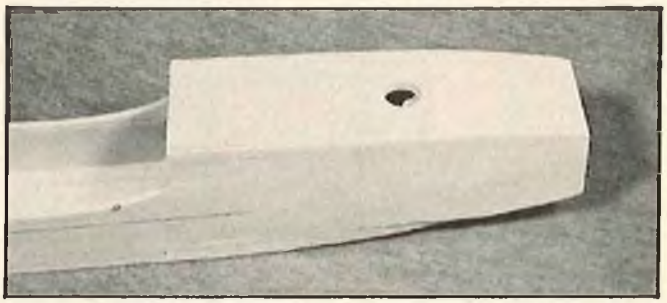
Tack glue the spacer to the back side



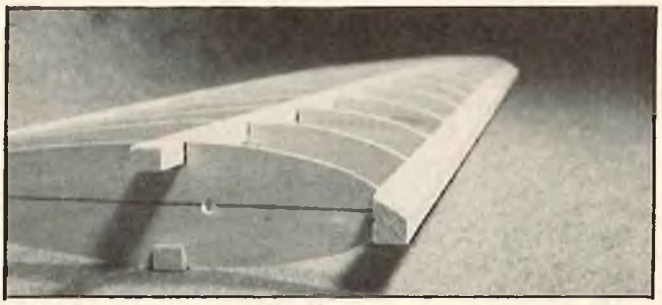
The fuselage sides glued in place from bulkhead #2 to the tail, with the fuse rear bottom block added. The sides are not yet glued in place forward of bulkhead #2.



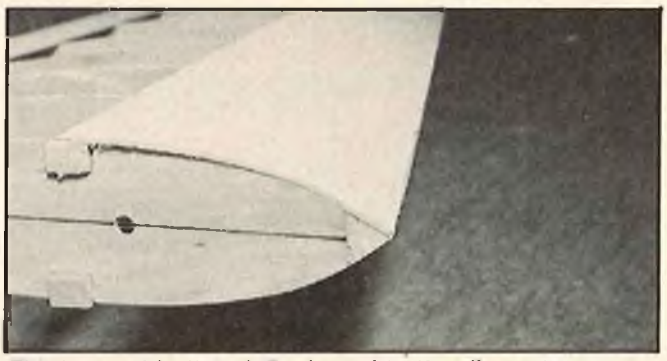
Using the scrap balsa motor mount locator template pinned in place across the front of bulkhead #2 to align the rear of the motor mount rails.



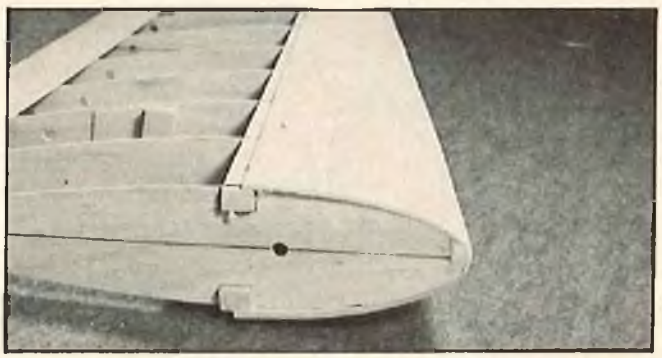
The bottom of the fuselage showing the chin block and fuel tank compartment bottom block.



The top of the leading edge shaped to the rib contour.



The top and bottom L.E. shaped to the rib contour.



The top and bottom L.E. sheeting installed and L.E. sanded to shape.

of your spinner back plate. Then, tack glue the ply spinner ring to the spacer. The spinner ring should align perfectly with the spinner back plate. Put the spinner back plate/spacer/ply ring assembly onto your engine. Add the prop and prop nut.

Make the cut-out as necessary for your engine. Put the engine temporarily in place onto the engine mounting rails so the ply spinner ring fits to the nose of the fuselage. Mark the location of the engine mounting bolt holes on the rails and drill the holes. Install the blind nuts.

Relieve the balsa motor mount support blocks for clearance of the blind nuts and motor mount screws. Seal the relieved area with epoxy then epoxy the motor mount support blocks in place. After the adhesive has set up, shave the bottom of these blocks flush with the bottom of the fuselage sides. Add the balsa chin block.

Cut the two 5/8" triangular stock pieces that are to be glued to the inside of the motor mount support blocks. The inside forward edge of each piece will have to be shaved a bit to fit into the space. Some of the triangular stock may also have to be relieved so your engine will rest flat on the engine mount rails. Glue these two pieces in place.

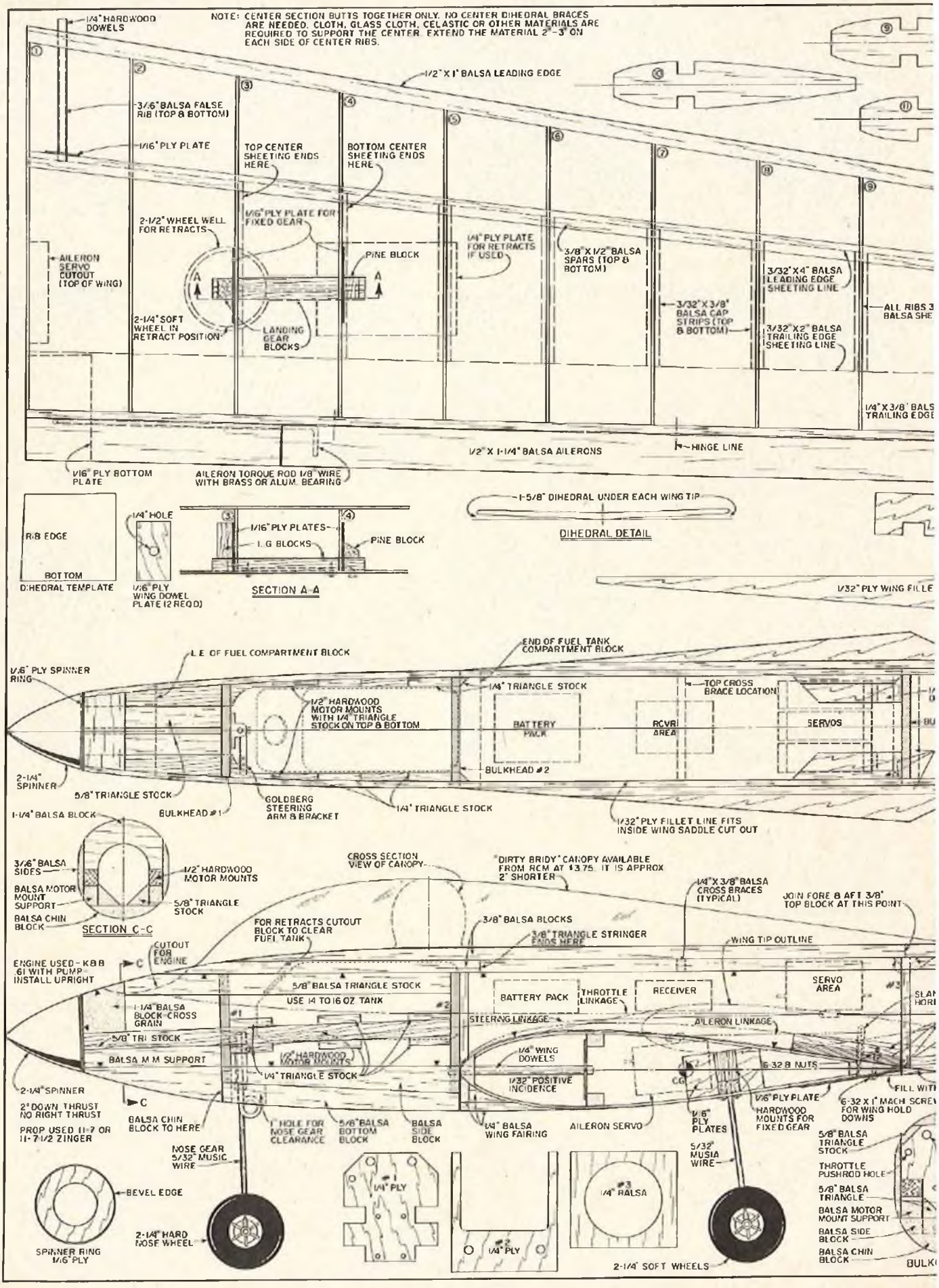
To glue the 1/16" ply spinner ring in place, put some epoxy on the nose of the fuselage and onto the bottom half of the ply spinner ring. With the spinner back plate/spacer/ply spinner ring still mounted on your engine, temporarily bolt the engine in place. When the adhesive has set up, remove the prop from the engine and break the tack-glued spacer and spinner back plate from the ply spinner ring. Remove the engine from the fuselage. Add the 1¼" balsa spinner block, cross grain. Relieve the spinner block for your engine. Fill any gaps between the ply spinner ring and the fuselage with epoxy or with resin and micro-balloons.

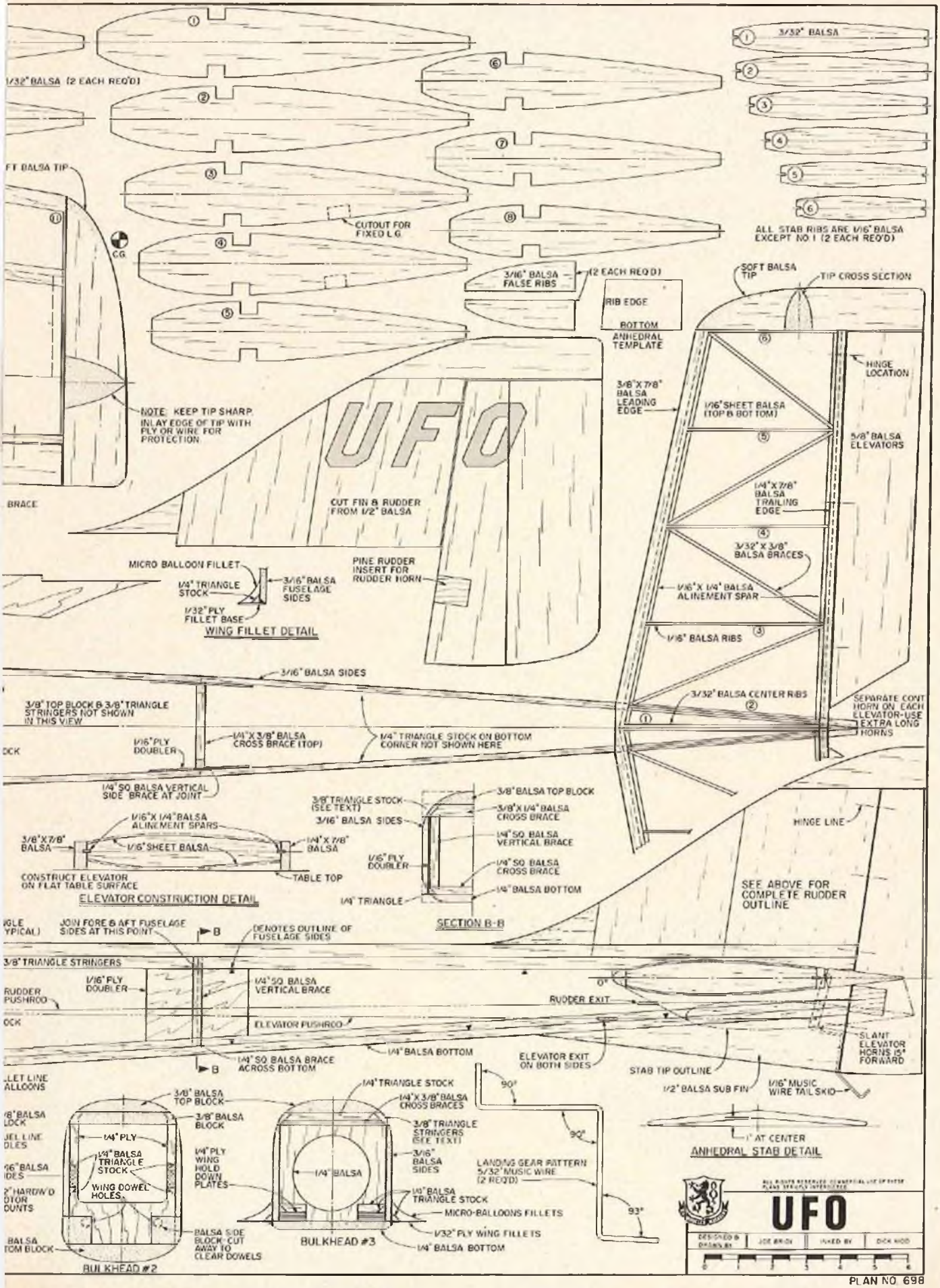
Add the two 1/4" ply wing hold-down plates and 1/4" triangle stock supports inside the fuselage as shown on the plans. That completes the fuselage construction. The 1/32" ply wing fillet base and bottom dorsal fin will be added later.

The Stabilizer, Elevator, Rudder, and Fin:

In looking at the stabilizer construction detail you'll note that during construction the symmetrical ribs are supported by the leading and trailing edge through the use of unique rib alignment spars added to the leading and trailing edge. Because the completed stabilizer will have anhedral, both stabilizer halves are built separately. Both stabilizer panels are built over the same lay-out on the plans. However, when the right stabilizer panel is built, the bottom side of the root rib is angled toward the stabilizer tip. When the left stabilizer panel is built, the top side of the root rib is angled toward the stabilizer tip. An alignment template is

text to page 138


1/4" HARDWOOD DOWELS
NOTE: CENTER SECTION BUTTS TOGETHER ONLY. NO CENTER DIHEDRAL BRACES ARE NEEDED. CLOTH, GLASS CLOTH, CELASTIC OR OTHER MATERIALS ARE REQUIRED TO SUPPORT THE CENTER. EXTEND THE MATERIAL 2"-3" ON EACH SIDE OF CENTER RIBS.
1/2" X 1" BALSA LEADING EDGE
3/16" BALSA FALSE RIB (TOP & BOTTOM)
1/16" PLY PLATE
TOP CENTER SHEETING ENDS HERE
BOTTOM CENTER SHEETING ENDS HERE
2-1/2" WHEEL WELL FOR RETRACTS
1/16" PLY PLATE FOR FIXED GEAR
1/4" PLY PLATE FOR RETRACTS IF USED
3/8" X 1/2" BALSA SPARS (TOP & BOTTOM)
PINE BLOCK
AILERON SERVO CUTOUT (TOP OF WING)
2-1/4" SOFT WHEEL IN RETRACT POSITION
LANDING GEAR BLOCKS
3/32" X 3/8" BALSA CAP STRIPS (TOP & BOTTOM)
3/32" X 4" BALSA LEADING EDGE SHEETING LINE
3/32" X 2" BALSA TRAILING EDGE SHEETING LINE
ALL RIBS 3 BALSA SHE
1/4" X 3/8" BALS TRAILING EDGE
1/2" X 1-1/4" BALSA AILERONS
HINGE LINE
1/16" PLY BOTTOM PLATE
AILERON TORQUE ROD 1/8" WIRE WITH BRASS OR ALUM. BEARING
RIB EDGE
BOTTOM
DIHEDRAL TEMPLATE
1/4" HOLE
1/16" PLY WING DOWEL PLATE (2 REQD)
1/16" PLY PLATES
I. G BLOCKS
SECTION A-A
1-5/8" DIHEDRAL UNDER EACH WING TIP
DIHEDRAL DETAIL
1/32" PLY WING FILLE
L.E. OF FUEL COMPARTMENT BLOCK
END OF FUEL TANK COMPARTMENT BLOCK
1/8" PLY SPINNER RING
1/4" TRIANGLE STOCK
TOP CROSS BRACE LOCATION
1/2" HARDWOOD MOTOR MOUNTS WITH 1/4" TRIANGLE STOCK ON TOP & BOTTOM
BATTERY PACK
RCVR AREA
SERVOS
BULKHEAD #2
2-1/4" SPINNER
5/8" TRIANGLE STOCK
BULKHEAD #1
GOLDBERG STEERING ARM & BRACKET
1/4" TRIANGLE STOCK
1/32" PLY FILLET LINE FITS INSIDE WING SADDLE CUT OUT
1-1/4" BALSA BLOCK
3/16" BALSA SIDES
1/2" HARDWOOD MOTOR MOUNTS
BALSA MOTOR MOUNT SUPPORT
5/8" TRIANGLE STOCK
BALSA CHIN BLOCK
SECTION C-C
CROSS SECTION VIEW OF CANOPY
"DIRTY BRIDY" CANOPY AVAILABLE FROM RCM AT $3.75. IT IS APPROX 2" SHORTER
1/4" X 3/8" BALSA CROSS BRACES (TYPICAL)
JOIN FORE & AFT 3/8" TOP BLOCK AT THIS POINT
FOR RETRACTS CUTOUT BLOCK TO CLEAR FUEL TANK
3/8" BALSA BLOCKS
3/8" TRIANGLE STRINGER ENDS HERE
WING TIP OUTLINE
CUTOUT FOR ENGINE
ENGINE USED - K&B .61 WITH PUMP INSTALL UPRIGHT
5/8" BALSA TRIANGLE STOCK
USE 14 TO 16 OZ TANK
BATTERY PACK
THROTTLE LINKAGE
RECEIVER
SERVO AREA
1-1/4" BALSA BLOCK-CROSS GRAIN
5/8" TRI. STOCK
BALSA M M SUPPORT
STEERING LINKAGE
AILERON LINKAGE
1/4" WING DOWELS
1/2" HARDWOOD MOTOR MOUNTS
1/4" TRIANGLE STOCK
1/32" POSITIVE INCIDENCE
6-32 B NUTS
2-1/4" SPINNER
2° DOWN THRUST NO RIGHT THRUST
PROP USED 11-7 OR 11-7 1/2 ZINGER
BALSA CHIN BLOCK TO HERE
1" HOLE FOR NOSE GEAR CLEARANCE
5/8" BALSA BOTTOM BLOCK
BALSA SIDE BLOCK
1/4" BALSA WING FAIRING
AILERON SERVO
1/16" PLY PLATES
1/16" PLY PLATE
HARDWOOD MOUNTS FOR FIXED GEAR
6-32 X 1" MACH. SCREW FOR WING HOLD DOWNS
5/8" BALSA TRIANGLE STOCK
THROTTLE PUSHROD HOLE
5/8" BALSA TRIANGLE
BALSA MOTOR MOUNT SUPPORT
BALSA SIDE BLOCK
BALSA CHIN BLOCK
5/32" MUSIA WIRE
NOSE GEAR 5/32" MUSIC WIRE
BEVEL EDGE
SPINNER RING 1/16" PLY
2-1/4" HARD NOSE WHEEL
1/4" PLY
#2 1/4" PLY
#3 1/4" BALSA
2-1/4" SOFT WHEELS


1/32" BALSA (2 EACH REQ'D)
FT BALSA TIP
CUTOUT FOR FIXED LG
C.G.
NOTE: KEEP TIP SHARP. INLAY EDGE OF TIP WITH FLY OR WIRE FOR PROTECTION
BRACE
UFO
CUT FIN & RUDDER FROM 1/2" BALSA
MICRO BALLOON FILLET
1/4" TRIANGLE STOCK
3/16" BALSA FUSELAGE SIDES
1/32" PLY FILLET BASE
WING FILLET DETAIL
PINE RUDDER INSERT FOR RUDDER HORN
3/32" BALSA
ALL STAB RIBS ARE 1/16" BALSA EXCEPT NO 1 (2 EACH REQ'D)
3/16" BALSA FALSE RIBS
(2 EACH REQ'D)
RIB EDGE
BOTTOM
ANHEDRAL TEMPLATE
SOFT BALSA TIP
TIP CROSS SECTION
HINGE LOCATION
3/8"X 7/8" BALSA LEADING EDGE
1/16" SHEET BALSA (TOP & BOTTOM)
5/8" BALSA ELEVATORS
1/4"X 7/8" BALSA TRAILING EDGE
3/32" X 3/8" BALSA BRACES
1/16"X 1/4" BALSA ALINEMENT SPAR
1/16" BALSA RIBS
3/16" BALSA SIDES
3/8" TOP BLOCK & 3/8" TRIANGLE STRINGERS NOT SHOWN IN THIS VIEW
1/16" PLY DOUBLER
1/4"X 3/8" BALSA CROSS BRACE (TOP)
1/4" TRIANGLE STOCK ON BOTTOM CORNER NOT SHOWN HERE
3/32" BALSA CENTER RIBS
SEPARATE CONT HORN ON EACH ELEVATOR-USE EXTRA LONG HORNS
1/4" SQ BALSA VERTICAL SIDE BRACE AT JOINT
1/16"X 1/4" BALSA ALINEMENT SPARS
3/8"X 7/8" BALSA
1/16" SHEET BALSA
1/4"X 7/8" BALSA
TABLE TOP
CONSTRUCT ELEVATOR ON FLAT TABLE SURFACE
ELEVATOR CONSTRUCTION DETAIL
3/8" TRIANGLE STOCK (SEE TEXT)
3/16" BALSA SIDES
1/16" PLY DOUBLER
1/4" TRIANGLE
3/8" BALSA TOP BLOCK
3/8"X 1/4" BALSA CROSS BRACE
1/4" SQ BALSA VERTICAL BRACE
1/4" SQ BALSA CROSS BRACE
1/4" BALSA BOTTOM
SECTION B-B
HINGE LINE
SEE ABOVE FOR COMPLETE RUDDER OUTLINE
JOIN FORE & AFT FUSELAGE SIDES AT THIS POINT
B
DENOTES OUTLINE OF FUSELAGE SIDES
3/8" TRIANGLE STRINGERS
1/16" PLY DOUBLER
1/4" SQ BALSA VERTICAL BRACE
RUDDER PUSHROD
ELEVATOR PUSHROD
1/4" SQ BALSA BRACE ACROSS BOTTOM
1/4" BALSA BOTTOM
RUDDER EXIT
ELEVATOR EXIT ON BOTH SIDES
STAB TIP OUTLINE
SLANT ELEVATOR HORNS 15° FORWARD
1/2" BALSA SUB FIN
1/16" MUSIC WIRE TAIL SKID
1" AT CENTER
ANHEDRAL STAB DETAIL
3/8" BALSA TOP BLOCK
3/8" BALSA BLOCK
1/4" PLY
1/4" BALSA TRIANGLE STOCK
WING DOWEL HOLES
1/4" PLY WING HOLD DOWN PLATES
BALSA SIDE BLOCK CUT AWAY TO CLEAR DOWELS
BULKHEAD #2
1/4" TRIANGLE STOCK
1/4"X 3/8" BALSA CROSS BRACES
3/8" TRIANGLE STRINGERS (SEE TEXT)
3/16" BALSA SIDES
1/4" BALSA
1/4" BALSA TRIANGLE STOCK
MICRO-BALLOONS FILLETS
1/32" PLY WING FILLETS
1/4" BALSA BOTTOM
BULKHEAD #3
LANDING GEAR PATTERN 5/32" MUSIC WIRE (2 REQ'D)
90°
93°
UFO
PLAN NO. 698

DRUINE TURBULENT

If you're looking for a Stand-Off Scale model that flies as well as it looks, you won't find a better subject than this .15 to .25 powered Druine Turbulent. A magnificent aircraft that will be a winner in Stand-Off Scale contests in the coming months.

By Flt. Lt. Gordon Whitehead

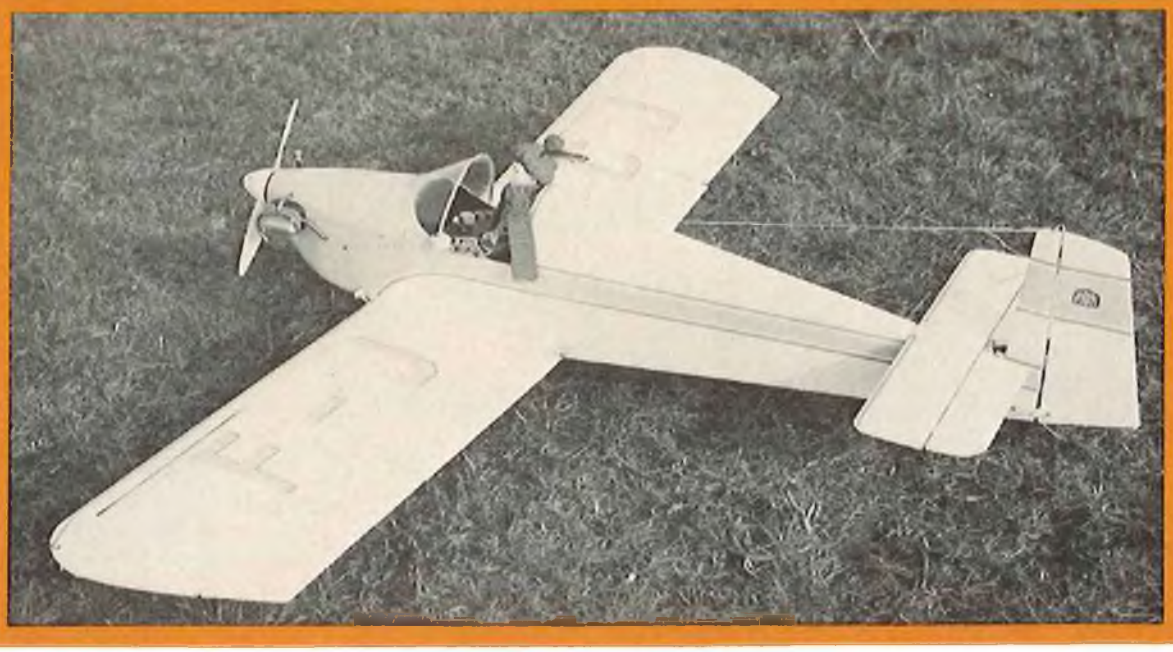
DRUINE TURBULENT
Designed By: Gordon E. Whitehead

TYPE AIRCRAFT
Stand-Off Scale
WINGSPAN
48½ Inches
WING CHORD
9 Inches
TOTAL WING AREA
420 Square Inches
WING LOCATION
Low Wing
AIRFOIL
NACA 2412 (slotted)
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
2 Inches
O.A. FUSELAGE LENGTH
39½ Inches
RADIO COMPARTMENT AREA
(L) 9" X (W) 3½" X (H) 2½"
STABILIZER SPAN
15 Inches
STABILIZER CHORD (Incl. elev.)
4¾ Inches
STABILIZER AREA
67 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5½ Inches
VERTICAL FIN WIDTH (Incl. rudder)
4½ Inches
REC. ENGINE SIZE
.15-.25 Cu. In.
FUEL TANK SIZE
2-4 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

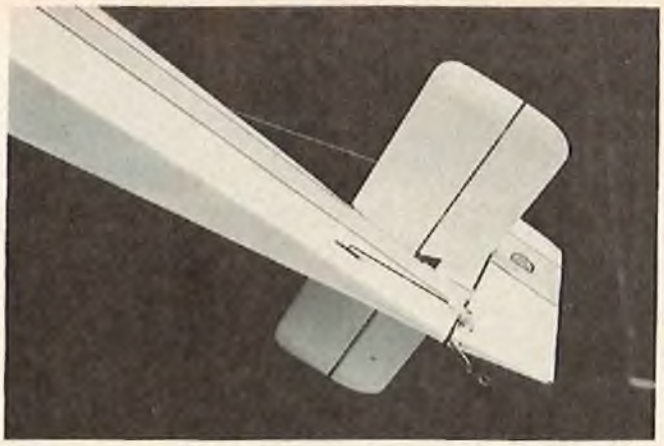
Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Weight Ready-To-Fly	50 Oz.
Wing Loading	17.2 Oz/Sq. Ft.

I don't think that the Turbulent will need any introduction to regular RCM readers owing to the article on Franz Meier's beauty which was featured within these pages last year. However, my model of the ship is totally different in concept to Franz's exquisite creation, being for general sport flying. You see, I like aerobatic models, and admire the virtuosity of all who compete seriously in FAI aerobatics. Not having time to practice sufficiently, I can't aspire to joining the ranks of the precision pattern exponents, but still thoroughly enjoy throwing my scale models about. In fact, I think that the best advice to give to a flyer who has reached the 4-function low wing stage using, say, a .40 powered New Era II or similar, is to study the FAI schedule and practice it. Yes! Even for sport flying. By the time he's got most of the maneuvers recognizable, he'll be competent and *confident* enough to fly any ship and rescue almost any situation. Notice that I didn't say he had to perfect the maneuvers - - - just get used to seeing an controlling the ship in all attitudes and through recognizable and reproducible evolutions.

Well, after that harangue, what has it all to do with my Turbulent? Certainly the full size ship isn't noted for its ability to fly Aresti patterns. However, besides possessing very shapely outlines, when built to a fairly light wing loading, using an adequately strong, but not beefy structure, she becomes a fantastic performer. Many modelers would expect to see a .40 in this size of ship, and hope to perform such things as vertical upward rolls until out of sight, and high speed fly-bys that leave the pulse racing. Well, with a .15, this ship will just about do half an upward roll before flopping out. When you perform a fly-by, she trundles past and you can study the pilot's facial expression. But when you start waggling the sticks, she'll perform wonderful antics in slow time that give you satisfaction because you can follow every



Close-up of O.S. Max engine mounted in the Druine Turbulent.



A view of the rudder and steerable tail wheel linkage.

movement. The secret is to use gravity and real wing lift to supplement the flea-power up front, and in using the last gram of energy from every position or movement of the ship.

The fixed slots were an attractive and unusual feature of the full-size ship, intended to inhibit spinning. So all you chaps who are terrified of tip stalls should experiment with this little gem. The purpose of the slots is to maintain unstalled airflow over the wing tips and ailerons at high angles of attack, thus delaying tip stall until well after the center section has lost its grip. They increase their effect as the angle of attack is increased, making turning and landing maneuvers safer. On the model, the effect of the slots is manifested by a marked reluctance to spin upright (even though she'll spin like a top inverted) and by powerful aileron control at slow speeds. Even when the middle section of the wing is stalled, and the model is 'mushing' downwards with full elevator applied, you can pick up a low wing using aileron with no fear of flicking out — with a little practice of course! More on flyability later. The foregoing was just to get you interested!

CONSTRUCTION

General: The structure is rib-for-rib, and sheeted where the full-size is sheeted. The rear decking can be sheeted with light 1/16" balsa, but I preferred the stringered early version. Construction is simplicity itself, but becomes even simpler if you pre-cut all parts. One evening's work will produce a kit of parts and help to keep the building board clear during the assembly stage.

Fuselage: Contact glue F1 to F1a. Glue the 1/8" square and 1/8" x 3/16" longerons to the fuselage sides, followed by uprights and the large doubler at the cockpit/wing seating. Follow the pre-bending procedure described on the plan when fitting the small front doubler. Note the grain directions. Next join the fuselage sides with F4 and the sternpost, then add formers F5 to F9 and crosspieces, ensuring squareness. When dry, draw the nose together and add F1/F1a, F2, F3 and then the ply doublers, holding the latter in place with clothespins until dry.

Build the ply exhaust duct and add the bottom sheet before and aft of the wing, noting that you will have to measure up your particular engine/silencer combination to ensure the duct lines up. The O.S. .25 silencer just fits inside the cowl lengths as drawn, but different silencers may need different holes!

After fitting the stringers, the top sheeting and cowl may be added — careful with those stringers! The fin and rudder are built up as shown, for lightness. Do not use solid sheet for two reasons — weight and cost.

When fitting the throttle linkage, note the re-positioned throttle arm on the engine, which keeps the Bowden cable run neat and along the fuselage wall.

Tailplane: This is of scale area, but gives no stability problems. The structure is very strong, light and easy to make so, again, do not use solid sheet. The elevator joiner is simple and solderless, and rugged. The tailplane and elevators are covered before hinging together, and then stuck to the covered fuselage. Remember to leave some bare wood for the glue to adhere to — tailplanes tend to go awry when just glued to covering! The cradle for the tailplane should be fairly soft, so as to break before anything else when cartwheel type maneuvers are being performed.

Wings: Both panels are built separately, joined by the dihedral braces, and the rest of the center section completed. The overall building sequence is shown on the plan. If you like the model, but do

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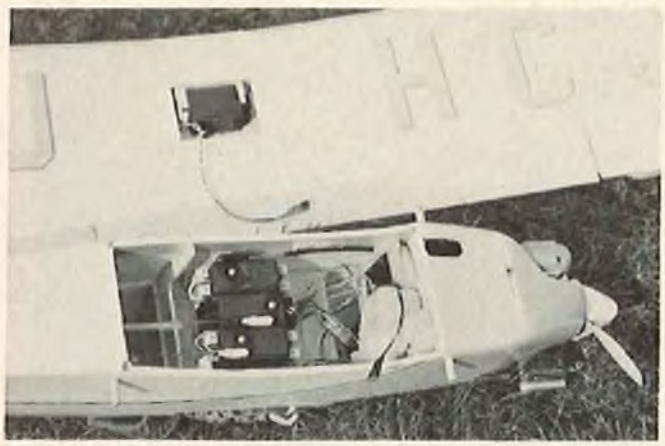
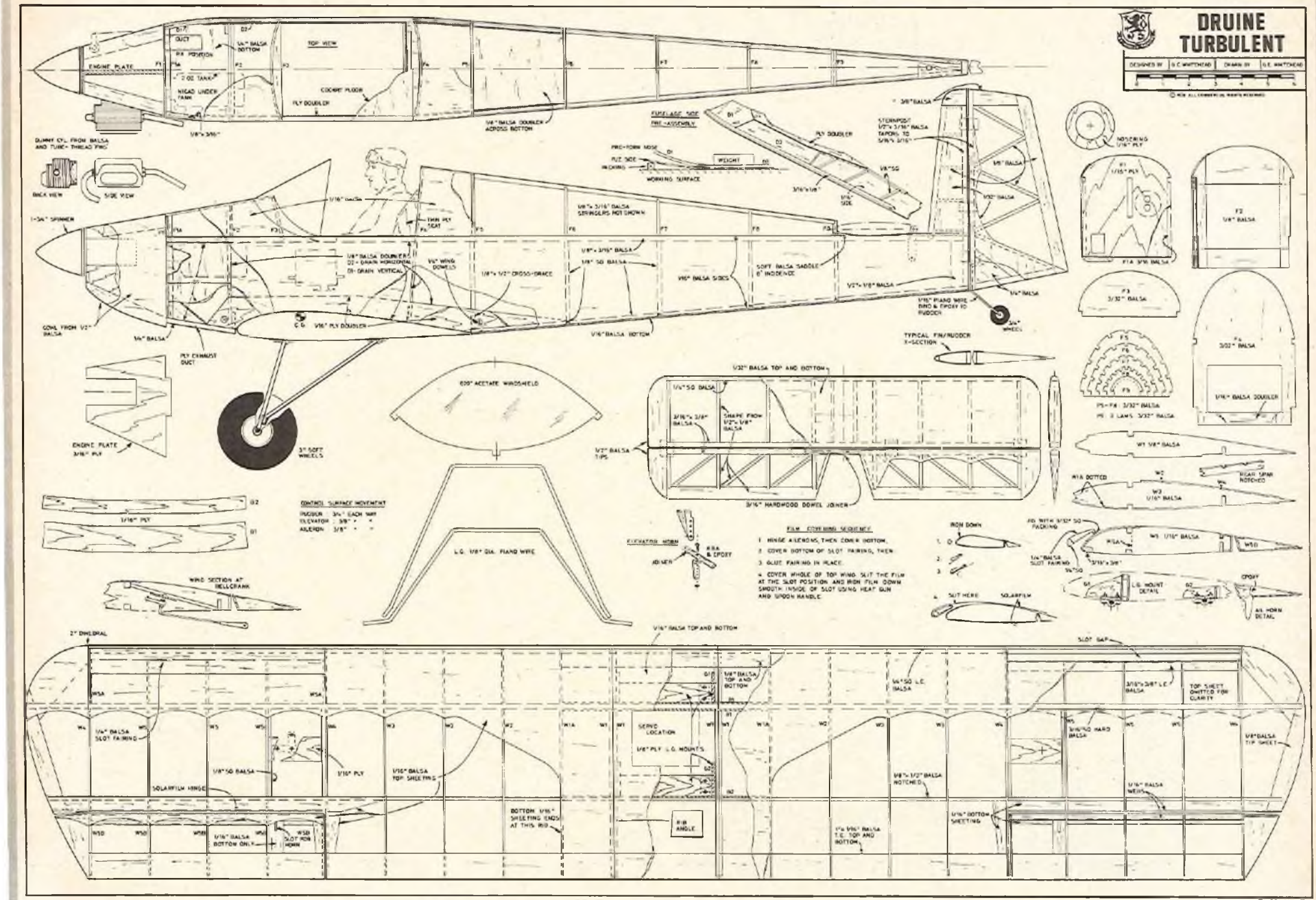


Plenty of room inside the radio compartment for your 4-channel rig.

. . . and you're ready to go. Try a low fly-by and have a ball!

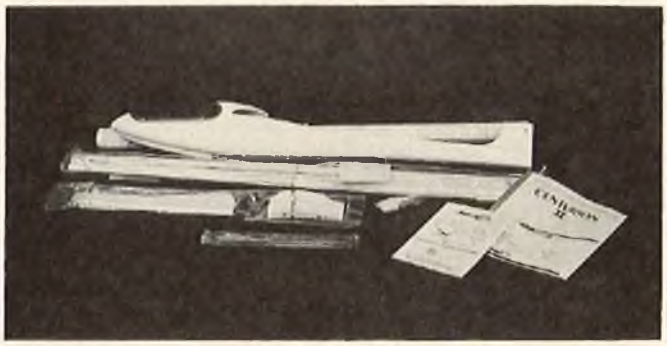
FULL SIZE PLANS AVAILABLE — SEE PAGE 189



PLAN NO. 701

RCM PRODUCT TEST

Soarcraft Products
CENTURION II



IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts		●			
Plans		●				Parts Match to Plans		●			
Written Instructions		●				Overall Parts Fit		●			
Quality of Hardwood		●				Ease of Assembly	●				
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials	●					Flight Performance	●				
Accessories		●				Overall Appeal	●				
Die-Cutting	●										

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

The Centurion II is a Standard Class sport and competition sailplane designed by Don Dewey and Hugh Stock, and manufactured by Soarcraft Products.

The fuselage is of a specially molded plastic while the wing and tail surfaces are of conventional balsa, spruce, and plywood. The hardware in the kit includes control horns, linkages, hinges, piano wire, brass tubing, nylon screws, nylon washers, tow hook and an EK on-off switch. The kit is somewhat unusual in that the fuselage and wing attachment is completely finished or, if you prefer, it can be painted with Hobbypoxy or Super Poxy.

The kit has excellent die cutting and, if you take the die cut wood and bend it gently, all the pieces fall out. There was not enough 1/16" planking for the first two top bays of the wing, so additional 1/16" sheets had to be provided from our own stock. The kit wood is of excellent quality and the pieces all fit well. The pre-shaped parts were cut to the exact shape shown on the plans and matched exactly. This kit could be assembled in a matter of only a few days. It is extremely easy to construct, and for this reason, is recommended for the beginner.

The flight performance for the Centurion II is excellent. It tracks straight and true on the Hi-Start or Winch and, on a 400 foot Hi-Start, 350 feet of altitude can be easily obtained. The Centurion II has excellent still air performance. The first flight was made at noon in still air and the flight time was seven minutes and 45 seconds. On the second day out, the first flight was a ten minute thermal flight, followed by several five and six minute flights achieved with no difficulty whatsoever. This airplane will turn on a dime and give you three cents change. It thermals like a home sick angel and floats like a feather. It has excellent penetration as well as a broad speed range that was evident in a ten knot wind. For either thermal or slope flying, either for sport or competition, in this reviewers opinion, this sailplane has excellent flight performance characteristics. □

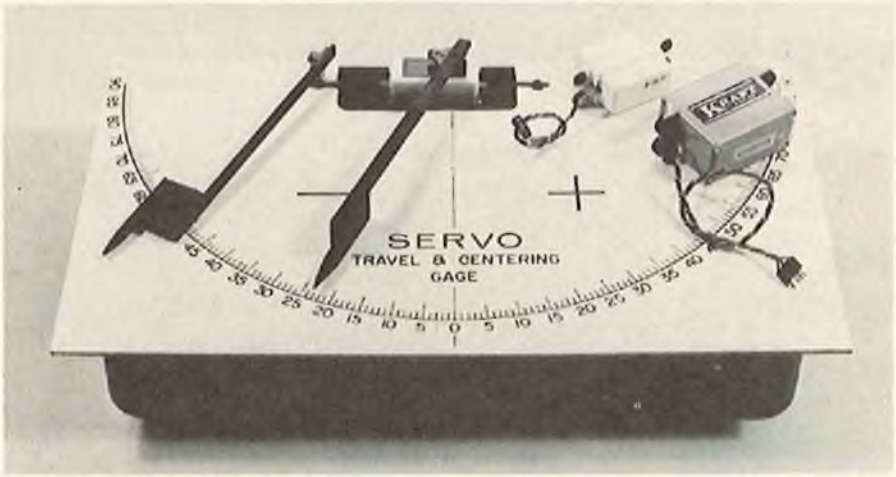
SPECIFICATIONS

Name ..... Centurion II
Aircraft Type ..... Sailplane
Manufactured By ..... Soarcraft Products
1550 Dell Avenue, Suite K
Campbell, California 95008
Mfg. Suggested Retail Price $59.50
Available From ..... Both Mfg. & Retail Outlets
Mfg. Recommended Usage ..... Sport/Competition Sailplane
Wing Span ..... 100 Inches
Wing Chord ..... 6¾ Inches
Total Wing Area ..... 618 Square Inches
Fuselage Length ..... 37.5 Inches
Radio Compartment Dimensions ..... (L) 8" x (W) 3" x (H) 4"
Wing Location ..... Shoulder Wing
Airfoil ..... Undercamber
Wing Planform .....
..... Constant Chord
..... Double Taper at tips
Dihedral ..... 4 Degrees
Stabilizer Span ..... 22 Inches
Stabilizer Chord (incl. elev.) ..... 4½ Inches
Total Stab Area ..... 82.5 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Mid-Fuselage
Vertical Fin Height ..... 8½ Inches
Vertical Fin Width (incl. rud.) ..... 4¾ Inches
Mfg. Rec. Engine Range ..... NA
Recommended Fuel Tank Size ..... NA
Landing Gear ..... NA
Recommended No. Of Channels 2
Rec. Control Functions ..... Elevator & Rudder
Basic Materials Used In Construction:
Fuselage ..... Plastic
Wing ..... Balsa, Ply & Spruce
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See Text
Plan Size ..... 36" x 56" (1 sheet)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... Yes (8 pages)
Construction Photos ..... Yes
Kit Includes ..... Die-Cut Parts
Mfg. Rec. Flying Weight ..... 28 Ounces
Wing loading based on rec. flying wt. ..... 6.5 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 37 Ounces
Wing Loading ..... 8.6 oz./sq. ft.
Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... NA
Muffler Used ..... NA
Radio Used ..... RS
Tank Size Used ..... NA

HERE'S HOW



A simple gauge to help you better understand your servos. Will let you know what servo works best on a given channel in your radio set. Many different types of servos can be checked.

Have you ever given thought about the performance of your servos?. How much travel can you expect and what servo works best on a given channel? Is it really true that our servos travel 90°? As you began to think about it, there are probably more questions you will ask yourself. The only way to find out is to build the servo travel and centering gauge as suggested by Tom Waller of Bronx, New York.

Tom has been fooling around with his servos lately and has discovered some surprising facts. And, it could be that some of these surprising facts may help you in some way, understand just a little more about your servos. So, I'll give Tom the floor and let him tell you what he has discovered:

For the past month or so, I've been learning something about my servos, and I'm beginning to think it's about four years late. Keep in mind, I didn't say "too late."

Considering the historical fact that I've been acquainted with these same gadgets for over five years, I should have tried the same routine tests when they were new, at least during the first year I had them. Ask yourself this question, "Do I know the exact range, in rotary degrees, that my servos will perform?" If you can answer that one, "Yes!" then you are ahead of me! If you can say yes, I also keep a record of each one and the range in both directions in all the channels in my radio equipment, for each servo, then you are up with me.

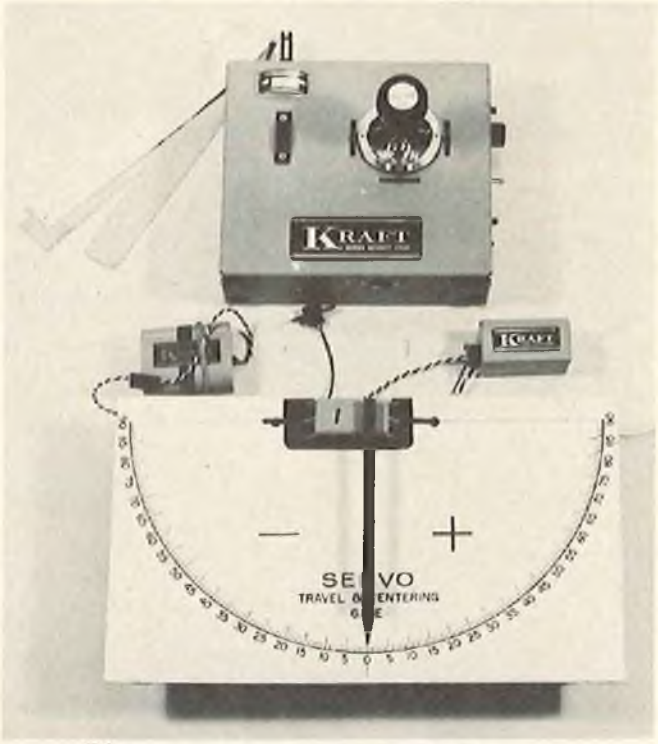
So what's the good of all that? If you just jam the servo into the aircraft, and get it airborne as soon as possible, that's a logical question. You probably don't need the rest of the ideas I'm going to bring up so, go back to your Playboy!

For the rest of you, lend an ear . . . Many times, I've wished I had the information that would tell me if a particular servo would operate a particular control function a given way. For instance, the rudder pushrod is a push-pull device. Simple enough? If it doesn't work one way, I only need to swing the servo arm 180 degrees, and presto, it's made! What if things don't line up and you need a servo that operates in the first instance only? Can you dig up the needed information or do you do a trial and error with one servo after another, until you get one that works the way you want?

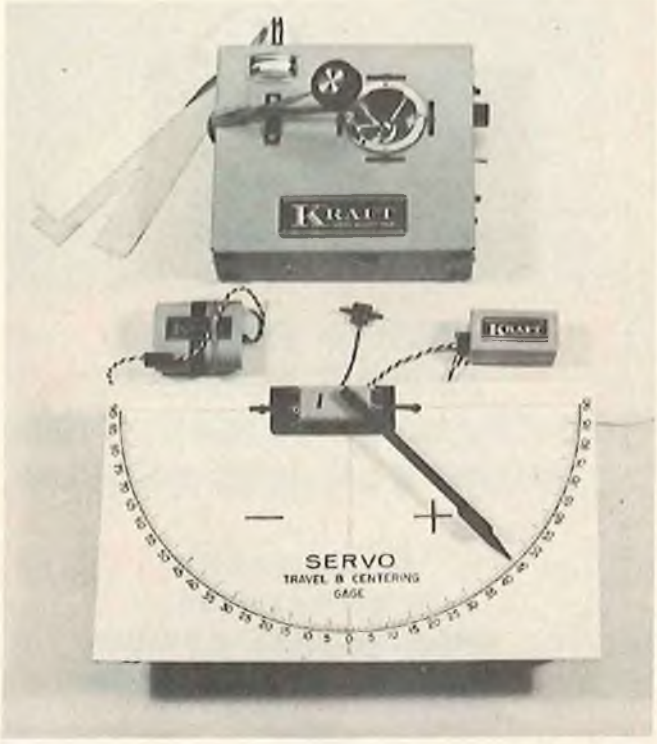
I'm not ordinarily that efficient either, but circumstances caused me to construct a "range indicator," and I wound up running all fifteen of my "working" servos through the wringer. The rest of them don't work — they're resting!

A servo simulator is a nice gadget, but I don't think it will produce anything but confusion here, so if you have one, don't use it for these tests.

Install the servo under test over the pins, so that the output shaft of the servo is in the center of the arc of the range indicator, and place the pointer on the shaft. The servo cable should be long

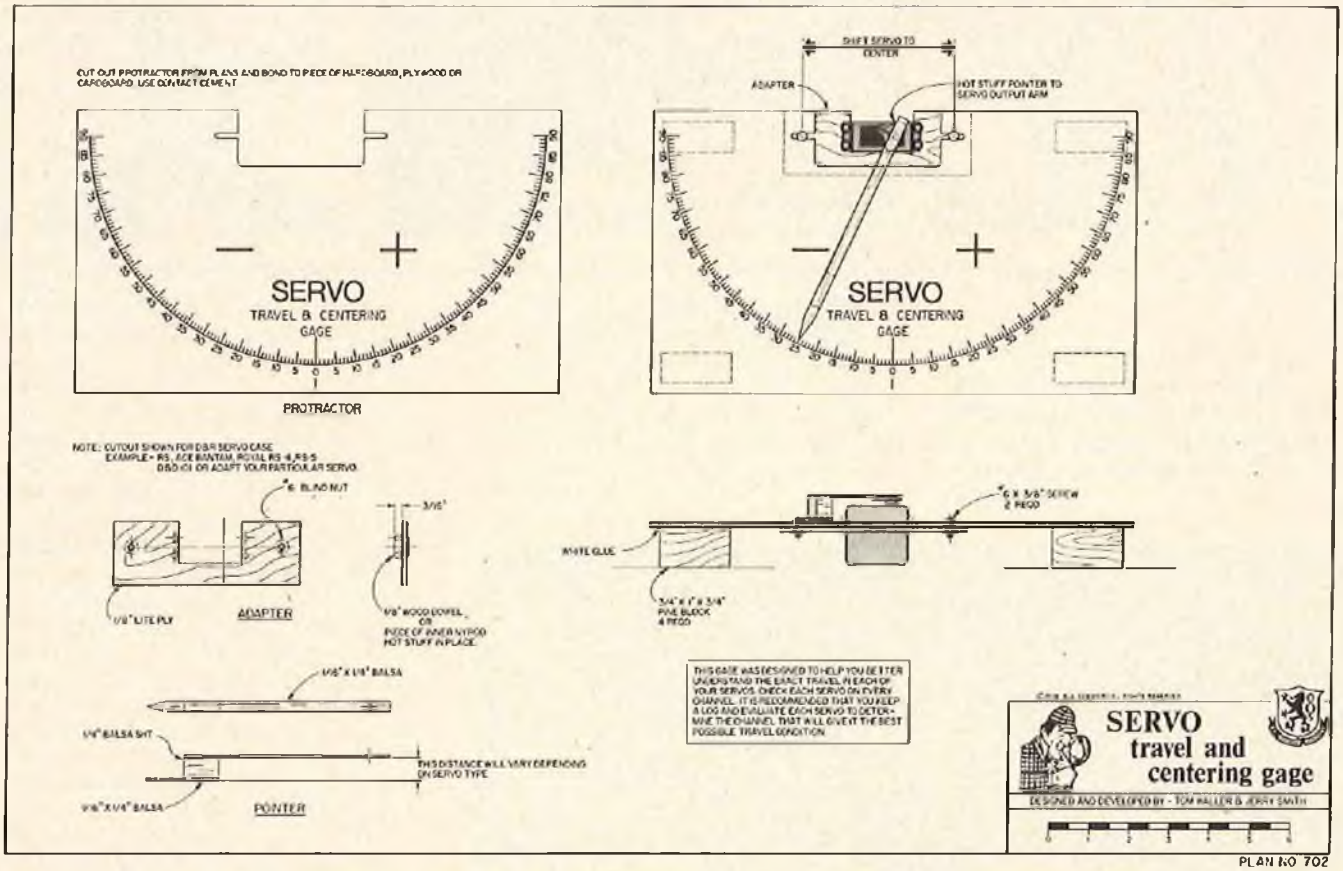


Servo #1 installed and ready for check.



Full left aileron indicates +44° maximum travel. Aileron trim lever is centered.

FULL SIZE PLANS AVAILABLE — SEE PAGE 189



enough to extend out beyond the board. Or the board width should not be so wide that it prevents connecting the plug to an extension cable, which is plugged in to your radio receiver. An aileron extension cord will work just fine. Plug it into Channel 1 (elevator). For my purposes, I used a 1/4" square graph paper, available at most stationary stores. List the transmitter (if you have more than one), the frequency, and assign a number to each servo. I use a Dymo label-maker and stick the tape to the top of the servo between the output arm and the short end of the case. I reserve the other end for channel numbers, after they're installed in the aircraft.

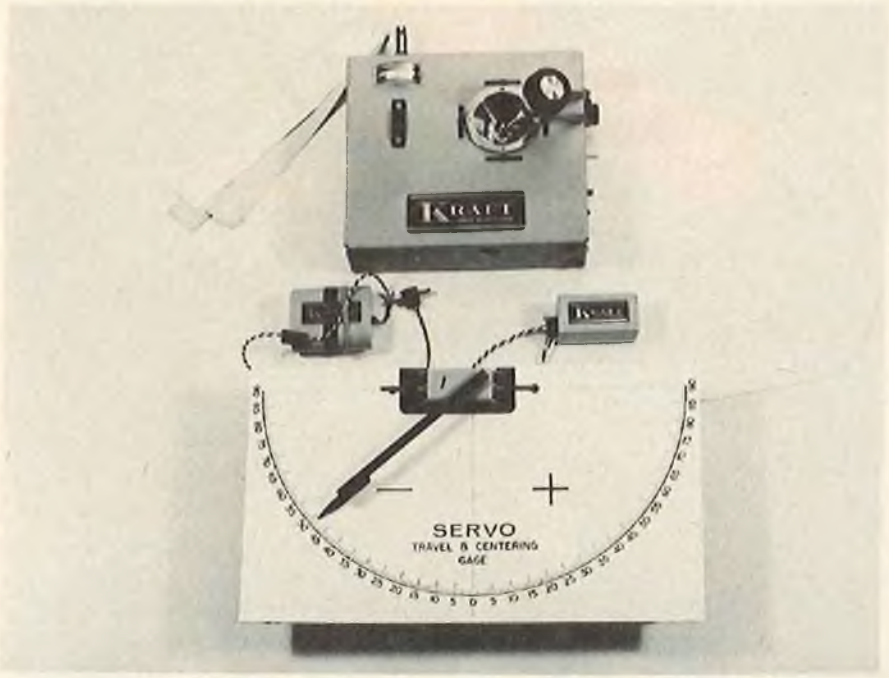
Starting from the left side of the page, I list the number of the servo, the make (if the mechanics and the amplifiers are made by different manufacturers I list that too), and then the channel number, starting with Channel No. 1 — Up 46° (plus) Down 44° (minus), Total 90°; Trim 7° (plus) 8° (minus), Total 15°; 1° (minus) centered. Channel No. 2, and so on, for all the channels in your radio transmitter. Record each channel the same way, so that when you start to evaluate the results, marking the total range in red ink for each channel, then the results might amaze you.

I found that they all didn't return to center, didn't return to the same point each time, and also, didn't range over anywhere near 90 degrees, as I'd been led to believe.

Now when you check back over your recordings, you can see how a servo acts, whether it rotates forward or reverse with the appropriate command from your radio. That's why I said don't use a servo simulator.

You can also determine the exact centering on your servo. How much travel to expect on trim and, lastly, what servo works best on a given channel. You will be also absolutely amazed that your servos do not function exactly the same.

Now you know as much as I do - - - have fun!! □



Full right aileron indicates −49° maximum travel. Total travel of Servo #1 is 44° + 49° = 93.

Sunday Flier

KEN WILLARD

Ted Kwalick of the Oakland Raiders and a member of the Pioneers R/C Club. Ted is holding a Skybolt and behind him on the ground is an RCM Trainer that he built himself.

In the 1976 September issue of RCM, I published a letter from Eric Thomasson, in Iceland, in which he described his concept of the reason for using right thrust on model engines. He said the principle reason was to offset the effect of slipstream.

In the March 1977 issue, Duane Eisenbeiss took issue with Eric (as did some other readers), describing "P" factor, torque, and gyroscopic action — as he saw it.

Came the avalanche! Letters started pouring in. I published a couple in June 1977 — and that just seemed to intensify the issue — and all this time, well up until this time — I had thought that the downwind turn was about the most controversial topic when it came to flying.

Well, the letters are still coming in on both subjects, but if it's okay with all of you, with this column I think I'll drop both subjects. Some of you have been pretty violent in expressing your views — and that's alright, too. However, some of you have even said that RCM shouldn't publish opinions which "obviously have no basis in fact," and it is our "journalistic responsibility" to refrain.

I can't go along with that. We're here to serve you readers, and one way to do so is to air some of the myths, misconceptions, and theories which are so prevalent. Besides, it gives all of you a chance to "sound off."

So, before closing off the discussion on propeller effects, etc., let me first thank all of you for writing — remember I need your input on all subjects for this column. Now, here's two letters. The first is from Bob Paddock of North Olmstead, Ohio. Of all the letters I received, Bob's is the clearest and most concise summary of the *four* factors involved in the forces created by a spinning propeller. Here's Bob's explanation:

Dear Ken,

One of the most hazardous things I know of, and the most frustrating, is trying to convince a fellow RC'er about anything dealing with the subject of aerodynamics. RC'ers are individualistic and each considers himself somewhat of an expert. However, you opened this can of worms and I feel I must put in my two cents worth (four bits worth, the way inflation has hit everything).

Over the years, I have obtained a commercial pilot certificate with instrument rating, a flight instructor certificate for airplanes and instruments, and advanced and instrument ground instructor certificates. In the course of these endeavors, I have been forced to study

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FLYIN' FLIVVER

By Bob Wallace

Ever wonder about the origin of the word "Klutz?" Read on . . . and if you can pass up this .40 powered, four channel biplane, you've left your soul on the outside aisle of a 747 . . .

Recently discovered in the musty archives of the Planeville Museum of Early Aviation History, and now available for the first time to the R/C modeling world in the form of a .40 powered minature, comes the 1929 Klutz "Flyin' Flivver".

The original Flyin' Flivver was designed and built in 1929 by Clyde Klutz, an obscure young inventor known for his eccentric ways and questionable mechanical aptitude. Clyde is perhaps best remembered for his development of the first gasoline powered pop-up toaster, acclaimed to be years ahead of its time, and for his creation of the world's first steam powered ornithopter. With this solid background in aeronautical expertise and engine know-how, it was only natural that young Klutz would soon turn his attention toward the development of an aircraft with great commercial potential.

The resulting design was called "The Klutz Model A Sky Truck", but soon was dubbed the Flyin' Flivver. It was constructed entirely from readily available native white oak and was powered by a four cylinder Kretzmer garbage truck engine, which delivered a modest 30 horsepower. This combination produced an aircraft, which, although being on the heavy side, was incredibly rugged.

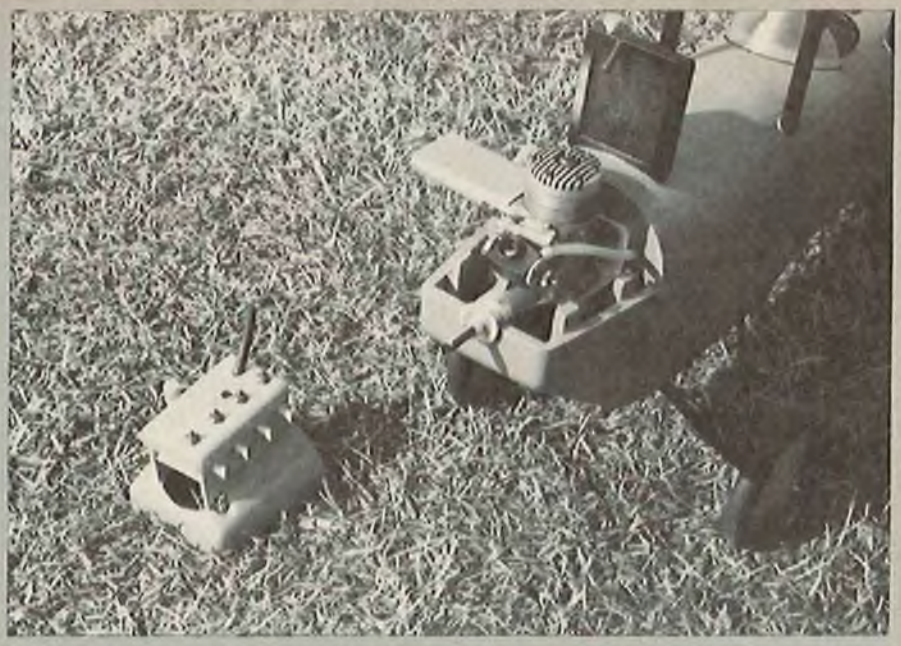
The Flivver was test flown on March 16, 1929, from the Farmington Meadows with a confident Clyde at the controls. This test flight, which amazed many of the locals who were aware of young Klutz's past projects, was deemed successful to the point that young Klutz, immediately upon landing, announced to all present, the formation of the Klutz Aero Service. Shortly thereafter, the Klutz Flyin' Flivver was a familiar sight to all, as it lumbered through the skies of Southern New England. Business was apparently booming for the fledgling Klutz Aero Service and, in an effort to keep pace with the increased demand for rapid pick-up and delivery services, the Flivver was frequently overloaded. This, coupled with the aircraft's heavy weight and marginal power, necessitated frequent low flying. The cry of "Duck, Here Comes Klutz" was soon to be heard throughout the countryside. This brand of flying was eventually to raise the ire of many and lead to the sudden demise of the Klutz Aero Service.

On a hot, humid day in August of 1930, Klutz was bound for the Hamlet of Onionville in the Farmington Valley, with a mystery cargo, which was rumored to be illegal spirits, destined for the local speakeasy. It was also the custom of young Klutz to "sample the goods" when carrying such cargo - - - his reasoning being that it was poor business policy to deliver a bad batch. After an epic journey of 70 miles, which encompassed much sampling enroute, the Klutz Flivver was spotted approaching Onionville at a height of ten feet, flying inverted. As Klutz rumbled on into town, cutting a 300 yard swath through the Mayor's prize cornfield, the towns folk scattered in all directions. Klutz, still inverted, roared down Main street, leaving a trail of splintered telephone poles, signs and assorted other debris in his wake. The trusty Flivver, except for some minor scratches, remained intact and flew wildly on. However, the sustained inverted flight had a telling effect on the sturdy Kretzmer engine, which quit abruptly. Young Klutz, never one to be awed by adversity, struggled valiantly to roll the Flivver over in order to make an emergency landing. The combination of low altitude, insufficient airspeed, and Klutz's numbed reasoning combined to bring the Flivver to rest on its back in the

FLYIN' FLIVVER
Designed By: Bob Wallace

TYPE AIRCRAFT
Sport Biplane
WINGSPAN
Top. 44¾" — Bottom. 40"
WING CHORD
9 Inches
TOTAL WING AREA
763 Square Inches
WING LOCATION
Biplane
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1" (bottom wing only)
O.A. FUSELAGE LENGTH
40½ Inches
RADIO COMPARTMENT AREA
(L) 9" X (W) 3½" X (H) 3⅛" min.
STABILIZER SPAN
18 Inches
STABILIZER CHORD (Incl. elev.)
6½ Inches
STABILIZER AREA
112 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5¾ Inches
VERTICAL FIN WIDTH (Incl. rudder)
7¼" (Max.)
REC. ENGINE SIZE
.40 cu. in.
FUEL TANK SIZE
8 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., & Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply & Maple
Wing	Balsa & Maple
Empennage	Balsa
Weight Ready-To-Fly	80 Oz.
Wing Loading	15.1 Oz./Sq. Ft.

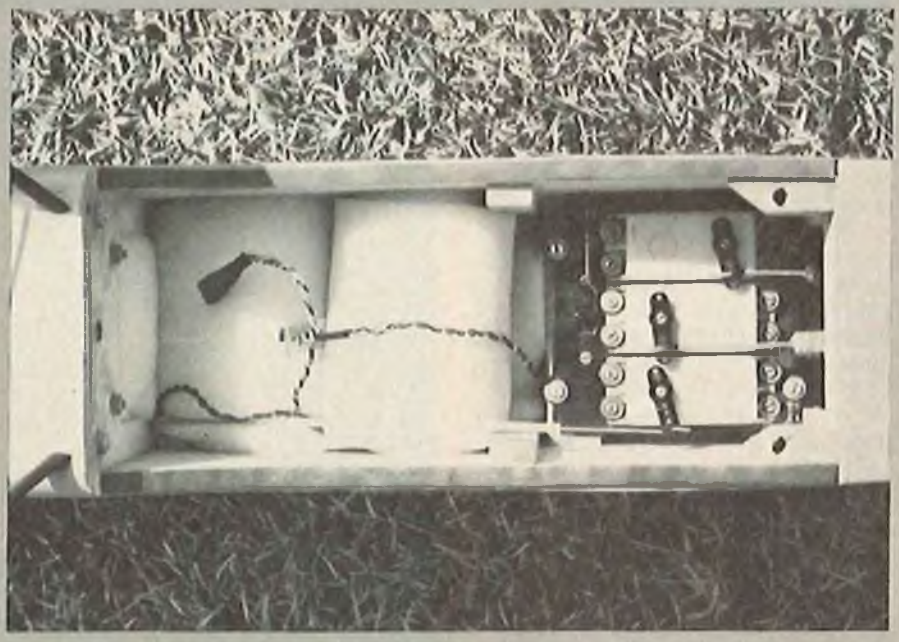


The dummy engine removed to show the real engine underneath.

mud flats at the far edge of town. Klutz, who was unharmed, wallowed to shore as the Flivver sunk beneath the slimy surface. Legend has it that young Clyde was last seen making a hasty departure from town, never to return.

The once proud Klutz clan, in a futile effort to protect the family name, ordered all records, drawings, and data pertaining to the Klutz model A Flyin' Flivver, be destroyed. However, the original design drawings, put down on 4½" wide perforated roll tissue, by Clyde and left in his outdoor study, were overlooked and consequently found their way into the Museum Archives.

In the years that followed, the Flyin' Flivver was forgotten, although the Klutz family was forced to relocate due to sustained public ridicule and scorn. Rumor has it that Clyde wandered throughout the land and finally settled in the wilds of Oregon where he met and married a fair young maiden, who was supposedly re-



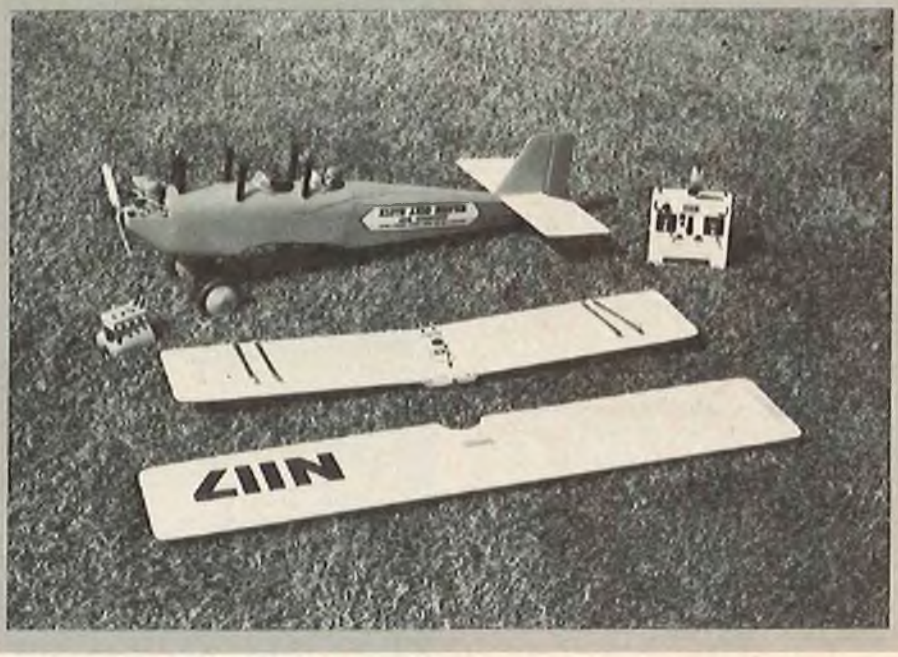
Inside the Flivver – and plenty of room for everything.

lated to the legendary Big Foot. A large family of little Klutzes resulted and, in the years that followed, many demonstrated their inherited aeronautical talents by entering in the R/C modeling field. To this day, the name Klutz is frequently heard being mumbled at every R/C flying field in the land, yet few know that it all began in the Farmington, Connecticut meadows in 1929.

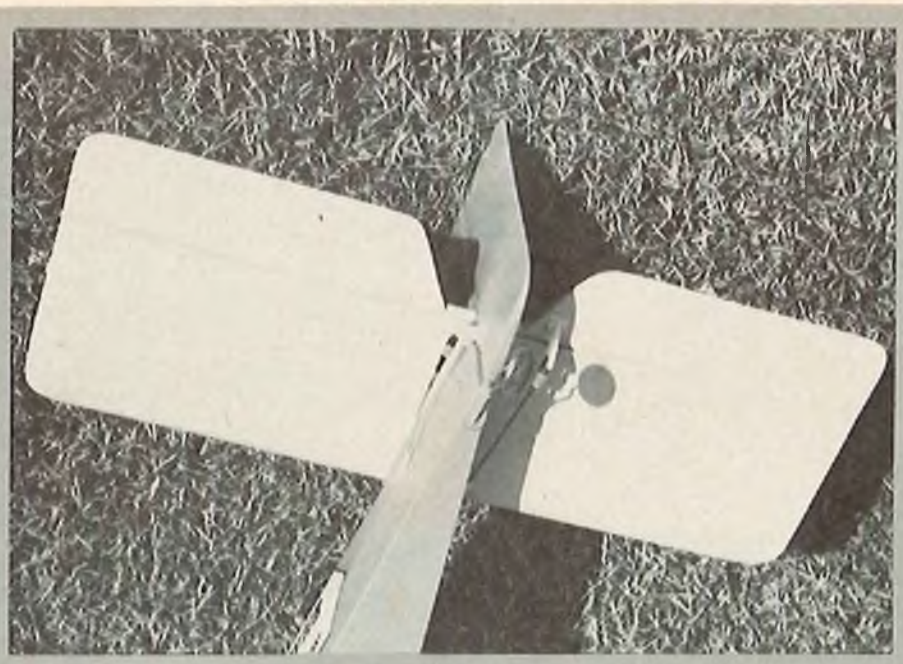
If you have had the tenacity to read this far, you must be interested in building a sport biplane with a vintage home-built look, or an RCM reader, such as myself, who reads every issue from cover to cover. In either case, we'll now start with the construction details, which follow simple proven methods.

CONSTRUCTION

Wing: Start by cutting 34 wing ribs from 3/32" sheet and 4 from 1/8" sheet. Cut 4 aileron end ribs and 2 aileron well cap ribs from 3/32" sheet. Cut the 4 wing tip blocks from 1/4" sheet. In studying the plan sheet, you will notice that both



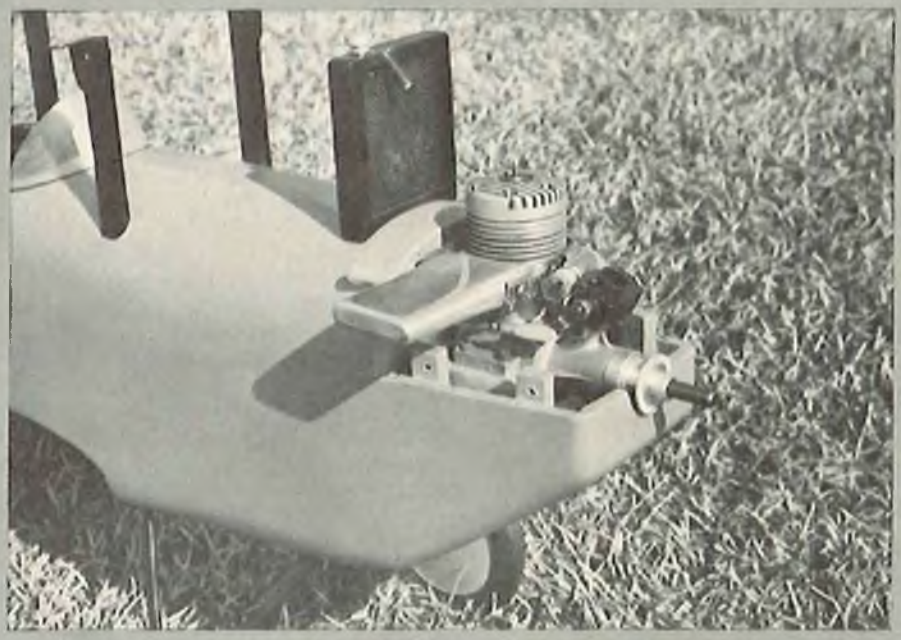
A nice day, two wings, and a trip back to yesteryear . . .



The tail feathers with linkages. Plenty of surface area if you want to go ape!

top and bottom wings are built over the same plan view. Any differences are noted with a (B.W.) for bottom wing and a (T.W.) for top wing. The top wing is two rib spans larger and is easy to build in one piece, as it has no dihedral. If you own, or have access to, a wing building jig, so much the better as its use will greatly simplify wing construction. Just drill the jig rod holes in the ribs in the proper location, and assemble the respective ribs, spars and sheeting. The assembly sequence covered here will be via the flat building board route.

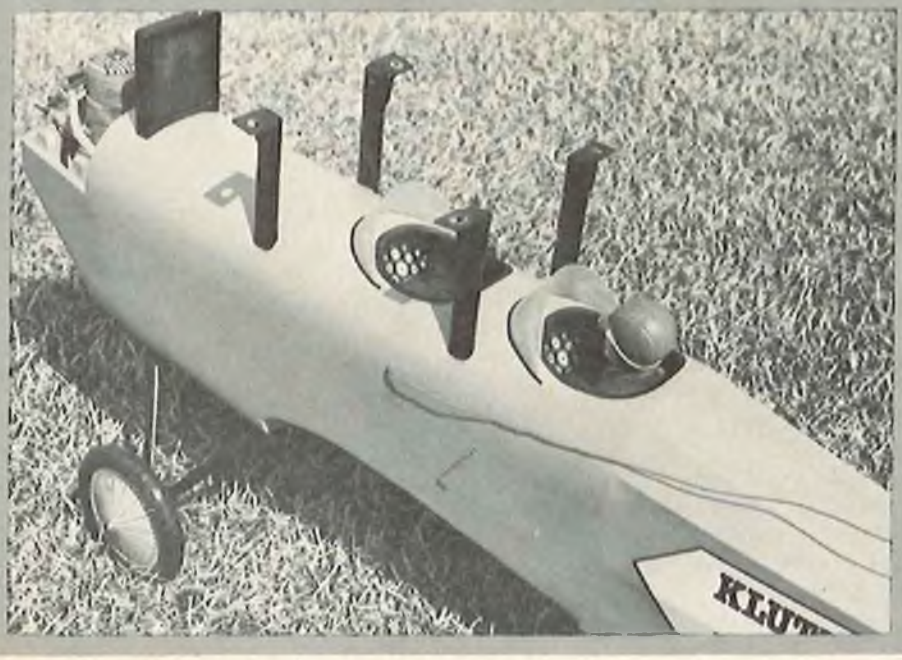
Start by pinning the 1/16" bottom leading edge sheet in place over the plan. Pin and glue the 3/16" x 3/8" bottom spar in place. The 1/16" trailing edge bottom sheet should be shimmed up to the proper height and pinned in place. If you have access to a table saw, a strip can be cut (from scrap lumber) that is 5/8" x 1" x 42" long, with an 8° angle cut on one 1" face. This strip will shim the



We already told you what this was – why did you want to see it again?

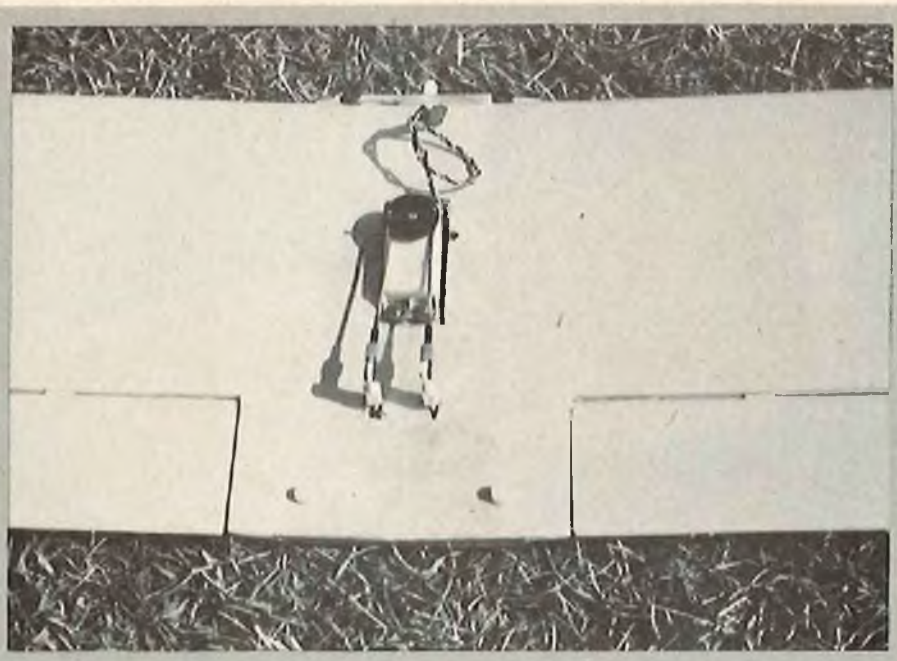
trailing edge sheet perfectly for both top and bottom wings. The 6 center section ribs (4-3/32" and 2⅛") should be notched on the bottom to accept the front 1/4" x 1/2" hardwood wing hold-down block. Pin and glue all ribs in place. Glue the 1/4" x 1/2" hardwood front hold-down block in place. Glue the top 3/16" x 3/8" spar and 1/4" square leading edge in place. Glue the center section trailing edge block in place and add the top 1/16" sheet trailing edge. The bottom 1/16" leading edge sheeting should now be shimmed up to the 1/4" square leading edge, rib bottoms, and glued. Add the top 1/16" leading edge sheeting and glue. The top of the center section 1/16" sheeting can now be added along with the 1/4" sheet wing tips. Glue the 1/16" x 3/16" top cap strips in place.

When dry, remove the top wing assembly from the building board and add the 1/4" x 7/8" x 1/2" hardwood rear hold-down blocks flush with the rib bot-



If you can pass this up, you probably don't like apple pie, girls, or football, either!

The aileron linkage is conventional. That means it's also stralghtforward.



toms. The bottom center section 1/16" sheeting is now installed, along with the 1/16" x 3/16" bottom cap strips. The wing strut blocks are more easily installed when the two wings are bolted in place on the fuselage.

The bottom wing can now be constructed. (Remember the bottom wing is shorter in span by two rib sections.) Mark the aileron cut lines on twelve 3/32" ribs with either a felt tip or ball point pen. The ailerons are cut out after each wing panel is assembled. Start by pinning to the plan the 1/16" bottom leading edge sheet. Pin and glue the 3/16" x 3/8" bottom spar in place. The 1/16" bottom trailing edge sheet should be shimmed up to the proper height and pinned in place. Pin and glue the ribs in their proper locations. The 1/8" center section ribs should be angled 3 degrees to insure the proper dihedral angle. Pin and glue the top 3/16" x 3/8" spar and 1/4" square leading edge in place. The bottom 1/16" leading edge sheet can now be shimmed up to the 1/4" leading edge, rib bottoms and glued. Pin and glue the top 1/16" leading edge down. Install the angular trailing edge hardwood hold-down blocks and glue. The 1/16" trailing edge sheet is now glued in place. Add the top center section 1/16" sheeting, top 1/16" x 3/16" cap strips and 1/4" sheet cap strips, and 1/4" sheet wing tips.

When dry, remove each wing panel and add the 1/16" center section bottom sheeting and bottom 1/16" x 3/16" cap strips. The ailerons should now be carefully cut from each wing panel. The rib material (between the previously marked cut lines) is discarded. Glue the 1/4" x 7/8" strips in place, making sure that the aileron fits properly into the wing cut-out. Glue the aileron end ribs and aileron well cap ribs in place. Install the aileron horns and cut the hinge slots as indicated. The two wing halves can now be joined together at the proper dihedral angle. Install the 1/4" hardwood dowel, front hold-down. The leading edge of both wings can now be sanded to the proper contour and the entire wing surfaces sanded smooth. The center sections of both wings should be reinforced with fibreglass cloth and resin. The aileron servo opening and servo rails are now installed in the bottom wing.

Tail Surface: Both the horizontal and vertical tail surfaces are constructed in the same fashion. The rudder and elevators are cut from 3/8" sheet and sanded to the proper shape. The elevators are joined together with a section of 1/4" dowel. The vertical fin and stabilizer are constructed on the plan, using the indicated wood sizes, pinned and glued in place. These frames are then covered with 1/16" sheet, top and bottom. If you are using water soluble glue, it is recommended that the tail frame assemblies be pinned down or weight covered, when the 1/16" sheeting is applied, to avoid warpage. The hinge slots are now cut and all tail surfaces are sanded smooth and to the indicated shape.

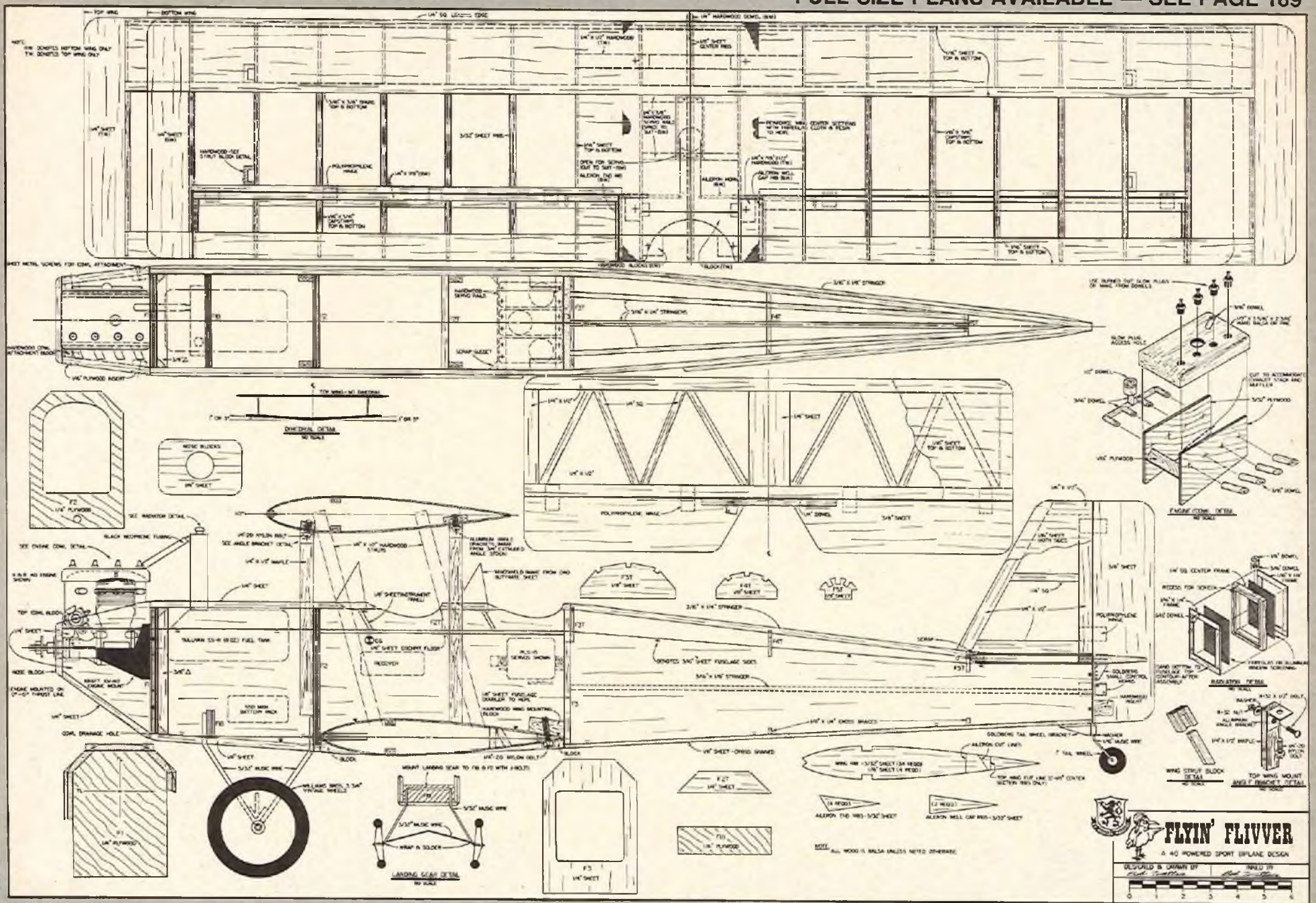
Fuselage: Cut out the 3/16" sheet fuselage sides, 1/8" sheet fuselage doublers, and all plywood and balsa bulkheads and formers. Epoxy the 1/8" fuselage doublers to the 3/16" fuselage sides. Glue bulkheads F1, F2, and F3 in place, making sure each is square. Install the 3/8" triangle stock reinforcing aft of the firewall (F1). Position the engine mount in place and mark and drill the mounting holes into F1. Install blind nuts on the back of F1 to hold the engine mount. Add formers F3T, F4T, F5T, and the 1/8" x 1/4" cross braces (below F4T and F5T) and glue. The 1/8" sheet fuselage bottom is now glued in place, cross grain. Position and glue the top 3/16" x 1/4" stringers in place. Add the 3/16" x 1/8" stringers to the fuselage sides.

The landing gear should now be bent from 5/32" and 3/32" music wire, as shown, and mounted to bulkheads F1B and F2 with J-bolts. Wrap and solder the landing gear joints as indicated. Add the 1/4" sheet front fuselage bottom. Install the engine throttle control rod through bulkheads F1 and F2. Add the 1/4" sheet fuselage top pieces. Assemble the 1/4" sheet lower half engine cowl pieces and glue in place. The 1/4" sheet top half cowl pieces should be glued together, but only tack glued to the lower cowl and F1. For the purpose of shaping to the proper contour, sand the fuselage to the designated contour. Remove the top part of the cowl, cut the two cockpit openings and from the lower wing opening, install the 1/8" sheet instrument panels and cockpit floor. The hardwood lower wing mounting blocks are now installed, along with the servo rails, to fit your particular servos or tray. Install the tail wheel and bracket. Position the lower wing in place, making sure that it fits properly. Drill the lower wing mounting bolt holes through the wing, and into the hardwood mounting blocks, with a #7 drill. Tap the hardwood mounting block holes with a 1/4-20 tap. Drill out the holes in the wing with a 1/4" drill to accept the 1/4-20 nylon bolts. Bolt the wing in place and add the bottom blocks to the lower wing center section. Sand these blocks to the proper fuselage contour. The top wing aluminum angle brackets should now be fabricated as shown on the plan and attached to the maple wing supports. Position the top wing in place. Mark, drill and tap the top wing mounting holes. Bolt the top wing in place. Place the horizontal stabilizer in place and check the alignment and incidence of both wings and the stabilizer. The wing strut blocks can now be installed, using the 1/4" x 1/2" hardwood struts as a guide to insure proper wing-to-wing alignment. The engine cowl and radiator can now be fabricated according to the detail views shown on the plan. Glue the 1/16" plywood inserts in place on the top cowl. Install the cowl attachment blocks inside the lower portion of the cowl. Drill the four cowl attachment holes through the plywood inserts into these blocks. Also drill a small hole, as shown, in the bottom of the lower cowl for drainage of residual oil. Disassemble, and fine sand all component parts in preparation for finishing.

Finishing:

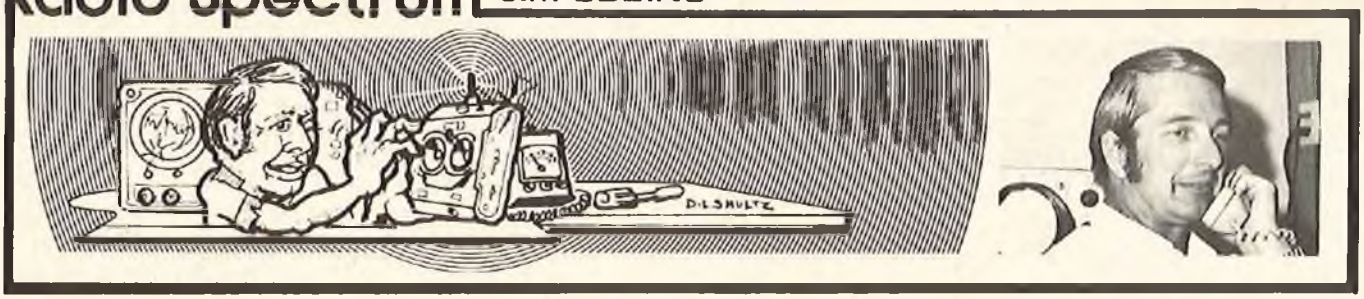
The original Flyin' Flivver was covered

to page 118


FLYIN' FLIVVER
A 40 POWERED SPORT BIPLANE DESIGN
PLAN NO 699

Radio Spectrum

JIM ODDINO



As a result of the Foam Cutter Circuit that was published in the April 1977 issue of RCM, there has been a flurry of letters from concerned readers who spotted the danger inherent in a device that exposes the operator to 100V 60Hz electricity.

If one looks at MIL-STD-454, which is the Military Standard covering general requirements for electronic equipment, we find that the number one requirement in electrical equipment is *safety*.

There are a couple of ways electricity can get to you; the one most critical is electric shock. The intensity of the shock is a function of the current and not the voltage. How much damage it does is determined by how much current is flowing; how long it flows; and what its path is through the body. Relatively small currents can be lethal if the path is through the heart or lungs. The following table is lifted out of the MIL-STD;

CURRENT (milliamps)		
AC	DC	EFFECTS
0-1	0-4	perception
1-4	4-15	surprise
4-21	15-80	reflex action
21-40	80-160	muscular inhibition
40-100	160-300	respiratory block
over 100	over 300	usually fatal

The voltage necessary to produce the fatal shock is dependent on the resistance of the body, contact conditions and the path through the body.

This might be a good spot to hit on a little basic electricity theory. A couple of guys at the field the other day had an argument going, over whether it was the current that pushed the voltage or the voltage that pushed the current through a circuit. They also wanted to know why you could grab a high voltage coil and yet it takes only a relatively low current to kill you.

If we compare an electrical circuit to a hydraulic circuit which most people can visualize, we may find the answers. A simple hydraulic circuit might look like Figure 1.

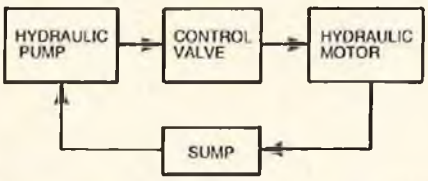


FIGURE 1

Let's assume the sump is vented to the atmosphere so the oil in it is at a pressure of 14.7 pounds per square inch (psi). We start the pump which can be driven by an air turbine, a water wheel or whatever, and it raises the pressure of the hydraulic fluid. If the control valve is open, the oil will flow to the hydraulic motor and then back to the sump. The faster you drive the pump, the higher the pressure will be and the greater the flow rate of the oil through the circuit. This, in turn, will cause the hydraulic motor to turn faster. If you close the valve, the pressure at the outlet of the pump will go up but the flow rate will go down to zero and the motor will stop. Likewise, if the valve were open but the line was broken at any point, you would soon pump all of the oil out of the circuit and the flow rate would be zero.

Now, let's look at the simple electrical circuit of Figure 2.

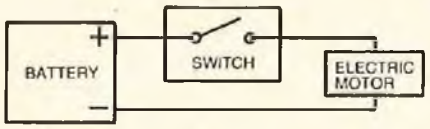


FIGURE 2

When the switch is closed, the current will flow from the battery to the motor and the motor will turn. The higher the battery voltage, the faster the current flows and the faster the motor turns. If you open the switch, the current stops and the motor stops. Likewise, if a wire is broken, the current stops and the motor stops.

We can now see that voltage is equivalent to pressure and current is equivalent to flow rate (gallon per minute). The voltage and pressure are the things that "push" the current and flow rate. It is possible to have very high voltage and pressure and no current or oil flow if you don't have a complete circuit. That is why the bird can sit on the high tension line. He has not completed the circuit from the high voltage of the line to some lower voltage such as ground. If you could string a wire across your room and hang from it with one hand, you wouldn't get a shock no matter how much voltage was applied to the wire because there would be no path through your body. However, if you grab your 110V 60Hz line, which is 110 volts referenced to the ground you are standing on, and you have good contact, such as grabbing a water pipe or are standing in a puddle, it is going to spoil your day.

This is exactly what could happen to you if you touched the cutting wire on a cutter, wired as shown in the April issue; particularly if the 110V "hot" side was connected directly to the cutting wire. This is shown in Figure 3.

Notice how an "earth" ground completes the circuit. An isolation transformer isolates the foam cutter such that an "earth" ground does not complete the circuit. However, you can still get zapped if you get across the secondary of the isolation transformer, or if you get across your cutting wire when you have the variable transformer turned up to high voltage. See Figure 4.

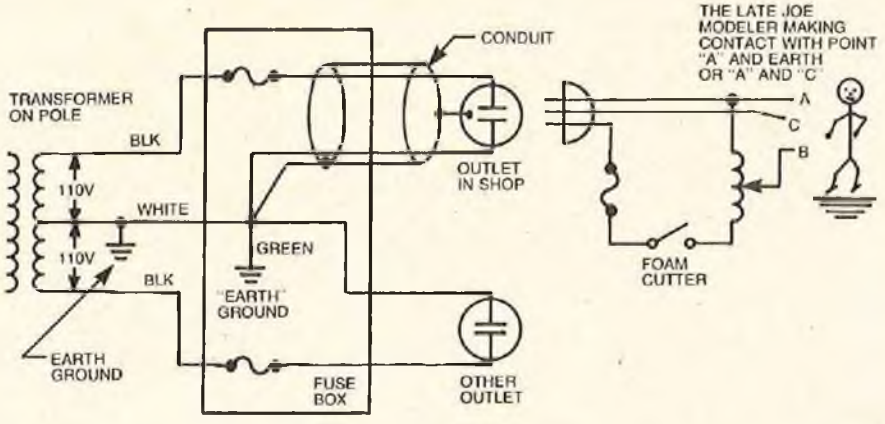


FIGURE 3

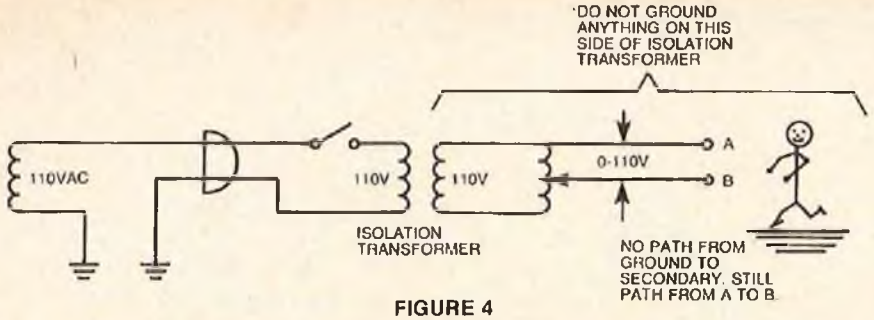


FIGURE 4

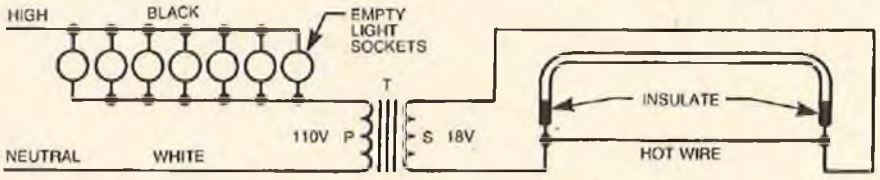


FIGURE 5

Let's assume you have a resistance of 5000 ohms from one hand to the other through your arms and chest. The current through you would be:

$$\frac{110}{5000} = .022\text{amps}$$

or 22 milliamps if you had good contact with points A and B and the transformer was turned way up. Consulting our chart, you can see that you might have trouble letting go.

The best bet would be to have a low voltage secondary on our isolation transformer and some other means of controlling the current to control the temperature.

Let's look at a few suggestions sent in by readers:

Dear RCM,

For my 'Bread & Butter', I'm a building construction electrician, so, when I read the April issue regarding the foam cutter, I was mildly surprised at the insistance on the use of a variable transformer – and again in the May issue.

Since I'm sorta' ancient (58), compared to most of the members in our club, The Blue Angels of the Bronx, I don't suppose you've used a light-bank to control the current in a circuit.

All this is, is a number of light sockets in parallel with each other and, in turn, in series with the load. And the load on my foam cutter is the power transformer, which reduces the voltage to 18 volts AC, and it's capable of delivering about ten amperes at that voltage, which would cost about $15-20. I salvaged mine from a power control panel that I helped remove during an electrical alteration. My trade has its advantages!

In order to regulate the cutting wire temperature, simply screw another light bulb into the set of sockets, one at a time, until the wire is hot enough to cut the foam wihtout burning it. If memory serves me correctly, about 160 watts was sufficient.

The best part, the transformer, also acts as an isolator, electrically. I've never been shocked by it, only burned by the hot wire, but that's another story . . .(See Figure 5.)

So, have fun with my can o' worms!

Tom Waller.

I thought this was a pretty clever solution to the problem. Tom also touched on one of the other dangers of electricity, namely burns caused by hot components.

Here are some other ideas:

Dear Sir,

I have watched the controversy over foam cutters in your magazine for the last few years.

The solution to line voltage isolation would be to change the transformer around. This would not only provide isolation, but also a lower rated variac could be used.

There is another method of protection which is the use of a ground fault protector, used for swimming pool lights.

It would also be possible to use a light dimmer control in the same manner. (Figure 6 illustrates these methods.)

Yours truly,

Michael Moshenko

Scarborough, Ontario

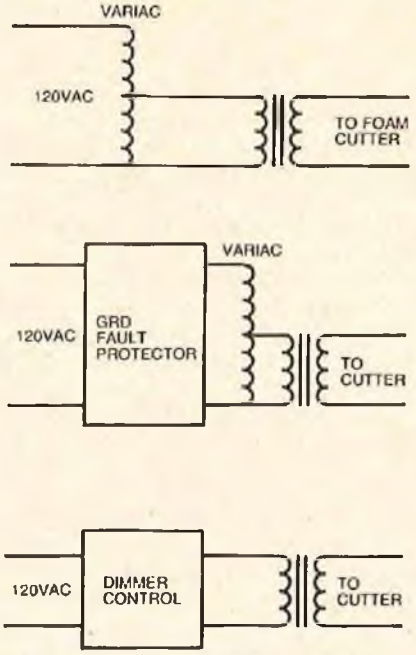


FIGURE 6

George Burkhardt of Los Angeles, California, suggests that if you do use a three prong plug, the power ground should be connected to the frame of the isolation transformer. This will prevent an internal short from the winding to the transformer case from becoming a hazard. See Figure #7.

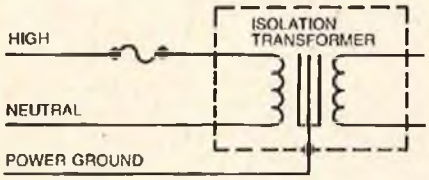


FIGURE 7

George also sent in some other safety items to worry about:

Now think about this: Did you ever wonder what the Electrostatic Potential of that pattern bird is when you land it and calmly taxi up to the flight kit, grab the rubber hose from the fuel can, and plug it into the electrically isolated fuel filler on that charged bird?

Yeah, I do it all the time too – but several unexplained accidents (fuel can explosions), some I have witnessed, have suggested that Electrostatics may be a source.

G.N. Burkhardt

I know it's standard practice to ground a full size aircraft before attempting to fuel it, to discharge any electrostatic potential. I have a feeling that electrostatics have caused many unexplained problems. A few years ago, a number of manufacturers were having trouble with unexplained transistor failures in the RF amplifiers of their receivers.

I believe it was Jim Fosgate who came up with the theory that the capacitor in

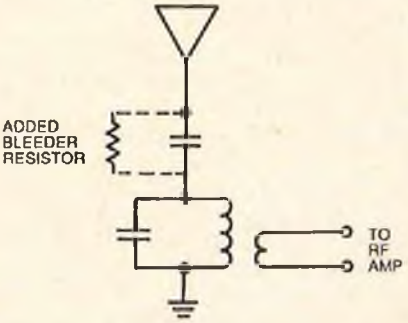


FIGURE 8

the antenna circuit might be storing a charge of very high voltage which finally discharges into the front end coil and zaps the transistor. He solved the problem by putting a bleeder across the antenna capacitor and, to my knowledge, this completely solved the problem. See Figure #8.

I modified my old receivers and suggest you do the same if you've got a similar circuit.

Just to show you we print both sides of the story . . .:

Dear Sir,

So now we should buy a $60.00 isolation transformer to make our $5.00 foam cutter safe! Typical of GISO Safety orders; make it super-safe and to hell with the cost. Well, until Big Brother has my garage inspected, I'll follow rules 4 through 7 of Mr. Hartmans suggestions (I had them figured out years ago without benefit of his writings) and go on using my $5.00 cuttter, and spend the $60.00 on another kit. I believe we should be aware of hazards, and how to overcome them; but to be treated like a six year old child annoys me. Perhaps this is an over-reaction to Big Brother not giving me the choice of using Saccarin or not (as well as all the other "carcinogens"), but I can't calmly let people "sanitize" our hobby in the same way.

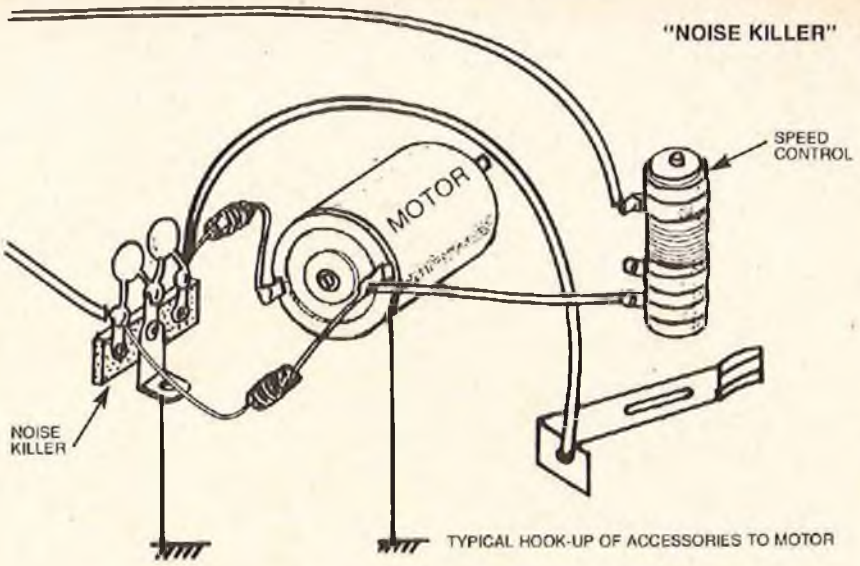
Very truly yours.
Calvin Malinka
Rialto, California

Interesting! Just remember Murphy's Law — if it can happen, it will. Maybe not to you, but maybe your son or his friends who don't know rules 4 through 7. I agree with what I think you're trying to get at, but once in a while people do need to be protected from themselves and each other.

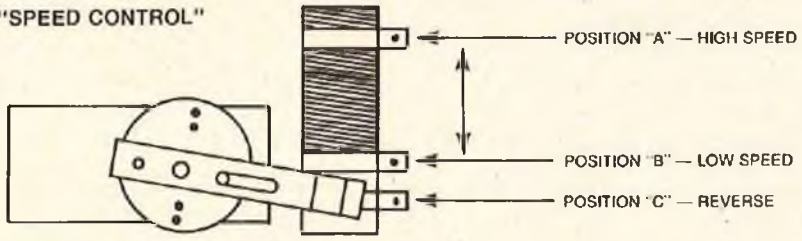
I'd like to thank everyone who sent comments in on the foam cutter and I'm sorry we couldn't print all of them.

★

Some RC manufacturers are having fits with reports of electrical noise problems interfering with receiver operation when used in electric planes, boats and cars. The 'Noise Killer' is a solution offered by Peerless Corporation.



The 'Noise Killer' is a noise suppressor to be used with electric motors for R/C models when applicable. In many instances, the electric motor will cause interference with the receiver. The 'Noise Killer' eliminates this problem, and can be used with any 6-12 volt DC motor. The unit consists of two chokes and two condensers pre-soldered to a terminal with leads. Complete instruction sheet included. Installation is simple and quick.



The Peerless/Kyosho Speed Control was designed for use with the Capri and Spearfish electric motor Cruisers. However, it works equally well with the Peerless/Kyosho Marine Drive Motor and similar 12 Volt DC motors on the market. The Speed Control can be used when installing proportional radio control units in R/C boats. In addition to controlling the speed, it also provides for forward and reverse operation. The unit can be connected to any standard proportional servo. Complete instructions are included.

The speed control shown is a simple rheostat with the wiper connected directly to the servo output wheel.

Dear Jim,

In your May column, you stated, "The 222 to 224 MHz band has been offered for a projected citizen radio service." WRONG! 222-224 MHz is a ham band. It never has been, and hopefully never will be, offered by the FCC as a citizen's band. The Electronics Industry Association did propose that the FCC take this band away from the hams and give it to C.B., but that has been squelched by the FCC. As for a simplified ham license for the 53-54 MHz band, don't count on it. The FCC recently proposed a "code-free" VHF ham license, but it was met with such stiff opposition that the idea was dropped. Nearly all hams are opposed to millions of frustrated CB'ers with "box-top" ham licenses invading the ham bands with profanity and "Big 10-4 Good Buddy." RC'ers, unfortunately, are considered CB'ers.

The 433 MHz band is also a ham band (although shared with others). RC'ers will probably have to go to 900 MHz to find adequate elbow room. No problem – we have the technology.

Jim Young
Monroe, LA

Thanks for the up-to-date info Jim, the long magazine lead time sometimes makes us look like we're not with it. I have been keeping tabs on the AMA Frequency Committee activity and let me say we all owe these guys something we can never repay for their efforts. My guess is that the first place we might get new R/C frequencies will be between the existing 72 MHz channels, probably every 40 KHz instead of every 80 KHz. Then, if we can get some really good narrow band receivers, this could be reduced to every 20 KHz. We could also add new frequencies up around our present 75.64. Even with 40 KHz spacing, we could add as many as 15 new channels.

★

Well, this has been a hectic month and this column is way over-due because I've been trying to get ready for the Master's contest. Once again I got a good reminder of what can go wrong in old R/C systems. I had two near disastrous experiences. The first was a broken wire which occurred while installing my old receiver in a new plane. After that, I decided to put a new receiver in it. The problem is that the wire gets very stiff

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Author Billy Walker demonstrating rotating wing panels on glider.

MAGNUS ROTOR

Winner of numerous scientific awards, including the NASA Award, the Magnus Rotor Principle is applied to R/C aircraft by a Willow Glen, California High School senior.

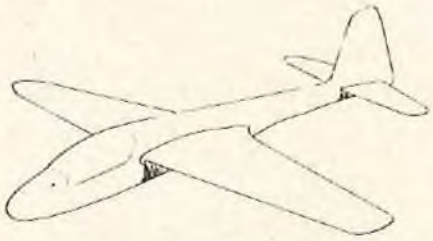
By Billy Walker

Magnus Rotor utilized on a sport aircraft.

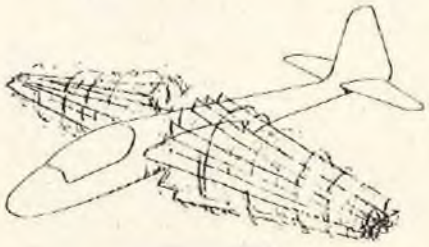
During the mid-part of 1976, the 16th Annual Science and Engineering Fair was held in Santa Clara County in California. At that fair, the science department of the Willow Glen High School took home a total of 50 ribbons and awards, the most any senior high school has ever won in the history of the fair, according to Horace Lucich, science department chairman. Representing 41% of the 90 senior high school projects and papers displayed at the fair, Willow Glen received the "Best Senior High School at the Fair Award." One of the top winners was 17 year old Billy Walker, a Willow Glen junior who won several first place awards, including the NASA Award and the USAF Award for his Magnus Rotor project. Bill also earned a first place ribbon from the fair and a journal of his choice from the American Institute of Aeronautics and Astronautics. Two cash awards for Bill included a $25.00 Savings Bond from the Instrument Society of America and a cash award and certificate from the Junior Engineering Technical Society. Bill was also recipient of a novus slide rule calculator from the National Semiconductor Corporation and a Certificate of Merit from the NASA Ames Research Center. The U.S. Navy and Army recognized Bill's scientific work with a leather attache case and a first place Certificate of Merit and medal.

The Hypothesis of Bill Walker's pro-

ject was "that an airplane's wing can be rotated in a manner comparable to the "Magnus Rotor" to produce a STOL type aircraft as shown in Figure 1 and Figure 1A.



CONVENTIONAL FLIGHT MODE
FIGURE 1



RECOVERY MODE
FIGURE 1A

This hypothesis was based on the research of Heinrich G. Magnus, who demonstrated in 1852, that a body rotating in an airstream experiences a force that acts substantially normal to the airflow. An autorotating flight vehicle designed to develop this "Magnus Force" and employ it as a major lifting force in free-flight, is called a Magnus Rotor.

According to test findings in the reference work, "Model Aeronautics Made Painless," by P.J. Hoffman (1955), whatever shape the rotating body is, there isn't much difference in the amount of lift produced.

In the reference, "Aerodynamic Theory" by William Frederick Durand, it stated that lift coefficients over 10 can be obtained by a rotating cylinder, as compared with 1.5 for normal wings and something approximating 2 to 4 for slotted and suction wings, respectively. In order to obtain such high lifting coefficients, the surface velocity of the cylinder must be roughly three times the velocity of the free airstream.

As Bill Walker pointed out in his research derived from the reference work from the Annals of the New York Academy of Science, Volume 107, Article 1, pages 249-255, it described a STOL Vehicle which utilizes a rotating cylinder (lying in the wing at about the 75% chord extending span-wise). The rotating cylinder acts as a vacuum re-energizing the boundary layer. This is illustrated by Figure 2 and 2A.

The purpose of Bill's project was to prove whether or not an airplane's wing can be rotated comparable to the "Magnus Rotor" to produce a STOL type aircraft. To begin solving the problem, he researched the project at Ames Re-

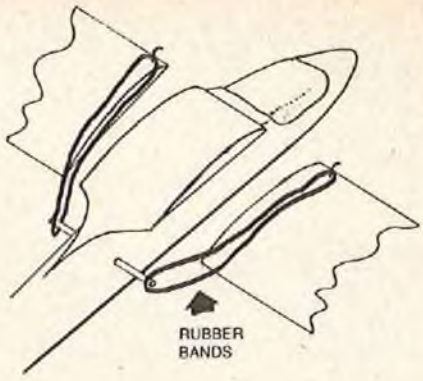
FIGURE 2

FIGURE 2A

search Center. By studying the flight characteristics of certain models that utilized the "Magnus Effect", Walker determined the point about which the wing would rotate and also how to balance the wing about that point. His next step was to apply what knowledge he had learned to an existing flightworthy 6' wingspan radio controlled glider. Following the transforming of the glider's wing into rotational form, he proceeded to construct a wing panel release mechanism to be activated by R/C gear. The aircraft was then hand-launched from a tall building and, while still in flight, the wings were activated and allowed to rotate.

Continuing the experiment, Bill added an engine. As a power plane, he made a few modifications such as a pre-spinning wing panel, and an improved wing release mechanism. As a power plane, the results were very successful. Upon actuation of the wing panels, the plane descended slowly, at times even hovering. The aircraft exhibited turning capabilities as Bill still had full control through the use of the rudder and elevator.

The first design of the mechanism is shown in Figure 3. With the release mechanism, the spring pushes the wing panels outward following the path of the bent rods, thus starting the turning action. The second and final design of the pre-spinning mechanism is shown in Figure 4.



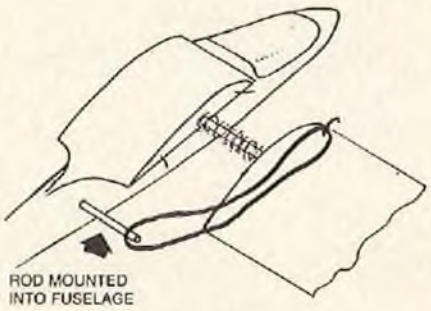


FIGURE 4

As a glider, when the wing panels were allowed to rotate while in flight, the plane ascended rapidly but soon leveled out and descended rapidly. After a few test flights, Bill discovered that the wing panel release was faulty and, therefore, modified it. He also had to design a pre-spinning device to assure rotation. Once the modifications were made, he applied power to the glider in the form of a .09 engine. The plane crashed many times due to incorrect rotation of the wing panels. To correct the problem, Walker designed a better pre-spinning mechanism. As a power plane, the results were very successful. Through various tests made through using model wing sections, Bill discovered that to obtain optimum results, the wing panel should be mass balanced. He did so by

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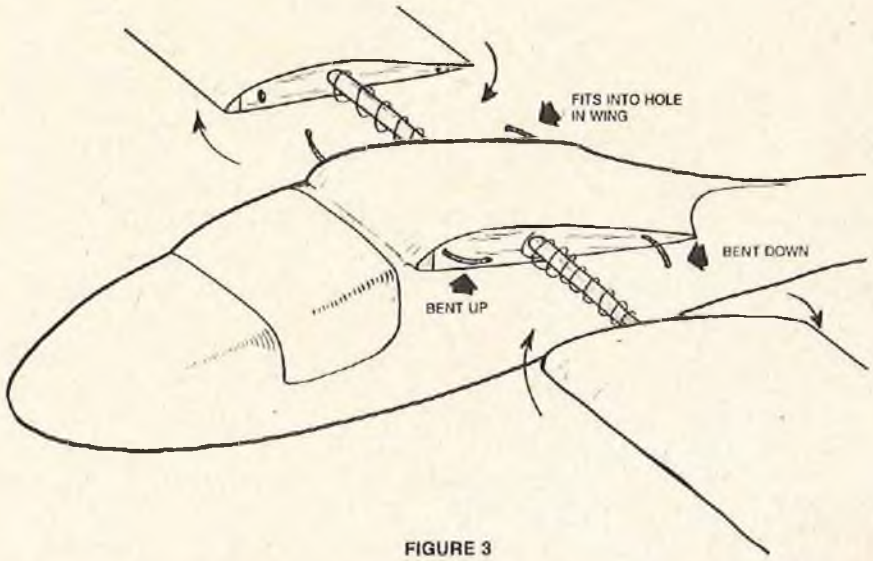
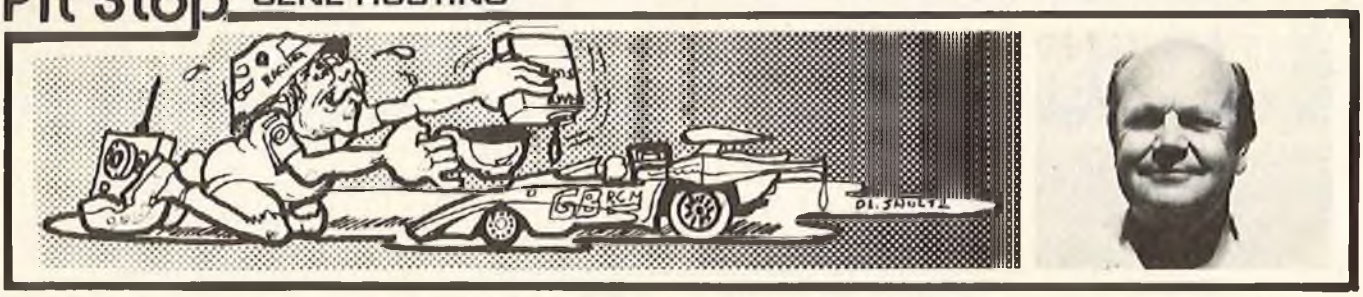


FIGURE 3

Pit Stop GENE HUSTING



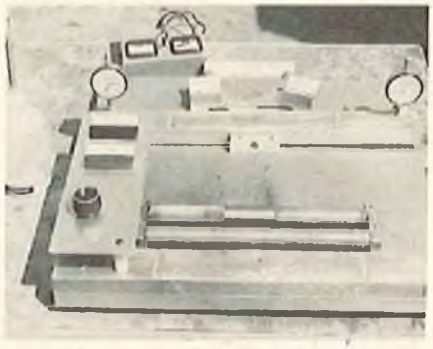
We showed you the "Correct Line" to take in order to get around the track in the shortest possible time in last month's column. Now, we'll give you some more "Speed Secrets" or, rather "Handling Secrets", which to me are more important to help you to be able to stay on the "Correct Line" around the track.

It's amazing how many people feel there is some kind of "Mystical Secret" that enables some people to win. I suppose if you don't know something, it could be called a "Secret", yet when you know it, it only seems like common sense. As an example, one Saturday afternoon, this fellow R/C car racer, we'll call Nehi, came by my house on the way to the track to practice for the race on Sunday. We were sitting in the kitchen and he said, "Now Gene, I know there's one Big Secret that you and Morrissey and Arturo (both former National Champions) know, that enables you to win. You might not want to tell me, but if you do, I promise not to tell anyone else." Before I could answer him, the door bell rang, and Bill Jianas, the current National Champion, also stopped by on the way to the track. I told Nehi to ask Bill the same question. He did, but Bill just thought we were kidding him. I had Nehi bring his car in, and Bill and I made a list of 17 different things that were wrong with his car; all of which would affect the handling. All of these points were explained in the car kit instructions, so I asked Nehi if he read the instructions and he said, "Oh, I don't have to read the instructions. I know how to put an R/C car together!" You know, to this day, I still think he believes there's one "Magical Secret" that only a few people know.

The Experts that are winning races, are doing it mainly on experience. They know how to set up their car to make it handle to its best possible performance for a given track. It takes a certain amount of experience to learn how to do this in a given time. I cannot tell you how to go out and beat the Experts, but I can tell you what the Experts do, which will help to make your car easier to drive and, thereby, help you to get around the track faster and beat your competition.

Chassis Tweak

You're asking, "What is chassis tweak?" If you don't know, you could be going a lot faster, a lot easier. Chassis tweak is when the chassis plate is "twisted" or the suspension is loaded so that one front tire is actually pushing down harder than the other front tire. This causes the car to turn much tighter in one direction than the other. It can also make your car spin out very easily coming out of a corner and/or going into a corner.



This is a real exotic Tweak Board, built by Jack Jacobs. Base is 1" magnesium. Front wheel swivel bar has 2 dial indicators to show chassis tweak down to .001". A chassis dyno was also built in by Jack, but this has proved impractical due to tire slip, etc.

A much simpler Tweak Board, but one that is very effective. Has a piece of 1" special plywood with a piece of 1/4" glass cemented on top. Make sure wood is flat. Left side of photo, a 3/8" rod is placed under the tire. The other front tire has raised 1/8" off the glass. The rod is switched to opposite front tire & the amount of the opposite front tire is checked. It should also be 1/8", otherwise chassis is tweaked. Never use the ground to check tweak!

To show you how important Jack Jacobs, one of the leading Experts in the Midwest, thinks correct chassis tweak is, I've included a photo of his "Tweak Board". Jack's tweak board is very elaborate, enabling Jack to tell right down to one-thousandths of an inch, how much "tweak" he has. The base of his tweak board is one inch thick *flat* magnesium. The rear wheels are positioned on the fixed side and then the front wheels are positioned on a ball bearing supported swivel bar with 2 dial indicators, one at either end. Readings directly in thousands can then be read on the dials to show how much the chassis is "tweaked" or "loaded" to one side or the other. Jack also has gauges to show toe-in. His board also contains a Chassis Dyno, but so far, this has been impractical due to tire slip, etc.

Delta has released a tweak board that tells you exactly how many washers to install to make your chassis tweak neutral. I would consider this a very worthwhile item.

Should your car be tweaked to the left or right or neutral? I can only answer this relative to Associated cars. For other makes, I would suggest referring to the instruction sheets. On Associated cars, normally the tweak should be neutral. The tweak is adjusted by placing thin, .005 to .010 thick washers between the front axle and chassis plate at the mounting bolts, on one side or the other. Naturally, not on both sides at the same time. Sometimes we'll purposely put a very *small* amount of tweak in the chassis for a particular track. If your car is handling exceptionally bad after a race, possibly due to a crash, check to see where the tweak is. Also, if it's handling exceptionally good, check the tweak too, so you'll know where ideal is for those conditions.

Crashes and worn tires are the 2 major causes of a tweaked car. If your car is tweaked to the right, so that the right front tire is pushing down harder than the left front tire, then your car will have over-steer to the right and under-steer to the left. You'll have to place shim washers on the right hand front axle mounting bolt.

Wing Location

One of the most often asked questions is, "Does a wing really help the car?" Not only is a wing *very important,* but the *location* and *type* of wing is *very, very important.* Again I'll be speaking for Associated cars. For other makes, run what the manufacturer recommends. Associated recommends the use of their #116 Lightweight Racing Wings on their RC100 cars. *Always run a wing.* Never use an aluminum wing on an RC100 car. They're too heavy and make the car

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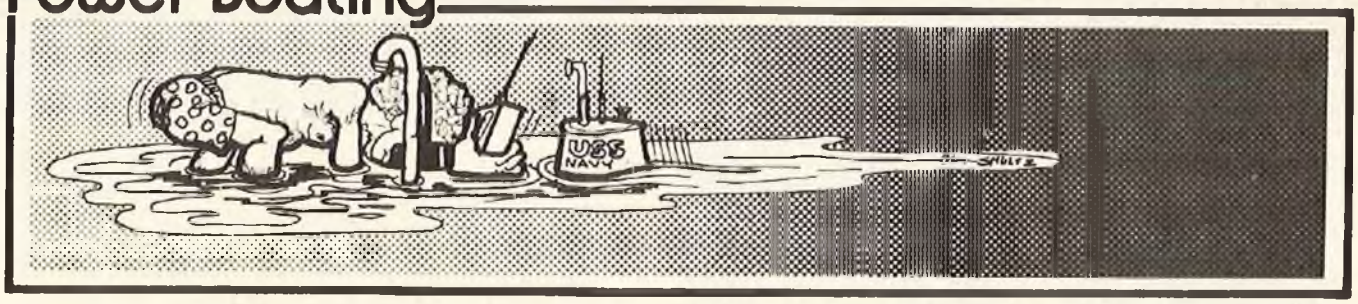
Power Boating

DAVID THOMAS



I'll start out this month by letting you in on a small secret — I am a worried guy! I've just figured it out; this is the thirteenth article of Model Power Boating since I joined the gang — I just hope nothing goes wrong with it! Anyway, fingers crossed, and on with the game.

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First thing, as usual, new products. Well, not necessarily new, let's say interesting, rather. And one of the most interesting I have come across in a good while is the MkII Sea Ram electric motor from Ray Kroker. I'm afraid that the photo doesn't really do the article justice (I really must get the Editor's side-kick to give me a couple of lessons!), but I can assure you that it is just about the most beautifully made and finished engineering product I have laid my hands on.

However, let's get one thing clear right away; not many of you are going to be dashing out to buy one of these, because this baby costs a cool $126.00, which is not chicken feed. I hasten to add that Cadillacs don't come cheap, either, and this motor is definitely in the Cadillac class, or maybe Ferrari would be a better comparison, because this is an exotic piece of really hot racing machinery.

The Sea Ram is a double-ended motor — in other words, it's two-in-one, and can be used either in the series or the parallel mode. In series 1.2 a/h or 2.5 a/h cells are fine, twenty of them, and in parallel ten cells of at least 4 a/h are required. The outputs are given as a 1/4 horsepower at 20,000 rpm and 3/8 at 17,000, and you have to admit, that is not hanging around! The efficiency is up around 70%, which, as anyone who knows anything about electric motors will agree, is pretty high. The only snag is that it has to turn a fairly small prop to reach these figures, in direct drive, but that's no real problem; 2:1 gearing will allow the use of much bigger, and more efficient, props. I am not going to go into any more detail at this time, since I haven't yet had time to try it out, and its not my policy to open my mouth until I've seen for myself — but I must say this: I already have two Sea Wasp 6's and a Sea Wasp 12 motor from the same firm, and if they are anything to go by, then this is going to be a real humdinger. I shall soon be publishing a plan of a high-speed electric cruiser, using this

The Kroker Sea Ram – a real jewel full of power.

engine, possibly with gears, so stick in there. In the meantime, if anyone is interested, the address to write to is Kroker Engineering, P.O. Box 14056, Albuquerque, New Mexico 87111, and Ray's catalogue will cost you $1.00.

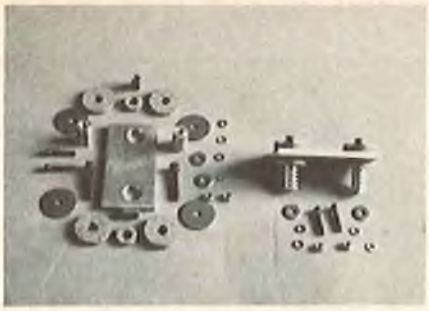
Next on the list are two new products from Racing Models in England. The first is nothing new, in that the USA has always led in the field — that of the use of flexible drive units. However, after some considerable experimenting, it was discovered that the American drive is not heavy enough to stand up to European-style racing where a typical day out would mean two one-half hour heats, with between eight and fifteen boats per heat, and a one-hour final with fifteen boats, over an M-shaped 300m course. Quite apart from accidents, which are frequent, one hour flat out puts quite a strain on all the different elements in the boat, and they have to be tough.

The new drive is very simple; in a brass tube, lined with a Teflon tube, runs a 3/16" hand-wound flexible cable, the business end being fitted with a 1/4" shaft running in twin self-adjusting, self-lubricating bearings, and fitted with a low-friction thrust washer. A skeg is supplied, as is the top-end collet, and a special flywheel nut, into which the flexible drive collet fits, thus eliminating the need for a coupling. The whole outfit sells for about $20.00, but if you want one, you'll have to wait, the manufacturer has a waiting list a yard long!

The new Racing Models flexible drive system; this one is really tough, will take any amount of hard treatment.

Now, it wouldn't be fair to hide from you the fact that I have done nearly all the production testing on this one, at the request of Racing Models, so you know what the score is. I can say, however, without fear of prejudice, that if you want to break this cable, you will have to have a mighty big engine, and some luck! I have been running it in a Cougar equipped with my own Webra Speed .60 WR and resonator — I won't say what power I believe this engine is putting out, because certain people would give me the horse-laugh, but you can believe it's plenty. The prop used for testing was an AMPS 2225, which equates to around 2.5" diameter and 2.5" pitch. After nine hours running time, and several collisions, one of which wrecked another guy's boat (see photo), I came to the conclusion that this flex drive unit is about as strong as anyone needs. I even tried throwing the boat into the water at flat-out revs — my usual launching technique — something the manufacturer advises against, and I still couldn't break it (yea, sure, I was actively trying to bust the thing, that's what this kind of production testing is all about, in part). So there it is, if you need a real tough unit, the Racing Models outfit is pretty good.

Honest, fellas, it wasn't my fault! This guy got in front of me when I was traveling fast, and --- BANG! (My boat doesn't have a mark on it – I bury 4mm music wire in the glass-fibre around the outside edge of the deck!)



The Racing Models silent engine mount kit – good for a couple of dbs' noise reduction, and easy to fit.

The same firm is now producing a silent engine mount. This consists of mounting plates, a series of specially nitro-proof bonded cork washers with insert, and all necessary hardware. The idea is that a solid engine mounting will transmit vibration to the hull which, in turn, resonates, causing noise. Insulating the engine in this way cuts right down on this noise. The big advantage is that the engine, when mounted in this way, will not flex at all, and so can be used with a traditional solid shaft, as well as a flex unit. My Cougar, fitted with both, currently runs at 79dbs, which is quite reasonable. (The fitting of a hatch on the engine compartment will cut this down by another 3dbs, but more of this later). The address is: Racing Models, 1 Melrose Avenue, Whitton, Middx., England, and the guy is also looking for dealers.

I have been hanging on for some time now in the hopes of being sent one of the new Rossi .65 ABC Marine engines, but the Italian manufacturer has been held up by material shortages. So I have just taken delivery of the ringed Speed .60 F model, and converted it to marine use. I haven't tried it out yet (I have to go and work from time to time, which is a pest, because it stops my modelling!), but a quick run on an airscrew indicates that it is going to be pretty healthy. I have also been getting good reports from all over on this motor, especially on the quality of the engineering, for which Rossi has always had a good reputation. I'll tell more about that later.

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My Rossi F 60 Speed converted to marine use with a brass water-jacket epoxied in place, and an OS No. 4 flywheel. Going well, but needs routing out a bit.

Some while ago, I mentioned Balloon Combat, but never got around to telling you what it is all about. Sorry, here goes. It's very simple really. If you get fed-up with running around your local patch of water, try and find another guy with a boat that has about the same top speed as yours. It really doesn't matter what it is, it can be a scale model, racing boat, precision steering boat, anything; and the type of power doesn't matter either — steam, electric, glow, petrol, you name it. The only criterion is that the two boats have about the same top speed, and that they will turn in about the same radius.

Okay, now go out and buy yourself a package of party balloons, medium sized ones are best, and some strong thread. All you have to do is to tie about 12" of thread to the transom of the boat, and at the other end attach an inflated balloon. On the bow (that's the sharp end!), you need a very sharp, fairly large sewing needle. The easiest way to fix it on is to Zap it, or use some fast-setting epoxy, but if you don't want to spoil your paint job, then make up a small block of wood, with the needle in it, and fix it to the boat with some double-sided servo tape, which can subsequently be peeled off. Make sure the needle protudes about 1/2" beyond the bows. With both boats similarly equipped, let battle commence!

The idea, of course, is to burst the other guy's balloon, without letting him burst yours, and believe you me, it's not as easy as you may think. But it's a lot of fun, especially if the boats have a good turn of speed. We've tried this out with Class A racing boats, but with a longer thread, to avoid accidents, and you really need hair on your chest to play this game! At the other end of the scale, I have also seen it played with small electric cabin cruisers, using 6" of thread, and you can get just as much fun out of it. One word of warning; if you are using a fast boat, be careful how you catch it when you bring it in after a run. One feels so stupid, stuck to the end of the boat! Not only that, it hurts, and I've got scars to prove it. (Some people never learn!)

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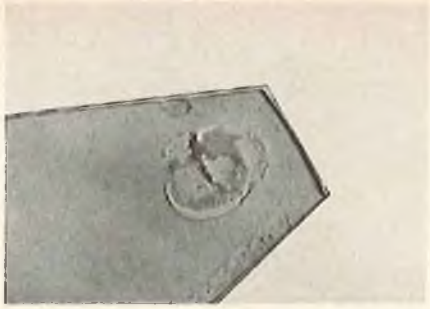
Your daft columnist, zapped to a cabin window! Some people never learn!



The cabin window, after parting company with my finger, but retaining some of its skin. (I bet the FBI would like more finger-prints like that – maybe they should supply all their agents with a bottle of Zap!)

I mentioned Zap just now, and I must say that I find this a great glue, but I am pretty careful now when I use it. I'll tell you why. I heard that this stuff can stick your fingers together, and must confess that I thought this just a bit of good publicity. Then, one day, a drop of the glue ran down the outside of the bottle, without me realizing it. I picked up the bottle, made the joint, and put it down . . . put it down . . . *put it down!!* No I didn't, I was stuck to the bottle. Right, being an intelligent guy (or so I thought), I worked it out that if my right hand was stuck to the bottle, the obvious solution was to pull it away with my left hand . . . that Zap makes good handcuffs, doesn't it? Well, finally I pulled myself loose with a lot of bad words, and picked up a piece of acetate sheet I had just cut up for a cabin window. How stupid can one guy get? Now I was stuck to the acetate. Well, I figured that this was too good to pass up, so I called my wife, who kindly came along with the camera, and took a couple of shots. (Any blurring of the photo is due to my loving wife shaking with laughter!) Finally, I pulled myself loose, but as you can see I left some of my skin behind (and it hurt, too — the things I do for these articles!).

Now this may sound like a comedy of errors, but there is a serious side. Zap is not dangerous if handled properly, but do make a point of keeping it away from the kids, because in their hands it could turn into a really nasty accident, needing hospital treatment. So be wise, fellas, keep that bottle in a place where the kids can't get their hands on it — somewhere up high is best, then burn any ladders lying around.

•

I guess that it would be a good idea to take a look now at a few letters I have received recently, because there are some interesting points which they bring up. First off, a long one from Dick Scrogin of Kansas, who has a problem with a Dumas "Miss Unlimited", fitted with a Fox .36 motor and a Dumas X-40 prop. Here's what Dick has to say: "But, as the

boat started to accelerate and gain speed, to the point I hoped it would get up on top of the water and really go, the engine would suddenly rev-up as though the prop was in an air-bubble or some kind of a "void", the boat would actually stop and settle back in the water — engine still revving. At this point, I would idle it back and start over."

Well, Dick, don't let it get you down, it happens to the best of us, as I know, because I saw a similar thing happen to Ed Fisher during last year's World Endurance Champs, when his Deep-V boat did pretty much the same thing.

Dick's comments about a void are right on the ball, because this is just what is happening. The hull starts to move forward, pushed by the prop, but at this time it is acting as a displacement hull — that means that it is moving through the water, rather than over it, in what we call the planing mode. There is a critical speed, where suddenly the hull is ready to start planing. But the transition from displacement to planing needs a great deal of extra power — this can be well understood when you see a hydro come up on the plane. With no change of throttle on the transmitter, that boat comes up, and accelerates. This is because all that extra power needed to bring it up is suddenly liberated as a speed factor, as opposed to the lift factor it was being used for during the transition.

Right now in this particular case, what is probably happening is that the boat gets up to transition speed, but the pitch of the prop is not enough to supply the necesary force to get the hull up onto the plane. In other words, the hull, in the displacement mode, is resisting the push from the prop. The prop spins faster and faster, and finally throws all the water away from its blades faster than the water can get to it. In other words, it actually creates a void around itself. We call this ventilating. The result is that there is no push, the hull stops in the water, and the prop goes on ventilating until the engine is throttled back, allowing some water to get in around the blades, so that they can go back to pushing. Then, as Dick says, you start all over. Very frustrating.

The obvious answer to this one is to change the prop for one with a heavier pitch, but if it was really as simple as that, life would be easy. You see, a two-stroke engine works best at high revs; at low speed it produces relatively little power. It's all a question of getting a prop that will allow the engine to develop enough power at low revs to get the hull up on to the plane, but which will allow that engine to reach peak revs in the planing condition. The answer, Dick, in a few words, is to change the prop, and see what happens. Play around with different props, until you get one which is right.

Incidentally, the proof of all this can be seen from the fact that the really fast hydros all have to be thrown on launch, to assist the engine in getting the hull on to the plane. With high-revving engines necessary for very high speeds, plus a big pitch on the prop, the boat would never get up and go on its own and, in fact, would probably stall the engine if just put into the water.

And there it is folks, easy theory. Now you know what to do if your boat starts ventilating on the turns — just throttle back and then open up progressively; as I say, Ed Fisher had his boat come off the plane in the Champs, and it took nearly a whole lap to get it back up again!

A letter from John Rayho of I Goodwill Place, Metuchen New Jersey, 08840, who saw the article on the Chicago Expo in our May issue, and who was very interested in the submarine shown by Bob Cline. John would like Bob's address so he can get some real expert advise on the subject. Well John, I don't have Bob's address, but if he reads this, he now has yours, doesn't he?

Similarly, Sgt. Robert Arnold 531-52-2661, 377 Med. Co. (AA), APO San Francisco 96301, would like to get in touch with the Seattle Model Yacht Club, so perhaps they would care to drop him a line. New members to the hobby are *always* welcome!

Finally a letter from J. W. Stewart of Tulsa, Oklahoma, who asks a whole load of questions about electric boats, but principally, where can modelers obtain couplings to link the motor shaft to the prop-shaft? Well, I have to confess that at this time, I am not too sure of the reply to that one. I am hoping, in the very near future, to send a letter to all the main marine model manufacturers, asking for details of their products, so that I can compile an index of this sort of thing, so that RCM can give more help to readers with this kind of problem. But, as you can readily appreciate, this depends entirely on the kind of support I get from the producers. So how about it gentlemen?

Of course, it all depends on what you are using in the way of a prop-shaft. If it is flexible, then all you need is a piece of dural rod, bored out to take the two shafts, with threaded holes for grub screws. If you know someone with a lathe, or if there is a light engineering works in your town, there is no problem. For rigid shafts you need a universal

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Coupling suitable for flexible shaft.

Double universal coupling with self-adjusting center piece. Low power electric motors only.

Center piece can be removed to make a single universal.

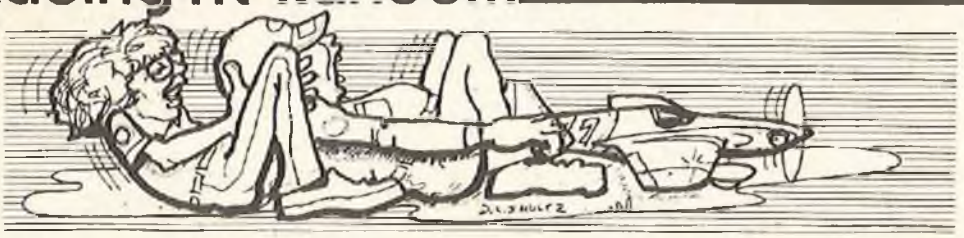
Racing Models pin-and-disc coupling – will take up to 3bhp.

A small, metal coupling, taken from an old TV tuning knob.

Traditional pin-ball and socket coupling.

Racing At Random

FRED REESE



Bob Brogdon came all the way from Atlanta, Georgia, to win Expert Formula I at Bakersfield. Bob's K & B powered El Bandito has an Irwin Funderburk glass fuselage.

Congratulations to Bob Brogdon and K & B engines. Bob won the Expert Class Formula I with Kent Nogy calling at the Bakersfield International Air Races, May 14 and 15. Bob flew to Bakersfield all the way from Atlanta, Georgia, just for the race and won the fly-off against Terry Prather and Bob Smith to win the event. All three had perfect scores for the two days of racing and everyone was anticipating the fly-off. Terry had been between 1:16 and 1:17 for two days and Bobby was only a fraction slower. The three airplanes were flagged off in rapid order with Terry going first. Bob Brogdon quickly caught up and Bobby Smith was following closely. Suddenly Bobby Smith pulled up and out in the second lap when he lost his rudder. Meanwhile, Terry and Bob were within twenty feet of each other, swapping the lead until the 8th lap when Terry flamed out with a blown plug. Apparently he squeezed the needle a little too much and actually blew the plug on the line as the heat time was slow compared to earlier times. With Terry out, Bob cruised the final two laps for his much deserved win. Ed Hotelling and Tom Christopher flew off for the fourth and fifth spots. Tom took off first and, in his anxiety, cut #1 the first time around and cut again later in the race. It was another close race that could have gone either way. Sixth Place went to John Rouse followed by Jerry Boyce and Pete Reed.

Terry Prather had the fastest time of the meet at 1:16.1 and won the perpetual BARKS Fast Time Trophy for keeps, since this was the third time he had won it.

★

Formula I Polecat by Bob Violett. Sleak design is fast and looks great. First quality, complete kit is available as a 1 or 2 piece airplane for $114.95 from Bob or your dealer.

Bob Violett was at Bakersfield with his new Polecat Formula I which he is kitting. Bob showed me a kit and it was very complete with first quality hardware, balsa, epoxy glass fuselage, pants and cowl. Although originally designed as a one piece airplane, Bob explained that it can also be built with a removable wing. The airplane is very sleek, yet does not appear "skinny" as do some airplanes. Bob had his troubles with horsepower over the weekend, but when his engine was running right, the Polecat was fast and handled very well. The price of the kit is $114.95 and is available through your dealer or direct from Bob Violett, 26516 Aiken Dr., Clarksburg, Maryland 20734.

★

New front intake K & B 6.5 in Jeff Berken's Toni. Jeff uses a remote needle valve as described in the text, mounted to the firewall to keep his fingers further from the prop.

More and more Formula I flyers are using the new K & B 6.5's as they offer more horsepower out of the box and less rework to be competitive. Several people had the new front intake K & B 6.5 but all used a remote needle valve further away from the prop. The easiest type of remove needle is the stock unit mounted through an aluminum "L" bracket on the back of the engine or mount with fuel tubing connecting it to the venturi.

★

For you 1/2A racers, Sunny Myers is kitting a new 1/2A Sport pylon racer called the Cricket. The design is basic with a shoulder wing and simple clean lines. The foam wing is pre-covered with balsa, and has a special laminar type airfoil which Sunny says gives lower drag, yet still allows the airplane to turn well. The kit includes detailed plans, machined parts and a complete hardware package. Available through your dealer or direct from Myers Airplane Products, 3911 E. Downey Ct., Simi Valley, California 93063, for $24.95.

★

I'll close this month with a reprint from the NMPRA Newsletter:

Q.M. President Comments

How does one show appreciation to all of the people who have worked so hard to make Quarter Midget the great event it has become without omitting some deserving person? One can let everyone remain nameless and say, "Thanks fellows, great job," but that's not very sincere.

There is a better way, and it makes our appreciation visible, and it is with action. I, for one, would like to ask that you join me by giving of your time to encourage a newcomer to try Q.M. Many interested non-racers are afraid to try. Many believe it takes too much skill to build and fly one; that the equipment and engines are too expensive, etc. In almost every club there are one or two of these fellows around, wishing they had the nerve to try what appears to be an expert's game. If you have a practice Q.M., invite them to join you at a flying session, and when the plane is high enough, get them to take the stick. You just might have to coax a bit as they will be afraid they can't handle it. Watch that gleam in the eye when they find the screaming beast handles like a Pussy Cat. Add a bit of information and advice – lo, another possible racer is born.

Those racing buddies of yours who haven't joined N.M.P.R.A. may also need a bit of prodding, so remind them

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RCM BUILDS THE

By Grady Howard

DU-BRO EXPERT
COLLECTIVE PITCH HEAD

Du-Bro has added to their line of helicopters a beautifully designed expert collective pitch head for their very popular Shark .60. This head is made for the more experienced helicopter pilot who is a very proficient helicopter flyer. The building of this head does not require an expert builder since it is very simple to assemble. However, Du-Bro feels that to get the best performance from this head, the flyer must be very proficient in flying in order to tell when he has it set up for the best performance.

We found that building as per the Du-Bro instruction book, we had no problems in the assembly. The instructions are written in a step-by-step check-off method, and following them is very simple. The photos will show each step of the assembly and, with these, no one should have any trouble in the assembly.

After we had assembled the head and installed it on our Shark .60, we were ready to try it. We used the measurements that were given in the book for setting up the control movements. These proved to be very close to perfect for our machine. The only adjustment that we had to make for hands-off hovering was two turns on the tail rotor clevis. Now this may not prove the rule for your machine because of your engine, and different gear meshes with different drags. However, the measurements are a good place to start and, with your adjustments, you will have a great flying and contest worthy machine.

Du-Bro has gone all out to make this expert collective pitch head the toughest and most durable head on the market today. With the simplicity of construction and the ease of set-up with the ability to use a standard .60 size engine instead of the high priced and high powered ones, we feel that Du-Bro has achieved their goal.

Now follow the photos and see how simple construction really is:

DESCRIPTION OF PHOTOS

1. All of the parts as they come from the box.
2. First step is pressing in the bearings in the yoke.
3. Install bearing block in yoke; use thin washers between block and yoke.
4. Install one 10-32 set screw but do not tighten at this time.
5. Install bearing sleeve.
6. Now install 10-32 set screws permanently, using Loctite.
7. Install 4-40 bolt on balls on pitch yoke.
8. Now fit 4-40 bolt on balls on studs.
9. With 2-56 ball installed on inside of pitch yoke, it is ready for installing on yoke.
10. Pitch yoke on main yoke ready for fly bar installation.
11. Fly bar installed through bearing sleeve and pitch yoke.
12. Fly bar control arm ready to be put on fly bar.
13. Control arm and 3/16 collar installed on each side of pitch yoke.
14. Use 4-40 bolt on ball and measure for cutting of control arm so that ball is in center of bearing.
15. 10-32 nut secured on end of flybar with Loctite.
16. Roll the two aluminum strips around small can to form the control cans.
17. Install cans on fly bar ends so that they are flat with each other when they are laid on flat surface.
18. Install blade axle in rotor hub. Use Loctite on set screws.
19. Install spring and 6-32 bolt on opposite side of set screw. Then repeat on other end of hub.
20. Install blade control arms to bearing block along with angled brackets.
21. Install 4-40 bolt on ball on end of control arms.
22. Slip bearing blocks on axles and use 1/4" locknut to secure to axle. Tighten only to bearing and leave block free to rotate without any end play.
23. Completed rotor hub less yoke.
24. Top blade mount installed on blades.
25. Lead-lag block with 6/32 x 1" stud installed.
26. Lead-Lag block installed on blade mounts.
27. Bolt blades to rotor hub being sure to put 6-32 stud through angled bracket.
28. Blades installed on hub. To this point along with yoke assembly is only 2 hours of work including stopping for the photos.
29. Remove two bolts from bearing plate that hold the two braces.
30. Slip 3/16" collars on jack shaft bearing and mount to bottom of bearing plate with 1/4" x 6/32 Allen head bolts.
31. Mount control arm on one end of jack shaft.
32. 5/32" collar with 4-40 stud and ball installed on jack shaft.
33. Jack shaft installed on bearing plate with control arm on right side of helicopter. Install other 5/32 collar and ball and stud on other side.
34. Install 1/4" studs into 4-40 bolt on balls.
35. Install completed balls into outer ring of pitch plate. Use Loctite here.

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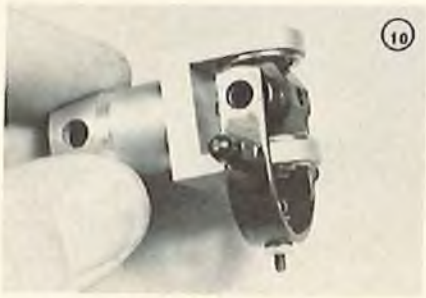
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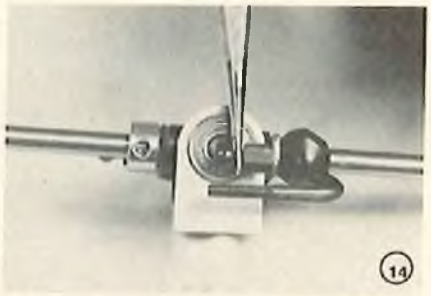
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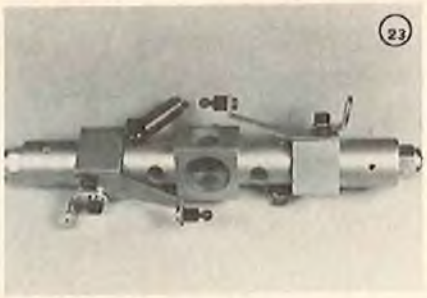
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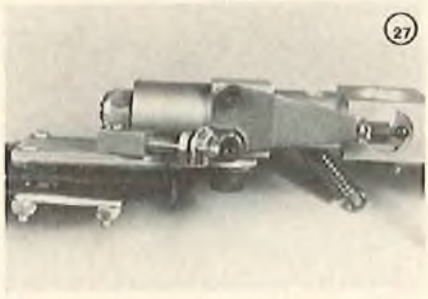
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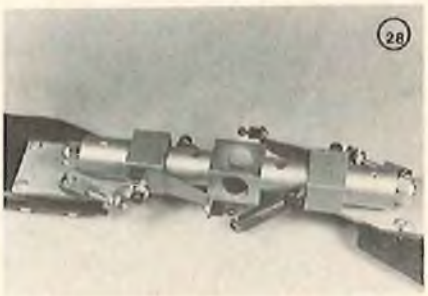
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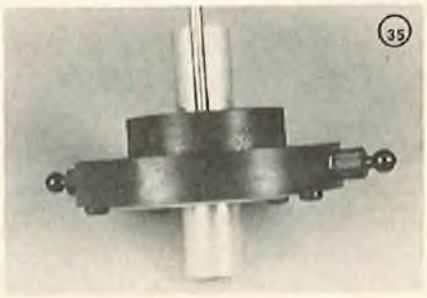
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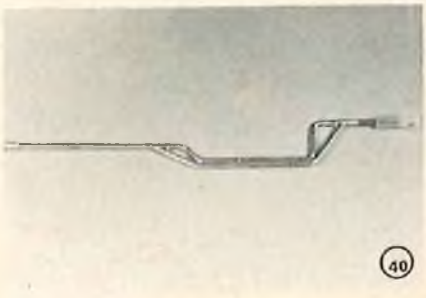
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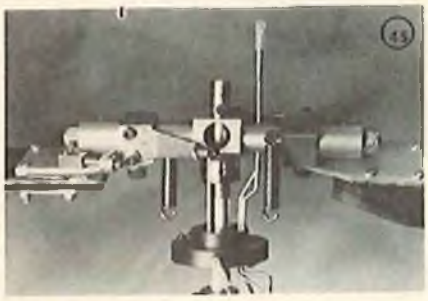
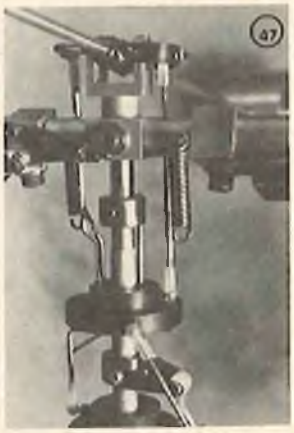




BY GEOFF WATKINSON

SO YA GOT A

No, Admiral Dick Kidd isn't fishing. That's the transmitter antenna he's holding so intently.

A pleasant formation run with no fear of a mid-air collision.

If you've got an old radio and a wife and/or kids, try one of these boat kits for some family fun. And if you have neither and do it just for yourself, anyway - - - we'll never tell!

Question: How many of you have an old radio with lots of servo mileage on it that you have been thinking about retiring altogether or taking to your club swap meet?

Question: How many of you think your wife and kids are not interested in your hobby of R/C airplanes?

Well maybe, just maybe, it isn't that they are not interested but rather that they are nervous about it. They are pretty close to it and see all the care and time you put into building your models and, even with all your experience in R/C flying, they have seen your face after you have "stuck it in the dirt". This can make them pretty uptight about aviating one of your gems and often this kind of tension can manifest itself in apparent disinterest.

One solution that has been briefly mentioned in RCM before, is a simple electric boat (Power Boating, May '77). In the same issue was the article on RC'ing a plastic scale destroyer that gave an idea of some of the novel things that can be done. However, a fully detailed scale destroyer is a bit delicate for 100% launch - sail - retrieve operations by the young 'uns. So, we decided to take a look at boat kits that are reasonably priced, readily available, rugged, meant to be powered and RC'ed, not requiring outstanding building skills, and that could be made to look good. We added the last prerequisite because we know that once Pop gets started, for whatever reason, he will get all wound up, himself, and want a good looking unit out there on the water.

The choice was either tough or easy whichever way you want to look at it. There is a plethora of kits that fit our requirements so it was easy thus far but which would make good examples? The two that were finally built were the Hobby Shack "Jupiter 65" and the Dumas "P.T. 109". The Jupiter is a very good looking and realistic cabin cruiser and made a good subject for a sedate 6 volt system (it will also handle lots of power too). The true-scale P.T. boat is a speed hull and would pay good dividends with a 12 volt system which would add variety to the project and the report. For motive power we used Astro Flight as there is a good variety of combinations in their line of motors and batteries and prices are quite reasonable. The next question concerned speed controllers. We have already reported on a low-cost, simple variable resistor installation (Melvin May, '77) and decided this time to try the rather more expensive, but more efficient, electronic controllers. They just plug into the receiver "throttle" connector and replace the servo and linkages completely. A "Vantec" forward and reverse control was obtained for the Jupiter and one of the new Astro Flight electronic controls was acquired for the 109.

Why use a speed control anyway? Well, you don't have to! They are very practical though since, at full current-full speed, you will probably run for 5-8 minutes whereas at around half speed you can extend running time up to 20, 30, or even 40 minutes. It depends on boat, motor, battery and propeller of course but extend it you will, and you can have more fun sailing when you can stop and vary speed, too. An Astro Flight Rapid Charger, operating from the car cigarette lighter, was already available from earlier boats and so were two Cirrus radios, so now the building could begin.

Both boats are all-wood construction and are pretty much the same way real wood boats are built. The hulls have keels, frames (or ribs), transoms and sheers around the gunwales (pronounce it "gunnels" and sound like an expert). When these frameworks are completed the hulls are then covered with wood planks of varying widths tapering to the bow. Both boats have removable decks which are built and fitted next. When that has been done the hulls and decks are resined inside and out, sanded, primed and painted — then the power and control installations can be made. The basic building techniques are much the same as model airplanes but there are some subtle differences. Weight is not critical; strength and rigidity are, as the finished product operates

WIFENKIDS HUH?

The busy Dumas PT-109 was built by Geoff Watkinson.

This stately Jupiter 65 cabin cruiser from Hobby Shack was built by Dick Tichenor.

in water which is both wet and hard - - yes, hard! Therefore, construction gluing is entirely epoxy which is strong and waterproof and the wood used is almost entirely hardwood and plywood. When building airplanes it is the usual practice to ignore excess balsa during construction and sand to shape later. Well you just don't do that with all-hardwood and plywood boats. Carve and sand everything as closely to fit and shape as possible before gluing in place which is much, much easier than trying to remove the extra material later. And watch those blobs of epoxy getting to the outside surfaces: wipe them off before they set. If you dislike final shaping and sanding as much as I do then get most of it done while you have the individual pieces in your hot little hands early in the game. You will be glad you did.

So, what can we say about the individual kits? Well, the Jupiter has outstanding quality materials and die-cutting and the parts fit is first class all the way. There is a large plan with instructions on it but the instructions are in Japanese. This proved to be no handicap at all as all parts are pre-numbered and the numbers show clearly on the plan with directional arrows and semi-exploded views of how the parts come together. It is all quite clear.

The Dumas kit takes a different approach. Again parts are numbered and die-cut but they supply a large sheet of twenty-seven 6" x 4" photographs keyed to four pages of instructions for step-by-step assembly. You can clearly see the parts with the numbers on them in every photograph. I think this is the first time I have ever built anything without once having any doubt about exactly "what went where and how". The plywood in the Jupiter is high-quality aircraft grade and in the 109 it is mahogany ply. I take pride in the finish on my models and was able to get this without any problem on the Jupiter. However, the mahogany ply in the 109 has a tendency to splinter back about 1/4" along the edges during sanding and, to get clean corners, edges and radiuses, I had to make quite a number of very tiny patches with resin and micro-balloons before the resin sealing coat was applied. Use a very sharp X-Acto #11 blade or similar to remove die-cut parts from the sheets so as not to unnecessarily aggravate this splintering problem.

So now we have both boats built and can start finishing them. They were liberally resined internally for waterproofing and strength. The outsides were very thinly resined, brushing out the resin as evenly as possible. Finishing is much easier if you don't have heavy brush marks to sand out. And, two thin coats of resin seal much better than one heavy one anyway. The main deck and aft cockpit of the Jupiter were very lightly stained to get the right wood-tone, then a very nice "varnished wood" effect was obtained with two coats of clear Superpoxy. The rest of the boat was primed then painted blue and white using Superpoxy also. The boat really looked great now so the follow-up kit of deck hardware was bought (including the running hardware also). You can buy other running hardware that will work, but the custom kit goes right in without any head scratching and I have run out of superlatives to describe the quality and totality of the deck hardware that comes in the kit, too. Adhesive vinyl letters (stationery supplies) were used to letter the bow and stern.

The P.T. boat required flat-finish navy-gray sides, deck and upper-works with flat light-gray undersides. So how about an experiment? The household paint locker was raided in the dead of night and yielded half an 8 oz. can each of Rustoleum flat white, flat black and gloss blue. The labels said "thin only with Rustoleum thinning oil" and a trip to the hardware store and an outlay of around a buck provided 8 oz. of this material. A little black in the white gave good light-gray and a bit more black with a dash of the blue gave a perfect navy-gray. I found that a ratio of 3 parts thinning oil with I part paint went through my Binks airbrush without any problems and the mixture hardened in 24 hours. The same mix brushed out well too, and two thin coats covered completely giving a nice even surface. I wasn't worried about this being waterproof as the adhesion and rust-resistant propensities of Rustoleum are legend. The 109 kit is complete with all the deck hardware and these cleats, bits, lights, ports, etc., were silvered, then mounted. Guns are black, torpedo warheads are red and life-rings and raft are yellow/orange. A final touch of realism was obtained with two rope coils, signal flags and a five-man crew. I found a bag of about 25 white soldiers in a toy store for .97 cents and the label said "for ages 5 to 7" which seemed about right for my mentality. So after dismembering a dozen of them then gluing back together various heads, arms, legs and torsos, plus judicious painting, I

got a realistic crew apparently doing whatever it is that crews do. McHale's motley mess of merry men made marvellous miniature models.

Okay! How about some "go-stop-turn"? The running gear from the extra kit for the Jupiter was installed as the plans showed and a marine Astro 05 and 6 volt battery went in. A "utility box" from Radio Shack was screwed into the stern and fitted with a plexiglass cover on foam wing tape for waterproofing. The receiver, battery, switch and steering servo went in the box using double-stick foam tape. The radio charging jack and the rod from the Du-Bro switch holder were brought through the box and the bulkhead into the main access compartment as were the leads to and from the Vantec controllers. The steering rod goes directly through the back of the box to the rudder horn. All egresses from the box are through rubber sealing grommets available at radio component stores. The stern flagstaff is 1/32" ID brass tubing and the antenna from the receiver is silver-soldered to a pigtail on the base of the staff. The removable whip antenna is .025" piano wire with a couple of small "wows" bent into it so that when it is pushed inside the flagstaff, it not only makes good contact, it stays there come what may. The motor charging jack is also in the main compartment as is a panel type fuse-holder (10 amp fuse) along with the speed control. The cabin top flips up on spring loaded hinges for simple access to this section or for starting a glo-engine if installed.

The complete Rx system and the Astro Flight speed control went inside a similar box in the 109 sealed and grommeted like the Jupiter. The antenna set-up is the same but the whip is supported by the scale mast. For operating convenience the Du-Bro switch is brought through the cover of the sealed box and up through the removable deck which called for a bit of careful measuring and drilling to get a tidy installation that was lined up. The charging jacks for both the receiver and motor batteries are led up into the aft turret where they can be fished out and replaced, so now the deck could be screwed down and the boat can be charged and switched on and off without taking anything apart. A Dumas custom kit of running gear was bought and installed, after shortening the shaft 2½" to get the motor as far back as possible, then the 12 volt battery and an Astro 075 were put in. The 075 is new in the line although it is actually the same motor they have used for some time in their 1/2A starter. It is a little longer than the 05 but on 12 volts it is more like the Astro 10 giving 9000 rpm with quite a bit more power than the 05. It is not as efficient as the 10, however, and draws more current, but the cost is only a little more than the 05 and it works very well.

Wowee! Two beautiful finished boats in all their gleaming eminence sitting on the dining room table. So — into the bathtub! The 109 floated exactly right and the Jupiter was a shade bow-down for best efficiency and appearance. Four small lead blocks (1½ lbs.) were sticky-taped into the stern corners and that solved that. So — pull the plug and head for the lake.

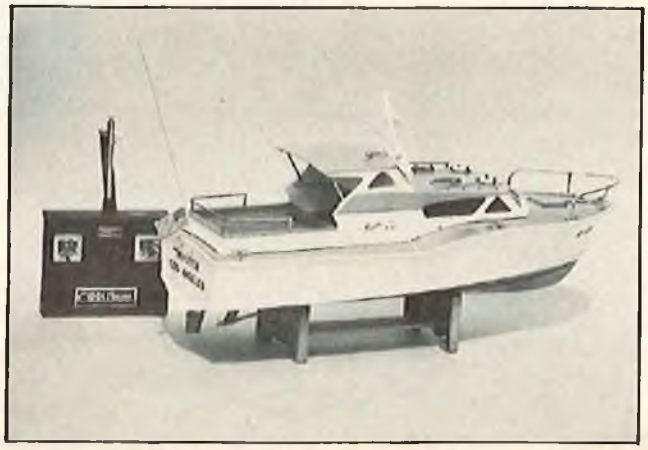
As I suspected, both kit props were just too much for the electric installations and, though both boats moved along right smartly, they ran out of battery in less than 5 minutes. Once again I called on Al Wood of Modelcraft Manufacturing in Hollywood. There isn't much in model boating that Al hasn't already found out. He casts machines and finishes bronze standard and custom props as well as a lot of other scale marine fittings and willingly dispenses a great deal of free advice. He suggested a .65 cent Dumas plastic P49 prop for the Jupiter and one of his scale three-blade bronze props for the 109 (D2, 1½" x 2½") — off back to the lake! Now the Jupiter runs wide open about 5 mph for 8-10 minutes or half throttle about 3½ mph for 20 minutes plus. The 109 runs flat out about 10 mph for 5-6 minutes and half throttle about 6 mph for 15-20 minutes. Both boats, at cruising speed, look really scale and very attractive and, at full speed, the P.T. boat is quite exciting with a big white bow wave and a rooster tail throwing about three feet back of it. Of course the Jupiter also would move right along with a 12V system too. The electronic speed controls give beautifully even throttle response and really simplify the installation too. Absolutely no radio interference has been experienced with either set-up at any time.

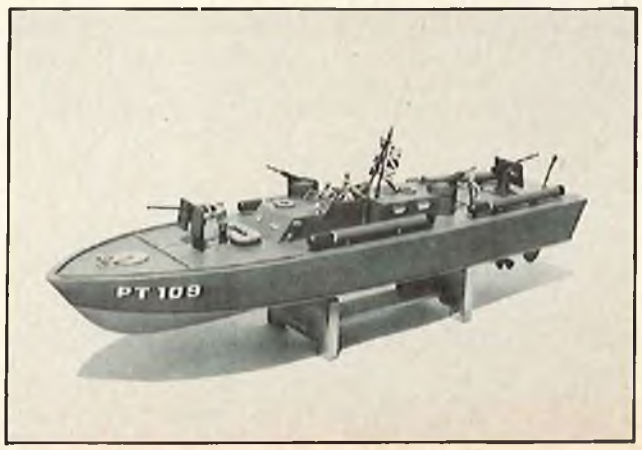
Well! We started out with a project for the wife and kids so come on Dad, it's time they had a turn! If they can ever get you to relinquish either of these two boats you will find that carrying, launching, sailing, retrieving and recharging are a snap for the young and uninitiated. They are stable in choppy water and windy weather and, if you built leak-proof hulls and running gear in the first place, they are both very dry boats too. A light smear of very thin oil on the shafts lubricates and repels water entry too. The kids can have safe fun for hours as long as they don't get too excited and fall in, but kids can fall in a lake just catching a 3" sunfish so the risk potential is only about the same.

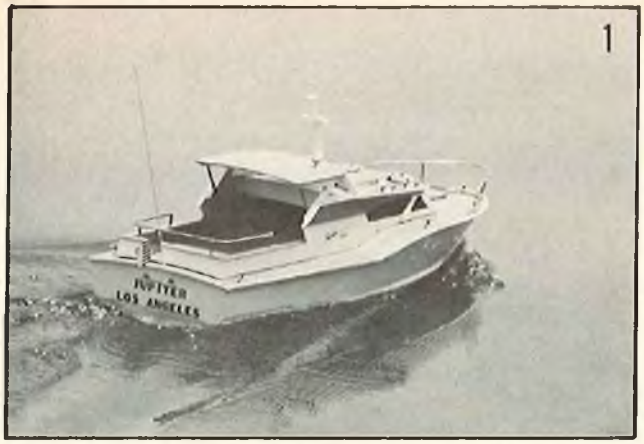
The 6 and 12 volt marine nicads have 70 amp/minute capacity and when run down they are actually 80-90% discharged. Therefore, safe rapid recharging would be about 85% of capacity or about 60 amp/minutes. On a rapid charge that would be, for example, 5 amps for 12 minutes or 4 amps for 15 minutes or 3 amps for 20 minuets, etc. If you pull the boat from the water when it slows down noticeably, you can recharge in 15 minutes with an Astro Flight Rapid Charger in the car cigarette lighter (charger switch at "hi-amp" for 12V and "lo-amp" for 6V). Be sure the boat is showing clear signs of low batteries before you recharge. A severe rapid overcharge will ruin the battery. Also, never completely discharge the battery either as this, too, will harm the cells. Read the battery and charger manufacturer instructions carefully.

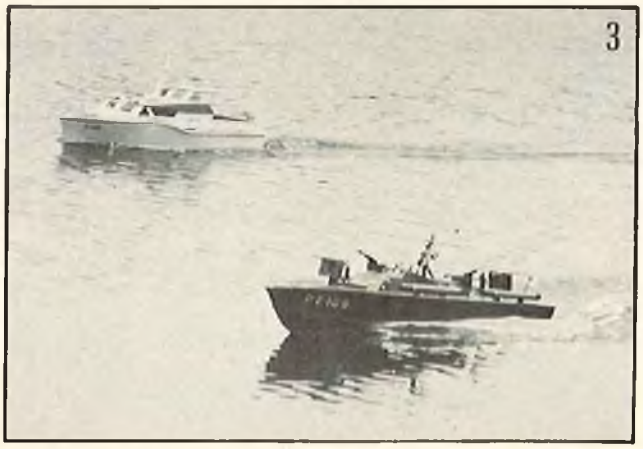
One last observation/orientation! For kids or adults who are having the usual heading problems as they are learning to fly R.C. airplanes, you will find that a couple of 20 minute sessions doing numerous turns and Figure Eights with and R.C. boat will make directional command signalling second nature. Forty minutes of continuous maneuvering on the water gives as much turning and heading experience as hours and hours of flying time.

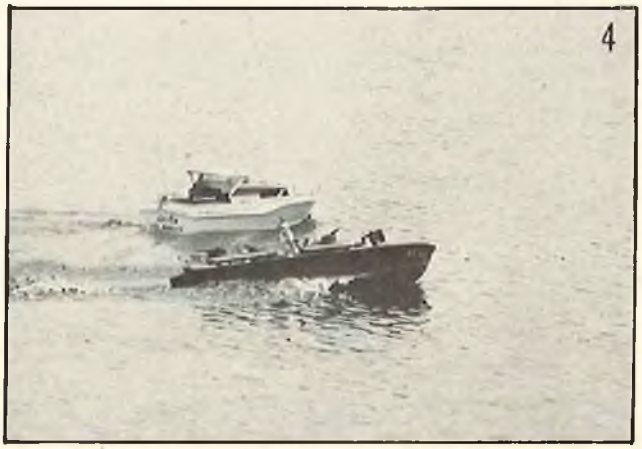
All kinds of fun and lots of practical benefits, so if you have that old radio and a wife and/or kids, go to it! And if you have neither and do it just for yourself anyway, well - - - we'll never tell! □

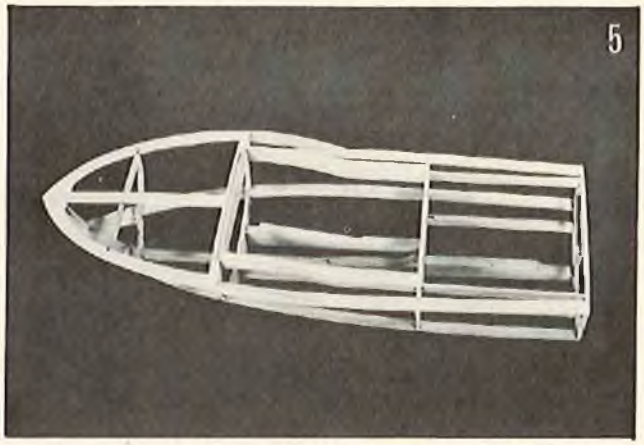


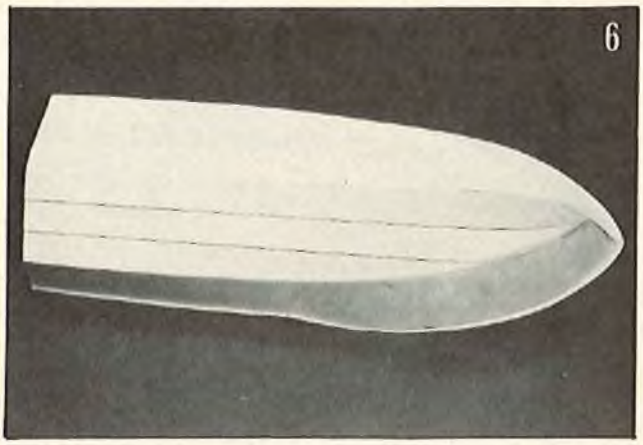




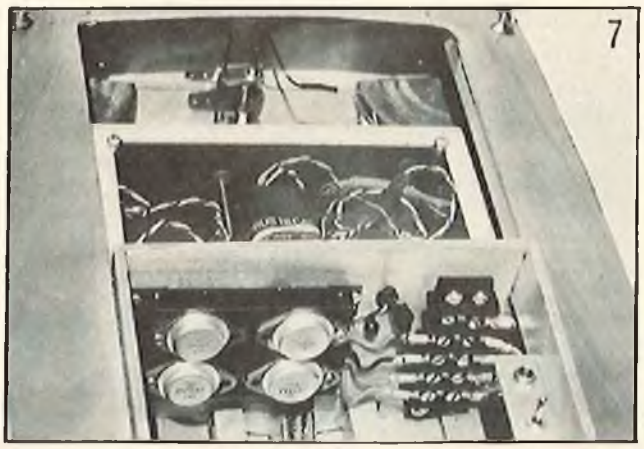


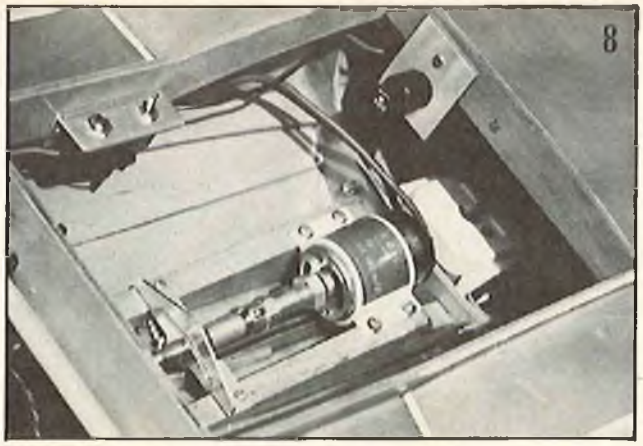


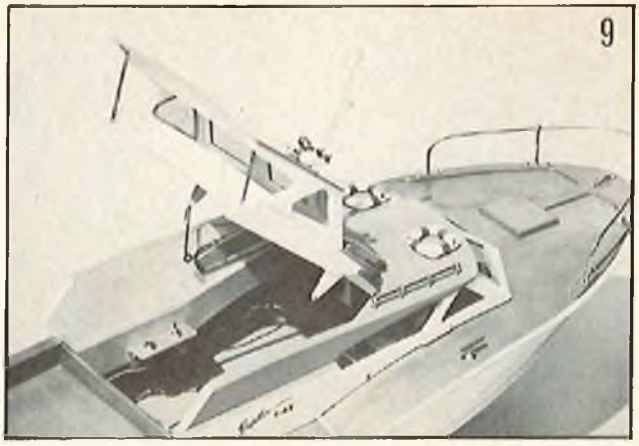


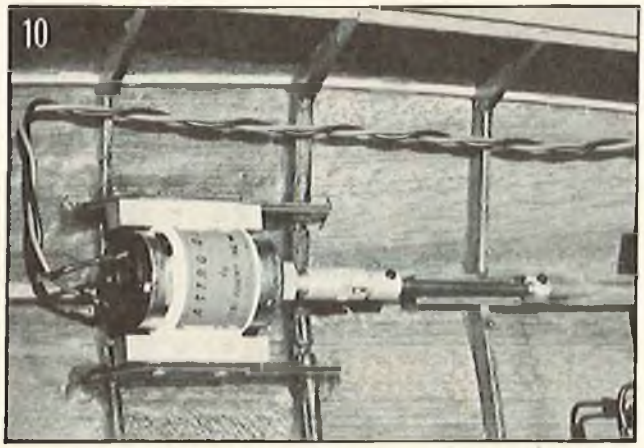


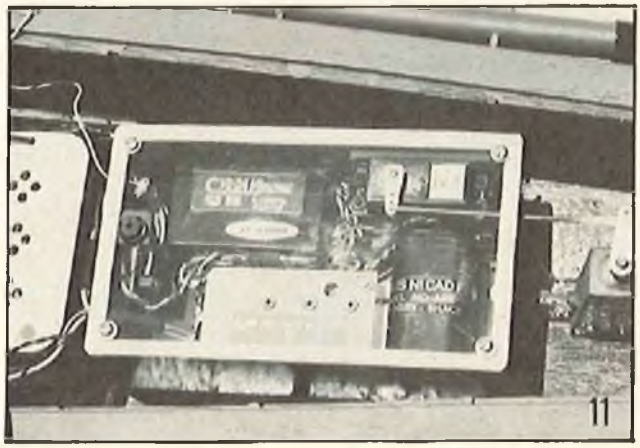
(1) Jupiter cruising at 3-4 mph looks so real, you look twice expecting to see a steersman & friends in the cockpit. (2) "Full speed ahead & damn the torpedos!" (About 10-12 mph). (3) "How about it honey? I'm a sailor with a month's pay & a two-day pass." (4) "Aw, come on back, I only wanted the next dance – honest!" (5) Jupiter keeled, framed, transommed & sheered. Engine-bearers in too. (6) Hull decked & planked. Note how much pre-shaping and finishing is done at this stage. (7) Aft compartment with steering, antenna connection, lead ballast & sealed radio box. Main compartment with Vantec control & terminal block also showing radio switch knob and charging plug coming through bulkhead between them.

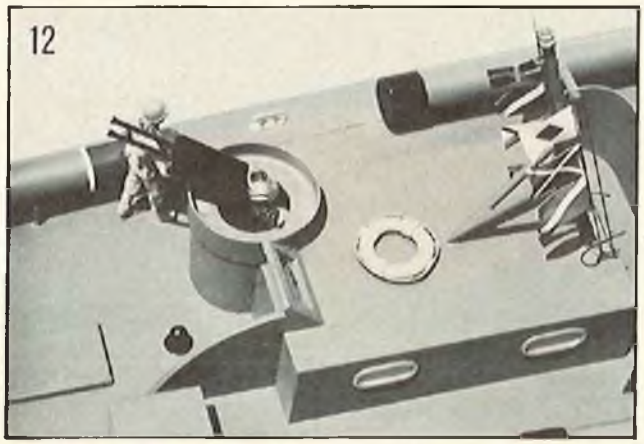


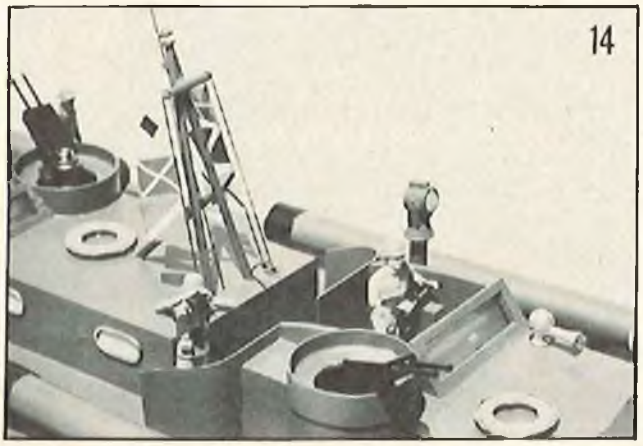












(8) Jupiter main compartment looking forward. (9) "Marlboro" might have "filter & flavor", but Jupiter has a "flip top box" too – great for quick & easy access. (10) PT-109 motor, mounts & U-joint. The Astro 075 is so new it has an "05" label. Power-feed wiring tightly twisted to stop loop-transmitting & possible radio interference. (11) PT-109 radio box with everything inside including very small Astro Flight speed control. Note very short & straight steering rod. (12) PT-109 radio & motor charging jacks pulled up out of rear turret ready for charging & also showing radio switch knob in center of deck. (13) Detail of the ports, vents, lights, bitts, horn, etc. (14) Gruber at the helm, McHale commanding (naturally) and, of course, Ensign Parker scanning the horizon through binoculars that have no lenses in them - - what else?

THE SERVO MOUNTING TAPE MYTH

BY AL ALMAN

Once upon a time, back in the middle ages (of R/C), there were only servo mounting trays . . . servo mounting tape had not been invented yet.

Then, one day, an R/C modeler noticed the double-sided sticky foam tape that was being used for attaching rugs, mirrors and nick-nacks in many homes. Being resourceful (naturally), he recognized it as a convenient way to mount the new breed of servos appearing on the market.

And so, this double-sided sticky tape became available in hobby shops throughout the land, and was called "Servo Mounting Tape". Unfortunately, nobody put any real thought into how the tape could be used most effectively. Since it was supposed to be a magic cure-all for mounting problems, instructions were not considered to be necessary, and each modeler was left to "play it by ear". After many discouraging attempts at mounting, which often ended in servo failures, "The Servo Mounting Tape Myth" had begun.

This myth was then perpetuated in the same way it got started — improper installation. Surface preparation was ignored, and modelers soon found that one side of the tape stuck tenaciously to bare balsa and was impossible to remove without also taking part of the plane with it. In contrast, the other side of the tape would very often part company with the servo case at the most inopportune time (usually while flying).

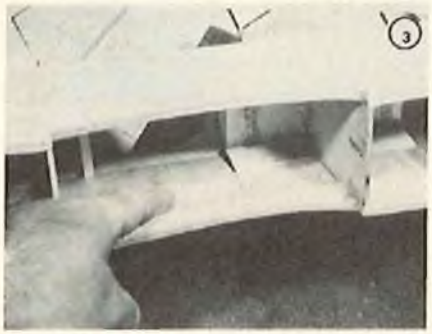
Servos were mounted individually to the fuselage floor, the tape on their bottoms. This type of installation allowed the servos to rock from side to side, resulting in binding and unwanted control surface movement. Because of this rocking motion, the servos would often hit each other and the airframe, causing shock damage. Sometimes a brick would be made by taping two or three servos together and bottom mounting them. Even with this arrangement, rocking was still evident, as was binding and undesirable control surface movement.

The end result was an untold number of broken airplanes, ruined servos, and angry, frustrated modelers. This put teeth into radio manufacturers' claims that servos should be mounted "the only way", in a servo mounting tray utilizing grommets and the built-in mounting lugs. Mounting tape was, and still is, considered to be a dastardly way to treat a servo.

As with any other tool, mounting tape can be invaluable if used properly. An

Installing hobby-type mounting tape on a servo.

Four different types of servos with mounting tape installed.



Preparing fuselage side for subsequent servo installation by smearing 5-minute epoxy on the area.

Preparing vertical aileron installation by smearing 5-minute epoxy on the longer side.

Quarter Midget installation showing two servos taped directly to the sides, and two servos mounted on Stand-Offs.

Super Kaos .40 installation shows Stand-Offs are slightly different. 1/4" square pine strips were epoxied to fuselage sides, and 1/16" ply plates were epoxied to them.

Vertical aileron installation showing a servo mounted in a Super Kaos .40 wing. The wing is deep enough to accept the entire servo.

ever increasing number of R/C modelers have realized this, and have been successfully using tape as their sole means of installing servos for years. They are convinced, as I am, that tape is safer than tray mounting and much more convenient.

I first started using tape in R/C cars back in 1968. After a year of running cars with no equipment troubles, I decided to try mounting my aircraft servos the same way, in spite of the many warnings and forecasts of doom from well-meaning modelers. These installations have included: large and small pattern ships; Quarter Midgets; a multitude of various size sport flyers; sailplanes; and for a year or so, racing cars. Servos used in these installations were: KPS-9's; KPS-11's; KPS-12's; World Engines S-4's; Ace Bantams; and a Dunham Dual Rack. Only one actual servo failure has occurred since then; a KPS-9 stalled and burned up due to a mechanically bad throttle installation. The few other apparent servo problems that have cropped up all turned out to be caused by flakey batteries.

At least part of the credit for this low servo failure rate must go to the preventative maintenance inspection my radio system received at least once each year, with servos getting a little extra attention. This kind of inspection is well within the capability of any RC'er - - - common sense, patience and a magnifying glass being the only requirements. You don't have to be "The Wizard of Menlo Park" to find most of the potential problems before they jump up and bite you. These inspections are vital for dependability and peace of mind, and I would have taken the time to perform them regardless of the servo mounting method used.

I mount my servos directly to the fuselage sides, first attaching two pieces of tape vertically to the servo case (photos #1 & 2), and then pressing the servo and tape to the fuselage at the appropriate place. Since mounting tape will only work properly if the surfaces it is applied to are smooth and clean, the balsa (or ply) fuselage surface must be given some sort of even, durable finish with 5-minute epoxy being perfect for this job. A generous amount of the epoxy is smeared on and allowed to cure while the surface is in a horizontal position (photos #3 & 4). This will provide a smooth, even mounting surface for the tape, additional strength to the area and will permit subsequent tape residue to be easily removed without harming the structure. This epoxy covered area and the servo case should be cleaned with alcohol before the tape is applied; otherwise, dirt and oil from fingers will prevent the tape from adhering as it should, with the distinct possibility of a servo coming loose in-flight.

Sometimes, because of longerons or trusses on the fuselage sides, there is not enough area to mount the servos. In this case, or if there is not enough clearance between a long servo arm that must be used and the fuselage, stand-offs must be glued in first. The thickness of this stand-off will vary according to each installation, from a 1/16" ply plate to a piece of 1/4" or 1/2" balsa sheet (photos #5 & 6).

Horizontal aileron installation in a Skylark wing. This is a twin . . open above servo is for throttle servo.

Plywood box for vertical installation in Super Kaos wing. Some tape residue from servo removal.

Servo about to be attached to ply plate which is part of horizontal servo installation.

Servo attached to horizontal mounting plate.

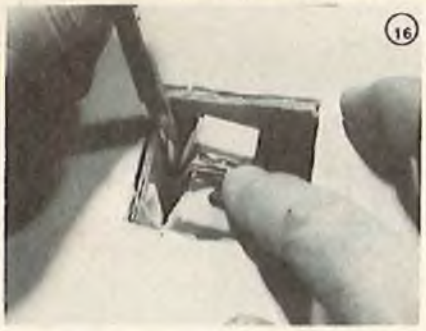
Servo attached to mounting plate, about to be installed in Skylark wing.

Servo and mounting plate in horizontal aileron installation.

Removing a servo from the Quarter Midget with a razor saw.

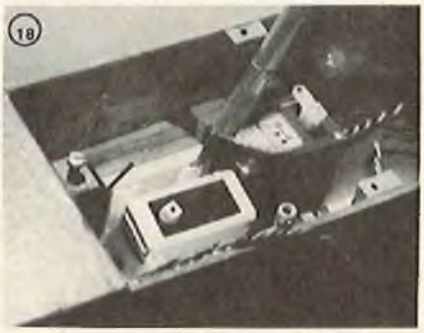
. . .and it comes right off with only a bit of tape left.

Aileron servos are mounted either vertically, to accomodate strip aileron linkage (photo #7), or horizontally, to accommodate a bellcrank or NyRod installation (photo #8). In both cases a plywood box for the servo is made in the center of the wing (photo #9). The four sides are made of 1/16" ply, while the bottom is 1/8" ply. Sometimes, in the



Removing servo from vertical alleron installation.

Removing the alleron servo from a Quarter Midget with a hobby knife.



Another view of Quarter Midget alleron servo being removed.

Rubbing tape residue off of servo case.

Another view of tape residue being rubbed off of servo case.

Slicing discount store-type tape lengthwise.

Servo with part of discount store tape installed.

Servo showing mounting lugs cut off.

vertical installation, the wing is not deep enough to accept the entire servo. In this case one of the sides of this ply box must be made high enough so that the servo can be mounted without bottoming out (photo #4 again). In the bellcrank/NyRod type of installation, however, the servo is mounted horizontally on a piece of 1/16" ply which is held to the 1/8" bottom with four 4 x 3/4" sheet metal screws (photos #10, 11, 12, 13).

The removal of a servo from any position is accomplished with either a hobby knife or a razor saw. After removing the pushrod or NyRod end from the servo arm (or removing the servo arm), the tape is merely sliced through, separating the servo from its mount (photos #14, 15, 16, 17, 18). The tape residue on the servo case and the mounting surface is easily removed by rubbing it with a finger tip or a piece of cloth mistened with alcohol (photos #19, 20 and also #9).

Double-sided sticky foam tape can be purchased from most hobby stores under the brand names of Bridi, Sonic-Tronics and Rocket City, or in discount department stores under a variety of names. There is an advantage to the department store brands — the rolls are larger and wider, and threfore more economical to use if they are sliced lengthwise (photos #21, 22). Until recently these discount store brands also enjoyed another advantage: They stuck to everything better than the hobby type tapes did. However, the hobby brands have improved within the last few years.

These tapes are available in 1/16" and 1/8" thickness. I've found that the 1/8" tape allows too much servo "float", which adversely affects the throw and centering of the control surface. The 1/16" thick tape eliminates this problem and still provides excellent isolation from vibration.

The horrified look on so many faces whenever I would mention using tape, accompanied by the usual rendition of "The Gospel of the Mounting Tray", used to make me feel guilty and intimidated . . . as if I were violating some natural law of man. I grew stronger and more resolute in my convictions however, as flight after successful flight proved that tape was, indeed, better than tray. I have since become adamant, perhaps almost militant, about the virtues of using mounting tape.

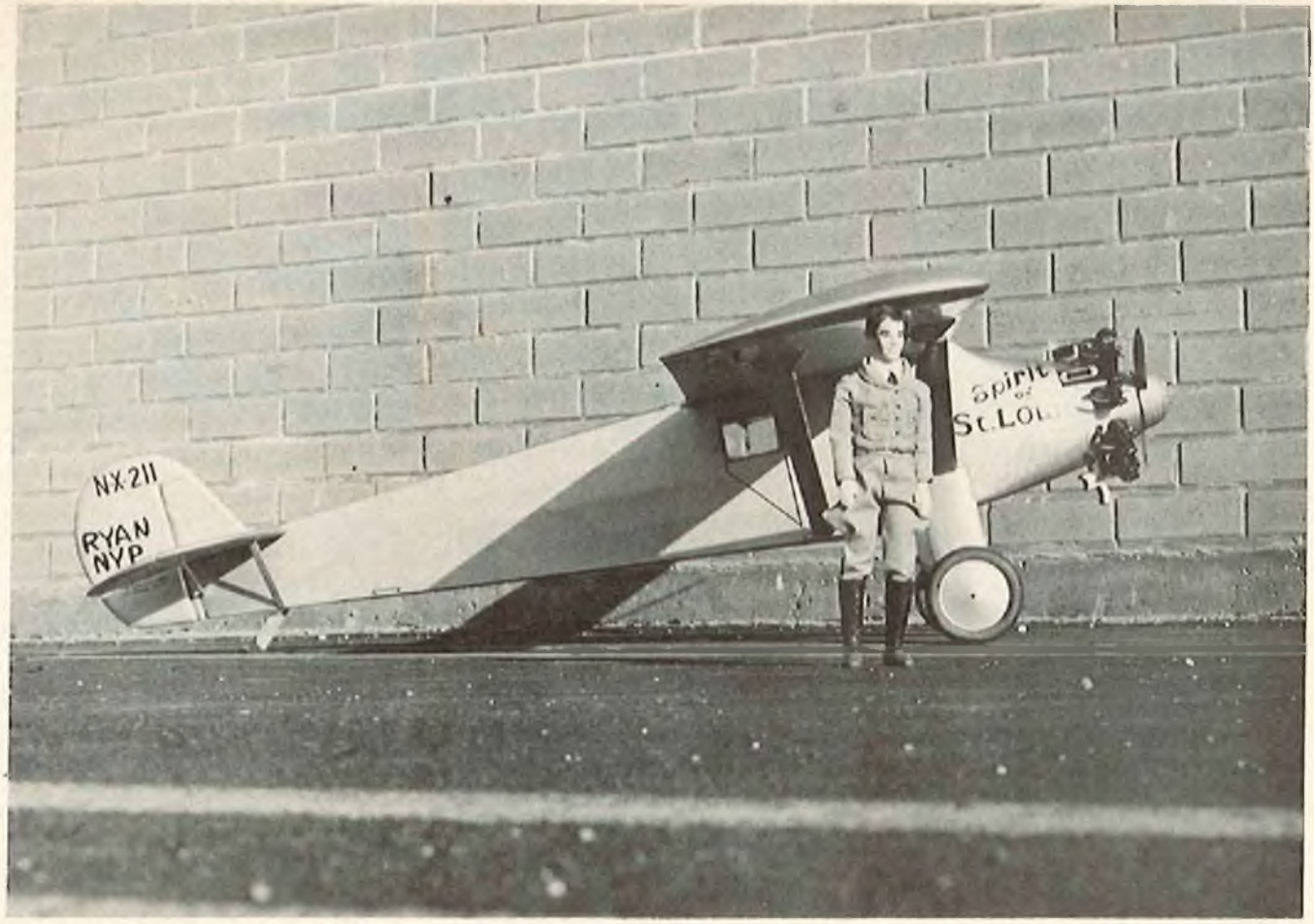
Take a look at the average mounting tray. Two or three servos are usually mounted side by side, the space between them so narrow that they often hit each other during normal operation. This cannot happen when servos are mounted individually by tape.

Now consider the isolation from vibration afforded each servo by the tray method. This isolation depends upon the grommets being neither too tight or too loose, which always seems to be a big question mark in the minds of most RC'ers. With tape, the servo is completely isolated from the airframe with no grommets to worry about.

Space is another consideration. A smaller space is needed for each tape mounted servo in comparison to tray mounting. The physical size of these tape mounted servos can be reduced even further by eliminating the unnecessary mounting lugs (photo #23).

Utilizing servo mounting tape gives you complete freedom in any installation. Servos can be mounted anywhere, without being limited to the dimensions of a tray. Each aircraft can have its radio installation tailored to its specific needs and still insure that servos have the protection so necessary for continuing reliability and longevity. □


Spirit
of
Louis



IN COMMEMORATION

of the 50th Anniversary of Charles Lindbergh's monumental flight, we present this pictorial submitted by one of our readers, Earl "Bud" Gay. The RC model is a much modified Royal kit powered by an O.S. .60 BH. It is covered in burnished silver MonoKote, has an 82" wing span and an all-up weight of 8 pounds. The figure is wearing an exact scaled down uniform as worn by Lindy and created by Charlotte Anderson. Note the extraordinary detail — down to the Hawk kit miniature model of the Spirit of St. Louis.

SPIRITS OF ST. LOUIS

Art Biehle with winning Spirit. Super Tigre power.

Spirits patiently waiting in the pits.

Al Poole with K & B powered Spirit.

Tom Davis' Spirit had a bad day.

The author, Walt Wilson with Rossi powered Spirit.

Line-up of Spirits and eight of the fliers.

BY WALT WILSON

PHOTOS BY FOREST TRENT

QUARTER MIDGET RACES

Everybody is doing his own thing in pylon racing. The Spirits of St. Louis R/C Flying Club is no exception. We've established our own one-airplane event using, you guessed it, the Spirit of St. Louis Quarter Midget (RCM, May 1972). All of the Spirits, except one, were built from RCM plans. One member chickened out and bought a Fibre-Foam kit.

Any legal Quarter Midget engine is allowed, and all planes must conform to current Quarter Midget rules. The only restriction is that they must be Spirts of St. Louis built either from RCM plans or from the kit which was derived from the RCM plans.

The Spirit of St. Louis QM is quick and inexpensive to build, and it also makes a good flying, economical sport aircraft. One roll of Solarfilm or MonoKote is sufficient to cover the entire bird. The radio compartment is large enough to accommodate most recent radios, and the tank compartment will hold a large enough tank to fly a .15 for quite a while. Admittedly, the Spirit QM is not as fast as some of the sleeker jobs like the "Rickey Rat" or "Miss Dara", etc., but it's an excellent trainer for the fledgling pylon racer. Plans for the Spirit of St. Louis (#491 - $2.50) are available from RCM.

Two races have been run with quite different results, showing that no one has dominated the action so far. Practically every competitive brand of engine was represented, but the relatively bulky airplanes seem to have an equalizing effect. A Rossi powered the fastest plane, however, first-time nerves, cut pylons in the first race, and a lost fuel tank filler plug, which caused a premature flame-out for a "0" in the second race, kept the screaming Rossi out of the winner's circle.

Art Biehl did an excellent job of flying smoothly and consistently with a Super Tigre to win the first race. This writer won a fly-off with Mark Been and Bill Chipman for second place. Mark Been cut a pylon on the first lap but managed to make up the lost lap, passing Chipman on the ninth lap for third place. Here are the results:

First Spirits of St. Louis Quarter Midget Race — (1) Art Biehl, 2.22, ST .15; (2) Walt Wilson, 2.11, Rossi; (3) Mark Been, 2.46, O.S.; (4) Bill Chipman, 3.01, O.S.; (5) Dick Teneau, 2.56, O.S.

Nine Spirits were entered. Fast time went to Walt Wilson at 2.11.

Spirits Al Poole, Al McCanney, Bill Chipman, and this writer flew their Spirit Quarter Midgets in a demonstration pylon race before a crowd of approximately 100,000 people at the Open House at Scott Air Force Base, Illinois, on September 19, 1976. This writer won that race. Al Poole also put on an aerobatic demonstration with his Spirit that had the crowd cheering and applauding.

Mother Nature and the first throes of the severest winter in the history of the Weather Bureau discouraged a number of Spirits from participating in the second race, but a stalwart few appeared to do battle. We flew in intermittent rain with fog, 40° temperatures, and a 15 mph wind. We came close to cancelling but it was late October and the weather was probably not going to get any better; we already had the trophies engraved, etc.

Dick Teneau started a winning day by flying a smooth consistent course around the pylons and won all his heats except one. This writer's Rossi made up for a first heat flame-out by lapping the bearded one's O.S. in a subsequent heat. The "0" we earned in the first heat couldn't be overcome, and the fly-off for

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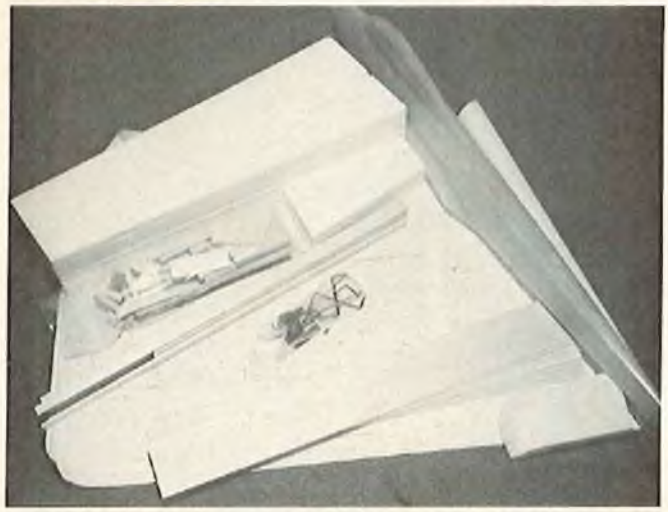
RCM PRODUCT TEST

Bridi Hobby Ent.
DIRTY BIRDY



IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	●					Pre-Shaped Parts	●				
Plans	●					Parts Match to Plans		●			
Written Instructions	●					Overall Parts Fit	●				
Quality of Hardwood	●					Ease of Assembly		●			
Quality of Fiberglass			●			Fidelity to Scale			NA		
Other Materials		●				Flight Performance	●				
Accessories		●				Overall Appeal	●				
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

The Dirty Birdy is a sport pattern aircraft manufactured by Bridi Hobby Enterprises. Designed by noted pattern flier, Joe Bridi, this .61 cubic inch displacement powered aircraft has a 64" wingspan with a total wing area of 690 square inches and is capable of all AMA and FAI maneuvers. It is designed for operation with the four primary control surfaces plus retractable landing gear.

The kit consists of a fiberglass fuselage with plywood and hardwood; a foam core, balsa sheet and plywood wing; and foam and balsa tail surfaces. The hardware with the kit includes a Kraft-Hayes motor mount, pre-bent landing gear, aileron torque rods, rudder horn, left and right elevator horn, nosegear bearing block, and steering arm. One unusual feature of the kit is the independently adjustable elevators.

With regards to any possible modifications, we would strongly recommend a very powerful engine, as this significantly affects the aircraft's performance. One of the new Schneurle ported engines is a must. With this aircraft, speed is a definite asset. This, in turn, requires a large fuel tank such as the Sullivan SS-16 which fits nicely with no modifications. This is a very fine kit. The fuselage seam required considerable filling, although other Dirty Birdy kits inspeced did not have this problem. One wing core had a very slight sag.

Our prototype weighed 131 ounces ready to fly, for a wing loading of 27.3 ounces per square foot. Our Dirty Birdy was finished with K & B glass cloth with K & B surfacing resin over all wood areas. The aircraft was primed with auto primer and completely finished with K & B Super Poxy. We used a Webra Speed .61F on a Fox aluminum motor mount and a MACS flow-thru muffler. A World Engine Expert 5 channel with S-11 servos and Carl Goldberg retracts were utilized.

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SPECIFICATIONS

Name	Dirty Birdy
Aircraft Type	Sport-Pattern
Manufactured By	Bridi Hobby Ent. 1611 E. Sandison Street Wilmington, California 90744
Mfg. Suggested Retail Price	$119.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Comp. Trainer
Wing Span	64 Inches
Wing Chord	10¾" (Avg.)
Total Wing Area	690 Square Inches
Fuselage Length	54¾ Inches
Radio Compartment Dimensions	(L) 13" x (W) 3" x (H) 2¼"
Wing Location	Low Wing
Airfoil	Symmetrical
Wing Planform	Swept L.E.
Dihedral	3/8 Inch
Stabilizer Span	27¼ Inches
Stabilizer Chord (Incl. elev.)	7¾" (Avg.)
Total Stab Area	212 sq. Inches
Stab Airfoil Section	Symmetrical
Stabilizer Location	Mid-Fuselage
Vertical Fin Height	10" + sub fin
Vertical Fin Width (Incl. rud.)	9" (Avg.)
Mfg. Rec. Engine Range	.61 cu. in.
Recommended Fuel Tank Size	12-14 Ounce
Landing Gear	Tricycle
Recommended No. Of Channels	4 + retracts
Recommended Control Functions	Rud., Elev., Throt. & Ail.
Basic Materials Used In Construction:	
Fuselage	Fiberglass, Hardwood & Ply
Wing	Foam, Balsa & Ply
Tail Surfaces	Balsa & Foam
Hardware Included In Kit	See Text
Plan Size	56" x 30" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (12 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	120-132 ozs.
Wing loading based on rec. flying wt.	25-27.5 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	131 Ounces
Wing Loading	27.3 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Webra Speed .61
Muffler Used	MAC'S Flow Thru
Radio Used	World Engines Expert
Tank Size Used	16 Ounce

RC GOES TO GRAND OPERA

By Arthur J. Sabin

Photos By David H. Fishman

Olympia – "The Automaton – in action on the radio controlled carriage.

Our understanding and involvement with radio control have provided us with insight into how man-made "seagulls" can fly and a "Zeppelin" made to slip through the air. Now R/C has invaded a most improbable area — Grand Opera. But then, perhaps it's not so improbable after all.

Opera often demands that fantastic illusion be created for the audience. This or that thing or person appears or disappears - - - movement of supernatural nature may be part of the storyline. To achieve such illusions and movements and have them believable has, for generations, challenged the skill of designers and technicians working in the field of Grand Opera.

Few operas present the challenges contained in Jacques Offenbach's "Tales of Hoffmann." E.T.A. Hoffmann, whose stories are strung together for this opera, was a genius whose mind envisioned men and women moving in and out of animal existance, mechanical dolls that move, statues that sing, glasses that, when worn, change inanimate into animate life and people who appear and disappear at regular intervals. Three of these Hoffmann stories (collections of these "Tales" are still quite popular in book form) were put together into a libretto by Jules Barbier and Michel Carre for an opera with Hoffmann (the author) becoming the central character of his own stories involving three love affairs. Jacques Offenbach took that libretto and composed some of the most beautifully lyrical music ever written. Even if you are not an opera buff, certainly you have enjoyed the famous Barcarolle music.

In the first act, Hoffmann, wearing magical glasses, falls in love with what is evident to all but him — a mechanical doll. The doll is a product of an engineering genius and an evil compatriot, the latter having provided her with "operating eyes." The challenge to the designer is how to create the illusion of a "human doll", an "automaton" that glides around a huge setting while regaling the onstage and viewing audience with a spectacular aria. A delicate balance is thus required; the performer (Olympia) must move with smoothness and grace and yet obviously still be a mechanical device.

Through the gift of a benefactor, the Lyric Opera of Chicago made an investment of $200,000 to create a basic set full of visual wonders. An Italian, Ezio Frigerio, was commissioned to design the set and faced with the problem of the "automaton" Olympia, turned to the use of a radio controlled carriage to carry and move this first of Hoffmann's loves on, around and off the enormous stage of the Civic Opera House in Chicago. The result was an illusion that was perfect and perfectly astounding!

The carriage was made of wood worked into a circular shape with a circumference of approximately 10 feet. It was mounted on wheels that fit on to tracks sunk into the floor of the stage; the carriage revolved by rotation of its top which floated on a spindle-like device mounted through the center of the carriage. The track led out to the middle of the stage, then circled around and came back to the same main track leading off the stage.

Two 24 volt motors, using double belt driven shafts, were used to power the carriage, one to move the carriage forward or back on the track, the other to rotate the top of the carriage to the left or right. The power for the motors came from two 12 volt automobile batteries (in

series) mounted inside the two foot high carriage.

Olympia's dress flowed over the carriage so that she indeed appeared to float across the stage as she demonstrated her mechanical abilities (playing the violin, drinking tea, etc.) all the while singing a delightful aria, but requireing "winding up" twice, in order to finish the singing — to the understanding delight of the onstage as well as the viewing audience, to all except poor Hoffmann who viewed the spectacle through his "magic glasses" seeing only the beauty of his gracefully floating love.

The demands on the artistry of the singer, Ruth Welting — the Olympia — thus including the rendering of an exceedingly difficult aria, as well as acting the part of an "automaton" while standing well over 7 feet tall (2 foot carriage plus over 5 feet of her person) and moving on a carriage that rotated as well, during her singing, were such that hours of practice were required. She had to become comfortable on the carriage and so it was operated over many rehearsals with Miss Welting becoming accustomed to its movements, all of which were radio controlled from offstage.

When the carriage and transmitter arrived from Italy, there were literally no instructions on how the mechanism operated! The technical director and his staff (none of whom were acquainted with R/C) had to figure out how the "thing" worked by hit or miss. They referred to the transmitter as "the box." It was a Futaba, model FPT2G, obviously modified for the purposes described. It was quite a struggle to figure out the battery system for the transmitter and receiver, which operated on dry cells; they had to be replaced just once and only in the receiver.

Mr. Tommy Nolan, a capable electrician, was put in charge of "the box" and its mysteries; only he was allowed to operate the device. A special stool was provided so that he could stand above the other heads in the wings and see Olympia as he moved her on her carriage. It was also he who spent hours working with Miss Welting, as well as constantly testing the device between rehearsals and performances. He understood that the receiver in the carriage received the signals and that through servos, relays activated the motors that moved the carriage. The left stick moved the carriage forward and back on the track. The right stick, when moved to the right, rotated the top clockwise and to the left counter-clockwise. There was no control of speed, only direction, though by centering the left stick, the carriage could be stopped at any point and then rotated in any direciton. Imagine working all of this out without instructions!

"Any trouble with the mechanism?" I asked Mr. Nolan. His response was, "Not really, except during one of the seven performances, for just an instant." He stated that he seemed to lose control. "A glitch," I responded, a term he had never heard.

It had been determined by Nolan that the frequency the system operated on was 27.095 (orange) and that while in Italy that frequency was clear of other users, the potential overlap by CB'ers and others (as we all know) was a real potential.

Literally, they held their breath during the performance because while they understood that on one would be operating another radio controlled device near the opera house on that frequency, someone close to it could splash over enough to send Olympia flying across the stage or have her singing with her back to the audience. Happily for all involved, it didn't happen.

Thus did radio control invade Grand Opera and with grand results. I saw the "Tales of Hoffmann" twice, the first time on opening night and devotee though I be of R/C, I was mystified as to how they did it. It never occurred to me that it was a radio controlled "automaton!" The second time around, having learned the secret, like a poorly disciplined magician, I delighted in explaining how that, which controlled my airplanes, controlled Olympia. Buy why shouldn't R/C be used in the Opera? Haven't we always boasted of its unlimited possibilities? When Opera utilizes R/C to enhance some aspect of fantasy or beauty, isn't that just another example of "doing our thing?"

●

Looking into R/C carriage. Note two 12 volt auto batteries being charged before the next use.

"The Box" – transmitter in hands of Tom Nolan; Futaba model 7PT2G, only receiver dry cells required replacement.

Receiver door open – holds receiver batteries (dry cells) & servos for activating relays. No instructions came with the unit when it arrived from Italy!

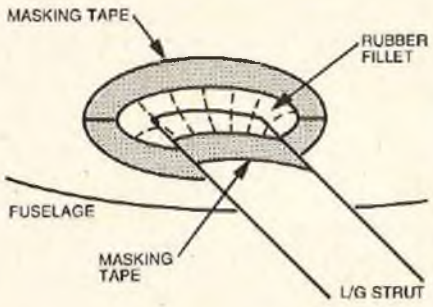
Away she goes – note cover now in place upon which Olympia stands. Tom Nolan holds transmitter as test run begins before performance at the Lyric Opera that evening.

Backstage at the Lyric Opera. The carriage is seen with the cover removed. Note center spindle & spokes used to revolve the top.

The R/C carriage weighed 300 pounds! Takes 4 huskies to place it on its tracks for a run.

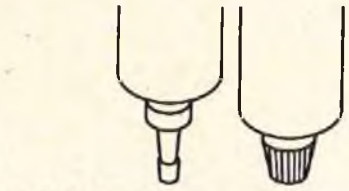
FOR WHAT IT'S WORTH

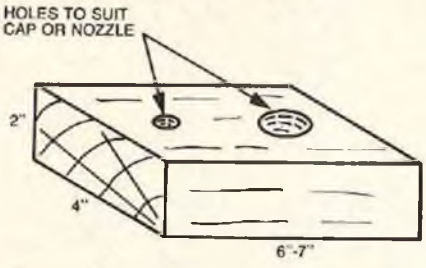
Major R.H. Jacquot, APO New York, writes that scale landing gear fairings between the fuselage and main strut are usually a problem, because of the flexing of the strut wire at this point. Either one must leave an unsightly gap here to allow for the flexing or accept distortion of the fairing due to the landing stresses. Major Jacquot's method allows an easy, scale-like, flexible fairing without any gap in the finished product. Depending on the expected amount of flexing, leave a 1/8" to 3/16" gap between the strut and fuselage. When all painting is finished, mask off the strut and fuselage where the fairing is wanted with thin masking tape. Use one layer of tape and do a neat job. Sand the area lightly to give "tooth" to the surface. Major Jacquot uses Dow Corning Silicone Rubber Bathtub Caulk (white), and mixes in powdered fiberglass pigments to match his paint job. Since the silicone rubber starts to skin over in about five minutes, use only what you need and work fairly rapidly. Apply the pigmented rubber between the strut and fuselage, and fillet the compound with a wet finger to the masking tape edges. When it is as you want it, allow it to set overnight and then peel off the masking tape. The tiny ridge left after the tape need not be removed because, on the full scale aircraft, such fairings are fabricated from sheet aluminum and the edges of the sheet metal panels are readily apparent.



If you have been using MonoKote or Solarfilm and cursing every time you come to a corner or concave surface, such as wing and tail fillets, here is a quick, durable solution suggested by Terry Terrenoire of Endicott, New York. Cover all surfaces prior to assembly. Then, cut away the plastic covering where wood will join wood and epoxy the parts together. After the glue has set, lay in a bead of silicone bathtub caulk and run your finger over it to a nice smooth finish. Let dry overnight and you have an indestructable joint. If you are using white or black, you will have a perfect color match for both MonoKote and Solarfilm. The GE Silicone silver is also a perfect match for silver Solarfilm.

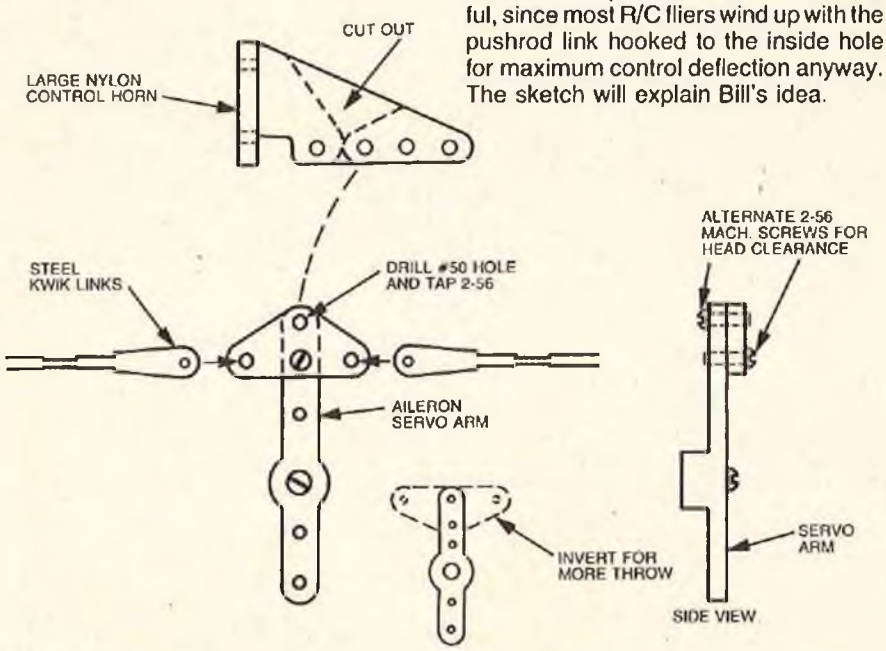
When you're using the large five minute epoxy bottles, and they are less than half full, it takes longer to get the material out of the bottle than it takes to cure! To solve this problem, Nick Ziroli of Smithtown, New York, stores the bottles upside down. Nick takes a short piece of 2" x 4" wood, about 6" long, and drills two holes in it, in which the cap will fit tightly. These wood stands become a little messed up after a while so he makes a few at a time and throws the old one out when it gets messy. The sketch should be self-explanatory.



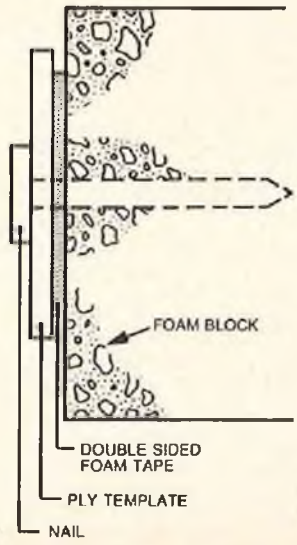


Charles V. Fox, Jr. of North Bend, Oregon, suggests that aluminum plate up to 1/4" thick can be cut on your Dremel saw. The secret is a liberal application of light machine oil. Fancy scroll work isn't possible, but you can make fine motor mount plates . . .or?

A quick, easy, effective and inexpensive aileron coupler that broadens aileron adjustment capabilities has been suggested by Bill Skipper of Greeley, Colorado. The large control horn from which the coupler is borrowed is still useful, since most R/C fliers wind up with the pushrod link hooked to the inside hole for maximum control deflection anyway. The sketch will explain Bill's idea.

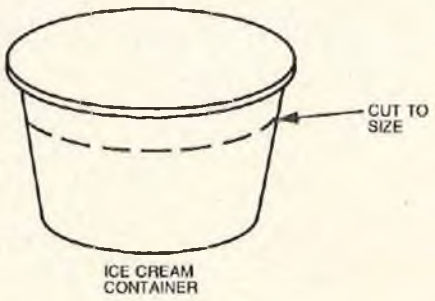


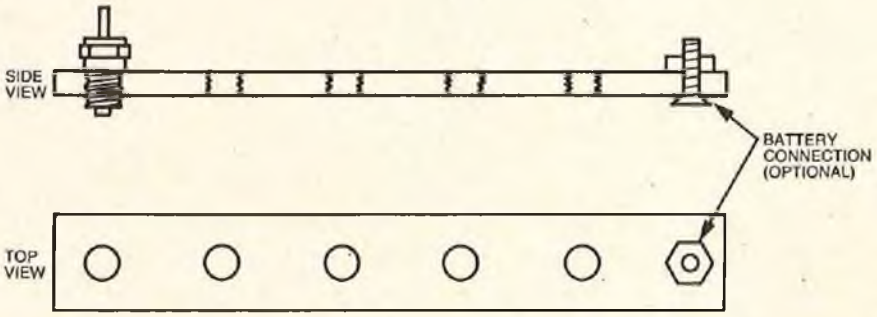
Magna Norland of Oslo, Norway, submitted this technique he's used to fasten the templates to foam cores when cutting wings. Using this method, the wings are warp free when the hot wiring is completed. Draw centerlines on both the foam and templates. Then drill 3 to 4 holes along the centerline of the template. Add some pieces of doublestick tape to the templates and then push nails through holes in the template. Align the tips of the nails with the centerline on the foam block and then push the template into the foam block. The dual sided tape ensures a firm non-slip adhesion to the foam. Using only nails causes somewhat sloppy adhesion.



FOR WHAT IT'S WORTH

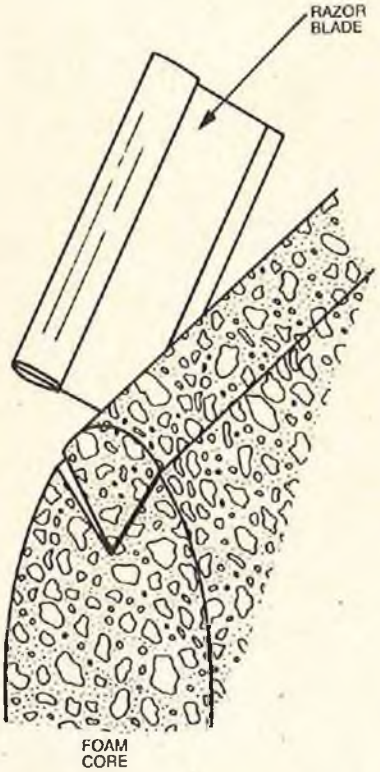
Frederick Alexander of New York, New York, submitted the sketch showing a spare glo-plug carrier, which he designed, and finds very convenient and practical to use. The bar can be either brass or aluminum, while the holes for the glo-plugs are threaded with a 1/4-32 tap to accept the glo-plug. This unit, complete with spare glo-plugs, can be carried in your tote box and each plug can be visually tested by attaching one wire from the battery to the bar itself, and the other to the electrode of the plug to be tested.

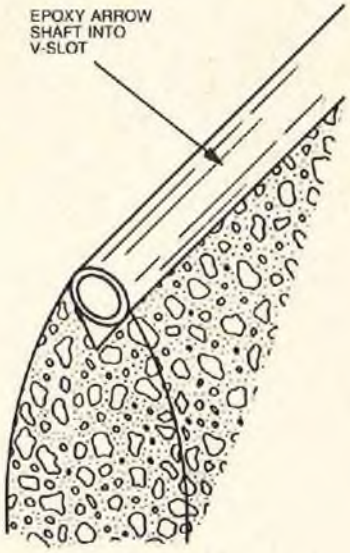




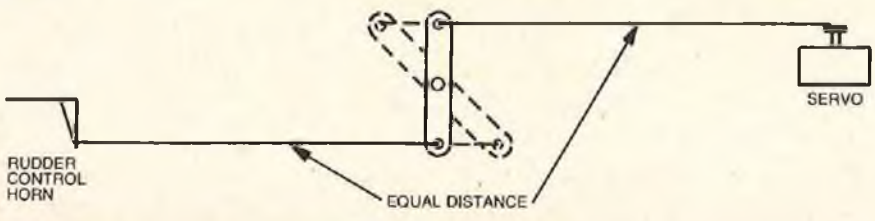
Here is a suggestion from Vincent Pollizzotto of Oceanside, L.I., New York, that he has used on a modified Aeromaster. Vince used a cowl instead of the usual blunt nose as indicated on the plans. You can get a perfect cowl from the ice cream counter in your supermarket. It is a one half gallon plastic container in which ice cream is packed. They are 4⅞" deep x 6¾" in diameter, tapering to 5½". A container is made by Sweethart Plastics Company, Wilmington, Massachusetts #064S. The cowl can be fiberglassed inside with epoxy and glass cloth. After taking the shine off the outside area, it can be painted with a coat of balsa filler coat, sanded smooth, then sprayed with Sears Acrylic enamel. The latter is obtainable in 13 ounce spray cans (#5648) and is fuel proof.

A simple, effective method for eliminating those soggy, unsightly, and irritating leading edge dents in foam wings was suggested by Bill Skipper of Greely, Colorado. As you can see from the sketch, an added bonus is a more rigid wing with minimal added weight.





The problem of trim changes due to the expansion or contraction of the control rods can be eliminated by the system shown in the sketch submitted by Robert A. Johnston of Cornwall, New York. This consists of a straight bellcrank installed half-way between the servo and the control horn. It is important that (1) the bellcrank be at the mid-point between the servo and the control horn and; (2) both arms of the bellcrank be of equal length and; (3) both parts of the control rod be made of the same materials. The diagram shows, in solid lines, the position of the parts at some normal conditions. The dotted lines show the position under conditions which expand the control rods. The expansion of the front half will push the end of the bellcrank back, thus bringing the other end forward to a distance equal to the expansion of the first half of the control rod. Since the second half of the control rod is identical to the first, it will expand the same distance, leaving the control horn in its original position. A little thought will indicate that this will also compensate for changes in the structure of the plane due to expansion or contraction, provided the materials fore and aft of the bellcrank are the same.



As most of us keep several hobby knives on our work bench, to keep them handy and sharp, try storing them in an old drinking glass with a piece of sponge in the bottom. According to Robert Govro of Albany, Oregon, this keeps them sharp and easy to reach. Bob also likes to identify one as a new blade by putting a piece of colored tape on the handle. Blue is new, black is dull, etc.

□

DIRTY BIRDY

from page 93

The only word we could use concerning the flight performance is super! The Dirty Birdy is very stable throughout its entire speed range and you can really drag it in without worry of tip stall. All maneuvers are easier the faster you go with this aircraft. □

QUARTER MIDGET RACES

from page 92

first place was between Dick Teneau and Mark Been, who had each won all their heats except one in which they had each finished second.

Teneau and Been lined up for the fly-off and each fired his engine. Been's K & B screamed briefly and quit suddenly, leaving the prop free wheeling. A fast check revealed a broken crankshaft. The results of the second race are as follows:

Second Spirits of St. Louis Quarter Midget Race — (1) Dick Teneau, O.S.; (2) Mark Been, K & B; (3) Walt Wilson, Rossi; (4) Joe Nabor, Super Tigre; (5) Pat Keebey, O.S.

Five planes were entered. The planes were not timed due to a shortage of stopwatches.

Interest in pylon racing is really growing in the Spirits club and several members are now racing who wouldn't have considered entering a contest a few months ago. Ray Sargent was Contest Director for both events and did an excellent job, as did all of the workers who also braved the elements.

We consider the experiment a success and plan to continue the Spirits' Spirit QM races in the 1977 season. □

DU-BRO COLLECTIVE PITCH

from page 74

36. Install 2-56 threaded ball to inner ring of pitch plate; now slip plate on main shaft.

37. Ball links installed on rods.

38. Snap pushrods on control arms on jack shaft and onto pitch plate.

Make up pushrod as shown to go from swash plate to fly bar control arm.

40. Completed pushrod.

41. Pushrod installed on swash plate.

42. Make up a pushrod to go from collective servo to the main control arm.

43. Pushrod installed on servo and main control arm.

44. Make up tail rotor control arm using 4-40 bolt and swivel links with 1/16" collar. Follow book instructions here for setting up tail rotor controls.

45. Set rotor hub on main shaft letting it rest on spring mount collar.

46. Set yoke assembly on main shaft and lift hub assembly up to yoke. Install 1/2" bearing on each side of hub and then install 10-32 bolt through bearings and yoke through main shaft.

47. Pushrod made up and installed from pitch plate to pitch yoke.

48. Make two pushrods from 2-56 x 1" studs and ball links. Rods should be 1⅜" center ball to center ball.

49. Snap rods between pitch yoke and blade arms.

50. Now attach springs to spring mount collar with 6-32 x 1/2" bolts.

51. With springs and pitch arms disconnected, balance blades and adjust lead-lag nuts until blades hand level. After balancing is complete, then snap pushrods back on arms and connect springs.

52. Make up blade gauge on flat surface.

53. Use gauge to adjust blades when at full pitch. Blades should be flat on gauge.

54. View of tail rotor control and mixing lever in low pitch position.

55. View with high pitch.

56. Flying the Shark .60 without fuselage for easy access to control adjustments. Note 2" x 4" x 20" pine block on skids for balance. Note flag on transmitter, strong tail wind.

57. After 30 minutes all adjustments made and the fuselage is fit to the Shark .60. Note wind had died.

58. Du-Bro Shark .60 with Expert Collective Pitch Head. Ours is a fine combination with a 1st Place win in Expert Class on its first contest outing at the 1977 Atlanta Helicopter Championships. □

RACING AT RANDOM

from page 73

that there is strength in numbers. The more members, the more of an impression is made upon AMA, the manufacturers, and the model media. These are the hidden benefits working for you and exhibit your gratitude to all those fine people above.

Show your appreciation – bring a new one in.

Leonard Wiederhoeft
817 Fairfield St.
Mechanicsburg, Pa. 17055
(717) 766-2468

Another item from Len in the same newsletter.

Dear Formula One Pilot:

I would like to extend an invitation to you gentlemen to come take a look at what is happening in Quarter Midget. If you tried QM's a few years back and didn't like them – that's all changed. If you were annoyed with the rules – 1978 rules are now more uniform. Most events this year are already going to the 78 proposals. Take a new look, you may like what you see!! My address and phone is above, if you want to tell me it's not a whole new game over 1975.

Len

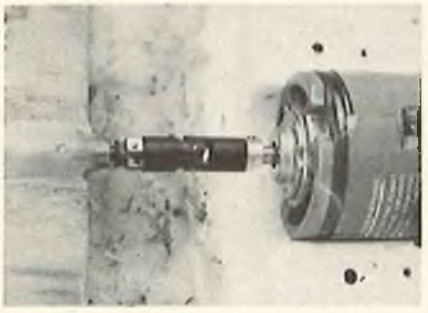
□

POWER BOATING

from page 72/70

Double ball and socket coupling.

A brass connector from a domino block, silver soldered to a piece of wire which is epoxied to hull. Aerial held in place by BOTH screws.



A very good plastic coupling, the HUCO, comes in 4 sizes, for up to .60 c.i. motors.

coupling, and as far as electric boats are concerned, the best I know of is the Huco coupling, but I don't know if it is available in the States. Take a look at the photo, and you will see what it is like.

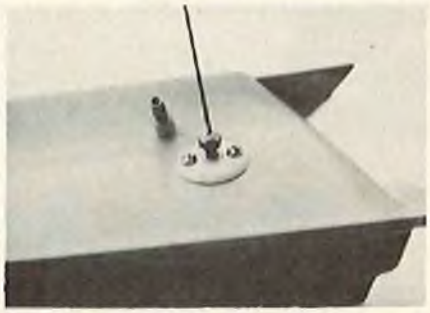
to page 102

from page 100/70

There are quite a few couplings of this kind around, used on industrial jobs — if anyone knows of one that is easily obtainable, perhaps they would tell us of it, together with the address.

Another question was on electronic throttles, and here I can be of some help. The Vantec is as good as anything, mine is working fine, and gives no bother. Anyone needing a throttle for an electric boat would do well to try them (see ads). Ray Kroker also makes a very high-power throttle unit.

How do you fix the receiver aeriel on the boat? Well there are several ways, see the photos. Don't use the banana plug system on an internal combustion powered boat. I once had one jump out of the socket, due to vibration, which cost me a new piston and cylinder in a Rossi, which is an expensive way of learning! The screw type is made by Racing Models of England, but for electrics, the domino connector is as good as any.



Racing Models simple screw-in aerial, with molded plastic base. Simple and practical.

Banana plug and socket fitting. Beware of vibration with this one.

What lubricant do you use for electric motors? The short answer is — none. Or at least, not on shielded ball-race shafts. Perhaps a tiny drop of very light machine oil on plain bearing motors, but really a tiny drop, because if that oil gets on the the commutator segments, it does no good at all.

•

Well, it looks like I have run out of space for this month. Keep those letters coming in and, above all, have fun! □

from page 67

The ideal wing location for 95% of the tracks you'll run on, will have the leading edge of the wing 2" behind the wing tubes, as shown, with 20 degrees to 30 degrees wing angle. Mount the wing as high as the rules allow.

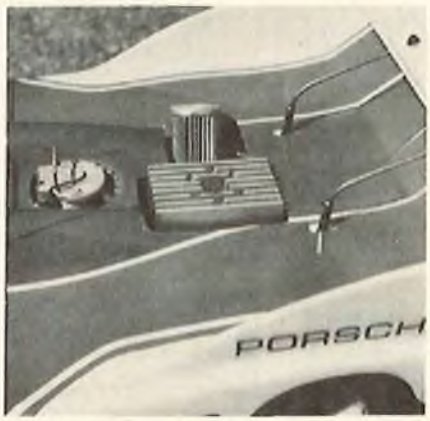
If your wing is mounted with the leading edge of the wing even with the wing tubes, as shown, you will not have enough rear end bite and your car will be difficult to drive. Always run a wing.

"tilty". The wing you'll use 95% of the time on sports cars, should have the leading edge of the wing 2" *behind* the wing tubes, with 20 degrees to 30 degrees angle, depending on your track. This puts maximum "bite" or "traction" on the rear tires, allowing you to "punch" harder and sooner coming out of corners without spinning out. In very rare instances where you might want more steering, try a wing with the leading edge 1" behind the wing tubes. Mount the wing as high as the rules allow.

On Formula I, Indy and G.T. (coupe) cars, mount the wings as far back and as high as the rules allow. Use a 30 degree angle. On Indy cars, do not use excessively large wing side dams. Large side dams will make the car stable in a straight line, but will make it "twitchy" in the corners.

to page 110

from page 106/67



A common mistake is to trim out bodies so they fit very close to the wing tubes, head, etc. The chassis has to be free to flex. If the body is mounted too tight, it prevents chassis flex & the car's handling will be affected. The body should be mounted tight in front, but at rear, there should be at least 1/4" clearance between the wing tubes front & rear. You should also have 1/4" clearance around the head, filler, fuel filler, etc.

Steering Travel

One of the biggest misconceptions most racers have is that they think the front wheels must travel "lock to lock" on all tracks. This only gets them into extreme over-steer conditions, making it impossible to drive. I would strongly recommend that all beginners start with the linkage coming from the steering servo; go to the farthest outside hole in the steering servo saver. This is the hole closest to the left hand side of the car, or the hole farthest away from the servo saver mounting bolt. The important thing is not whether the wheels go lock to lock, but, rather how easy it is to drive the car. If you feel you need a little more steering, go in *one* hole at a time and try it. Don't over-do this step — it's *extremely* important.

Tires

We could do a whole article on tires. There are many good tire manufacturers on the market. Choose your brand. Normally, you want the most rear traction you can get. You should have 2 or 3 different types of front tires. Try them all. You'll find different compounds of front tires can drastically change how your car handles. If you run on slippery, no traction tracks, then a harder front tire will cut down on front bite, helping to keep you from spinning out in corners. If you have a high traction track, then softer, or special compound tires, such as Associated #832 front tires, will help. For people who run in the rain, rear capped tires work well.

Instructions

I'm sure all of you read the instructions when you assembled your new car. After you've run it awhile, I would suggest that you read the instructions a second and even third time. It can really help you. It's very hard to read all the instructions at one time and remember them all.

Handling Is Very Important

Every once in awhile, someone will hand me their transmitter and ask me to drive their car during practice sessions. Half the time, I'll give them their transmitter back after one lap and tell them I can't drive their car the way it's set up. I know they feel, because I'm an Expert, I should be able to drive anything — but it's not quite that simple. I can only drive good when my car is handling great.

Emerson Fittipaldi was twice World Champion in 1/1 Scale Formula I racing, in 1972 with Team Lotus and again in 1974 with Team McLaren. He then

to page 112

PIT STOP

from page 110/67

started driving a new car, the Copasucar, for his brother Wilson. In the last couple of years in this car, he has done miserably, even failing to make the starting line-up on a couple occasions! We're talking about a two-time World Champion. I've had the privilege of seeing him drive 3 times. Two of these occasions were at Formula I races at Long Beach, where he was struggling in the middle of the field with an obviously poor handling car. On the other hand, I also saw him drive in the IROC Series at Riverside, with identically prepared racing Camaros, driven by the best drivers in the world. On this day, he was easily the best. He started in last place and passed 5 champions before his engine blew! To me, Emerson is still a World Champion, but he can only show his true potential with a good car.

You too, might be a potential R/C Car Champion, but you'll never know if you drive an ill-handling car. Spend as much time as you can on getting your car to handle as well as you know how. Then it will be a lot easier to go a lot faster.

Good luck in your racing. □

MAGNUS ROTOR

from page 66/65

using lead tape as shown in Figure 5.

The first design of the wing release mechanism is shown in Figure 6, while the second and last wing release design is illustrated in Figure 7.

After several successful Magnus Rotor landings were achieved with the power glider, Bill proceeded to construct from scratch an Ugly Stik powered by an O.S. Max .60. Modifications included making the wing panels rotatable, making the plane a tail-dragger, utilizing an

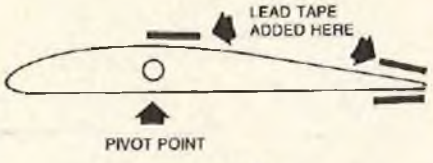


FIGURE 5

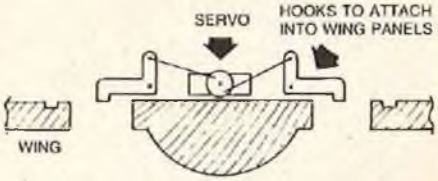


FIGURE 6

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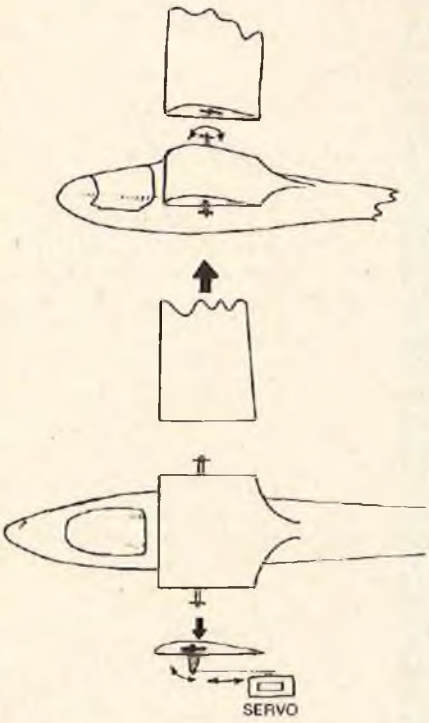

FIGURE 7

all movable elevator, and engineering a vibration resistant wing panel release mechanism. The completed model used five channels operating rudder, elevator, throttle, elevons, and a wing panel release mechanism.

The test flights for the new model consisted of flying the model at its normal flying speed and then activating the wing panels into the rotating mode. During the testing period, Bill varied the various aerodynamic characteristics such as dihedral, elevator, and wing position. His tenth attempt proved to be very successful. Upon activating the wing panels free, the plane ascended slowly at about half its normal flying speed. Throughout the flight, the plane remained completely stable.

This has been a two year project for Bill Walker. The first year, he proved the Magnus Rotor landing with the powered glider. At that point, he entered it in the local science fair as previously mentioned. This year, Bill entered the entire project which included both the powered glider and the modified Ugly Stik. He was awarded first place overall in Physical Science which won him an all expense paid trip to the International Science Fair held at Cleveland, Ohio. Other special awards included first place on his Technical Paper at the project, a first place certificate from the American Society of Mechanical Engineering, in addition to the awards previously mentioned.

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MAGNUS ROTOR

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With help from his science teacher, Bill was able to place in a NASA-student program for the entire school year where he was able to work with a research scientist in the field of aerodynamics. Currently Bill is preparing to do some wind tunnel studies on his Magnus Rotor project.

Continuing the competition at the International Science Fair, Bill Walker was awarded second place overall in the field of Engineering, a first place certificate from NASA, which included an all-expense paid trip for two to Cape Kennedy to watch the Voyager space launch on August 19, 1977, a second place medal and plaque from the Army, a $50.00 bond and a first place certificate from the Department of Transportation, plus a first place certificate from the Patent Department. Shortly after the competition, an aircraft company in North Carolina offered 17 year old Bill Walker a summer job.

R/C Modeler Magazine extends its congratulations to Billy Walker for an outstanding effort in the field of aeronautical engineering and aerodynamics, as well as a valuable contribution to model aerodynamics, especially in the field of radio control. □

RADIO SPECTRUM

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and brittle with time. The solution is to replace the whole wiring harness, servo cables, switch harness, etc.

I usually like to put flight tested equipment in new airplanes, so I borrowed a servo from partner, Bill Salkowski, which he had been flying in his Patricia. While range checking the second day out, my ailerons quit at a relatively short distance. However, it was not due to running out of range, but to a servo motor with dead spots. The moral of the story is to get your system overhauled periodically or sell it and get a new one every couple of years. If I crash now, it will probably be because I don't follow my own advice and I keep on flying that four year old transmitter. If I don't weaken, I'll see you next month. □

FLYIN' FLIVVER

from page 60/57

with silkspun Coverite. Prime coats were with K & B Superpoxy Primer. The wings, horizontal tail surfaces and fuselage side portions were finished with a

2/3-1/3 mix of K & B Superpoxy yellow and white, with satin finish catalyst. If you have used yellow in the past, you are well aware of its poor covering qualities. It helps considerably to tint your primer with some yellow if you decide on that color. The fuselage and vertical fin and rudder were painted with 2/3-1/3 mix of K & B Superpoxy blue and white, with satin finish catalyst. The "Proud Klutz Logo" on the fuselage sides was applied with Chart Pak "velvet touch" transfer lettering, and covered with K & B clear satin finish. The "velvet touch" type lettering is available in most drafting and/or art supply stores. It is different from the other brands of transfer lettering, in that it is a vinyl type transfer process. Its one drawback is that it will not readily transfer to a glossy or slick surface.

The heat shrinkable films should work equally as well, as a finishing medium, and result in a even lighter aircraft which is certainly an added bonus. Ya takes yer choice! The only point to be stressed in your finishing process is *keep it light!* If you yield to the temptation to apply a "super" finish, in all probability you'll wind up with an overweight aircraft that will be marginally powered with a coventional .40 size engine, and one that will likely be tail heavy to boot. Airplanes that fall in this category just don't fly too nice or too long!

FLYING

No attempt is being made to try to tell you how your Flivver will fly since there are many variables envolved. It is not intended as a beginner's type model. However, any flyer who has had a reasonable amount of aileron, elevator, rudder, and throttle experience should have no difficulty and, hopefully, many hours of enjoyment at the flying field with this sport design. Build it light and you'll have a real fun type design, with a vintage look.

If you're lucky, someone at your flying field may even call you a "Klutz"! □

SUNDAY FLIER

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the subject of basic aerodynamics with more than just casual interest.

The subject of engine torque, while once thought to be very simply the action, and reaction of a rotating propeller, is now known to be a more complex subject. Actually what we lump all together under the label "torque" is really four separate forces acting upon the aircraft. These forces are: the action of, and reaction to, the rotating propeller, the sprialling slipstream, the gyroscopic effect, and the P-Factor effect.

The rotating propeller action, and the reaction of the rest of the airplane, tends to roll the airplane opposite the direction

that the prop is turning. This does in fact, tend to turn the plane to the left (in American made aircraft at least) because when an airplane banks left, it tries to turn left. Also on the take-off roll, it puts more weight on the left wheel, causing more friction and thus tending to retard that wheel.

The spiralling slipstream is probably the most important torque force acting on the airplane. I haven't tried the tuff test yet (I've decided to tuff it out for awhile), but it seems obvious to me that a rotating prop is going to cause other than a straight airflow. If not, then the NASA people have spent a great deal of money on vanes and other devices to straighten the airflow in their wind tunnels. At any rate, the spiralling slipstream theory is generally accepted in all the texts on aerodynamics that I have read. It causes the slipstream to strike the left side of the vertical fin above the thrust line and this yaws the nose of the airplane to the left. In theory (and probably in practice as well) this could be eliminated by putting a fin of the same size below the airplane, where the slipstream would strike the right side of this fin, thus cancelling the force exerted on the top fin.

Those modelers who go back that far may remember a fairly successful free flight model of the mid 1950's called the "Spacer". This model had its vertical fin underneath. The plans called for the rudder tab to be offset to the left, a foolish thing to do as everyone knows that torque is going to pull the model to the left and so the rudder tab should be to the right. Right? Wrong! I personally found out the hard way. The spiralling propwash striking this sub-fin caused a strong right turning tendency and a bit of left tab was necessary to diminish that right turn or the model would spiral in under power.

The gyroscopic effect is caused by the mass and rotational speed of the propeller causing it to act as gyroscope. To try to change the plane of rotation of a gyro (tilt its axis) is to bring down the wrath of the gyroscope upon you. The gyro responds with a force of its own, not in the direction that you desire, but rather in a direction 90 degrees from your wishes. In the case of an airplane's propeller disc, the resulting force would be felt as a force apparently applied 90 degrees around the prop disc in the direction of rotation (clockwise as viewed from the cockpit). A taildragger pilot abruptly pushing the stick forward to raise the tail on take-off (same as applying a force to the top of the prop disc) would feel a stout force on the right side of the prop disc, yawing the nose left. You can further reason out the effects for sudden pull-ups or push-overs in flight. You're most likely, however, to notice the gyroscopic effect on getting the tail up for take-off because the rud-

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der is comparatively ineffective at this low speed and the sudden yaw is harder to control.

The P-Factor effect comes into play when the airplane is not moving in the same direction that it is pointing. This would be the case when a taildragger is on the take-off roll and has not yet lifted the tail or when any airplane is mushing along nose high but maintaining constant altitude. The P-Factor results from the nose high airplane's propeller striking the air at a higher angle of attack on the downward moving blade (the right blade, again as viewed from the cockpit), than the upward moving blade. The higher angle of attack produces more thrust on the right side of the prop disc than the left side and this tends to yaw the nose to the left. This is hard to explain, but easy to see if you hold a prop horizontally and view it end on. Hold the prop so that the prop shaft hole is parallel to the floor and note the downward moving blade would be meeting the air at the same angle (angle of attack) as the upward moving blade. Now tilt the prop so that the prop shaft hole is making an angle of about ten degrees with the floor, simulating a plane that is mushing along in a nose high attitude or a taildragger in the early stage of the take-off roll. Still viewing the prop end on, note that now the downward moving blade is striking the air at a high angle of attack while the upward moving blade is striking the air at nearly zero angle of attack. The P-Factor effect disappears when the airplane starts moving in the same direction that it is pointing.

To sum up then, we have a spiralling slipstream effect, a force that operates as long as the engine is running. This force is taken care of by the designer by more or less permanent rigging when the plane is built. Offsetting the vertical fin is a popular way of doing this and some manufacturers use engine offset just as we do in our models. The plane is rigged to cancel the torque at cruise speed and power, because this is the mode that the plane operates in most of the time. The consequence of this is that when the plane is throttled back, as for descent, or the speed increased above normal cruise speed, as in a dive, the offset fin may be too effective and will result in a right turning tendency.

The reaction of the aircraft to the rotating propeller, causing a left rolling tendency, is also with us as long as the engine is running. This rolling tendency is only a minor factor in the total torque and may be compensated for in manufacture by a bit of wash-in in the left wing.

The other two forces are with us only momentarily or intermittently, the gyroscopic effect (technically known as precession) only when we rather abruptly change direction, such as lifting the tail on take-off, and the P-Factor only when we are operating the airplane nose high relative to the direction of flight.

This discussion is limited to American made aircraft only, as most foreign aircraft have engines that rotate in the opposite direction. Are we running our engines backward or is the rest of the world?

Sincerely,
Bob Paddock

And, finally, here's another letter from Duane Eisenbeiss, who sorta' started the whole ruckus. Although he "doesn't want to use valuable space in the column", I thought it only fair to him — and to all of you, to let him be heard from again. Listen:

Dear Ken,

Just read your column for the June issue of R/C Modeler, and I must say I was rather surprised. After reading Buescher's letter, I thought "what is he so hot about, he is saying the same as I in more detail." (I am the fellow who wrote the March letter.) Then I read Bartell's letter and was again surprised when he stated he "disagreed" with me. I then got a copy of the March issue and was really surprised, more like shocked.

What came out was not what I intended to write at all. How I could intertwine two different concepts at the same time and still have coherent sentences is really amazing. What I wanted to say was that of the several forces that result in a left turning tendency, the dominate force is asymmetrical thrust. And, even though this left turning tendency can be countered by other methods, perhaps using right rudder (in a ship with movable controls) would be more correct.

I do not want you to use valuable space in your column for this letter, but felt I did owe you an explanation. I, like Buescher, worry that some people may accept what was written because it was printed in a magazine. I wish (now) that you had used some of your "journalistic responsibility" which Buescher made reference to. But I know you would not do that out of fairness to your writers. Perhaps, however, when you receive a letter such as mine, that is so obviously in error, you could add a little editorial comment to "protect the innocent" so to speak.

In addition to apologizing, I would also like to thank you for your offer of a "shield of protection" when you stated that perhaps I was just "misinformed." But, I cannot hide behind that shield. Buescher offered his credentials to lend

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SUNDAY FLIER

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weight to his statements. I am sure glad that I did not use that ploy. I am embarrassed enough as it is. I guess I will just have to order a BIG piece of humble pie. Hopefully, the final outcome will be that modelers will become more knowledgeable of the TOTAL effect of the rotating propeller. One positive thing that comes out of an erroneous letter such as I wrote is that you see how many readers you have. And, I can state you have a lot of readers. A lot of my friends, who know that I know better, are sure having a good time "sticking it to me."

Hopefull not too suspicious,
"Hoaky" Duane Eisenbeiss

So now we're all agreed that four actions are involved — torque, P-Factor, gyroscopic action, and slipstream. But note that Bob Paddock thinks the spiralling slipstream is the most significant, and Duane thinks the asymmetrical thrust is most dominant.

Well we each have our own opinions and that's what this is all about.

• •

Whatever happened to "Allsa" — the miracle replacement for balsa? During my travels between Sunnyvale, California, and Yuma, Arizona, when I was involved in test flights of a new RPV, I frequently passed through Phoenix, Arizona, where the Envoy Corporation, which is developing Allsa, is located.

On one trip, I was met at the Phoenix Airport by Mel Herzog and Larry Krebaum from Envoy. They showed me some samples, and were quick to point out that development is still in process. It was evident that they still have some problems to solve. I asked them to give me a statement that I could publish, because the modelers are very interested. Here is the letter which I received last April, but had to delay publishing be-

cause of the timing of the trade shows:

Dear Ken,

Yes, we do owe the modeling world an answer to the question, "What ever happened to Allsa?" The reasons for the long delay are: (1) The original announcement was premature. Based on an engineering pre-research estimate of what COULD be accomplished, we asked, "What if. . . " and we received 3800 replies, many of which indicated that the readers thought the product was available. (2) The research challenge of combining the properties of lightness, strength, flexibility, grain, "feel", uniformity, resistance to glue, paint and fuels, heat formability and many others turned out be more than a 90-day exercise. (3) We were severely limited by a lack of funds to conduct research on a continuing schedule.

At last, now we are almost there. We have several grades of products with different qualities of strength, "feel", grain and density which we are about to scale up to full sized logs. We are still a bit short of capital, but we are optimistic that we will be able to start sending out logs very soon.

Sincerely,
Dave Jones, Mel Herzog and
Larry Krebaum

Let's hope they achieve some success soon.

• •

Did all of you note the cover picture on the July RCM? And did you read Don Dewey's column — that part about Jack Youngblood and the Rams? Well, let me share with you the letter I wrote to Don, after reading all that:

Dear Don;

Please! Not again!

Every two years or so I run my "Mr. Dum-dum" contest. You nearly won the last one by building right thrust and downthrust into a fuselage firewall – only forgetting that you were building it UPSIDE DOWN!

Now it's time for me to run the contest again and already you are a top contender by writing in your column that the Los Angeles Rams are headed for the Super Bowl – and Jack Youngblood is one of the reasons.

You blew it! First, let me say that I do agree (I'd better, looking at all that muscle) that Jack is a great football player – handsome, talented, and a credit to the Rams and the NFL. But he doesn't fly R/C!

Up here in the Bay area, we have a club called the Oakland Raiders. We have another club named the Pioneers R/C Club. Ted Kwalick is a qualified member of both clubs – a great football player, and an enthusiastic R/C pilot. Ted flies R/C – Jack doesn't!

The enclosed photos show Ted with some of his models, and some action shots of Ted flying. The one photo, showing Ted holding a football in one hand, and an R/C model in the other, is to signify that he can handle both! When I saw your shot of Jack with the helicopter, I was impressed – until I read the true facts.

So get ready to make good on your promise to write "I am a hacker" one hundred times. (Maybe you should get a rubber stamp?) And Jack had better start lessons with Mickey, because the Raiders are going back to win the Super Bowl again! In addition to Ted Kwalick, several other Raiders also are into R/C flying – Ray Guy for one (with his kicking accuracy, you might almost conclude that he has a hidden transmitter on his foot that guides the football) – and we all know that flying R/C quickens the reflexes, teaches you patience and determination, improves your distance perception – and can also make you fighting mad. All good qualities for a good football player.

So – watch for the Raiders in the Super Bowl, hacker. Or I will be ready, at your or Jack's command, to crash my Top Dawg smack into the Rams tackling dummy. By R/C, of course. □

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not fancy the slots, then omit them! If you are incorporating slots, merely tack-glue them in place during shaping and sanding, and remove before covering is commenced. The ailerons are built integrally with the wings and cut out afterwards.

Covering: Although the outline is pretty well scale, and is good enough for Stand-Off events, I would recommend the use of transparent film on the structure. Those scallops on the wing sheet look gorgeous and it's a shame to cover them up.

Radio Installation: The home-made radio gear used in the prototype is old hat by the modern micro standards, and weighs 1 pound all-up. There is so much room inside the fuselage that no difficulties should be encountered by even the tyro looking for a first low winger (if he dare tackle the slight added complexity of the slotted wing).

FLYING

This is the bit I like discussing most, especially regarding this ship. Make no mistake, despite its low power and relatively large size, the ship is highly aerobatic. The main characteristic to beware of is the relatively slow climb rate. You can't point the nose up, and expect the mill to haul the airframe up to the clouds; you ease the elevator up and let the wings fly her up there, just like the real Turbulent (or Tiger Moth, Chipmunk, or PT 20 — all of which are considered to be aerobatic!). When you stop climbing and level off, the ship will pick up speed and will loop from straight and level. As mentioned above, height and lift are the main tools you use to aerobat this ship, so rolls and Cuban Eights need a slight dive to provide enough speed.

A second prototype was made by one of my colleagues, who fitted an O.S. .25. Needless to say, the performance is much more sprightly, climbs are faster, and she doesn't wallow when inverted, as does my O.S. .15 powered job if I feed in too much down elevator when in this attitude. Both prototypes needed about 3 ounces of weight inside the nose cavity to balance. With no down or side thrust (or warps), about 1/8" up at the T.E. of the right aileron was required on both machines. She will cruise on half throttle, and if the taps are opened, she starts to climb — so if you prefer a "neutral" zero-zero set-up, don't be caught out. A couple of degrees downthrust could be incorporated at the building stage, but I

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have never thought the effect marked enough to modify the completed model. Initial trimming flights should be straight-forward. At take-off, she'll need slight right rudder to stay straight, and slight up at the start of the run will prevent nose-over. As she accelerates, let the tail rise, and a slight pull of "up" will fly her off. Do not try to zoom straight up. She'll go up alright, but more like a Fournier than a Bearcat! When trimmed for straight flight, and when you've got used to her, you can start experimenting with the model's behaviour. All the following relates to the .15 powered ship.

Take-Offs: These can be automatic. Set a little up trim, open up gently and watch her rise off all by herself, with a couple of gentle hops for good measure! Alternatively, open the throttle wide and, once rolling, push the stick forward to lift the tail. With the model in flying attitude, she'll accelerate fast and you'll be able to haul her off in record short length. In a strong wind, whe lifts off immediately and confounds the owners of big trike-geared .60 powered jobs.

Climbs: The best description of the climb lies in the inscription on the RAF crest — *Per Ardua Ad Astra!* If you must fly here out of sight upwards, then set the elevator stick trim to give the best climb angle and just steer. The .25 gets here up quicker!

Landings: With this ship, landing is fun. In a strong wind, I can pick my landing speed from anything forwards to a couple of mph backwards. In flat calm, I can juggle up-elevator and throttle so that she descends in a controlled stall from about 30 feet altitude. The ailerons are effective to pick up a dropping wing, and I've often thought of seeking out someone with an autogyro to have a slow landing competition!

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Aerobatics: The usual Stand-Off Scale schedule can be performed with ease. If your engine throttles well, such maneuvers are made more enjoyable. Control-line style flying round and round with the odd wing-over thrown in is a gas. Upright spins are impossible when entered at low speed, but a dive, followed by full up-elevator, and full right aileron-rudder sometimes works, probably due to creating a G-stall condition.

One peculiar evolution which makes people gulp when they see it done, is executed as follows: Dive to maximum speed and level off. Immediately roll to the right and, as the wings reach vertical, slam in full down stick and full left rudder, keeping engine and aileron at full whack. She does a sort of tumbling outside flick-roll or two, before losing all headway and flopping into an inverted spin. Centralize the controls, and exit in a half loop. If you try that one, don't become too mesmerized, and don't try to delay your exit from the inverted spin to below about 40 feet altitude or you might not make it! In windy weather, try hanging her on her prop, semi-stalled with about 1/3rd throttle and see if you can fly her backwards. This gives you a most unusual sensation, especially if she disappears over a hedge as nearly happened to me the first time I tried this.

CONCLUSIONS

All the above aeronautical antics are easily attainable provided you practice. I have made nothing up, and I haven't even changed the name of the plane to protect the innocent late Roger Druine! I get a lot of pleasure from my Turbulent; she's big enough to be seen easily at a distance and slow enough to stay in sight a long time. She's ideal for school field flying, due to the low noise output of the silenced engine. Perhaps most other models can manage the evolutions I've described. But I reckon that this job takes some beating if your flying space is restricted! □

UFO

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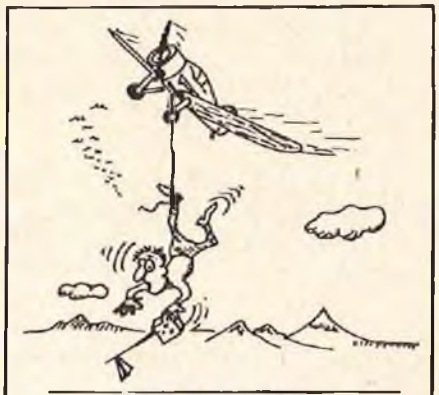
provided on the plans to get the proper angle of the root ribs.

Use 2 or 3 carborondum discs on your Moto-Tool to cut a 1/16" groove down the length of the leading and trailing edge stock. This groove is cut off-center to assure that the ribs will clear the surface of your work bench. Cut the leading and trailing edge to length. Glue the 1/16" x 1/4" rib alignment spars in place. Pin the L.E. and T.E. in place over the plans using the root and tip ribs for



COMING UP NEXT MONTH
TOM MOUNTJOY'S CULVER DART

proper spacing. Glue ribs #1-#6 in place, using the anhedral gauge to align the root rib properly. Add the 3/32" x 3/8" balsa braces, the tip block, and the top sheeting.

After the adhesive has set up, remove the stabilizer panel from the building board. Turn it over and pin it down — blocking up the leading and trailing edges as necessary so the ribs and sheeting clear the building board. Add the bottom sheeting.

Build the other stabilizer half in the same way. Then, sand the leading edge, trailing edge, and sheeting in the area where the stabilizer panels will join for the proper anhedral. Check the way the root ribs will mate. Add 5-minute epoxy and join the stabilizer panels, blocking them up, as necessary, for the proper anhedral.

Tack glue the elevators in place on the stab. Sand the stab tips, leading edge and elevator halves to shape. Break the tack-glued elevator halves free from the stabilizer and sand the leading edge of the elevator halves to shape as shown on the stabilizer side view. The elevator halves are hinged after the stabilizer is installed in the fuselage. A horn is used on each elevator half. Each horn is to be slanted 15° forward to equalize the response of the aircraft to up and down elevator.

For installation, the point at the center of the stabilizer leading edge will have to be sanded back about 3/8", leaving the flattened center piece inside the fuselage. Reinforce the stabilizer center joint with a 1" width of 4 oz. glass cloth and resin.

Glue the front and rear rudder pieces together. Add the pine insert for the rudder horn. Glue the forward, center, rear, and fin tip pieces together. Note that the center and rear fin pieces extend below the forward piece to fit into a slot cut into the fuselage top block for a strong joint.

Prepare the balsa sub fin. Add the 1/16" wire tail skid. At this point the stabilizer, elevator halves, fin, rudder, and sub fin are ready to install.

The Wing Panels:

Lay both pieces of the 1/2" x 1⅛" balsa leading edge on your workbench with a 1⅛" side down. Draw a centerline down the length of the leading edge pieces. Draw a similar line down the trailing edge. Also draw a centerline down the wing ribs, from the front to the back. This takes some time, but it will help you build a straighter wing.

The right wing panel will be built first. Ribs #3 and #4 are notched for the main leading gear blocks. The notched edge of these ribs should be "down". If you're using retract gear, relieve the ribs, as necessary, for the retract gear mounting plate and gas tubes, wires, or linkage. Rib #1 will not be glued in place until you're ready to join the wing panels.

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Pin down the 3/8" x 1/2" bottom spar. Pin rib #1 in place onto the spar. Pin and glue ribs #2-#11 to the bottom spar. Add the 1/4" x 5/16" balsa trailing edge, using the centerline on the ribs and trailing edge as a reference. When the adhesive has set up, block up the trailing edge of the wing so all of the rib centerlines are parallel to your building board. Sand the trailing edge to the rib contour, then add the 3/32" x 2" top trailing edge sheeting — but don't glue the T.E. sheeting to rib #1.

Glue the top spar in place to ribs #2-#11. Add the leading edge, making sure that the centerline on the back aligns with the centerline on the ribs. When the glue has set up, use your X-Acto knife or razor plane to roughly shape the top of the leading edge to the rib contour so the L.E. sheeting can be installed. Then sand the L.E. to the rib contour with your sanding block. The front of the leading edge should not be sanded to the final shape until after the top and bottom sheeting have been installed.

Add the top leading edge sheeting. After the adhesive sets up, trim the leading edge sheeting flush with the front of the leading edge. Add the 3/32" x 3/8" balsa capstrips on ribs #4-#11.

When all of the adhesive has set up, the wing is removed from the building board. The main gear blocks are to be installed next. Begin by adding the 1/16" ply plates to ribs #3 and #4. Glue the short grooved block to the inboard side of rib #3. The grooved side is toward the rib. Add the long grooved main gear block and the pine block gusset at rib #4. Then a hole will have to be drilled through the long grooved block for the landing gear arm. To do the job, drill the hole down from the top side of the wing using the groove in the small block as a drill guide.

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Add the 3/32" balsa top center section sheeting. Pin the wing back down on your building board, upside down. Block up the T.E. Shape the bottom side of the leading and trailing edge to the wing contour. Add the balsa bottom trailing edge sheeting and the capstrips. When the adhesive has set up, the wing panel may be removed from the building board. The bottom leading edge sheeting and center section sheeting will be installed later after the wing dowels are installed.

Follow the same general building sequence to build the left wing panel. When the left wing panel is built over the plans, however, the bottom side of the wing will be "up". That means that the notched edge of ribs #3 and #4 will be up. Do not install the bottom leading edge sheeting or center section sheeting.

Completing The Wing:

Align both wing panels blocked up as shown on the plans. Adjust the angle of the root rib on both wing panels so they'll mate for the proper dihedral. Glue the root rib to the spars and the sheeting. Trim the leading edge, spars, trailing edge sheeting and top leading edge sheeting flush with the root rib. Then glue the wing panels together using 5-minute epoxy.

With the brass sleeve in place on the piano wire for the aileron torque rods, bend the torque rods to the proper shape. To provide differential throw, the aileron linkage arm of the torque rods should be bent back 4°-5°. During test flights, this angle may have to be increased or decreased slightly for maximum performance. Also, these arms must be in line with each other when the ailerons are at zero. Be sure you prepare one right and one left torque rod. Solder the torque rod ends onto the

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aileron servo arm. This is just a 1½"-2" piece of brass tubing with half of it flattened. Drill the holes for the aileron linkage clevis through the flattened end and deburr the holes. Cut a notch down the length of the front edge of the balsa center section trailing edge pieces for the aileron torque rods. The aileron servo arm end of the torque rod should come up through a notch cut into each center section trailing edge piece about 3/4" from the center of the wing. See the plans.

File a notch in the trailing edge of each wing panel to permit the back and forth movement of the torque rod arm. Put some Vaseline around both ends of each torque rod sleeve and tack glue the torque rods in place in the center section trailing edge pieces. Then, making certain that the center section trailing edge pieces are aligned with the wing contour, and that the torque rods are centered on the wing trailing edge, glue the center section trailing edge pieces in place.

Add the 1/16" ply hold-down plate on the wing trailing edge with some 5-minute epoxy.

As preparation for the installation of the wing hold-down dowels in the leading edge of the wing, draw a line on the bottom back side of bulkhead #2 to indicate the location of the center of the wing dowel holes. Put the wing in place on the wing saddle so it is perfectly aligned. Drill small diameter pilot holes for the wing mounting bolts down through both the wing and the ply plates in the fuselage. Before the wing is removed from the wing saddle, transfer the marks made on the back of bulkhead #2 to the leading edge of the wing. Remove the wing from the fuselage.

Drill the clearance holes through the wing for the wing mounting bolts. While you have the drill ready, drill the two 1/4" holes through the center of the wing leading edge for the dowels. Drill and tap the holes into the ply plates in the fuselage. Put the wing back in place on the fuselage and install the two wing mounting bolts so they are snug. Turn the fuselage over and draw a line along both sides of the fuselage on the top side of the wing. These lines on top of the wing are to be used to install the 1/32" ply wing fillet base pieces. Using the line on the top of the wing as a reference, measure and draw a line parallel to each one, but 3/16" inboard of them. Then, tape each wing fillet base piece in place on the top of the wing so it lines up with the inboard line. Be certain that the tape, itself, will be clear of the wing saddle. Put the wing temporarily in place on the fuselage and check the alignment of the fillet base pieces. If they are okay, remove

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the wing from the fuselage and put a strip of masking tape down the wing so it butts up to the inboard edge of the ply fillet base pieces. This will prevent glue from seeping out from the ply pieces and fixing the wing permanently in place.

Do a final check of the wing incidence and alignment of the wing saddle. To glue the wing fillet base pieces in place, remove the wing from the fuselage and put a very thin coat of 5-minute epoxy on both wing saddles. This application should be very thin so the epoxy won't squeeze out and glue the wing to the fuselage! Bolt the wing down in place and push down firmly on the front center of the wing. Hold it there until the epoxy sets up. After the epoxy has hardened, remove the tape that holds the wing fillet base pieces to the wing, remove the wing bolts, and carefully remove the wing from the fuselage. Any gaps between the ply wing fillet base pieces and the wing saddle may be filled with epoxy. Add pieces of 1/4" triangular stock along the ply pieces. See the plans. Use 5-minute epoxy to glue the back ends of the fillet base pieces to the fuselage sides. Add some 1/4" triangle stock in this area as well.

In order to install the wing mounting dowels, bolt the wing in place onto the fuselage again. Slide one end of each of the dowels through the hole in the wing leading edge and into the hole in bulkhead #2. Glue the ply dowel support pieces in place onto each dowel. Glue the dowels to the leading edge and to the support plate. Add the false rib to the top and bottom of each dowel. Remove the wing from the fuselage after the epoxy has hardened and add the bottom leading edge sheeting and bottom center section sheeting.

Use your sanding block to shape the leading edge. For the desired flight characteristics, the leading edge should be blunt, rather than sharp. See the plans. Trim the leading edge sheeting, spars, and trailing edge sheeting flush with the tip rib and add the tip blocks. Sand to a sharp edge as shown.

Use 4 to 6 oz. glass cloth at least 5" wide with resin to reinforce the wing center section. Sand the ailerons to shape and drill the hole for the torque rod. Then, put the wing in place on the fuselage and glue the balsa wing fairing front, sides and bottom in place using 5-minute epoxy. Add resin and microballoons as a fillet on the bottom center section so it is flush with the bottom of the fuselage. The aileron servo well may now be cut into the top side of the wing. Add the 1/2" x 1/2" hardwood servo mounting rails.

Completing the Airframe:

Complete the stab cut-out in the fuse-

lage by trimming the stringers as necessary. Mount the wing onto the fuselage. Then, with the fuselage right side up on your work bench, put the stabilizer in place into the stabilizer cut-out with the stabilizer in the anhedral configuration. Check the alignment and glue the stabilizer in place with 5-minute epoxy. Fill the hole in the fuselage above the stabilizer leading edge.

With the fuselage right side up on your work bench (and the slot cut into the fuselage top block for the fin), glue the fin in place. To glue the sub fin in place, first pin the rudder to the fin. Then, use the rudder to align the back of the sub fin. The front of the sub fin should be centered on the fuselage bottom.

Finish sand the entire fuselage to shape. Sand the bottom wing fairing to shape. Complete the wing fillet by adding resin and micro-balloons to the ply plate. See the plans. Also use resin and micro-balloons to build a fairing at the stabilizer/fuselage joints and along the fin/fuselage and sub fin/fuselage joints.

Use 3/4 oz. glass cloth and resin on the fuselage, stabilizer, fin, rudder, elevator, and sub fin. Finish the area under the canopy and glue the canopy in place. Use resin and micro-balloons to build a fairing around the canopy.

The wing may be covered with one of the plastic, heat sensitive covering materials or with silk and dope. When the fuselage and tail section is painted, it should first be primed with a light coat of K & B Primer. Then the color coat is to be added.

The elevator halves, rudder and ailerons may now be hinged. Cut the pushrod exit holes into the rear of the fuselage for the elevator and rudder pushrods. Two holes must be cut for the elevator pushrod.

The rudder and elevator pushrods may be prepared and installed at this time. Since the split elevator will need two rods and clevises at the rear, double clevis rods will have to be attached to the rear of the elevator pushrod. They are bent into a "Y" shape to exit the holes in both sides of the fuselage.

Resin the inside, bottom of the fuel tank compartment and the inside of the engine compartment. A piece of scrap balsa may be used to seal the inside of the nosegear spring clearance hole to keep out dirt and oil. Coat the balsa piece with resin as needed. Install the nose gear, nose gear steering arm and main gear. Finish the job by adding the nose gear linkage and throttle linkage.

The landing gear should be set up so the stabilizer — at the fuselage — is level and the wing incidence, in relation to the ground, is slightly positive.

Install the radio equipment. While the specific location of the C.G. for a pattern ship is a matter of personal preference, we recommend locating it as shown on the plans for your first flights.

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JULY 1977 PUZZLE WINNERS

William H. Altenhofen	Dennis McMahon
G.W. Ashdown	Anthony R. MacLane
Roger L. Bach	Hunter R. Macpherson
Michael Barton	William Marhefsky
Paul G. Bodner	Joseph P. Mascio
Ora L. Burke, Jr.	Donna Mattson
Sharon Doumitt	Rev. Don E. Merkel
William Farnum	Lucien B. Miller
Gordon Fisher	George Schmidt
W. Riley Franklin	Dan Shallenberger
Mike Gantz	Leonard R. Shelton
John Gebhardt	Karl H. Siegmund
Doug Hahn	Elmer Slopey
Jerry Hamilton	Jason Su
Bob Hayden, Jr.	T. Telesca
Fred Jamieson	Larry K. Tillery
Marie J. Kaba	Roddy Walker
Larry Kennell	William K. Washburn
Ken Kistler	Charles M. Wehler
Louis Leonard	Rick Weiss
Richard D. McCarthy	Allan Wernick

UFO

from page 155/41

Flying the UFO:

There is only one characteristic of the UFO about which we want to alert you. The way the plane rests on the ground — with the stabilizer level and the wing slightly positive — is necessary for a smooth lift off. Otherwise, the plane stays on the ground far beyond its flying speed. When a little up elevator is given, the plane may then jump into the air into a steep climb. Adjust the main and nose gear as recommended. With this recommended adjustment, however, you will probably have to watch your speed at touch-down. Try to land the plane at too high a speed, it may want to lift off and fly around again!

That's about it. Good flying and happy landings. □

Q-TEE CHALLENGE RACE

from page 39/38

some "expert" launching his model after the rest of the field had a couple of laps.

As in any kind of pylon race, the trick is to hang in there and finish without cuts. You know how often the hot shots get carried away in their zest to win and cut pylons, letting the slow poke end up two

laps behind with four points. In the first round Lee Renaud set a precedent while helping Gary Moline. Gary's engine flamed out on its way back to pylon two and Lee caught the gliding model by the wing (talk about reflexes), put it down by the tool box, and Gary got it re-started and flying in no time flat. Wow! How can you say that that is not legal? So, from then on, re-start was allowed as long as there were other models still flying. I can't remember how many had re-starts, but I saw at least half a dozen.

I think that the funniest thing during the whole day was Cliff Weirick's face as he watched his model describe a very graceful curve after launch. Up, and up, and left, and down, and crashing in tall grass beind the pits. His helper (name withheld) thought the receiver switch was off, and flipped it to the other side just before launch. He was wronggg! But being a Q-Tee, it was patched up with some 5 minute epoxy and Cliffy was back in the air in the next round to win his heat.

Come to think about it, the attrition rate was remarkably low, all considered. You see, the Q-Tees are relatively slow and all the machines are evenly matched with many of the flyers being pretty good at turning pylons. The result is a very small amount of air where

everybody wants to be and the thing gets hairy. We had only one fatal mid-air in the last heat of the last round, when Kamikaze McSpadden winged Joe the Bridi, who had the gall to have a perfect score until then.

At the end of four rounds the points of all members of each team were added and the totals compared. The locals got the edge and their team got the prizes. Because here is where the catch is, you see. If your team loses you are out of the money even if you had a perfect score! The guys in the winning team are classifed by their individual points as if the guys of the other team didn't exist. The only individual prize, not related to the team, is for Fastest Time.

The prizes were very nice decorative plates for first through fifth, provided by the host club; a Q-Tee kit with a Cox Black Widow, by Cox; three one-year subscriptions to RCM; and some more Cox Black Widows. The prize for Fastest Time was a really good looking marble trophy that ended up on my own trophy shelf.

Now don't think that the Challengers took all this lightly. There were rumbles about "next time" and there were even rumors that an extra heat run "for the heck of it" by some of the hottest shots

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Q-TEE CHALLENGE RACE

from page 160/38

actually was some private bet involving large amounts of money and/or beer.

There were lots of funny things. Actually, the whole thing was the funniest fun-fly I've ever been in. On top of that we picked up all the marbles, fastest time and all.

Maybe Gary was right after all. We *are* The Greatest. *(Ed. Note: While the RCM team placed dead last, Dick Kidd reported that this was done deliberately in order that claims of "professionalism" could not be made. If you buy that, you'll buy anything . . . Don Dewey).* ❑

P-39 AIRACOBRA

from page 37

. . . . . 1977 RCM) and is exceptionally easy to apply with very little weight penalty. This finishing method is good for balsa sheet surfaces only. Do not try it over open framework. It must be noted that these small 1/2A Sport/Stand-Off Scale aircraft must weigh no more than 24 ounces to have good flight characteristics. When starting to build, one should have the final weight fixed in his mind and then work to achieve it. The finishing process you choose must be light. For those of you interested in knowing more about fiberglassing with 3/4 ounce cloth, here is how it was applied (on the Airacobra) providing a light and effective finishing process for 1/2A models:

For explanation purposes, let's start simple and cover a rudder. After sanding the surface smooth, cut a piece of cloth approximately 1/2" larger than the rudder. (Fiberglass cloth is very manageable around compound curves.) Lay the cloth on the rudder and apply (epoxy or polyester) resin directly on it with a brush. If using Hobbypoxy II, thin about 10% for better penetrating and brushing characteristics. Thin with Hobbypoxy thinner.

Make sure the cloth is completely saturated and no air bubbles are trapped. At this point, unroll a piece of toilet tissue and lay directly into the resin. Pat the surface gently with your fingers so that the tissue will absorb as much as possible of the excess resin. When the tissue is full, remove it carefully by pulling it back over itself. Then apply a fresh piece of tissue, again patting it to absorb more resin. When the tissue will no longer take on resin, allow the surface to cure. When covering a rudder or elevator, it is possible to cover both sides. Cut the cloth large enough to cover both sides. Glass one side, then fold around the edge and glass the opposite side. You will find over-lapping no problem because of the glass cloth thickness.

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P-39 AIRACOBRA

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After the surface has cured, the excess glass cloth may be trimmed off by sanding it lightly with 220 garnet paper. Sand surface lightly with 220 to take off any high spots. Be careful, it is very easy to sand through at this point. Next, apply a very heavy coat of K & B Super Poxy primer. When cured, wet sand with 400 paper until the weave in the cloth can be clearly seen. Spray on a transparent coat of primer and lightly wet sand with 600 paper all over. Incidentally, wet sanding the primer keeps the dust from your lungs. Two light coats of R & S Perfect Paint were sprayed on with just enough to attain good coverage. Using the excellent three-view drawing supplied with the kit, final details such as panel lines and rivets were applied using water soluble Pelikan drawing ink (green label) in a Rapidograph drafting pen with a #1 point. After marking and applying decals, the entire model was sprayed with R & S flat satin P-15 to seal in the ink lines and decals for additional fuel proofing.

Drawing panels and rivets with ink on your model can be a frustrating experience if your talents are not in that direction. Some of you may want to try it. Not having experienced this method of marking, with regard to models, we decided to try it and pass along a few helpful hints discovered. Of course, all of this is dependent on your ambition level; just how much time you have and want to put in your model.

First, look over the three-view drawing and decide how much detail you want to show. Remember, too much on a small model can cost you a lot of time and can be seen for only a short distance. Stick with the important features. Second,

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practice with the pen and straight-edge to get the "feel". All straight and curved guides used must be elevated from the surface slightly to keep the ink from bleeding under. Use masking tape strips, set back from the edge slightly, to prevent this from happening. If you happen to make a mistake, the line can be washed off or erased with a wet eraser quite readily, that is, if done right away. The longer the ink dries, the more difficult the line is to remove. By all means, start with the wing as it is relatively flat and easy to mark on. Next mark the tail plane. You will find it more difficult because of its small size, even though it is flat and easy to mark on, the fact that it is attached to the fuselage makes it difficult to hold in a good drawing position. Try retaining the straight-edge with masking tape to keep it from slipping. And, finally, the fuselage.

By this time, your confidence level should be somewhat elevated. Because of its demi-round and tapered contours, drawing lines on the fuselage is by far the most difficult. You may find it necessary to make a special template with which to draw a line. This can be quickly made from mylar or heavy paper. Some lines will look almost impossible to draw, especially around the canopy. For this type of line, we suggest you try the following method: Purchase a roll of .090 wide black crepe tape such as used in printed circuit board art work layout. Most drafting supply stores carry this product under the brand name of Chart-Pak. This tape is quite flexible and is also ideal for masking around corners, however, the edge must be sealed for a good sharp line. To draw that special line, first lay down a piece of tape slightly off the line to be drawn. Next, lay another piece of tape on top of the first one, but right on the line you intend to draw. This provides a slight step to keep the ink from bleeding under. With very little side pressure on the pen, carefully draw the line. Remove tape when through. You'll find this method quite flexible for those especially hard to get at places. However, it will require some practice on your part to lay down a good clean line. Panel marking and rivet detail do add considerable overall appeal to your aircraft.

The RCM prototype was flown with a Kirn/Kraft Cox .049 engine swinging a 6/3 propeller. A 2 ounce tank filled with Cox Racing fuel provided approximately 12 minute flights. Flown with a Pro-Line transmitter, our radio included the new 1/2A, 2 channel receiver kit manufactured by Royal Electronics, 3535 S. Irving Street, Englewood, Colorado 80110 — priced at $21.95 introductory offer. The weight of this receiver is 1.2 ounces. The servos used were D & D Electronics (D & D 101 Dunham D5 Mech.), P.O.

Box 2102, Lake Havasu City, Arizona 86403 — purchased in kit form, priced at $28.45 each. These servos are not extremely fast, but are powerful enough to fly a .40 size airplane. We were impressed with their size and power. Each servo weighed .9 ounce. The rest of the airborne included a 225 MAH battery pack and switch harness.

Our particular model flew extremely well in the prevailing weather conditions. The model was hand launched and flew straight out. A slight trim of pitch was required for level flight after the model was up to speed. The aileron throw specified on the plans (±3/16") was somewhat snappy in flight, however, an experienced pilot would have little difficulty with it. The aircraft flys very smooth (not quite as smooth as the 1/2A patterns) and will do most any maneuver not requiring rudder. Removing the landing gear provides even better flight characteristics. With less weight and drag, our model performed noticeably better. However, it did look nice in the air with the gear down - - - especially on landing. Overall, the House of Balsa P-39 Airacobra is an excellent machine for general sport flying or 1/2A Scale Stand-Off. Build it light and you will be rewarded with outstanding performance! □

PIONEER 15

from page 35/33

These can also be painted with PLA enamel.

The rudder assembly can be cut, sanded, covered and epoxied to the fuselage at this point. Make sure to add the 1/4" triangular braces for rigidity during flight.

Motor Installation:

The Astro 15 recommended wiring diagram is used in this model along with the Astro Flight SPDT switch and charging jack (Astro Flight #4003 Switch Harness). However, because of the design of the prop a stop mechanism, an SPDT Roller Lever Switch is used to actually turn on and off the Astro 15. The Astro Flight switch is operated by hand to place the system in charging or flying mode. I have been using an Archer #175-1101 SPDT Roller Lever Switch rated 10 amp. @ 125V AC. This is available at any Radio Shack store as are the capacitors, resistors and voltage regulator. Be sure to break-in the motor for one hour on a 12 volt battery without the propellor to seat the brushes.

Radio Installation:

Any 3 channel system can be used. However, be sure to check for chatter or interference from the electric motor system. I use about ±20° up and down elevator and ±30° rudder to assure full control.

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PIONEER 15

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Charging:

Use the Astro Flight field charger with two 12 volt motorcycle batteries for charging. I use batteries rated at 9 amp. Follow the instructions and you'll be ready to fly in 15 minutes. Note that the first few charges of a fresh battery will not be at capacity. You will notice your motor run duration increase until it levels off at 5½-6 minutes after about 15 cycles.

Flying:

Check the radio with the motor on. Once this is done, gently hand launch into the wind with the motor on. Let the model climb on its own and go easy on the elevator so you don't stall it. The climb should be quite fast with a slightly nose-up attitude. Circle up to your desired altitude looking for thermals on the way up. Shut off the motor at the apex and you're on you own.

I'm sure you'll be hooked on electric soaring! ☐

BD5½

from page 30

.....mended throws. Outside of these minor items, the isometric plans provided are a work of art. In the test model we used a dowel into the nose block from the canopy with a screw hold-down, accessible from the wing opening at the rear. Luckily the RS30S radio we used came with a 500 ma battery pack. We found it necessary to put the battery all the way forward, followed by the two servo brick and the receiver under the control linkages, and as far forward as possible to attain the specified CG. This is the first time we wished for a heavier radio since the all-up weight of the RS flight pack was only a little over 7 ounces. Even with the tail as light as possible, and the radio installed as far forward as possible, we still had to use about 1/2 ounce of weight in the nose to attain the specified Center of Gravity.

The wing on our prototype was covered with white Solarfilm and the fuselage was painted with white Perfect Paint. We chose the latter rather than a plastic covering for the fuselage because of the difficulty of covering the odd shape aft end of the structure. Green MonoKote trim sheet was used for trimming.

Be sure to set the wing and stabilizer at zero degrees incidence. We found the BD5½ to be a hot little handful, definitely not for a beginner. While aileron control was excellent, with tremendous roll capability, elevator control was ex-

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BD5½

from page 170/30

tremely sensitive. The control throw was reduced to 1/8" and a marked improvement was noted. This airplane will do all two channel maneuvers such as rolls, loops, Immelmans, etc. In addition, it flies inverted with minimum forward pressure. Spins are so tight and quick that they should only be attempted if you have sufficient altitude for recovery. Although the flight characteristics are good under power, this model seems even better as a glider. We found its fast, low sink-rate glide gave good penetration and required considerable distance to drain off speed for the landing. Even at slow speed no serious tendency to fall off on a wing was noted. All of our flights have been hand-launched. Because of the rear mounted engine, there is no airflow over the wing, or control surfaces from the prop so a healthy heave is required to get initial control effectiveness. Because of the placement of the tank relative to the engine, holding the nose up to see if the engine dies is not an indication of an over-lean condition. Rather, if the engine dies or starts to lag, it is because the tank is now higher than the engine and gravity fuel flow is flooding it out.

As previously mentioned, this airplane is definitely not for a beginner. The short tail moment makes it extremely responsive and easily over-controlled by the heavy handed novice. For an experienced flier, it is a ball. With the optional racing wing offered by MH, it should be highly competitive on the racing circuit, judging by the speeds obtained by our test model. □

HOVER

from page 27/24

Helicopter Nationals will be over, but you can still make the NRCHA Nationals to be held August 20-21 at Greenville, Pennsylvania. Bill Curtis is the Contest Director. If at all possible, try to come and enjoy the fellowship and some of the wildest stories on helicopters you've ever heard. In the process, you'll also learn a lot about helicopter flying from some of the more experienced pilots.

Until next month, remember, when in doubt, give it full throttle and keep the stick forward. □

ARMCHAIR ACE

from page 20/19

cient room on the right for editing. Put "(more)" at the bottom of each page. At the top of each succeeding page put

your last name and a word or two from the title, along with the page number as follows: Steele: September Armchair Ace, p. 2. Identify your photograph cutlines similarly because pages sometimes get separated from your package. At the end put ### (or END).

Roll your plans carefully and insert in a mailing tube. Now assemble your article, photographs, and cutlines, along with a cover letter telling what you've sent off to the editor who bought it. He hasn't bought it yet? Shame! All that work and money spent on the speculation of a sale is a tough way to go. Your best bet is to write the editor before developing your design for publication and putting in all the work and money which plans, pictures, copy, and the like, require. Send him a good photo of your plane, tell him what it does, why it's special, and ask if he can use a construction article. If your ship is unique and your presentation professional, his answer may well be "yes". However, one editor's rejection may not mean you don't have a great design. Your pylon racer, or whatever, may come in just behind six similar aircraft, and the editor won't want to sit on it for the length of time necessary to work it in. On the other hand, another publisher may be tearing his hair out for a gimmick like yours when your letter or call comes in.

Remember in contacting any editor, that he's busy as all-get-out and has hundreds of other things on his mind besides your labor of love. And, for goodness' sake, don't take a rejection personally. It isn't.

You shouldn't take editorial changes or the return of copy, artwork, and/or photos for revision personally, either. There is a good reason for anything the editor asks you to do and even though he may be wrong in your eyes, he's still the editor. When you're the editor, you can use your stuff any way the publisher lets you — even editors have bosses. If the editor suggests it, re-write and then again, if necessary. Shucks, even Hemingway and Bach had to re-work their carefully "finished" material to suit their editors.

When the article is accepted and you're waiting for your work to appear, start on another project. Then, about a month later, the check comes. If it pays you $1.00 an hour for labor — over the cost of material for the plane's airframe, plan drawing, and photos, you've done pretty well. The first draft of this column took well over six hours and will require another six to nine hours' work before mailing — even simple (minded) work like this isn't quick and easy. You gotta want to do it and love it or it just won't happen.

But, if you really want to write in the worst way, stay with it, persevere, strive for perfection and you may become — like me — a writer in the worst way. □

WHEN INDEED?

from page 18

forces are continually at work to control a man's destiny?" "What forces are at work beyond human control that determine success or failure?" "What chain of events cause failure at some moment of time?" "What or why at that **precise** moment of time?"

What chain of events led one of our best flyers to be at that precise impact location at that precise moment of time?

Why was the chair **unoccupied** at that precise moment when, only moments before had been occupied?

What forces at work beyond human control caused failure either equipment or human, that led to a chain of events to control the destiny of these individuals?

As RC'ers we fly over spectators; we make low passes; we fly directly at ourselves.

Why don't we have failures at that precise moment of time?

Or do we?

No, fellow RC'ers, we're **not** playing with toys in a make believe world. We have progressed into the remote piloted vehicle business of real flying and of **real** accidents. □

FOR OLD TIME'S SAKE

from page 17/16

girlfriends. We know of one lady who felt nothing but contempt for model airplanes, but after spending some time at the field, she is now 100% more tolerant of her hubby's avocation.

We'd like to hear from more of you gals out there who fly or help out. There's got to be more than just a handful of us!

Thanks, Diane, for the letter. Hope this will encourage the women in your area to get out to the field and join you in the fun!

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Bits and pieces

Otto Bernhardt, the super craftsman, will be introducing a .61 ignition engine shortly — a brand new design, not a conversion. It promises to be a real eye-opener: blue enamaled case with polished components and 125% more fin area for better cooling. Hope to have a picture in the next issue.

Next month we'll have a report on the Champs at Vegas. Hope to see you all there. □

from page 15

those large multi-functional sailplanes, or for the L.S.F. endurance achievements. If you are at all interested, contact Red Scholefield, P.O. Box 114, General Electric, Gainesville, Florida 32602. Ask for information on G.E. Super Pack PPS 3077-Ro.

•

From South Africa's SAARF, is a column about instructors by Len Salter. I will not print his entire thoughts, but will give you the highlights of a universal problem that we all have been confronted with at one time or another:

There have been opinions expressed regarding the necessary requirements that have to be met in order to qualify as a flying instructor. It is thought by some that the standard set is too high, but I hope to convince those holding this opinion that it is not.

There have been many accidents caused through faulty installation of equipment, wrongly or badly connected linkage, and structual failure caused by high stresses. Flying without the frequency pin; switching on without the pin; NOT checking the correct frequency of a new set (because it is marked, for example, 72.40 MHz (o/w), this fact does not guarantee that it has been fitted with the correct crystal); forgetting to charge the batteries.

These are some of the safety considerations that have to be borne in mind even before becoming airborne. A novice pilot is probably not aware of some of these aspects of safety, and it is part of an instructor's duty to make him fully aware of them.

The average pupil/pilot has a smattering of the theory of flight and his main concern, after having built his aircraft, is to see it fly, and fly it himself. There is a natural tendency to want to "run before he can walk".

An experienced flyer may find it difficult to orientate his mind with that of a pupil, because of his long experience his transmitter control movements have become spontaneous, and he can overlook facts that he should relate to the pupil when executing a turn, i.e., the lower wing will stay down even when the control stick is neutralized. Being a good flyer does not necessarily make one a good instructor.

Apart from being told what effect a certain control movement will have on the aircraft, the pupil should also be told why it will react in a certain manner. "Feed in a bit of up" may be common jargon, but will a pupil necessarily know what it means?

I am sure that an instructor would feel

somewhat embarrassed if his pupil asked him a reasonable question that he could not answer. For instance, a pupil has some knowledge of the theory of flight and has learned that a wing derives lift from the decreased pressure above it, owing to its curvature (venturi effect). He sees an aircraft flying (even climbing) inverted, with the venturi effect now acting downward, and pops the question, "What enables it to still fly although inverted?".

A pupil is not likely to ask highly technical questions, but there are many reasonable ones that may be asked, such as, "What is the angle of incidence?", "wash out and its purpose?", etc. An instructor should surely be able to answer these reasonable questions. If the instructor can answer readily, it will enhance the pupils confidence in him.

The standard of knowledge required of an instructor will also enable him to diagnose faults in an aircraft's performance. A pupil can surely expect that of his qualified instructor.

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I will close this month with a good solid piece of advice . . . mentally set yourself a task, and go up and practice that task with your model. You fly your sailplane — don't let it fly you.

Good lift. □

ENGINE CLINIC

from page 12/10

lower the pressure slightly. If the mid-range mixture is too lean, you increase the pressure slightly. Then you forget about the pump even being on the engine. If you start having engine problems, look for a hole in the fuel line, foreign matter in the carburetor, etc., the same as with a non-pump engine. Unfortunately, fellows will try to compensate for a hole in the fuel line by increasing pump pressure, etc.

The type of muffler you use has no bearing on whether you use the pump system or not. You can use either a flow-thru or closed chamber muffler.

As for your Veco .45 — you probably goofed it up with the hand lapping. Sounds like whoever did the lapping for you went a bit too far — this, provided you haven't run any dirt through the engine since the lapping. Hard starting and loss of compression can only be caused by the piston being fit too loose or a scored piston/sleeve. The con-rod wear would indicate the engine has seen some lean runs or you have used a fuel without ample lubrication. The Veco .45 was discontinued when K & B purchased Veco Products nine or ten years ago. There is nothing available in the way of parts, unless you happen across a hobby shop that still has a piston/sleeve/rod assembly in stock.

Dear Clarence,

Regarding Perry pressure pump and carb, how much pressure does it develop?

What is the difference between using the pressure pump and just using engine timed pressure?

Just how much pressure does a Veco .61 develop timed and untimed?

Is it feasible to drill and tap the front housing 180° behind the carb for timed pressure?

My understanding is that using timed pressure makes the carb extremely sensitive, but how would it be with the Perry pressure carb (no pump)?

Yours truly,
John Lenoch
Brooklyn, N.Y.

The Perry pump/regulator is not considered a pressure system. The pump draws fuel from the tank the same as the fuel pump on your automobile. It does supply fuel to the carburetor under low pressure, but this low pressure is, in turn, regulated by the regulator portion of the pump which senses the demand of the carburetor and supplies the engine's needs. At high speed, more fuel is passed than at idle. As far as straight pressure — it was never intended for this.

You cannot use either timed or untimed pressure with an engine if you intend it to idle. Pressure is strictly for full bore operation as with the Formula I pylon engine, etc. Timed pressure does make the needle valve very sensitive, due to the pressure being in the neighborhood of 6-8 pounds. Untimed or bypass pressure runs in the 1/2-1 lb. range, but is still too high for idle. This is due to pressure in the tank at full throttle. Then, when reducing the speed to idle, the residual build-up of pressure in the tank causes the engine to load up and die. If the idle mixture is set lean enough to compensate, as the residual pressure in the tank drops, the engine dies lean.

You cannot use the Perry pump carburetor with tank pressure as it has been calibrated for use with the metered pressure of the pump/regulator.

Dear Mr. Lee,

Yours is the first article I read in RCM. It seems the problems that plague us with these small engines have no end. Mine is with fuel draw on my two Wankel engines.

The fuel tank is butted right up against the bulkhead that the engine is bolted on, and center line of the tank is even with the carb, which is horizontal.

In order to keep the engine from leaning out and sagging on the bottom half of the tank, I have to set it slobbering rich on the top half until I can hardly get it off the ground!

I know the engines have to run rich, but this is ridiculous. I was wondering if there is any place on them to tap in that

new Robart Super Pumper advertized in the July RCM? I am running this engine on a 10/6 Top Flite nylon prop and the plan is the Senior Playboy on floats.

Any suggestions will be greatly appreciated.

Yours truly,
Jack Young

Normally the O.S. Wankel has pretty good fuel draw, so it's hard to say exactly what your problem is. You did not say what size tank you are using or what you are using for fuel — both of which could contribute to the problem. A 6 oz. tank is as large as you would want to use. Anything larger than this is too much capacity and you will have trouble with the engine having to be set off rich at the beginning of the flight and leaning out towards the end. Fuel without adequate lubrication will also cause the engine to sag, so be sure your fuel contains at least 22% oil. The Wankel likes to turn up — not being a lugger. The 10/6 Top Flite might be just too much prop for your engine. Check the rpm and if the engine is not turning 12,000 or better, use a 9/6.

Although the Wankel is considered a two cycle engine, it is closer to a four cycle in operation in that there is no crankcase compression. Because of this, there is no way that I know of for you to use the Robart pump unit or any form of crankcase pressure. The best solution to use here would be muffler pressure.

Dear Mr. Lee,

First, I would like to say that I really enjoy your column. I'm a newcomer to R/C and I find the info very valuable.

Mr. Lee, now, maybe you can help me with my problem. I have an O.S. Max .30 w/muffler. I have run 3 gallons of fuel through it in the 3 months I have had it. I have changed the plug and also the con-rod had to be changed right after I got it.

After about 2 minutes in the air, you can hear the power drop and then it will quit. I can let it cool, then it does the same thing. I use a 9/6 prop and Fox glow plug and a custom blend fuel of 10%. Also the engine has run hot before because the sleeve is a bluish color. Should I send it off for re-building or would it be cheaper to buy a new one?

I would appreciate any help you can give me Mr. Lee.

Thank you,
Chuck Mays
Danville, VA

Chuck, it sounds like you are just plain running your engine too lean. These engines cannot be set to flat out scream at the beginning of a flight and then be expected to hold that setting the whole flight. The blue sleeve is certainly an indication of the engine having been run far too lean. Set the engine so that it is just breaking out of a four into a two cycle on the ground. In the air, you want to hear it trying to break back into a four cycle at the bottom of loops, long dives,

etc. If it goes too rich, then lean it in a click or two more. If it flat out screams at the bottom of loops, and in long dives, it is too lean so set it off richer. If you are not using muffler pressure, do so, as it will help considerably.

As for replacing or re-building — I couldn't say without knowing how much damage has occurred to the engine. Generally it is cheaper to re-build, but the engine should be sent to the factory (World Engines). If the engine is not repairable, they will usually send you a new engine for a minimum price — considerably less than you would pay for a new engine through a hobby dealer.

Dear Mr. Lee;

Just had a front bearing failure on an O.S. Max .40 FSR. Engine is mounted in a Heli-Baby copter, and had about one gallon of fuel (K & B 500) through it. Upon disassembly, it appears that the bearing was receiving NO lubrication. Any suggestions for the new bearing? Should I oil it before every flight?

Thanks – Keep up the good work.

Sincerely,
Don T. Weber
Fort Collins, Colorado

Pretty hard for me to say if the bearing failed due to lack of lubrication, or possibly, having been fit to tight to begin with. This does happen quite often. When you install the new bearing, check for a slight amount of end play in the crankshaft. A tiny bit is desirable as it indicates the bearing is not too tight. If there is no end play and upon spinning the shaft you hear a tight "whirring" sound, the chances are pretty good that the bearing will fail again. Although bearings can be loosened on shafts and in bores, it is not a job for the inexperienced. Better to try another bearing.

After you get the engine together, run it on the bench and see if any fuel leaks out the front of the case. A drop or two now and then is desirable as this indicates lubrication to the bearing. If bone dry, you can loosen up the seal area directly behind the bearing by using the end of a drill or wood dowel with a piece of #400 grit Wet or Dry emory paper and 3-in-1 Oil. Rotate the dowel as you move it in and out of the hole. Then try running the engine again. Be careful as it is easy to take too much out and then have excess fuel spray out the front. This being a more common complaint by many.

Dear Mr. Lee,

I have a K & B Torpedo .45 R/C engine. I followed the break-in procedures per the manufacturer. I had run about a gallon of K & B 100 fuel through it.

Then I place it in my airplane and proceeded to fly. After about 3 minutes into the flight, the engine got hot and quit. I understand it is because the piston is expanding in the body, and causing it to shut off due to not being lapped enough.

Friends told me it is a very hard engine to break-in. They advised me to lap it using a mixture of jeweler's rouge and castor oil. The only problem is that the engine does not have a through hole behind one of the rear cover screws which would enable me to put the mixture in.

I would like to know if what my friends told me is correct, and if so, where would be the best place to put the mixture.

If what they told me is not correct, how can I solve my problem? Thank you.

Sincerely,
Vincent O'Neill
Coopersburg, Penn.

The K & B .45 just like the Veco .45, was discontinued eight or nine years ago. The engine usually did not require too much in the way of breaking-in — just a few right flights. One complaint about the engine was a short life if run too lean.

You did not say what size propeller you are using, how far your tank is from the engine or how large — whether the center line is below the needle valve, etc. It is pretty hard to figure out a problem with nothing to go on.

So, first off, use an 11/6 prop on the engine and a fuel with 22% oil such as K & B 100. The tank should be no larger than 8 ounces with the center line about 3/8" below the needle valve. The tank should be as close to the engine as possible with all fuel lines as short as possible. Do not leave a couple of extra inches of fuel line just to ease refueling as many fellows do. Be sure you are setting the engine off rich enough to begin with as covered in the previous letter.

As far as running jeweler's rouge through the engine — **forget it!** You never want to run rouge through a plain bearing engine. As the rouge is loosening up the tight parts, it is also loosening up the parts that are not tight, or may even be on the loose side to begin with, such as the crankshaft bearing, con-rod, etc. If you are going to lap an engine, it should be disassembled and the tight parts located; piston/sleeve, crankshaft in the case, etc., then these parts loosened by hand lapping. The crank should spin freely in the case. If not, make a mixture of rouge and light oil and using a hand drill, lap the parts for a few minutes. Check the fit and proceed as indicated. The piston/sleeve fit should be just a light drag more noticeable at the top than at the bottom. If the piston is tight in the sleeve, then lap it until it is looser. This can be done by sticking a piece of dowel through the con-rod and using an up and down rotating motion. If the fit is tighter at the bottom than at the top, use some #360 grit Wet or Dry emory paper and sand from the parts down. □

CUNNINGHAM ON RC

from page 7

increasing number of women are taking up the sport although, generally, these gals seem to be interested along with their husbands or boyfriends. I haven't seen any girls interested in the hobby who were not connected to some guy who was hooked, but this day is probably coming too. With so many really good radios, engines, and kits on the market it is awfully hard to recommend any one thing to a beginner. I have found that each area in the country usually has its "standard" type of aircraft and radio and, generally, engines too. The best advice that a beginner can get, and that an advisor can give, is to go to the local flying field and observe what is being used, then purchase a similar kit and set about building it. No, I don't mean a fire breathing pattern aircraft, but the type of trainer most often found at your local flying field. If you build the same type of aircraft that is popular, then when it comes time for you to get some help, the helper will generally be familiar with the flight characteristics of that design of aircraft, and will not have to learn how to fly your aircraft before he teaches you to fly. This isn't to say that your aircraft might be different, it probably will be a bit, but the more familiar the pilot is with a certain design, the easier it is for him to overcome some problems that the beginner may have built into it.

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This month I'd like to discuss an ailment that can, and does, affect both old and new modelers. That is control surface flutter.

Flutter can be caused by several things, and all of them are bad, as are the results of flutter. First, let's take a look at the problems that flutter can cause.

Structural damage to the control surface, or to the parent surface is almost always a result. A fluttering elevator can play havoc with a horizontal stabilizer. The glue joints can break, the wood can fracture, the covering can rip, just about anything can, and does, happen. The hinges can be worked loose from their surroundings, thus causing the hinges to pull completely loose from the surfaces, and the result is usually a bash with the ground. If this isn't enough damage, the fluttering surface can transmit the vibration back to the servo causing gears to fail or lock, electronic components to

1977 NRCHA NATIONALS

PLACE
Greenville Municipal Airport
Rt. 58W., 3 mi. from Greenville

DATE
August 20,21, 1977

TIME:
8 A.M. Saturday, 9 A.M. Sunday
Pre-registration Appreciated

CONTEST DIRECTOR
William Curtis
R.D. #2, Greenville, Pennsylvania 16125
Phone Day — (412) 588-4120 — Phone Night — (412) 588-8720

ENTRY FEE: $15.00

PRIZES
Trophies and entry fee will be divided among top three in both classes.

CLASSES:
Sportsman, Masters: Both classes will be run outdoors.

Qualifying Round
Saturday AM, all contestants will be required to fly the three Sportsman maneuvers. The top thirty contestants of which ten will be Masters will continue through the remainder of the contest. A special award for the highest score in the qualifying round.

All manuevers are precision hovering. There will be no aerobatics. Let's give something new a try. This contest will be the first ever run where there will be no judging or racing the clock. All maneuvers will be set up in progressively harder tasks. Either you do the required tasks or no points, no in-betweens.

This years's contest has been designed by some of the most experienced helicopter pilots in the world. All of the maneuvers will be available before the contest on request. Why not plan now to attend the world's most prestigious R.C. Helicopter Contest.

Gyros: As in the past these will **NOT** be permitted. I found out recently that a few of these devices have, in the past, secretly made it into this contest. This year there will be people watching during all flying. If one is observed working in a model, that model will be barred from the rest of the contest.

MEMBERSHIP APPLICATION

NATIONAL RC HELICOPTER ASSOCIATION
R/C MODELER MAGAZINE
P.O. Box 487
Sierra Madre, California 91024

Date _____

NAME _____ **AMA #** _____

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STATE _____ **ZIP** _____

PLEASE FILL OUT THE ABOVE AND ENCLOSE $4.00 FOR ANNUAL DUES —

FOREIGN DUES $5.00
☐ **Renew My Membership** ☐ **New Member**

fatigue, or the vibration may be transmitted to the receiver. The damage that this flutter has caused to the radio and the servos might not show up until later when suddenly the radio and/or servos fail, and you can't figure out why. Of course this also holds true for engine vibration due to an out-of-balance prop, or an improperly mounted engine and firewall. Eliminate flutter and vibration and save your radio.

Now, what causes a fluttering control surface? Generally, it is an improper pushrod set-up. A long unbraced length of wire in the pushrod system can cause flutter. A right angle bend to avoid a structural member, and then another right angle bend to get back to the control surface, can be a cause of flutter if the length of the two bends is very great. In the case of ailerons, torque rods of insufficient size can cause flutter, as can long unbraced runs of music wire within a wing structure. Ailerons that are too large for the normal connections can cause flutter. Once, many years ago, I was experimenting with an aircraft that had normal strip ailerons on it. It was a good flying aircraft, but I wanted to get a faster roll rate. At the tip of each wing I added an extra bit of balsa wood about 10" long and 2" wide to the strip ailerons. When I took off, everything seemed normal, until I climbed up, made a turn, and then came back over the field. The wings started to flutter and set up the darndest racket you ever heard. I immediately chopped throttle and landed. The extra area at the tips had turned the entire aileron structure into a torque rod, and a very flexible one at that. So much for that experiment. Watch the hook-up.

Another place that can cause long run problems is, once again, the elevator control rod. If it has some flex to it, this can lead to a crash, because if the flex is in the 'up' side of the control, airload can keep the control surface from giving you the control you need. What I mean is this: If, when you give the aircraft an up elevator command and you can grab the elevator and return it to neutral with finger pressure, then you have too much flex. Most control set-ups place the elevator control horn on the bottom side of the elevator. This means that to get up elevator you must have a pushing motion on the control surface by the pushrod. If you have a long unbraced run of wire, then you can force the elevator back to the normal position by pushing the elevator and letting the wire pushrod flex. When this aircraft is in a dive, the air load on the elevator will tend to push against a command of up elevator, and guess what - - - you can't get any up elevator! Some fun. You holler, "I ain't got it," and down it comes to bash the ground. Not radio trouble, not interference, not pilot problems, but an elevator that has too much flex. When you're building, take care that this doesn't happen, and when you're getting ready to

help another modeler put his bird into the air, check the control surfaces for flexing. If it flexes, don't fly it. Correct the flex first and save an airplane, an engine, a radio, and a friend.

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One of the best new ideas that I have seen for the preservation of sailplanes and Old Timer planes is the new tie-down set available from J & J Advertising. These tie-downs are really a must when you have big birds sitting out in the grass waiting for their turn to fly. They can safely anchor them to the ground and, yet, with just a flip of the fingers, they can be released. Contest goers know the value of some form of tie-down because it's always windy at a contest. Contact J & J Advertising, 5812 Wales, Fort Worth, Texas 76133, and send them $5.95 for your set of tie-downs, postage paid.

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By the way, Fearless One, that cover shot of Jack Youngblood of the L.A. Rams really takes the cake. In case you don't already see the handwriting on the wall, the Dallas Cowboys will be in the Super Bowl this year. I hear tell around the Cowboys circle that it you could put the L.A. Rams and the Oakland Raiders together, you *might* get a team that would look something like competition for Dallas- - -

'Nuff said, Hacker? □

FROM THE SHOP

from page 2

ple; if two blocks are to be laminated together, and the adhesive is applied to the entire length of one side, you will know by glancing at the other side, and seeing the light blue line, whether or not the adhesive has completely penetrated through to the opposite sides and ends of the blocks to be joined. If this thin blue line is erratic, or broken, then you know that a total surface bond was not achieved and additional material can be added exactly at the point where it is needed. In other words, by actually seeing the *bond*, it is apparent at first glance whether or not a joint has actually *been* bonded, eliminating duplication of application or a potential failure of this structure because of lack of applied material. This saves you time, money, and perhaps, your model.

Now, if you're thinking ahead, this visible bond of laminated blocks leads to another distinct advantage. Let's assume a condition where these laminated blocks are to be sanded to a compound curve. For example, you may be building up a cowl, a fillet, or a wing tip. Using a conventional cyanoacrylate adhesive, you could sand to the desire compound curve and hope that you had achieved

uniformity throughout your sanding, but could only be sure if you had a set of templates to check the sanded surface. Now you're getting the picture — by using Blue Line, these laminated compound curved areas can be formed to perfection using the distinctive blue line formed by the new Hot Stuff as a reference in order to assure uniformity of the compound area being sanded. Once you try this, you'll find that this thin blue line allows you to sand your compound curves to the exact desired contour with that thin blue line acting as a built-in sanding jig! Once you try it, you'll be absolutely amazed at how easy, perfectly uniformed compound curves, can be achieved.

Now, if this isn't enough to convince you of the merit of what we consider to be a revolutionary new building item, here's an added plus you're going to have to try to believe. We didn't believe it — we tried it — and we're absolutely amazed at the results! It involved the use of a filler material where joints are not perfectly mated. In the past, we have always used micro-balloons, balsa dust, and other various and sundry materials as a filler when using cyanoacrylates to bridge a slight gap. How about a filler that is completely inexpensive, can be obtained at any market, and will last virtually indefinitely? What we're talking about is plain old baking soda! After extensive testing, this is, without doubt, the very finest filler that can be used with Hot Stuff. For example, should a gap exist, or pitchy wood such as spruce or pine are to be bonded, fill the gap, or dust lightly with common baking soda before bonding. The Hot Stuff Blue Line will kick it off immediately and you can see exactly how much to apply because of the color of material.

Here's a test you can try that will convince you of the properties of these two items, when used in conjunction with each other, which you actually have to try in order to believe it will really work. I say this in all sincerity because, when Bill Hunter suggested we try it, I truly did not believe it would work. Try taking a block of balsa and drilling a 1/4" diameter hole in that block to a depth of approximately 1/2". Pack some baking soda into the hole and add about ten drops of Blue Line. Add more baking soda followed by another ten drop application of Blue Line. Repeat this process, as necessary, until the hole is filled flush to the outside surface of the wood. Now take some sandpaper and sand the filled hole flush with the surface of the balsa wood. Once this has been accomplished, drill and tap the hole, filled with baking soda and solidified with Blue Line, for an Allen head bolt! That's right, we said *drill and tap* it. Blow out the loose baking soda and you'll find that you have a perfectly threaded hole for your Allen head bolt. Now, simply run a small amount of Blue Line down around

the threads and allow to dry. You'll find that this drilled and tapped hole in the baking soda is stronger than any blind mounting nut you've ever installed in a firewall! As I said, it's hard to believe until you've actually tried it!

When using baking soda as a filler, be sure to flood the area with Hot Stuff, since it kicks off so fast that you have to put the necessary amount of adhesive on quickly in order to insure a proper bond. When building up an area of a depth previously mentioned, it is better to do this in several applications, rather than try to do it all at once, wherein the Hot Stuff Blue Line may not have time to penetrate the entire depth of the hole before kicking off the baking soda.

As with conventional Hot Stuff, Blue Line shelf life runs six to nine months at room temperature. However, you can extend its shelf life virtually indefinitely by placing the unopened bottle in the freezer portion of your refrigerator. The material will not freeze or change. When you're ready to use the bottle, allow it to return to room temperature prior to application. Before using, wipe off all condensation from the bottle and remove the cap only after the bottle is completely dry. The shelf life, which has been suspended while the unit was stored in the freezer, starts again *after* removal from the freezing unit.

As with any cyanoacrylate adhesive, avoid liquid contact with the eyes and keep out of the reach of children. In case of liquid contact with the eyes, flush thoroughly with plenty of water and get prompt medical attention. This material can instantly bond skin and, if the latter occurs on other parts of the body, quickly flush the bonded area with running water. Fingers may be pried apart by gently rolling a pencil or paper clip between them. Curing fumes can cause momentary irritation to the eyes such as is caused by cigarette smoke or soapy water. If this occurs, flush lightly with clear water. Alwyas use a cyanoacrylate adhesive with proper ventilation.

Thus this is the story of Satellite City's new Hot Stuff Blue Line — something we feel is a giant step forward as an aid to model construction. As a summary, because you can see each drop, less material is used. This provides a better bond, reduces waste, and lessens possibility of accidental bond. In addition, Blue Line adds a visible aid to contouring compound curved areas with each lamination giving a distinctive Blue Line as the work is shaped, allowing you to produce perfectly shaped cowls, fillets, and laminations — all of which can add new dimensions of beauty to your model.

RCM extends it congratulations to Bob and Bill Hunter of Satellite City for their research and development in an outstanding new product. You can find it at your local hobby shop priced at $4.95 for a bottle containing 14.2 grams or .50 fluid ounces. You'll like it a lot! □