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OCTOBER

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FROM THE SHOP

Don Dewey

This issue marks the 13th Anniversary of R/C Modeler Magazine.

During these past thirteen years the sport and hobby of radio control has changed drastically and grown tremendously, both in size and in sophistication of equipment and aircraft design. Hopefully, RCM has kept pace with the times, changing according to your wishes and desires for a magazine that reflects all of the varied interests and facets of this challenging and ever-growing sport. Many of you reading this issue of RCM, never saw the first issue dated October 1963. The magazine had a total of 40 pages, sold for a cover price of 40¢, and contained the following items on its table of contents page: A construction article for Phil Kraft's Stagger-Bi and another for Barry Halstead's single channel rudder only Exodus. In the Features Department, we had coverage of the 1963 Nationals, an article on construction techniques, another on improving performance and reliability of single channel escapements, and an RCM interview with Hal deBolt. Departments included the editor's column, an electronic column entitled Bench Bits, a club news section called Fly-In, the Showcase '63 new products section, Frank Junstin's Solo column, RCM Technical Monthly Data Sheet, and an AMA news section.

In that first issue, which contained no typesetting (we were too under-capitalized to afford it) all of the text of the magazine was manually set on an IBM electric typewriter, meticulously counting each character and space and manually justifying each line so that it would come out even on both the left and right hand side of the column. It was printed on pulp paper, as was standard practice for model magazines at the time (until RCM introduced slick paper into model aviation magazines) and was printed in black ink only with a red and black cover.

The following were the list of advertisers in that first issue: Aero Models, Aero-Trol Engineering, Arcadia Wheel and Hobby, Babcock Models, Bonner Specialties, C & S Electronics, Exportations, G & M Hobby Specialties, Grid Leaks Data Service, Hi-Way Hobby House, Justin Inc., Kraft Custom Radio, Lee's, Magna-Jig, Micro-Mo Electronics, Model Covering Company, Murray RC, Nashville Hobby Center, Octura Models, Sig Manufacturing Company, Spacetron, Stazon, Timely Plans, VK Model Aircraft, and West Town Hobby Shop. It would be interesting to know how many of you remember the majority of those advertisers and their products, many of whom are no longer in the industry.

Somehow, from that first issue, and its print order of 2000 copies, we made it through the next 153 issues, although we often wondered how we survived the first few years. We borrowed more money than we ever felt we could pay back, and often found ourselves in the position of robbing Peter to pay Paul. Each issue - - - each month - - - was a fight for survival until, finally, somewhere around the eighth year we actually broke even for the first time. We never could have made it through those early years without your support and encouragement. Hours seemed to stretch into days and days into complete frustration as we struggled to keep our heads above water while still producing the kind of magazine you wanted to see, despite the limited resources at our command.

Over the years, I have often been asked what philosophy prompted the magazine to continue in the face of the many obstacles that confront the publishing business wherein a new publication is given less than a 2% chance of surviving its first year. And, once you pass that first year, your chances of getting through the second year increase to an overwhelming 7%! Insofar as the philosophy goes, I cannot speak for all the wonderful and talented members of the RCM staff who have worked so hard over the years, but can simply give you my own personal philosophy which is summed up by one of the most magnificent pieces of writing I have ever read. It is called the Desiderata, which was found in Old Saint Paul's Church in Baltimore and dated 1692, author unknown. It reads as follows:

DESIDERATA

Go placidly amid the noise and haste, remember what peace there may be in silence. As far as possible without surrender be on good terms with all persons. Speak your truth quietly and clearly; and listen to others, even the dull and ignorant; they too have their story.

Avoid loud and agressive persons, they are vexations to the spirit. If you compare yourself with others, you may become vain and bitter; for always there will be greater and lesser persons than yourself. Enjoy your achievements as well as your plans.

Keep interested in your own career, however humble; it is a real possession and the changing fortunes of time. Exercise caution in your business affairs; for the world is full of trickery. But let this not blind you to what virtue there is; many persons strive for higher ideals; and everywhere life is full of heroism.

Be yourself. Especially, do not feign affection. Neither be cynical about love. For in the face of all aridity and disenchantment it is perennial as the grass.

Take kindly to the council of the years, gracefully surrendering the things of youth. Nurture strength of spirit that shield you in sudden misfortune. But do not distress yourself with imaginings. Many fears are born of fatigue and loneliness. Beyond the wholesome discipline, be gentle with yourself.

You are a child of the Universe, no less than the trees and the stars; you have a right to be here. And whether or not it is clear to you, no doubt the Universe is unfolding as it should.

Therefore be at peace with God, whatever you conceive Him to be, and whatever your labors and aspirations, in the noisy confusion of life, keep peace with your soul.

With all its sham, drudgery and broken dreams, it is still a beautiful world. Be careful. Strive to be happy.

It is too bad that we cannot all live by this seventeenth century credo. But, as human beings, limited by our own imperfections, we can only continue to strive towards the unobtainable goal of perfection.

This holds true in our sport and hobby as well as in our daily lives and our relationships with others. We can learn to enjoy this sport to the fullest . . . to reach out towards the new and different challenges that it has to offer . . . to try to raise our own levels of proficiency and skill . . . to share with others what we have learned . . . and to extend our hand in friendship to modelers throughout the world, regardless of race, creed, religion, color, or political boundaries. For this is a sport and hobby that has, as its foundation, a universal language, without any of the barriers that man so often erects as monuments to his own ignorance.

On this the thirteenth anniversary of R/C Modeler Magazine, we wish for each and every one of you, the fullest enjoyment possible from this sport and hobby. May the dawn of each of your days be marked by blue and sunny skies.

Good flying, always. □

RC DESIGN MADE EASY

BY CHUCK CUNNINGHAM

PART II: BASIC DESIGN CRITERIA

● Last month I kinda' jumped out in front of my usual format on this series and talked about the ins and outs of designing your own biplane. I also promised that, this month, I would go back, re-group, and start all over again with the basics of designing a successful trainer type aircraft. This would be combined with a bit of delving into some ideas and thoughts on some of the more popular pattern designs, along with the development of today's Formula I racing type aircraft. Please understand that the ideas and formulas that I am going to set forth are not hard and fast rules that must be followed in order to avoid being doomed to failure. These ideas and guidelines are simply averages that have proven to be successful for many many years and have been arrived at by analyzing many successful designs all the way from .049 aircraft to eight foot monsters. Since this series was first introduced in 1965, thousands of aircraft have been built following these averages, and I'll bet that there were no failures to this group due to design. If you want to design your own models and to know that, when you get finished with your project that you will have a good flying model, then read on. Better yet, go out and purchase an extra copy of RCM and keep this in your files for future use, because even though you may not be thinking of designing your own ship right now, a year from now you may get bitten by the "I designed it myself" bug.

Size of Aircraft to Design

First, you've got to start someplace in your quest for your own design, and the best place to begin is based upon your own desire. Do you want to design an aircraft around a .15 size engine, or do you want to work around a .60 fuel drinker? Or, perhaps, someplace in-between? For our purposes, we'll simply select a size around which to work. Last month when we were working on the design of a bipe we picked on a .40 engine to yank around a pretty fast bipe. This month, let's consider that we want to fly a rather tame trainer, and we have a perfect .60 engine for this work. We don't want to design a fast flying pattern bird, and we don't want to design a great big cabin aircraft such as the Telemaster that I have been flying for a couple of years. Also, we don't want to "design" another "Ugly Stick" type aircraft, and we aren't interested in trying our hand at scale.

So, what's left? Not too much since we have kinda' backed ourselves into a corner. So, for our proposed "semi-docile" aircraft, how about a shoulder wing ship that doesn't look like an Ugly Stick, flies with all of the forgiveness of a trainer, and yet has a bit more eye appeal?

All right, let's work out a shoulder wing model, with a cockpit, or cabin above the wing, a trike geared undercarriage for easier take-offs, a good amount of area, and a nice large space for the radio equipment and fuel tank. Also, since we are more interested in easy flying than in super appearance, we will stick the engine upright in the fuselage so that everything is easy to reach.

Wing Area:

Now that we have decided upon the basic concept of our model, and we have also decided upon using a .60 engine, we next need to decide how much wing we are going to be flying, and the type of airfoil. We will talk a bit more about airfoils later on, but for now, let's assume that we are going to use an airfoil that has a semi-symmetrical section, much like the NACA 2415. The symmetrical airfoil proponents are going to argue with this, but I firmly believe that the semi-symmetrical foil gives you just a bit more stability at slow landing speeds on a moderate type aircraft than does the symmetrical section. Look at chart number one.

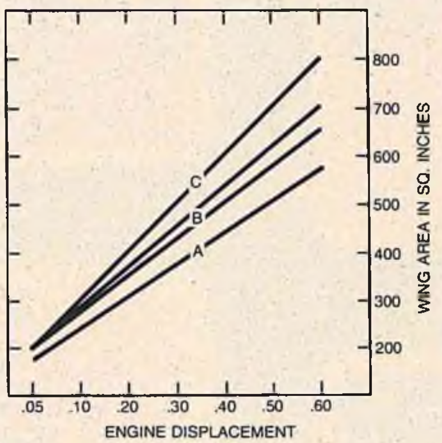

CHART 1

On it are plotted three lines, A for a higher wing loading, B for a moderate wing area, and C for a larger bird. Let's take the middle of the road (B) and we find that, for our trainer, we are going to have a wing area of 700 square inches.

Looking for a moment at the remainder of the chart, we find that, following this median line, assuming we are using a .40 engine, we would be working with a wing area of 500 square inches, and for a .199 engine, we would have a wing area of 380 square inches. If we take a look at the more docile line C, we find that our .60 engine would be pulling around 800 square inches and our .40 would be flying 600 square inches, while our .199 would find that 400 square inches would be the ticket. Remember, these are averages and not "must follow" rules. They are merely guidelines so that you will have a plane of reference upon which to build your dream design. Now, back to our .60 bird with a 700 square inche wing area.

Wing:

As I have said many times before, the most pleasing combination to the eye, as well as for flyability, is to have the wingspan between 5 and 6½ times the wing chord. This combination makes for a very strong wing structure, while providing a very good looking wing planform. I have designed models with an aspect ratio of 3:1 (span 3 times the chord), and most soaring aircraft have wings that are 10 to 15 times the chord. But for that good old average figure the 5.5:1 or the 6:1 are quite hard to beat. We can work out any combination of wing chord to wingspan for any area and aspect ratio that we decide to use, simply by using the simple formula:span times chord equal the area, or $S \times C = A$. If the span we want to use is 6 times the chord, then, by substitution of this for span in our equation, we have $6C \times C = A$, or $6C^2 = A$. Chart number two has this plotted out for wings of this description and, by consulting this graph, we find that for a wing of 700 square inches of area and an aspect ratio of 6:1, we have a span of 64+ inches and a chord of

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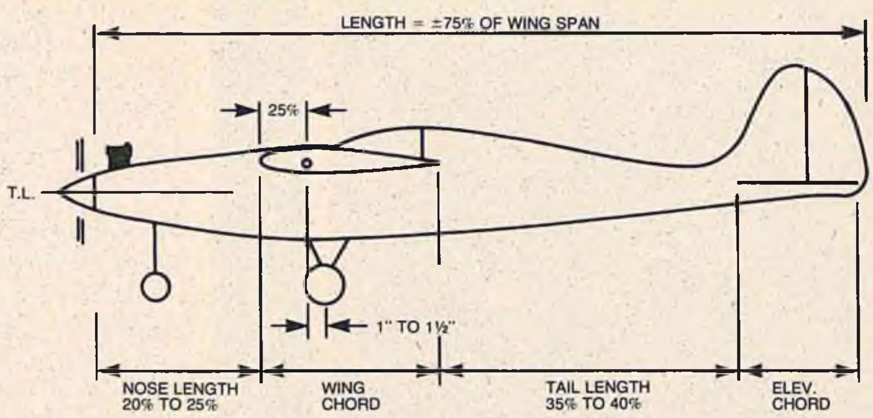

CHART 4

engine clinic

By Clarence Lee

● This month we have another old timer for you which will be the fourth engine in this series on lesser known old timers and engines with unusual features. The engine is the Condor Kopper King. Although being of .60 displacement, the physical size of the engine is comparable with engines in the .35-.40 displacement range making the Kopper King one of the smallest .60's of all time. The motor was designed by Mr. Roy Lloyd, an English toolmaker, in 1938 or 1939. The motor was originally produced by Lloyd and a friend, Robert Gardner, in Gardner's basement in Pittsburg, Pennsylvania, and was first marketed in 1939. Each engine was hand fitted and lapped with extreme care, resulting in an exceptionally good piston/cylinder fit. After assembly each engine was bench run, then disassembled and cleaned, then reassembled and run again before being boxed for shipping.

In late 1939 The Pittsburg Brass Manufacturing Company became interested in the engine and began negotiations for the manufacturing rights. In June of 1940 a contract was signed and Pittsburg Brass became half owner. Gardner and Lloyd operated as individuals until about 1943 when they founded the Rob Roy Company to produce defense work. Most of the time that Gardner/Lloyd and Pittsburg Brass were associated was consumed in perfecting the design of the engine and building production tooling. Just before WW II started, Pittsburg Brass was obliged to give up the idea of manufacturing and it is estimated that only about 100 engines were completed. I, personally, believe that more than this number may have been produced. Several have passed through my hands besides the one in my collection, and I know of many in various antique collections. When 100 or less of an engine have been built they seldom show up as often as I have seen the Kopper King.

In 1945, Pittsburg Brass was approached by a Mr. Robert Miller of Miller Machine Products Company in Chicago with an offer to purchase the production rights. A sale was arranged and Mr. Miller paid Pittsburg Brass $2,000.00 for their half interest and the same to Rob Roy for their remaining interest. Miller assembled engines from the parts he obtained and probably made others in his own shop. The engine was sold through Aero Crafters Hobby Shop in Chicago in 1946 for a price of $24.00. An ad appeared in the August 1946 Air Trails for the engine. It was believed that Mr. Miller also owned Hobby Crafters at the time.

The number of post-war engines built is not known. Post-war engines seem to be even harder to find than the pre-war which would indicate less having been made.

Some of the features that made the Kopper King unusual were a coupled throttle and spark advance system. Many fellows associate the barrel type carburetor with our present day R/C engines, however the Kopper King had a barrel type carburetor connected by a wire to a ring around the base of the cylinder. This ring, in turn, had teeth on the front that mated with teeth on the back side of the timer housing. Movement of the throttle arm rotated the ring around the base of the cylinder which, in turn, advanced and retarded the spark, or timing, of the engine.

For you fellows who are not familiar with the operation of the old spark ignition engines, the timing had to be retarded for starting, otherwise the engine would kick back much the same as a flooded glow engine, but even worse. When the engine started, the spark timing was then advanced. Some of you who have trouble setting a needle valve correctly should have had the spark lever to fool with as well!

Engine speed could be controlled by advancing or retarding the spark lever. This, coupled with a carburetor made for a very nice throttling system. However, back in 1939, there wasn't all that much of a need for throttle control. RC was in its infancy, U-control was still only a thought in Jim

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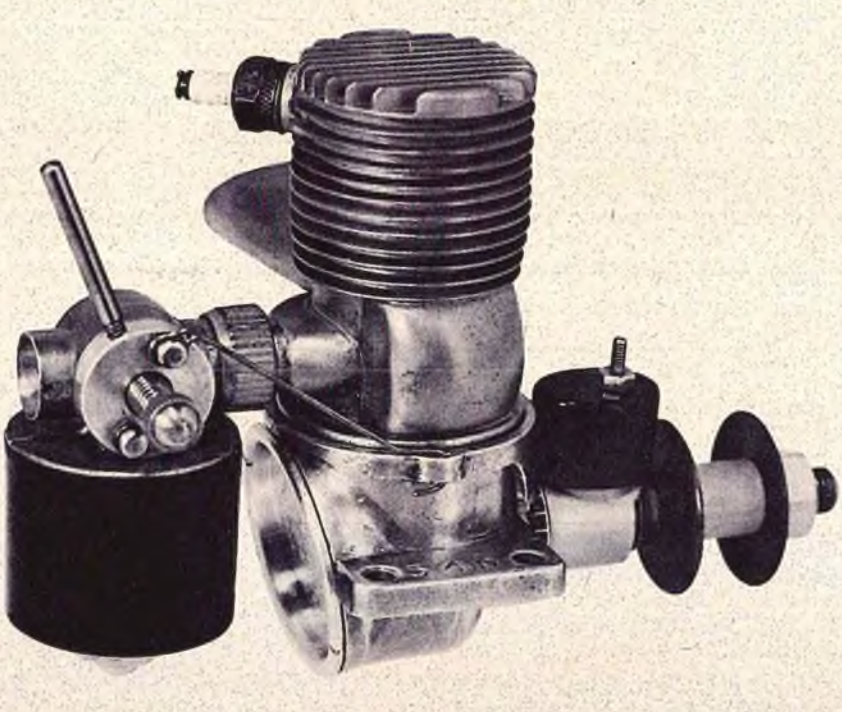

CAN AN
FAI FLYER
FIND HAPPINESS?

BY TONY ESTEP

One of the most unique phenomena ever to come across the soaring scene has been the FAI team selection process which has been going on this spring and summer throughout the country.

Briefly, it works like this: In May, some 23 qualifying contests were held, using the European soaring rules which I'll describe later. Flyers who scored 80% of the winner's score or higher were qualified for the semi-finals, which took place on the July 4th weekend. There were six of these semi-finals, and they narrowed the field to 36 flyers. Those hardy survivors will do battle on Labor Day for a pretty darn nice prize — a trip to South Africa next March to represent the U.S. in the World Soaring Championships.

So far, all sounds reasonable. But the big hooker has been in the surprisingly hostile reception to the FAI rules among U.S. flyers. I think this hostility is unwarranted. FAI certainly demands a lot of both pilot and plane, and reduces the luck element in a soaring contest. In addition, the design demands on the plane will certainly benefit us all. Besides, I think it's fun — sort of.

The FAI rules call for duration, distance, and speed, all to be flown with the same plane. The problems of flagging the speed and distance turnpoints has meant that, in most cases, only one plane has been on the course at a time. This makes the contest a bit slow. And the terrific speeds achieved by the top flyers are intimidating to a lot of glider guiders who don't like down elevator.

Let me tell you a little about the three mid-west contests I've attended, and perhaps you'll see why I think that both pilot and planes are benefitting from FAI experience.

My first taste of FAI was at a hideously windy blow-out at Fort Wayne in early May. With windspeeds measured at 32 mph on the ground, the majority of the nineteen competitors failed to finish. It was so violent that you had to have a helper assist you when you carried your plane out to the winch. Nonetheless, many of the speed times were under 20 seconds, topped by Jerry Mrlik's blazing 17.5. And, from a 200 meter winch in 30 mph winds, Bob Gill and Bob Robinson made perfect 6 minute maxes, capped by high scoring landings. The qualifiers at this bash were Gill, Robinson, Bob Steele, and me. I slid through with a two-lap distance flight, most of it at an altitude of 25 feet or less.

Two weeks later the non-qualifiers met at Chicago for a re-run, and I went along to practice and watch. The winds were about 20 mph on the ground, but the conditions were good enough so that we all began to get an inkling of what FAI was really like.

The first thing we began to discover is that the more ballast you carried, the longer you stayed up on that particular day. As we shall see later, the typical FAI plane has a wing loading of 10 oz./sq. ft. and up — way up! In the Chicago breezes, the lead was coming out of everybody's toolbox, not only for speed and distance, but also for duration. Keith Finkenbiner turned a 15.0 second speed run, and John Nielsen made 10 laps against a pounding headwind. John missed out on at least two laps when a radio glitch sent his Legion-Air into a wild wing-fluttering dive which broke the covering. But he recovered and landed safely. Qualifiers on that day were Ray Hayes, Finkenbiner, Nielsen, and Dan Pruss, who won with his beautifully finished Graupner Cumulus.

Now for the semi-finals, and the true test of nerves, skill, and preparation. Three rounds of three flights each for two days, a total of eighteen flights per man! Again Fort Wayne was the site, and genial Jerry Kay was the well-organized CD. The chore of flagging and calling was beautifully handled by Frank Wren, who put in fourteen hours of hard work in that capacity. Going through the pits before the contest, you could see that the main thread running through the competitor's choice of planes was to build a plane which was slick, low in drag, low in dihedral, and could carry lots of lead. Sizes ranged from 100" to 12'. Aspect ratios were mostly in the 15:1 range, but Keith Finkenbiner's plane had a 21:1 wing which looked too skinny to fly. Three of the planes had flaps, and two had releasable towhooks. Most had spoilers. All had flat bottomed airfoils, but some were thin and some were thick. There were only four kit designs represented: A Cirrus, a Grand Esprit, and Aquila were clustered together in one corner of the pits. And Dan Pruss, having damaged his Cumulus, was flying a Magnum 12.

After the first round I thought I could already discern a pattern in the type of plane which was going to do the job. The biggest plane got lower launches and required too much ballast to get up to the 13 oz./sq. ft. loading needed to do well in speed or distance. The little planes didn't have the L/D or sinking speed capabilities to do well in distance or duration. And the flapped planes were getting no benefit from the extra complexity — just another thing for Murphy's Law to work on. So it looked like the contest would go to a medium sized, ungimmicky, strong, slick plane with a wide range of wing loading.

Also, it became apparent in the early rounds that U.S. flyers need not tremble in fear of the Europeans in the World Champs. Although we have just started to try their rules, we were turning in some excellent scores. Jerry Mrlik blasted through the speed traps in 14.6. Jeff Mrlik racked up 16 laps in the distance. Distance flights of 13, 14, and 15 laps were made in every round. Perfect 100 point landings were fairly frequent. One flyer, Bob Robinson, made 6-minute maxes in 5 of the 6 rounds. And, again, we were finding that there was a strange fact about ballast. Even though the winds never rose above 5-10 mph, many of the flyers discovered that in order to reach the distant lift-generating areas about 1/4 mile from the launch point, it was a good idea to carry full ballast for the duration event.

Jeff's 16-lap distance flight deserves a fuller description. Since the course is 500' long, that represents 8000' of straight-line distance. Figuring in some turns and some moving around in the course to stay in the best lift, Jeff probably flew about 1¾ miles in the 4 minutes allotted for the time on course. That works out to an average ground speed of 26 mph, which is not bad at all for a plane with no motor, launched from about 500 feet of line. On the straights, Jeff was probably going about 35 mph.

Jerry's 14.6 speed time can be worked out to about 55 mph on the straights. When a glider is diving at 55 mph, it looks like it is

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TABLE I

Place	Flyer	Plane	Span	Approx. Area	Configuration	Weight	Features
1	Dave Corven	Original	10 ft.	925 sq. in.	Polyhedral	60-75 oz.	Spoilers
2	Bob Gill	Cirrus (Stk)	10 ft.	805 sq. in.	V-dihedral	60-75 oz.	Rel. hook
3	Jerry Mrlik	Original	10 ft.	1050 sq. in.	Polyhedral	60-84 oz.	Spoilers
4	Tony Estep	Original	10 ft.	960 sq. in.	V-dihedral	70 oz.	Rel. hook

RADIO SPECTRUM

BY JIM ODDINO

● If you've been receiving RCM for any length of time, you may remember a series of column's by Clarence Lee which were the result of his describing the effects of engine torque on a model airplane. Well Clarence started getting letters from experts all over the country explaining that torque wasn't the problem. It was really P-effect, or from others who insisted gyroscopic precession was the real culprit. The net result was one of the most interesting series of articles I have seen in a model magazine. Well, ever since I started this column, I've been hoping we could get the same kind of thing going where we would get inputs from various experts in related industries, military agencies and/or universities.

Hopefully the following letter is the first of many:

Dear Jim;

I read your article in the June issue with great interest. I have been in the Interference analysis and control business for the Air Force for over 15 years, and am acutely aware of the problems we are facing in the R/C hobby. I would like to make several comments related to your article which may clarify some points. These are: (1) relative field strength vs. distance; (2) methods of off-channel sensitivity measurements; (3) most likely cause of radio failure at low altitudes.

First, Power Density (P_d) falls at $1/r^2$ while Field Strength only falls off at $1/r$. The math is as follows:

P_t – power transmitter in watts.
G_t – gain of transmitter antenna (linear).
r – distance in meters.
R – free space impedance.
V/M – field strength in volts/meter.
P_d – power density in watts/meter.

$$P_d = \frac{P_tG_t}{4\pi r^2} = \frac{(V/M)^2}{R}, \quad V/M = \sqrt{\frac{RP_tG_t}{4\pi}} \times \frac{1}{r}$$

Therefore, the distance ratio is directly proportional to the voltage sensitivity ratio not to the square of the distance.

Your table should read:

Freq.	Sens.	Range Ratio
72.080	4μ volts	1
72.160	.1	25,000
72.240	.1	25,000
72.320	.016	4,000
72.400	.075	18,750
72.960	.001	250
75.640	.2	50,000

Note: This can also be calculated using Signal generator power in dBm or milliwatts and using $1/r^2$. The results are the same.

The second point is the method of measurement. I assume you inductively coupled a signal generator to the antenna coil of the receiver since you came up with an absolute measure of sensitivity (4μ volts). This is fine for measuring on-channel sensitivity, but the tight coupling usually reduces selectivity of the tuned front end and gives erroneous indication of image rejection. This would be all right on a 50 ohm receiver, but not on a high impedance input like a R/C receiver. The best method would be to radiate the signal to the receiver/antenna system from at least several meters away with good isolation from ground reflections. This method would uncover another source of interference we are experiencing which is probably more prevelant at close range. This is direct detection of the R.F. signal by the receiver detector and pulse amplifier stages without regard for the path through the I.F. Since our receivers are not shielded, this is very likely. Local radars couple into the receivers and cause interference in this manner. It's called radiated susceptibility. Incidently, I have the equipment for performing radiated testing. When

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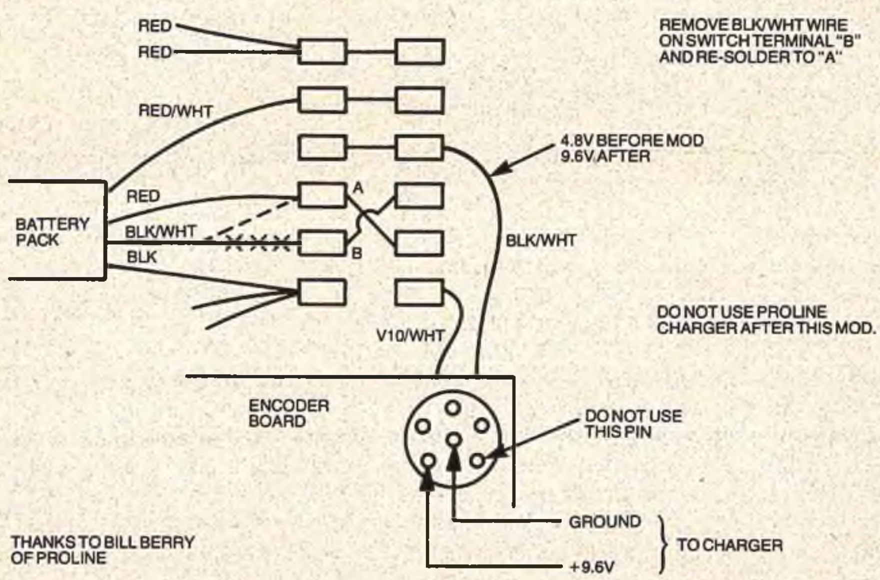

FIGURE 1

I get a chance, I'll really 'wring out' an R/C system and send you the results. By the way, that unexplained increased sensitivity is probably due to a re-entry in the I.F. filters. This is especially prevelant in crystal I.F. filters. They are not usually specified lower than 60 dB below F_O. The actual rejection at 72.320 is 72 dB which isn't too bad. Once you get this far down on the curve, signals start leaking around the I.F. cans in unpredictable fashions.

The third area is that of loss of signal at low altitudes. My experience has shown that this is usually caused by cancellation of the direct signal path by signal reflected from the ground. At low grazing angles they are almost equal. This coupled with the fact that a plane during approach attitude has its antenna positioned in an almost perfect null to the transmitter can reduce the received signal below the receiver sensitivity for several seconds at a time. We have tested this using Jeff Ives sailplane with RCS servo controller operating the power switch for the Thermal Sniffer. When the signal drops, the Sniffer stops transmitting. This produces some interesting results. The solution to this is – don't make long, low approaches.

Well Jim, I've bent your ear long enough. I hope this may be of some value. On the side, if the CB'ers are going to stay on 27 MHz, their gross mis-use of the band presents a real hazard to us. We should push for clear channels on 72 MHz and get off 27 MHz after 5 years to transition (not on a shared basis).

Sincerely,
Richard E. Rabe
Rome, New York

Before commenting on the letter, I would like to make it clear that the test results printed in the June column were reprinted from an article published in the Pioneer Newsletter by Gary Kelson. He should be given credit for running the tests and presenting the data which does highlight the basic problem of spurious responses in Superhet radios. I'm happy (for myself) to say that it was Gary who had the trouble on 72.08, and who crashed at the Madera contest, prompting him to run these tests. I think he has provided a valuable contribution to those who were unaware of such phenomena. My only contribution was to try to explain why it wasn't only 72.96 that bothered the 72.08 receiver, but that other R/C frequencies could also cause problems, although not as severe.

Back to Mr. Rabe's letter. There is no question about it — power density falls off at $1/r^2$, while field strength falls of at $1/r$. Mr. Rabe's math took some giant steps, that might be a little hard to follow. It reminds me of my old math professor who used to say, "It should be obvious to the student . . .". Somehow it never was. Let's take it step by step.

(1) The power density P at a point due to the power P_t radiated by an isotropic radiator is:

$$P_d = P_t/4\pi r^2 \qquad \text{watts/meter}^2$$

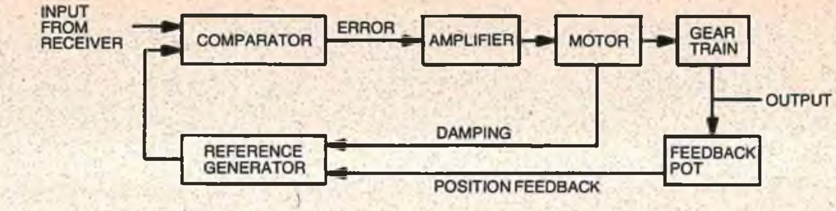

FIGURE 2

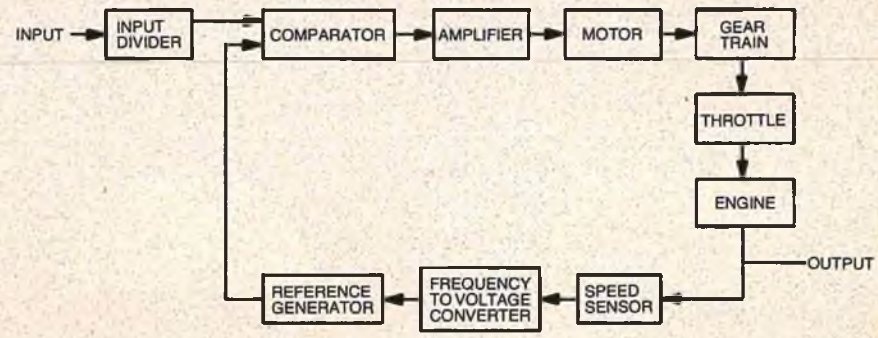

FIGURE 3

An isotropic radiator is a theoretical antenna so the formula must be modified by the actual gain which is the G_t in Mr. Rabe's formula. We can ignore antenna gain to illustrate the range relationship. The r in this equation is the range in meters and the P_t the transmitted power. The relation between power and voltage is:

$$P = \frac{E^2}{R}$$

and likewise the electric field intensity E in volts/meter and power density P_d in watts/meter^2 at any point are related by:

$$P_d = \frac{E^2}{R} \quad \text{or} \quad E^2 = PR$$

Where R is the resistance of free space (120π ohms). Then:

$$E = \sqrt{P_d R} = \sqrt{\frac{P_T R}{4\pi r^2}} = \sqrt{\frac{P_t R}{4\pi}} \times \frac{1}{r}$$

So you can see the field intensity which is measured in volts per meter will be cut in half if you double the range, while the power density would drop by a factor of four.

So, how does all this affect what appeared in the June column? It says that the problem is not as severe as it appeared to be based on the range ratio calculations presented. It says that instead of 16:1, the range ratio for 72.96 is 250:1, which might make you breathe a little easier. However, if you have been having problems, you will continue to have them. This discussion only attempted to explain why and the only solution offered is to get off of 72.08 or take the precautions we mentioned in June about staying away from 72.96 transmitters. If the 16:1 number had kept you from ordering a system on 72.08, don't be too hasty to run out and order that frequency now, because we've changed it to 250:1. I'm not sure how Gary made his measurements, but I would guess that the problem would be worse if both input signals (72.08 and 72.96 MHz) were very strong and present at the same time. So, if someone out there has the time and equipment, it would be very interesting to see the results with various levels of field intensity, using the techniques suggested by Mr. Rabe.

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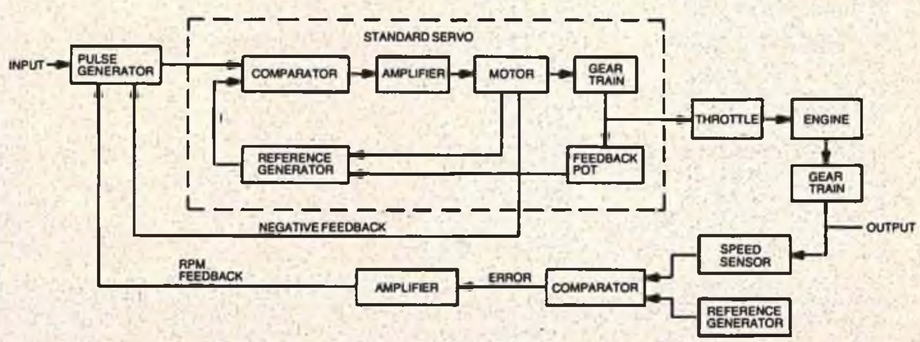


FIGURE 4

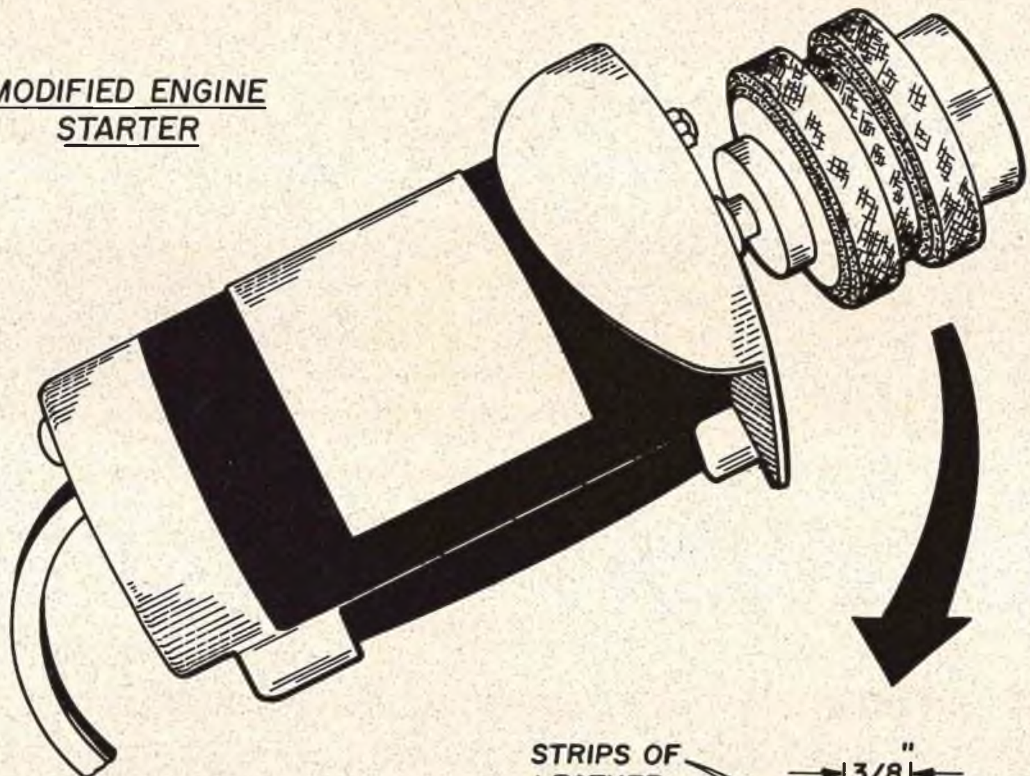
HERE'S HOW

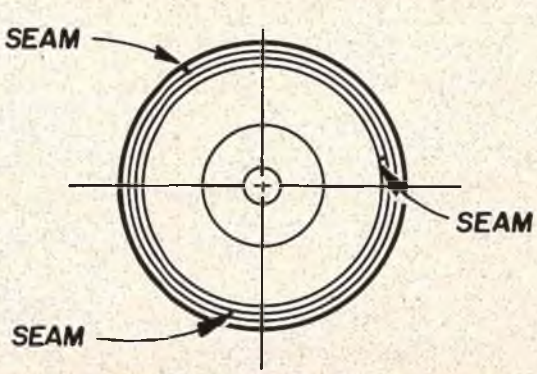
BY JERRY SMITH

IF YOU HAVE A MODEL ENGINE STARTER THAT HAS NO PROVISION FOR DRIVING A BELT FOR BELT STARTED ENGINES, YOU MIGHT TRY THIS IDEA FROM DR. NINO CAMPANA. AS SHOWN BELOW, CUT A PIECE OF THICK SOFT LEATHER (FROM THE LOCAL SHOEMAKER) TO FIT AROUND THE OUTSIDE OF THE STARTER CUP. SPRAY OR BRUSH CONTACT CEMENT ON THE SMOOTH SIDE OF THE LEATHER AND ON THE OUTSIDE OF THE CUP. WHEN READY FOR APPLICATION, APPLY THE LEATHER TO THE CUP, ROUGH SIDE OUT. NOW CUT TWO STRIPS OF LEATHER. APPLY CONTACT CEMENT TO THE LEATHER ON THE CUP AND THE ROUGH SIDE OF EACH STRIP. APPLY THE STRIPS TO THE LEATHER ON THE CUP LEAVING A 3/8" SPACE BETWEEN THEM. THIS WILL FORM A GOOD SHOULDERED GROOVE FOR THE BELT. LAYER AN ADDITIONAL STRIP ON EACH STRIP TO DEEPEN THE GROOVE.

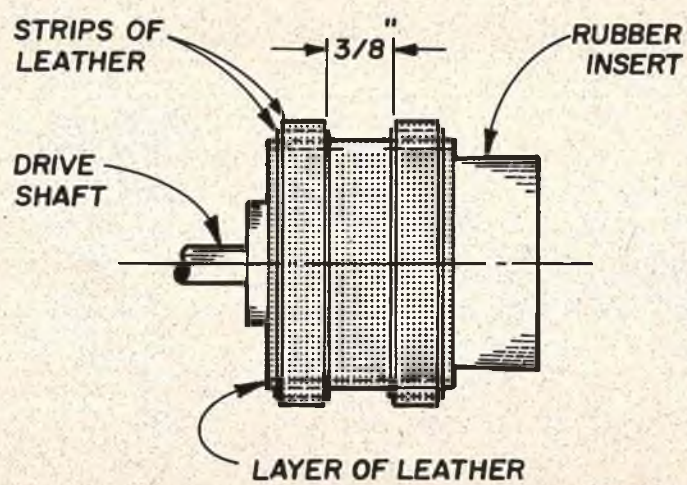
NOW YOU WILL NEED A BELT. (AND WHO DON'T NOW AND THEN). GO TO YOUR EUREKA VACUUM CLEANER DEALER. BUY A DRIVE BELT SUCH AS USED ON THE UPRIGHT EUREKA. THAT'S IT — AND CHEAP TOO!!

MODIFIED ENGINE STARTER





WHEN APPLYING LEATHER BE SURE THAT BUTT SEAMS DO NOT FALL OVER EACH OTHER.



GUPPY

Steep vertical ascents and descents with positive control at all times, characterize this STOL aircraft. Designed for flying from confined areas, the Guppy is an all-around sport ship where fun is the name of the game. By Bob Thompson.

● Funk & Wagnall's Standard Dictionary defines a guppy as "a small, tropical, fresh water fish, valued as an aquarium fish for the brillant coloring of the males, and for mosquito control." Which leaves me with something of a problem . . .

As with most things in our world, Guppy came to life as the result of a need. Our fields are getting ever smaller as every open area sprouts housing development signs. Add to this the ever increasing cost of getting to a flying field and it is evident that something is needed that can operate out of whatever we have close by.

An article in M.A.N. by Peter Russell (Nov. '74) entitled "The STOL Machine" provided the idea. The problem then became one of finding something to hang those flaps on. This was solved by, and Guppy patterned after, an article and plan by Bryce Peterson in the July '72 edition of RCM.

Once the initial set of plans were drawn up, several new ideas evolved. Why not install a camera, why not a set of slats a la Pete Russell's ship? They remain just ideas, however, as it's been too much fun just flying it. Anyone who does come up with enough drive to carry them through would give me great happiness if they would communicate their results to me c/o RCM.

Now to the construction.

Wing:

The wing is quite straightforward, however, building as outlined will insure a true wing.

Start by pinning down and gluing the 3/32" bottom sheeting, capstrips, and leading edge. Following this, glue and pin down the front and rear lower spars. Next all W1 and W2 ribs. The last part of this operation is installing the front and rear upper spars. Give everything a final check for trueness and allow to dry overnight.

At the same time as the wing is being constructed, you may also lay up the wing tip. Begin by fitting and gluing the outer 1/4" pieces together, however, insure that you in no way connect it to the wing proper. Lay out the lower capstrips, then the front and rear lower spar pieces. Follow this with W3 and allow to dry. With the better aliphatics you should have sufficient tack in two hours to remove the pins and gently remove the tip from the plan. Using a convenient 1/2" piece of scrap to achieve the proper tip angle, glue the tip to the wing panel.

When both wing halves have been constructed to the point described, glue together using the dihedral as noted on the plans. It should be noted that no dihedral braces are used, however a 2" width of Silastic is a must once the wing is sheeted. The purists may grunt about the Silastic showing but Guppy is a sport model and this method puts the strength where it does the job. If you don't have access to Silastic, be sure to install full depth 1/8", 5 ply plywood spar braces extending out 2½" to 3" beyond the fuselage sides.

GUPPY
Designed By: Bob Thompson

TYPE AIRCRAFT
Sport STOL
WINGSPAN
52 Inches
WING CHORD
11 Inches
TOTAL WING AREA
572 Square Inches
WING LOCATION
High Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
3¼ Inches
O.A. FUSELAGE LENGTH
42 Inches
RADIO COMPARTMENT AREA
(L) 10½" X (W) 5" X (H) 7½"
STABILIZER SPAN
22 Inches
STABILIZER CHORD (incl. elev.)
8" (widest point)
STABILIZER AREA
150 Sq. In. (approx.)
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7¾ Inches
VERTICAL FIN WIDTH (incl. rudder)
8" Average
REC. ENGINE SIZE
.30 Cubic Inch
FUEL TANK SIZE
6 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Flaps
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply, Spruce
Wing	Balsa & Spruce
Empennage	Balsa
Weight Ready-To-Fly	72 Oz.
Wing Loading	18.1 Oz./Sq. Ft.

At this point cut out for, and install, your flap servo compartment. For the beginner, the following method works well:

I use KPS-12 servos, so if yours differ, insure that the installation is adequate for your servo. Start by cutting an opening 2¼" x 3" just to the rear of the main spar in the bottom sheeting with the 3" measurement going spanwise. Next, cut a piece of 3/32" plywood to the same measurements. Following this, cut two pieces of 1/8" balsa 1¼" x 3". Remove the piece of the center rib showing in the wing opening to a depth of 1⅛" measured from the bottom of the wing. Now for a trial fit.

Place the plywood floor into the opening. When it bottoms, place the 1/8" balsa pieces at the front and rear of the opening. It shouldn't take much imagination to realize that when this whole mess is glued up you have a first class servo compartment. The side walls can be fitted once the servo has been mounted and all the fussing is over with.

A word on the servo mount. The Kraft aileron servo mount can be fitted by drilling four holes in the outermost corners. I use the small screws supplied to mount the servo to the servo mount. Once you have the holes drilled, place the unit in the appropriate spot and mark the hole locations on the plywood base. Drill with a small bit and tap with the screws you will be using.

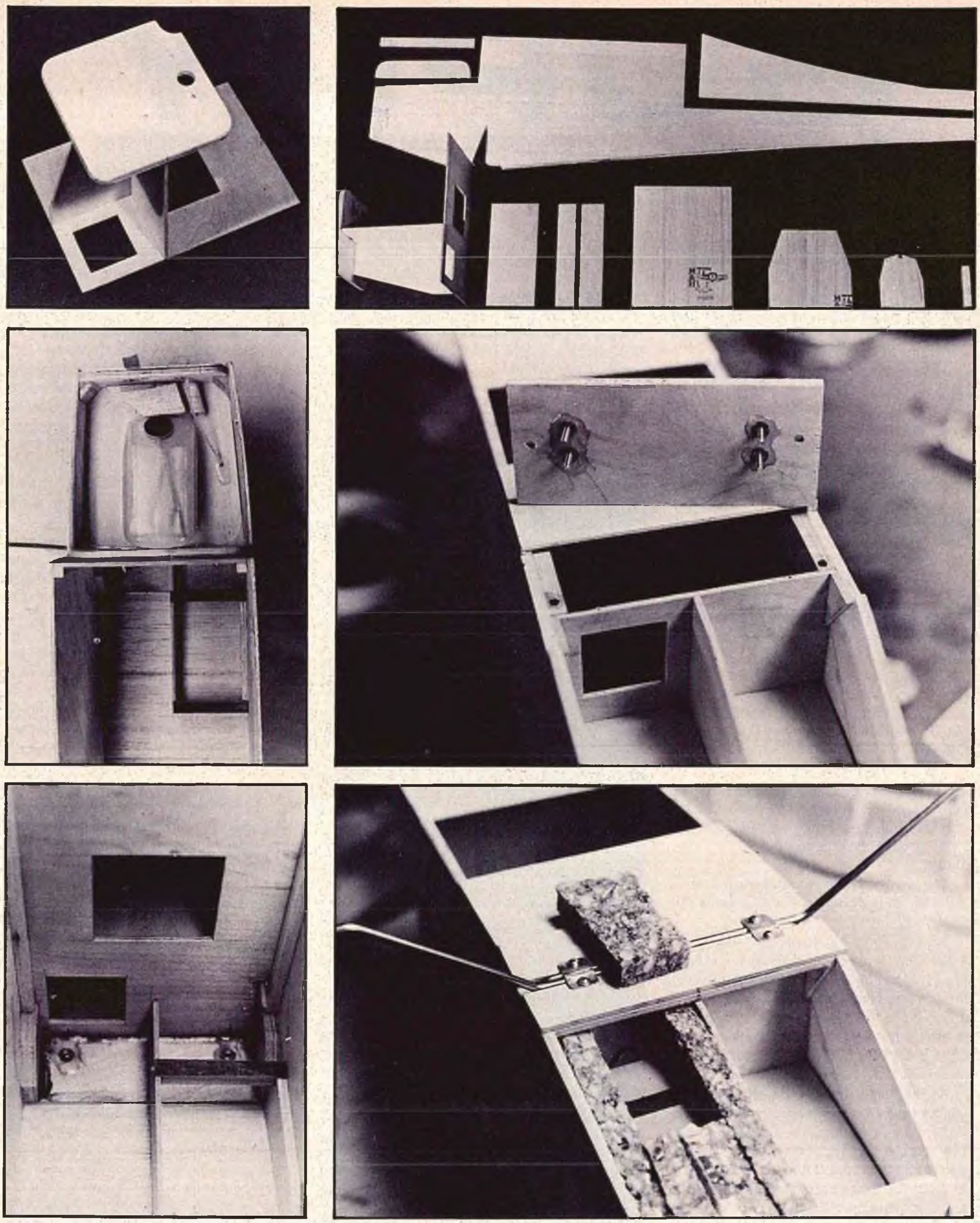
You now have a wing requiring the upper trailing edge sheeting. This allows you to cut out and install the flaps while the rest of the upper sheeting is absent.

Place the wing on any flat surface capable of accepting pins. Measure, cut and glue on the upper trailing edge sheet. Once dry, remove and pin down the other side of the wing, repeating the process.

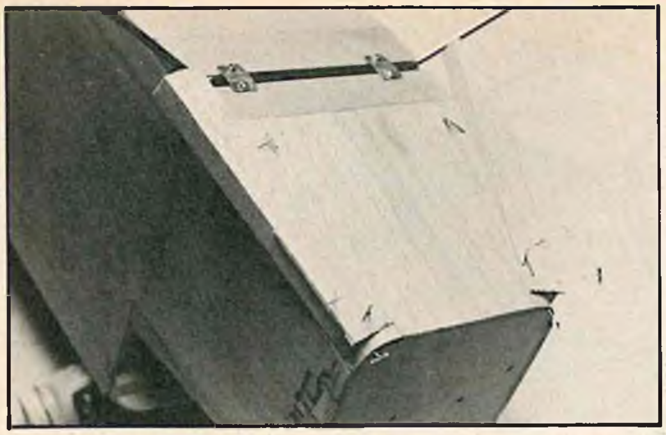
Mark out the flap locations then cut through the top and bottom sheet only. Once cut, slip your cutting blade through the top and bottom cuts. Now proceed to cut through the appropriate ribs. Complete the cuts and remove the flaps.

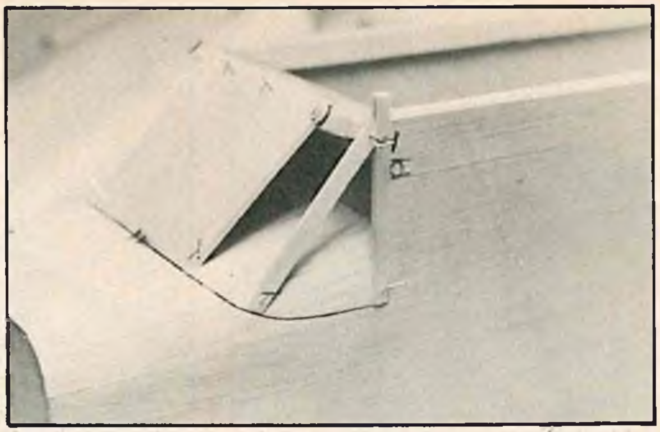
Fill in the area between the upper and lower sheet in the wing flap area with 3/32" scrap and do the same with the flaps. After sanding you should have approximately 1/16" clearance all around to allow for covering material and still have decent clearance on the working aircraft.

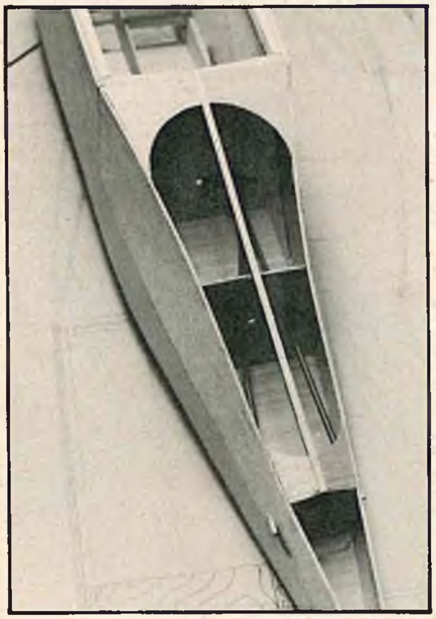
From here it is very much straight ahead. As noted in the photograph of the completed horn installation, reverse the horns and use Z-bent pushrods. The reversed horns allow for better control in the full flap position and

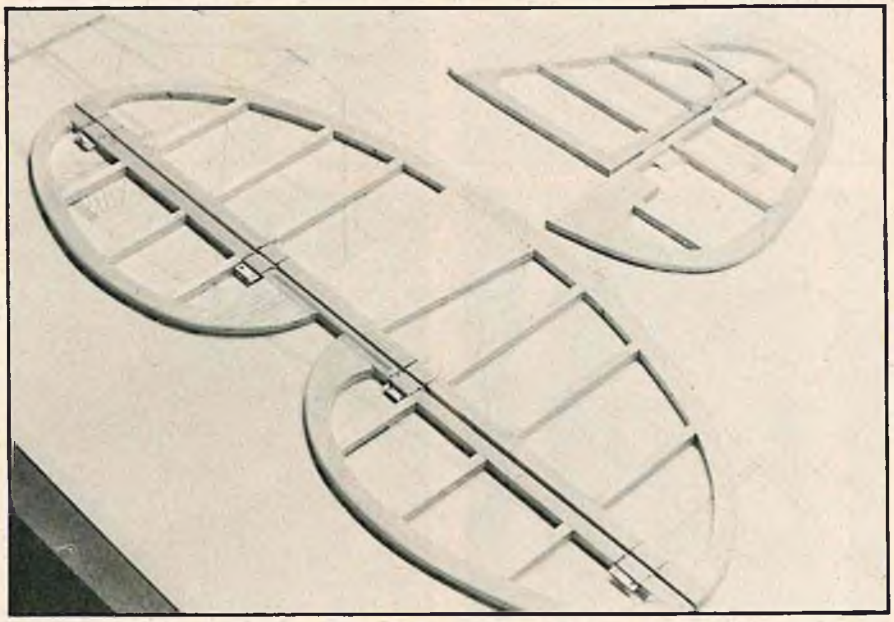


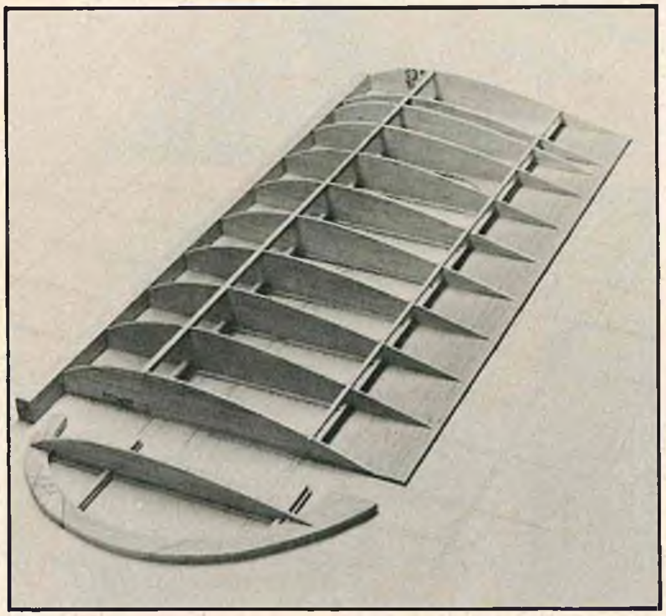
FIRST ROW, LEFT: View of the forward section. Note the hole between the motor mount. Feed all fuel lines through, then plug with Silastic. RIGHT: Photo of the basic fuselage components. SECOND ROW, LEFT: Tank compartment. Note scrap block to ensure that tank does not slide forward, pinching fuel lines. Throttle control cable tube at right. RIGHT: Plywood landing gear mount with blind mounting nuts in place. THIRD ROW, LEFT: View showing desired location of servos - - low and forward. Note throttle cable tube mid-right. RIGHT: Method used to construct a foam socket for the battery pack.

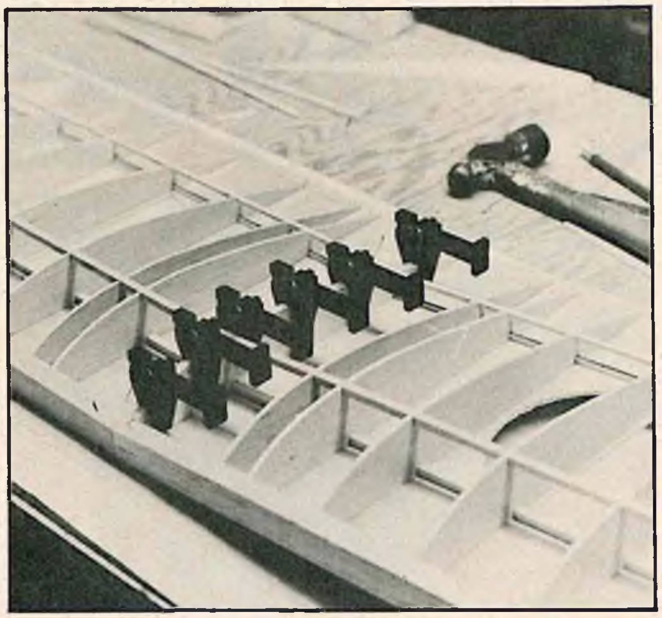




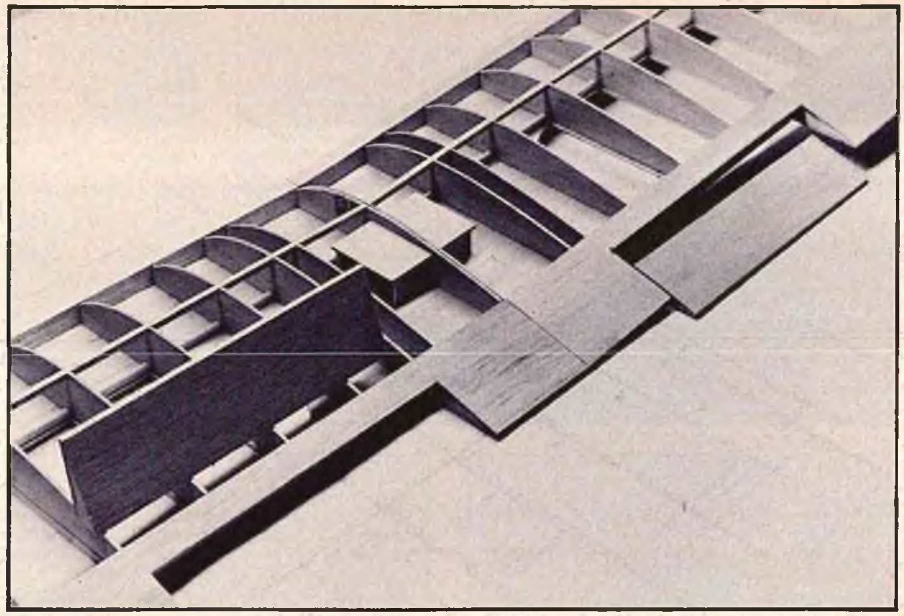


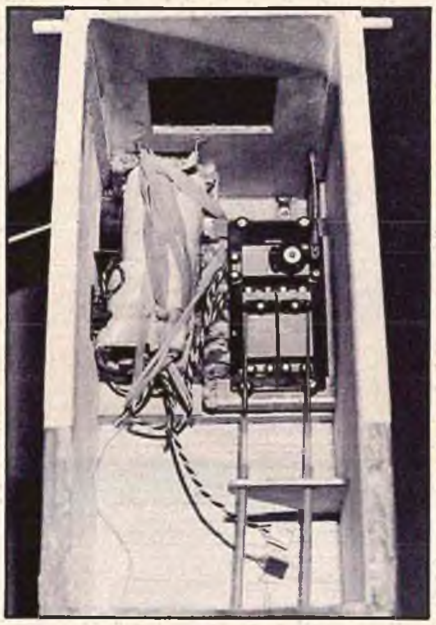


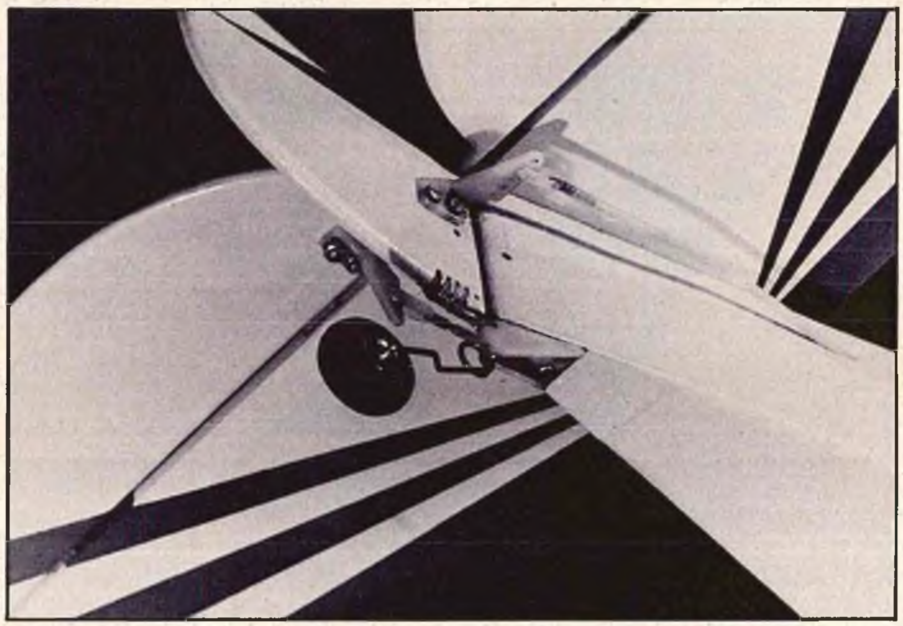




FIRST ROW, LEFT: Lots of scrap balsa is used to round out those corners. RIGHT: The windshield line is drawn on cardboard, then outlined on the model to aid in planking. Finally, the windshield is formed in as shown in this photo. SECOND ROW, LEFT: View of turtledeck area of Guppy. Note that pushrod tubing is installed during construction. RIGHT: Empennage during construction. On this prototype diagonal bracing was not used and the stab warped. THIRD ROW, LEFT: One wing panel is shown being constructed over the plans. RIGHT: Here the wing halves are being joined using clamps until the glue dries.







FIRST ROW, LEFT: Kraft servo ready for installation in wing servo compartment. RIGHT: View of completed wing ready for final finishing and hinging of flaps. SECOND ROW, LEFT: The radio installation leaves plenty of room for those cameras. Again, keep everything low and forward. RIGHT: View of steerable tail wheel and rudder and elevator linkage. THIRD ROW, LEFT: Wing center section showing wing fairing and center section reinforcing strip. RIGHT: Yes, it's a Z-bend linkage, but I haven't lost a servo in over seven hundred flights. Maybe they're just good servos - - - I'll leave the choice up to you.

the Z-bent pushrod relieves the pressure on the servo in the same full down position. Once **all** controls are installed, the top sheeting can be completed.

The wing can now be set aside until the fuselage reaches the stage where the windscreen is to be fitted.

Fuselage

The fuselage construction is standard with the possible exception of the forward section.

Begin construction with the assembly of

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BILL OF MATERIALS

Fuselage:

1 pc 6 x 6 x 1/8 (L.G. base).
1 pc 3/4" triangular balsa.
1 pc. 6 x 6 x 1/4 plywood (firewall).
2 pcs 6 x 12 —3/32" plywood (formers).
1 pc 3/16 x 3/16 sq. spruce (scrap from wing spars).
10 pcs 3/32 x 3 med. balsa (sides, doublers, formers).
1 pc 3/8 x 3/8 x 3 balsa (tail post).
1 pc 1/2 x 1/4 x 36 med. balsa (wing seat doublers, etc.).
1 pc 1/4 x 1/4 x 36 balsa.
1 pc 1/4 x 36 dowel.
Assorted block material as required. (Nose block. As I build I just glue up scrap till I arrive at a chunk larger than required.)

Wing:

13 pcs 3/32 x 3 x 36 med. balsa (wing skins, ribs, etc.).
2 pcs 3/8 x 3/4 x 36 (Straight) (leading edge).
2 pcs 3/8 x 1/8 x 36 (leading edge).
4 pcs 3/16 x 3/16 x 36 spruce (spars).
4 pcs 1/8 x 1/8 x 36 spruce (spars).
1 pc 1/4 x 3 x 36 med. balsa (tips).
1/4 x 3/32 capstrips are cut from scrap 3/32 sheet.
3/32 plywood servo comp. material cut from left-over fuselage material.

Stabilizer:

2 pcs 1/4 x 1/4 x 36 balsa.
2 pcs 1/4 x 3/16 x 36 balsa (anti-warp).
1 pc 1/4 x 2 x 36 firm balsa (outline).
1 pc 1/16 x 1/2 x 36 hard balsa.
1 pc 1/4 x 1/2 x 36 med. balsa.
1 pc 1/8 x 1/2 x 36 soft balsa.

Rudder:

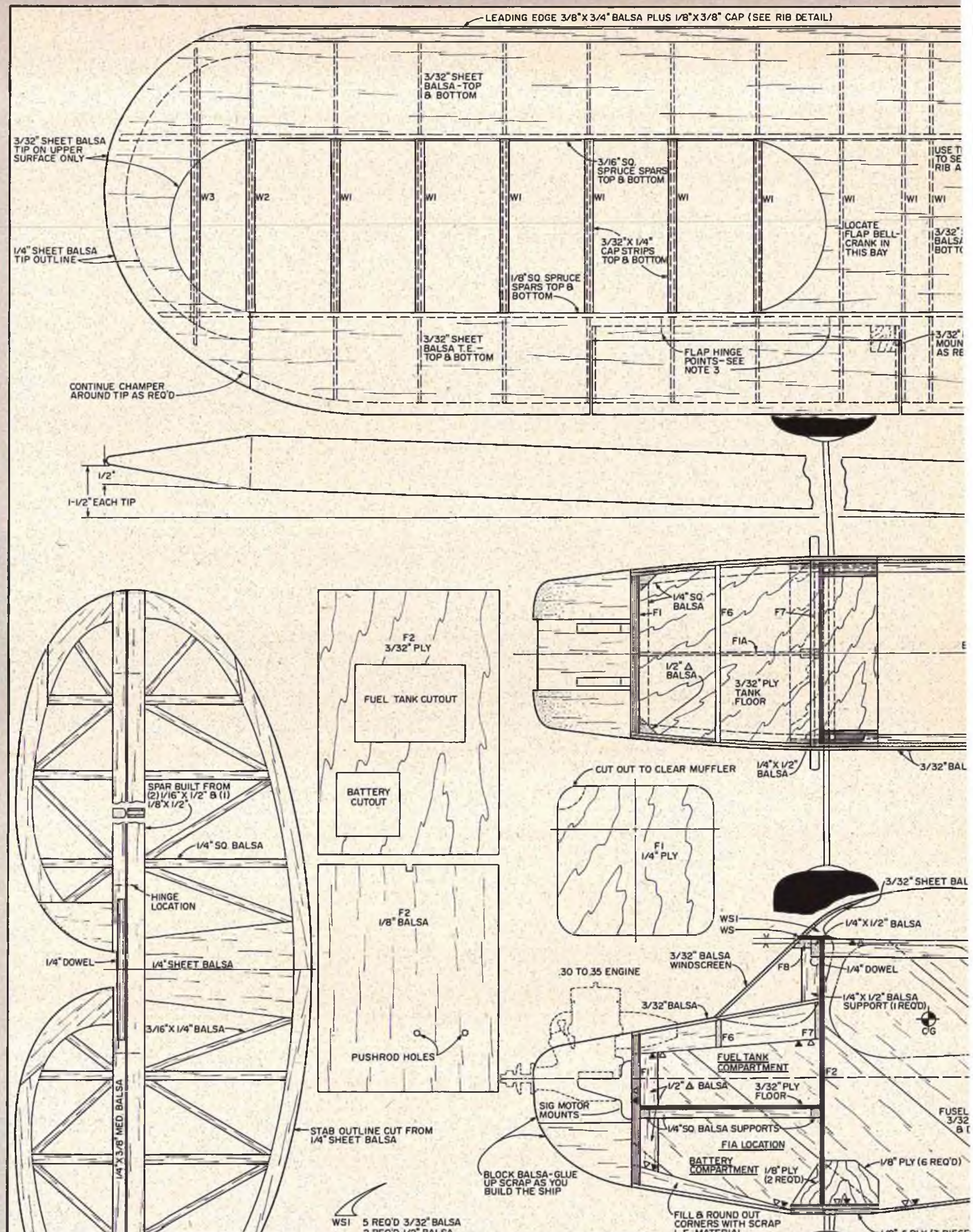
1 pc 1/4 x 2 x 36 balsa (outline).
1 pc 1/4 x 1/4 x 36 balsa.
1 pc 1/4 x 3/16 x 36 balsa.
1 pc 1/4 x 1/2 x 36 balsa.

Hardware:

2 motor mounts (Sig or equivalent).
8 blind mtg. nuts 4/40.
8 —1" x 4/40 bolts.
1 set Trexler 10G or equiv.
1 set Gold'N-Rod GRF-36 or equiv. (control rods).
1 set Gold'N-Rod GRC-3 or equiv. (motor control).
1 pc 5/32 diam. music wire.
1 pc 1/16 diam. music wire.
1 tail wheel bracket (Sig or equiv.).
1 Goldberg Fitting Set #1 or equiv.
1 —1" diam. tail wheel.
1 —6 oz. fuel tank.
24" large diam. silicone fuel line.
12" —5/32 ID Brass tube (landing gear).
4 —7/32 ID Brass washers (landing gear).

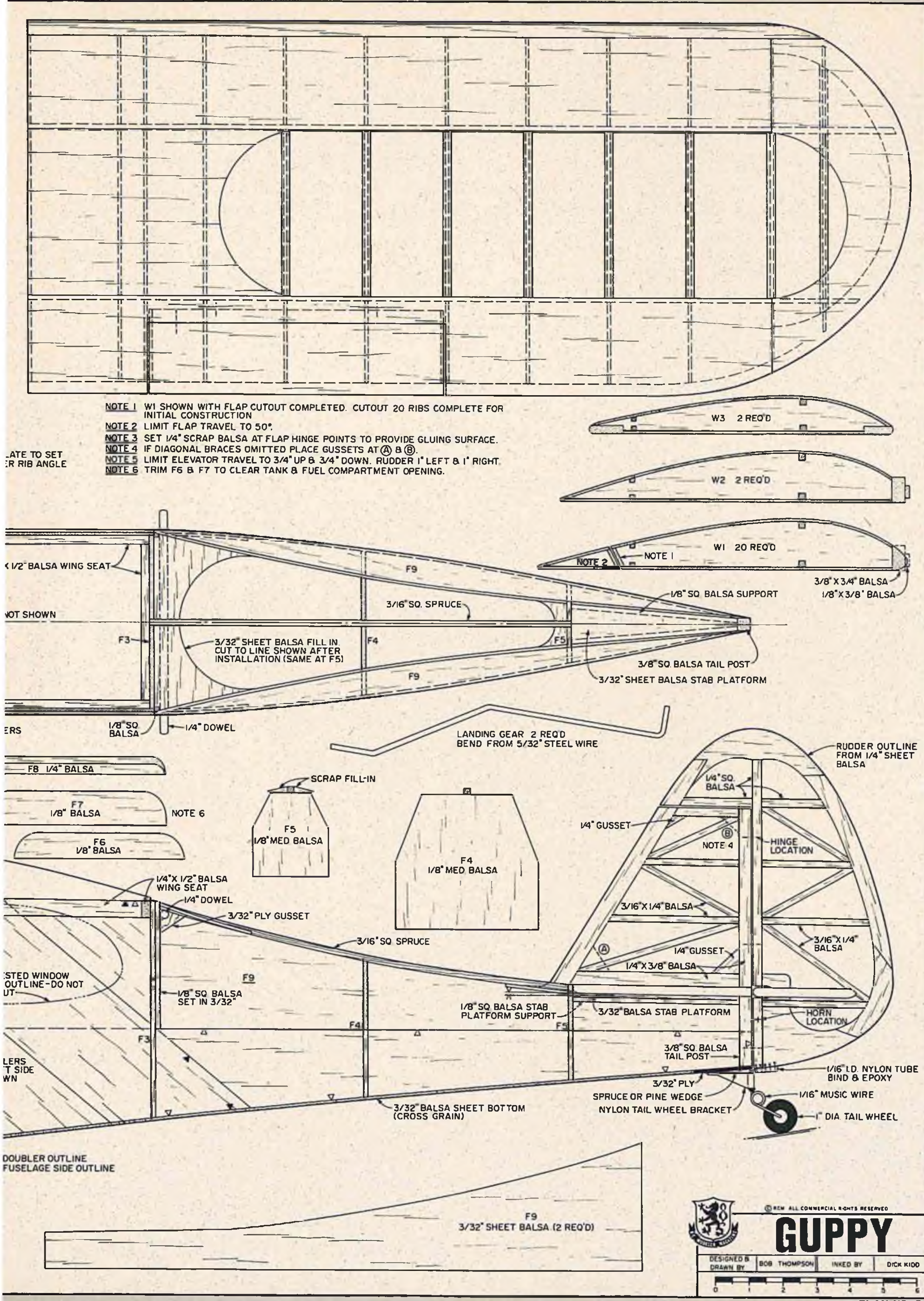
On a normal aircraft, this would definitely be a disastrous stall, resulting in a crash. With the Guppy, however, it's a normal climb-out. Note flap deflection for steep angle of ascent.

The Guppy can be flown in for a normal slow and easy landing or it can come in with a very steep descent angle of 60 to 75 degrees with a gentle flare-out and touch-down controlled by elevator only.



LEADING EDGE 3/8" X 3/4" BALSA PLUS 1/8" X 3/8" CAP (SEE RIB DETAIL)
3/32" SHEET BALSA-TOP & BOTTOM
3/32" SHEET BALSA TIP ON UPPER SURFACE ONLY
3/16" SQ. SPRUCE SPARS TOP & BOTTOM
W3
W2
WI
LOCATE FLAP BELL-CRANK IN THIS BAY
1/4" SHEET BALSA TIP OUTLINE
3/32" X 1/4" CAP STRIPS TOP & BOTTOM
1/8" SQ. SPRUCE SPARS TOP & BOTTOM
3/32" SHEET BALSA T.E.-TOP & BOTTOM
FLAP HINGE POINTS-SEE NOTE 3
CONTINUE CHAMPER AROUND TIP AS REQ'D
1/2"
1-1/2" EACH TIP
1/4" SQ. BALSA
F1
F6
F7
F1A
1/2" Δ BALSA
3/32" PLY TANK FLOOR
1/4" X 1/2" BALSA
F2 3/32" PLY
FUEL TANK CUTOUT
BATTERY CUTOUT
CUT OUT TO CLEAR MUFFLER
F1 1/4" PLY
SPAR BUILT FROM (2) 1/16" X 1/2" B (1) 1/8" X 1/2"
1/4" SQ. BALSA
HINGE LOCATION
F2 1/8" BALSA
1/4" DOWEL
1/4" SHEET BALSA
3/16" X 1/4" BALSA
PUSHROD HOLES
1/4" X 3/8" MED BALSA
STAB OUTLINE CUT FROM 1/4" SHEET BALSA
3/32" SHEET BAL
WS1
WS
1/4" X 1/2" BALSA
3/32" BALSA WINDSCREEN
.30 TO .35 ENGINE
F8
1/4" DOWEL
1/4" X 1/2" BALSA SUPPORT (1 REQ'D)
3/32" BALSA
CG
FUEL TANK COMPARTMENT
1/2" Δ BALSA
3/32" PLY FLOOR
SIG MOTOR MOUNTS
1/4" SQ BALSA SUPPORTS
F1A LOCATION
BATTERY COMPARTMENT
1/8" PLY (2 REQ'D)
1/8" PLY (6 REQ'D)
BLOCK BALSA-GLUE UP SCRAP AS YOU BUILD THE SHIP
FILL & ROUND OUT CORNERS WITH SCRAP L.E. MATERIAL
1/8" 5 PLY (3 PIECE
WS1 5 REQ'D 3/32" BALSA 2 REQ'D 1/2" BALSA
DENOTES WS OUTLINE 3/32" PLY
F1A 3/32" PLY
10G TREXLER AIR WHEELS

FULL SIZE PLANS AVAILABLE — SEE PAGE 189

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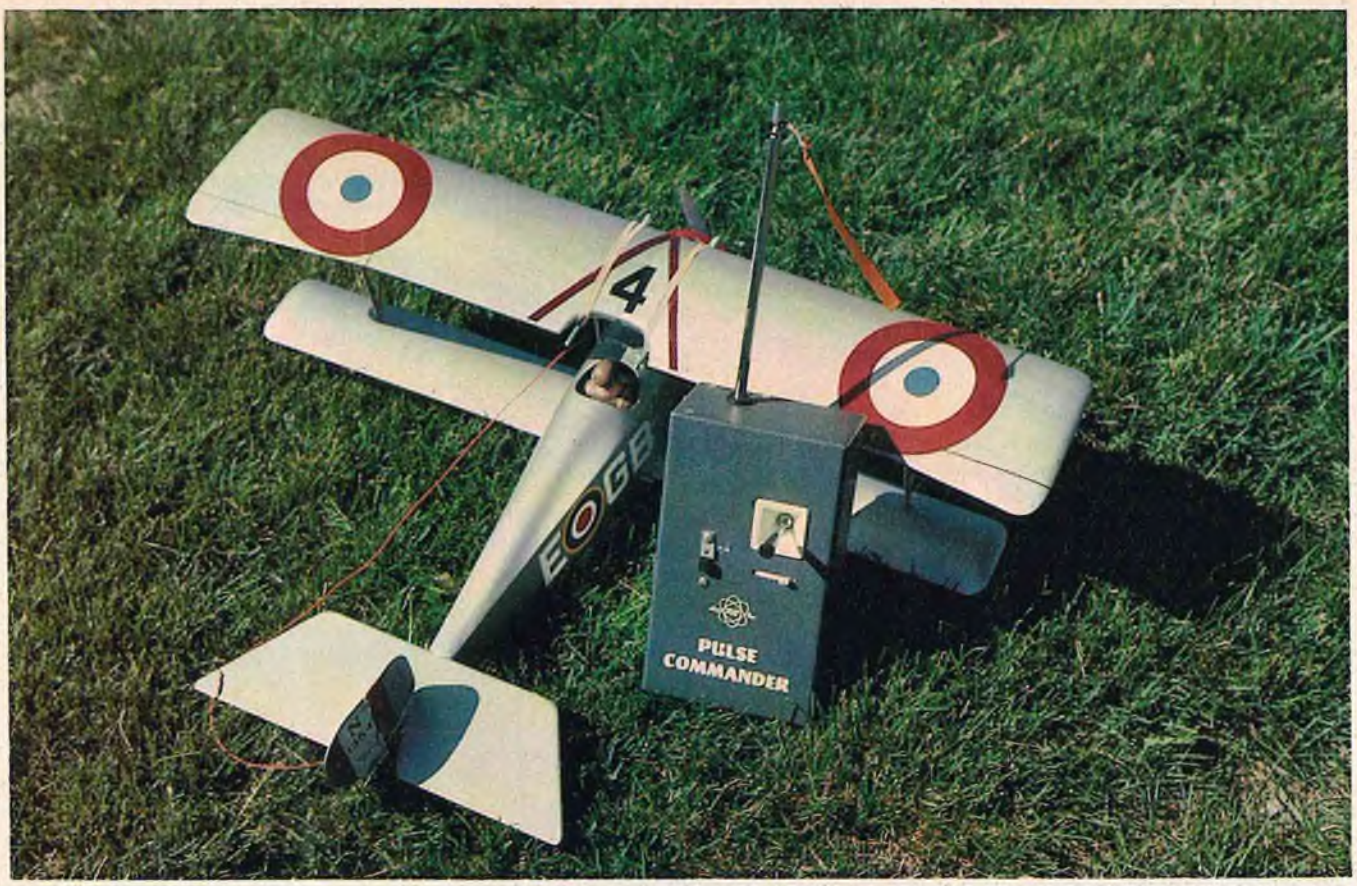


An easy-to-build sport Nieuport and an inexpensive Ace rudder-only system - - - hours of flying pleasure with a minimum of hassle.

PEPPE LA PEUW

Dick Erickson's sort-of-scale Nieuport for rudder-only pulse proportional. Photos by Dick Fish.

● From out of the past comes a roaring throb of a World War I aeroplane, an .020 powered rudder-only bi-plane known as the Nieuport, in this case, "Peppe La' Peuw", so named for its lively performance and aerobatic ability. A stand-way-off-scale all sheet balsa replica of a famous aeroplane that will have you smiling before, during, and after every flight into the blue yonder.

In this day of everything inflationary, the current trend towards lower building and operating costs of smaller R/C aeroplanes is something to think about. Every modeler has a choice of countless designs to build and fly and, overall, this great hobby has much to offer. My own thinking and choice has always been with small models, from my Goldberg 1/2A Skylane with a Rand Galloping Ghost (still flyable), to the present series of rudder-only .020 and .049 powered bunch of fun. Rudder-only flying offers maximum building and flying pleasure, while the dependable Ace Pulse System maintains complete control with its low cost and super dependability. With only a flapping rudder to control our enjoyment, rudder-only flying is an art of fascination - - - it's all done with any good design and a little practice.

This Nieuport was designed to fly with a minimum of effort, the sight of it cruising around is enough to satisfy anyones interest. While some .020 powered models tend to be a handful because of their size and "scale effect", this design was thought out thoroughly with flying ability first. With all the down and side thrust in the engine, it looks like it's ready to fall out of the cowl, but then with all the power in a T.D. .020, it is very necessary. A Pee Wee .020 would have been plenty of power for sport flying, but I was after more than that - - - I wanted performance for whatever my thumb could come up with. I have always used a Vogt throttle on my T.D.'s, since this enables you to select any amount of power from the engine. The throttle is a two piece aluminum sleeve which can be pre-set before launch.

So, if you like peppy rudder-only aeroplanes and have some "stick time" with only a rudder, "Peppe La' Peuw" will make you happy, for nothing beats low cost fun R/C.

CONSTRUCTION

Check the Bill of Materials for the necessary wood and miscellaneous materials used. Cut out the fuselage sides from 1/16" medium balsa following the arrows for the exact outline. Pin the sides down to construct a right and left side, then outline each side as shown with 1/8" square balsa and the 1/16" balsa lower wing doubler and dowel gussets.

While they are drying, cut out the firewall from 1/8" ply and drill the engine mounting holes for the 2-56 blind nuts. Two sets of holes are shown, depending on whether you use either a Pee Wee or T.D. The T.D. is mounted with the regular back plate as a separate fuel tank is used. Push the blind nuts into the firewall and screw the engine in place until the blind nuts just start to bite. Push some epoxy under, and around, the blind nuts then tighten the screws all the way. This procedure holds everything in alignment, making it much easier to remove and re-install the engine for cleaning or switching from one plane to another. Cut out former F-2 from 3/32" balsa, noting the grain direction. Remove the completed fuselage sides from the plan and pin them upside down over the plan top view. Glue in former F-2 and epoxy the firewall in place between the fuselage sides. Check with a small square to make sure they are vertical. Also, be sure the firewall has the proper side thrust, shown dotted in the top view for construction purposes.

While this part of the assembly is drying, cut out the rest of the fuselage formers from 1/16" balsa. The upper wing cabane struts can be made up now. Bend the two cabanes from 1/16" wire as shown on the side view. Cut two 1/8" dowels to length, round off the ends slightly, and then bind them to the wire cabanes. Build these accurately as the upper wing incidence angle depends on this. I use Goldberg 1/2A U-Control Dacron thread for all my thread bindings and rudder hinges - - - it's inexpensive and very strong.

Remove the fuselage structure from the board and install all the rest of the fuselage formers except F-5. The latter is glued on after the fuselage is pulled together at the tailpost. Glue in the rear 1/8" square fuselage cross pieces and then former F-5.

Bend up the landing gear from 1/16" wire, lay it against the firewall, and draw around its outline with a pencil. Drill twenty 1/16" holes as shown on the firewall front view, then bind the landing gear to the firewall with soft copper wire and epoxy well. Install the upper wing cabane struts next, spot gluing each in place as seen on the side and top views. Lay the fuselage accurately over the side view after the glue has set and check the incidence angle. Now epoxy the cabanes on permanently. At the same time the 1/16" sheet fuel tank mount is epoxied over the cabanes as seen in the side view. Using a "Perfect" #5 tank, cut out the two holes in the tank mount for the fuel and vent lines, then using Silicone RTV glue, install the tank permanently.

Build the rudder torque rod next, as it will have to be slipped into the fuselage before going any further. Bend up the front yoke first, making sure the loop that engages the actuator arm is a loose fit to prevent binding. Cut out the torque rod bearing plate from 1/16" ply, drill a 1/16" hole on center, and slip it on the front yoke. Cut the 1/8" square hard balsa torque rod to length, then drill a hole at one end for the yoke to slip into. Spot glue the yoke to the torque rod and, when set up, wrap this joint with thread. Bend the rear half of the torque rod leaving the end that engages the rudder yoke straight until later. Bind with thread and coat the bindings liberally with glue and set aside to dry. Cut out the actuator mounting board from 1/16" ply and drill the center hole to fit the actuator. Then drill eight 1/32" holes where shown and, with needle and thread, bind the actuator to the board. I always put a little glue on the thread after sewing to hold the actuator tightly.

Drill a 1/16" hole in the rear of the fuselage as shown in the side view, and slip the completed torque rod through the fuselage bottom, starting just ahead of former F-6. Spot glue the mounted actuator to the front of former F-2, making sure it is at the height shown in the side view and on center when viewed from the top. Engage the torque rod to the actuator arm, making sure the torque rod lines up with the actuator from the top and also is the same height. Glue the torque rod bearing plate to the fuselage sides and let it dry thoroughly. Before removing the actuator from the fuselage, mark the actuator board to former F-2 for reference so that, when it is glued in permanently, it will still line up. Remove the actuator from the fuselage until all sanding is done, then it can be permanently glued in place.

Sheet the lower fuselage next. The front sheeting is 1/16" ply from the firewall to former F-6. The rest of the lower sheeting is 1/16" balsa cross grained. Score the sheeting on the center back 1" from former F-2 to make it conform to this former. Now, the upper 1/16" sheeting can be made. I cut a template from light cardboard first, since it's a lot easier and cheaper to fit a piece of cardboard around the cabane struts. Cut out the cockpit hole also, then fit the template length from the front former F-3 to the center of F-4 which leaves a little gluing area for the rear sheeting on F-4. Trace the template to a piece of 1/16" balsa and cut it out. Wet the sheeting with water on the outside and bend it over the formers. Hold in place with masking tape until the sheeting is dry again. Remove the formed sheeting for a minute and drill a hole in former F-3 for the fuel line to pass through. Also, slip on a continuous piece of fuel tubing 1½" long over the vent pipes. Cut a 1/4" x 3/8" hole in the upper sheet for the vent tubing to slip through to the outside. Now, glue the sheeting in place, using masking tape again to hold in place. The rear upper sheeting is 1/32" balsa, again using a cardboard template as before. Trace and cut from balsa, wet and hold in place with masking tape until dry, then glue in place permanently. The fuselage side sheeting is also 1/32" balsa. Make a cardboard template and leave the rear edge where the sheeting meets the fuselage sides at former F-4 slightly long so the sheeting can be bevel sanded to form a smooth joint. Glue the sheeting in place, holding until dry with masking tape and pins. The small gap between the fuselage sides and sheeting at the lower wing saddle can be filled in with glue. Now sand the completed fuselage. None of the corners have much of a radius as these old aeroplanes were pretty "boxy".

The cowl is built next. Cut out C-1 from 1/8" balsa and C-2 from 1/16" plywood. Drill two 1/16" holes in C-2 as shown for mounting the cowl with #2 wood screws. Cut five cowl spacers to the size indicated and mark their location on former C-2. Pin C-2 down to the board and glue the spacers in place. When the glue has set up, glue C-1 in place on the spacers. Cut three pieces of 1/16" sheet balsa 1" long and glue together to form a piece 1" by 9". Starting at the bottom, wrap this piece around the cowl structure. Check its fit and then glue in place.

When dry, the completed cowl can be

PEPPE LA PEUW
Designed By: Dick Erickson

TYPE AIRCRAFT
R/O Sport
WINGSPAN
22⅝" (upper)
20" (lower)
WING CHORD
4" avg. (upper)
2-9/32" (lower)
TOTAL WING AREA
140 Square Inches
WING LOCATION
Biplane
AIRFOIL
French Clark Y
WING PLANFORM
Constant Chord (mostly)
DIHEDRAL, Each Tip
1⅛ Inches (both wings)
O.A. FUSELAGE LENGTH
16 Inches
RADIO COMPARTMENT AREA
(L) 4" X (W) 1⅝" X (H) 2"
STABILIZER SPAN
10 Inches
STABILIZER CHORD (incl. elev.)
3½"
STABILIZER AREA
25.3 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
2 Inches (Average)
VERTICAL FIN WIDTH (incl. rudder)
3⅝" (Average)
REC. ENGINE SIZE
Cox Pee Wee .020 or T.D. .020
FUEL TANK SIZE
1/2 oz. (french wine only)
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
Single (pulse)
CONTROL FUNCTIONS
One Flapping Rudder

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa
Empennage	Balsa
Weight Ready-To-Fly	11 Ounces
Wing Loading	12.8 Oz./Sq. Ft.

BILL OF MATERIALS

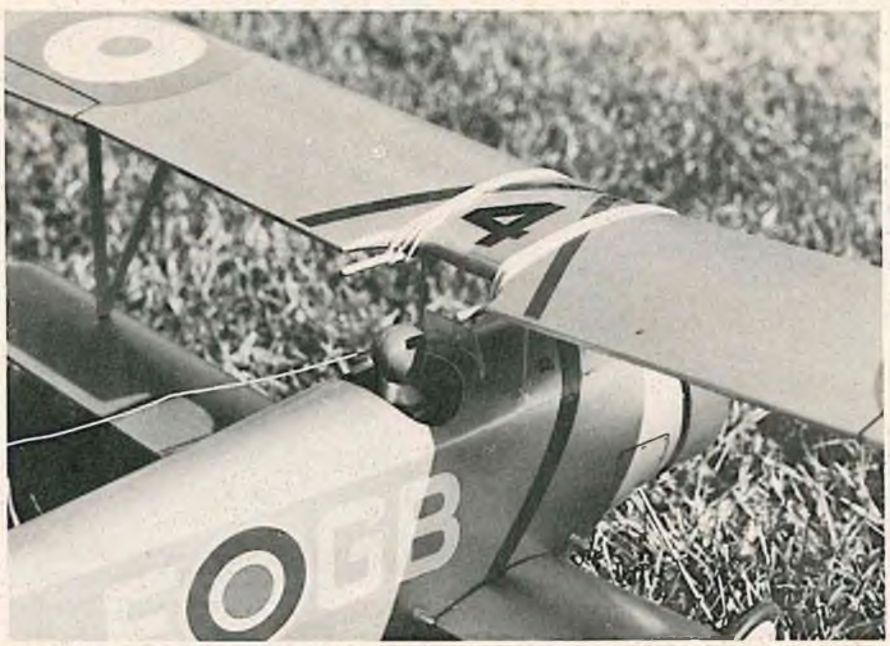
1 — 1/16" x 4" x 48" medium balsa
4 — 1/16" x 3" x 36" medium balsa
3 — 1/8" x 1/8" x 36" medium hard balsa
2 — 3/16" x 1/4" x 36" medium balsa
1 — 3/32" x 3" x 15" "C" grain balsa
1 — 1/32" x 3" x 20" medium balsa
1 — 1/8" x 3" x 4" medium balsa
1 — 2" x 2" x 1/8" ply
1 — 3" x 8" x 1/6" ply
1 — 1/8" x 16" dowel
1 — 1/16" music wire
1 — .045 music wire
1 — .020 music wire
1 pr. 1½" vintage wheels
1 pr. 1/16" wheel collars
1 — roll Goldberg 1/2A U-Control Dacron Thread
2 ft. soft copper wire
6" plastic fuel line tubing

sanded rounding off the front edge as seen in the side view. With all the down and side thrust in the firewall, the cowl has to be "shimmed" with scrap balsa so it comes out straight with the fuselage. Start with two pieces of balsa 1/2" wide and 1⅞" long glued to the firewall and formers FS-1 and FS-3. Block sand these pieces until the cowl fits square to the fuselage. Now the two holes for the cowl mounting screws can be drilled. I always run the screws in to make the threads and then coat these threads with epoxy using a common pin to get the epoxy down into the holes. This makes the threaded hole strong and also fuel proofs them. Bolt the engine to the firewall; mount the cowl in place; and cut the hole in the top of the cowl for the cylinder head and also the needle valve. Cut out the fin, rudder and stab from 3/32" "C" grain balsa. Outline the stab with the wood grain as shown. Past experiences with 1/16" sheet rudders and stabs have proven they warp too easy in time, thus the 3/32" wood size used now. Block sand the tail feathers when completed, then glue the stabilizer to the fuselage. Glue the fin in place on the stabilizer, but leave the rudder off until later. Bend up the rudder yoke from .020 wire and drill a hole in the rudder for the 2-56 bolt and nut.

The upper and lower wings are 1/16" sheet balsa using 4" wide stock for the upper wing and 3" wide stock for the lower wing. Cut out the upper wing sheets and splice as shown at the trailing edge tips. Cut the ribs from 1/16" sheet and mark for future reference. Pin the bottom wing sheeting over the plans, gluing the 3/16" by 1/4" leading edges over the sheeting. Glue all the ribs in place noting that the center ribs are angled outward 1/16" to allow for dihedral. When the assemblies are dry the leading edges are block sanded to an angle that will allow the upper sheeting to match the airfoil shape. Also, the upper wing sheeting is sanded along the trailing edge where it meets the lower wing sheeting. Fill in the upper wing center, then cut out with 3/16" x 1/4" balsa and blend with the rib shape.

Remove all the pins from the construction so far and glue on the upper wing sheeting using rubber bands stretched over the top at each rib station between pins along the leading and trailing edges. Cut out the wing tips from soft balsa and glue in place after the wings are removed from the board. Block sand the wing panels, blending in the tips and to the tip cross section. Keep the leading edges quite blunt with a smooth radius. Pin half of each wing panel down flat over the wing plan, then raise the other tip to the proper dihedral and glue the wing halves together. The center sections are reinforced with half-inch wide fibreglass cloth and 2 or 3 coats of blue.

Build the wing interplane struts from 1/16" x 1/4" hard balsa. Push a common pin into the ends of each, as shown, and cut off with a quarter inch sticking out. Smear some epoxy over the struts where the pins are into the wood for strength. These struts are optional but a Nieuport ain't a Nieuport without them!



Bend the tail skid from .045 wire and its support from 1/16" hard balsa. Spot glue the tail skid in place, then smear some epoxy to both joints. Drill the holes for the lower wing dowels, then cut the dowels to length allowing a half inch to stick out of the fuselage. Glue the dowels in place if you intend on using a dope finish, but leave them out until later if you plan on covering your Nieuport with a plastic covering.

My French Nieuport (sorry Snoopy) was given two coats of clear dope and then covered with Japanese tissue stuck on with a mixture of 90% thinner and 10% clear dope. (I hadn't finished an aeroplane with dope for years but I felt a doped silver finish would be more realistic.) Brush on 3 coats of thinned silver dope and 2 coats of dull clear. I had some old decals from a Guillows rubber band powered (what's that?) kit to dress up my Nieuport. I also added some red stripes to the fuselage and upper wing to finish it off. Give the inside of the cowl and firewall a coat of Hobbypoxy #2 to fuel proof. I hate aeroplanes that get fuel soaked when it's so easy to spend a little extra time to prevent it!

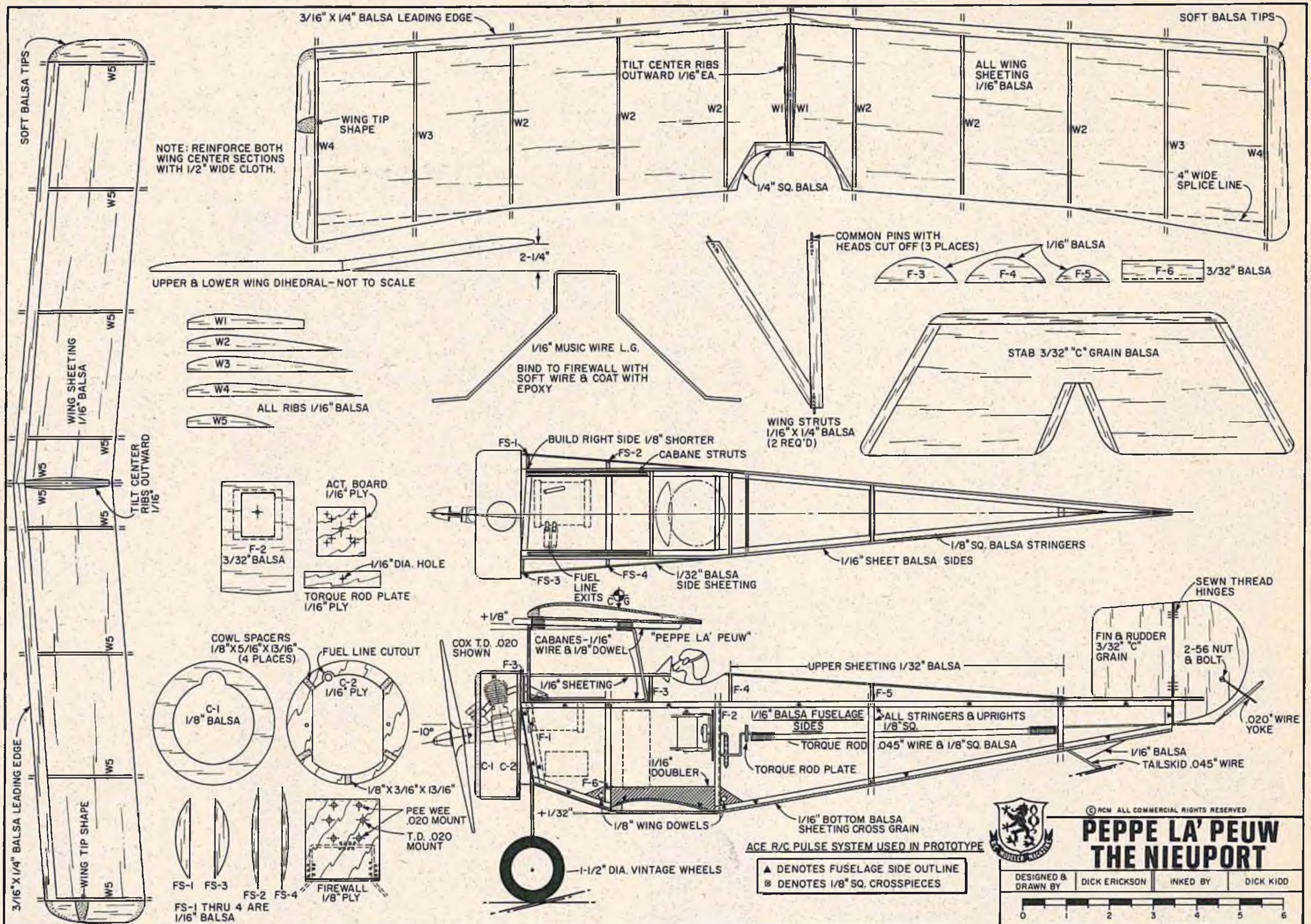
Well, that great day of test flying is getting close. Install the engine, hook up the fuel line, and cut the fuel tank filler and breather tubing allowing a half inch to stick out. Use silicone RTV to seal the tubing where it passes through the fuselage. Slip on the 1½" vintage wheels and secure with collars. Install the radio gear with the receiver and batteries well wrapped in foam rubber. Sew the rudder to the fin with a Figure 8 stitch, bolt the rudder yoke back on, and bend the end of the torque rod as seen in the side view. Slip on a piece of shrink tubing over the torque rod to prevent interference. Turn the radio on and check the rudder throw so it is equal to the right and left. Rubber band the wings on and check the C.G. - - - my Nieuport took a half ounce in the nose to balance.

Now it's time for some fun. I don't test glide a rudder-only ship since it doesn't prove it's going to fly. Simply range check the radio, fire up the engine and run it slightly rich for the first flights. Give "Peppe" a gentle toss to where it belongs in the sky and fly it. Any turning under power can be corrected with side thrust changes. Little or no climb is corrected with less downthrust, while zooming or hanging on the prop is corrected with more downthrust. When the engine quits, the glide should be flat with no stalling. If she stalls in the glide, add a 1/32" balsa shim under the trailing edge of the upper wing. If the glide is too steep, add a 1/32" shim under the leading edge. As with any rudder-only aeroplane the glide should be trimmed first, then work on the powered part after that. Without trying to sound like trimming out a rudder-only is a hassle, any model has to be trimmed, no matter how many channels are under your thumb.

Nothing is more beautiful than a single channel model cruising around under complete control from just a rudder to "stay with the program". My Nieuport didn't fly "off the board" on the first flights - - - in fact, I spent six minutes doing climbing left turns until the engine quit. More down and right thrust cured my problem and many beautiful flights followed. The original plans were changed to what you have now.

"Peppe La' Peuw" will give you many flights of relaxation, and I think this is what this great hobby is all about. □

FULL SIZE PLANS AVAILABLE — SEE PAGE 189



PLAN NO. 663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Chipmunk

The world's finest scale model in flight, Robert W. Nelitz's DHC-1B Chipmunk.

1976 SCALE CHAMPIONSHIPS

RCM REPORT BY FREDDY STENBOM, EDITOR ALLT OM HOBBY

The week before mid-summer the best scale modelers in the world gathered in Borlange in the middle of Sweden to compete in the World Championships. The competition was also called "The Light-Night-Flight" because the sun almost never goes down at this time of the year. There were 60 scale modelers from 13 countries in the contest, with M.J. Newnham from Australia, Alan Platt from South Africa, and the Americans and Canadians traveling the greatest distance. For the first time ever, a Russian also competed in the radio control contest and with a ducted fan jet aircraft! And, also for the first time, a girl competed in the Control Line Championship — Miss Cathy Burnstine from the USA!

Robert W. Nelitz — Canada World Champion

Robert W. Nelitz is an airline pilot who flies a Boeing 727 for Air Canada and is now also the best scale modeler in radio control in the entire world. His perfect model of the DHC-1B Chipmunk took second in the static judging, but, in flying, he was the best. And this is what a scale model contest is all about. You have to be good in both modeling and flying. For example, the third best model in static judging ended up in seventeenth place after flight troubles.

Nelitz's model of the Chipmunk required 1300 hours of construction.

"The first thing I did," stated Nelitz, "was to make the canopy. I said to myself that if I could be satisfied with that part which was the most difficult to make, I could continue with the rest. At almost the same time I constructed some parts of the instrument panel with a functioning horizontal gyro just for fun."

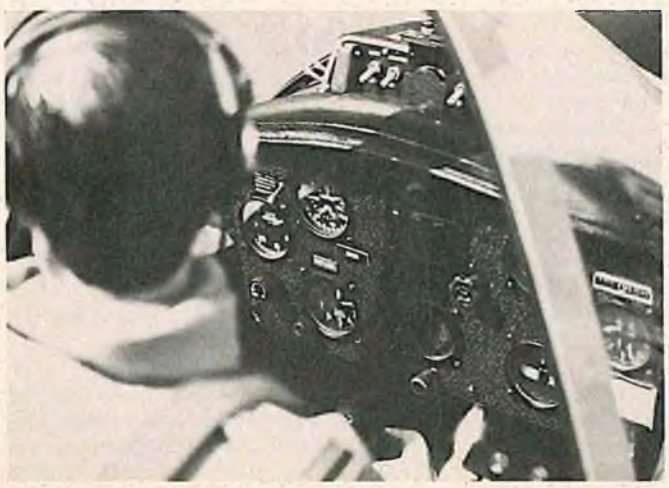
Well, Robert was satisfied with the canopy which, by the way, slides and has a functioning locking device, and the construction continued. Among all the fine features are functioning flaps and fuel gauge on the wing. The spring system of the undercarriage and an elevator trim that functions proportional to the degree of flaps is also worth mentioning. Furthermore the pilot doll is a miniature of Robert, himself.

"Actually, the pilot doll is not scale because I have only flown in the full size Chipmunk as a passenger," Robert said with a smile.

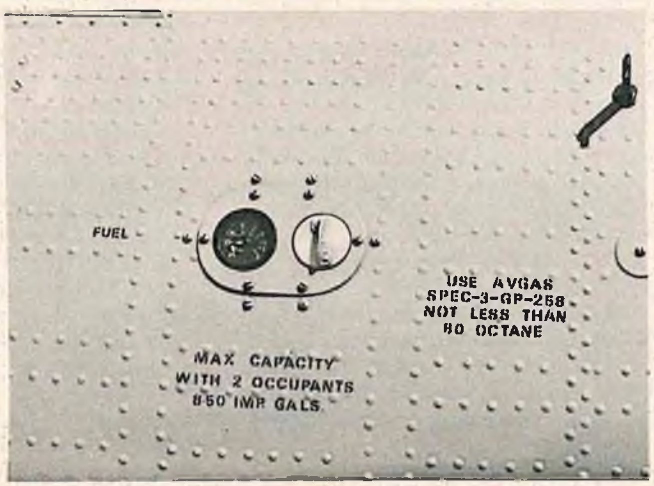
The model is built to a scale 10:48, that is 2.5 inches equals 1 foot. The only parts that Nelitz bought ready-made was the Webra Speed .61 engine, the Kraft KPT 7Z radio, and the tires for the undercarriage!

Robert won the Canadian Championships in scale in both 1972 and 1975. "Last year I crashed my Chipmunk," Nelitz said during an interview, "and I had to make new wings after that. There is now a little difference in finish and color between the fuselage and the wings. The end result is actually bet-

LEFT: Bob Nelitz and winning Chipmunk. BELOW: Close-up of DHC-1B cockpit.



This close-up photo of the fuel gauge on the wings of Nelitz's Chipmunk illustrates the outstanding scale details.



Canada's Robert W. Nelitz, and wife Pauline, with Bob's winning DHC-1B Chipmunk. BELOW: Cockpit details of this magnificent effort.

ter."

A happy champion, Robert W. Nelitz has been model flying for only 10 years, the last six years in scale, and that makes him the "youngest" model flyer in the championships even if he is 38 years old. Most of the others had 20 years or more of experience. Robert lives in Hudson, Quebec, and is married and has two children.

It Took Four Years To Build The P-38

An equally qualified world champion was 42-year-old Jerzy Ostrowski from Poland, entered in the control line class. The models in this class were even of somewhat higher quality than those entered in radio control.

"It took me four years to construct my model of the Lockheed P-38 L Lightning," says Jerzy. "the last two years were almost full time work." The only things that Jerzy did not construct was the two Super Tigre .60 engines and the electric bulbs!

I think that this model was the most popular of all among the spectators. All the details, the finish, and the fact that the P-38 is an aircraft with a little bit of "that". A rumor said that an American air museum has offered $25,000.00 for the model, but Jerzy has (so far) turned the offer down. Anyway, think of the idea of risking $25,000 whenever you fly your model!

One of the special features of the model, the firing rockets, almost cost Jerzy his victory. Sharp shooting at the judges is not very popular but, if Jerzy had been at a shooting range, his hits would have scored full points. At the third, and last, flight Jerzy avoided the judges and got very high flight points - - - high enough, in fact, that he won over Victor Yougov from the USSR, who had been in the lead earlier.

Jerzy is by no means a beginner in scale model flying. He became World Champion in Toulouse, France in 1972. He was second in the USA in 1974. He has been flying models for twenty years and the last eleven years he has concentrated in scale. Another hobby of Jerzy's is flying with a Rogallo wing hang glider.

The Best Model . . .

The best model in all categories, according to the judges in the static judging, was Victor Yougov's control line model of the YAK-18. That model had special features

Victor Yougov and high point YAK 18 PM.

Stephen Sauger with Stinson Flying Station Wagon.

John Roth with well-known Evans Volksplane.

Bob Wischer and his Piel Beryl C.P. 750.

Highest static points, David Vaughan's Wirraway.

Carl Plotsinch, U.S.S.R., with Aero L-39.

Jerzy Ostrowski and winning P-38 Lightning.

Alan Platt's model of the B.E.2E bomber.

such as a self-starter, adjustable in-flight propeller pitch control, and adjustable enging cooling!

Victor put in a very good flight on the first day. In fact, his points were so high that most people thought that he already had won. He did not fly the second day but, after Jerzy's flight on the third day, Victor had to make another flight. He did not succeed in beating Jerzy - - - a tactical failure, perhaps!

A Father and his Daugther

A *girl* among the world elite in scale model flying! It is a sensation when one thinks of how very few girls there are in model flying, and especially in contest flying.

A part of the explanation is, of course, that 19-year-old Cathy Burnstine's father, Ralph Burnstine, has been a model flyer for 25 years and is also among the elite in control line circles.

"I started flying models when I was 6 or 7 years old," says Cathy, "but it took some years before I really learned to fly and build by myself. When I was 13 years old I entered into my first competition. The last four years I have felt able to construct more complicated models. Daddy simply taught me well!"

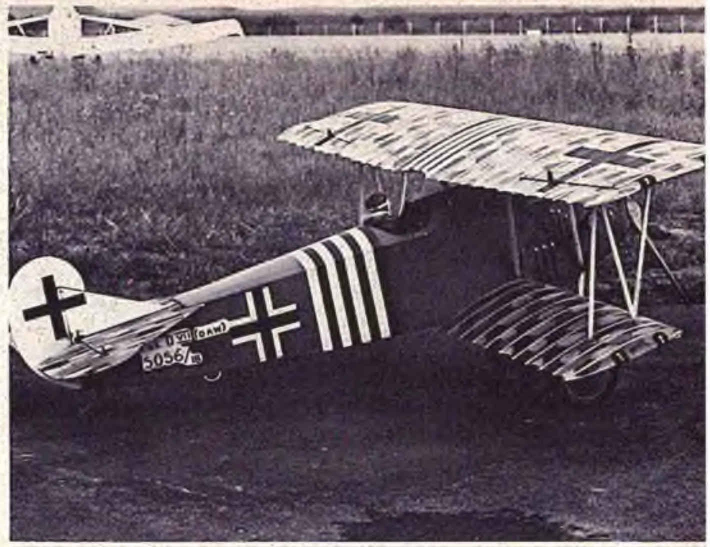
Cathy's model of the Douglas 025C from 1932 in a scale of 1/12 received medium high scale points in the static judging. The model had features such as a functioning spring system on the undercarriage, navigation lights, and functioning controls in the cockpit.

The Burnstine family had very bad luck in the competition. Cathy's model was totally destroyed during her first flight when a gust of wind caught her model. With a light model and a small engine (only 3.5cc) in heavy, turbulent wind, an accident is not too far off.

"One thing for sure," said a very sad Cathy, "the next model I make will be heavier and have a more powerful engine. This model will take at least half a year to repair and it is not worth it."

Ralph Burnstine, who is a pilot by profession, did not have any better luck with his model of the Boeing F4B. The first day his model was also damaged but he was able to fix everything before the next flight. He lost

The Royal Swedish Air Force held a special air show for the World Scale Championship, Saab 35 Draken in background.



Fokker D VIII built by Jack Swift, as a reserve model, since Waco CTO Taperwing crashed just before the championshi

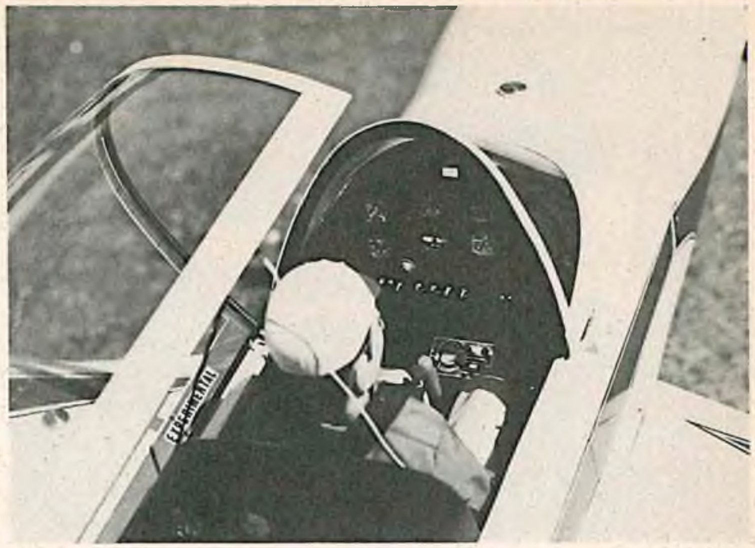
The winner in control line, a P-38 Lightning built by Jerzy Ostrowski.

Close-up details in cockpit of Ostrowski's P-38.

Tupolev TU-2 built by Lech Podgorski from Poland.

Stefan Gaudynski from Poland with his Demoitine D 520 S.

champion Bob Wischer with his new model of Piel Beryl ' 750.

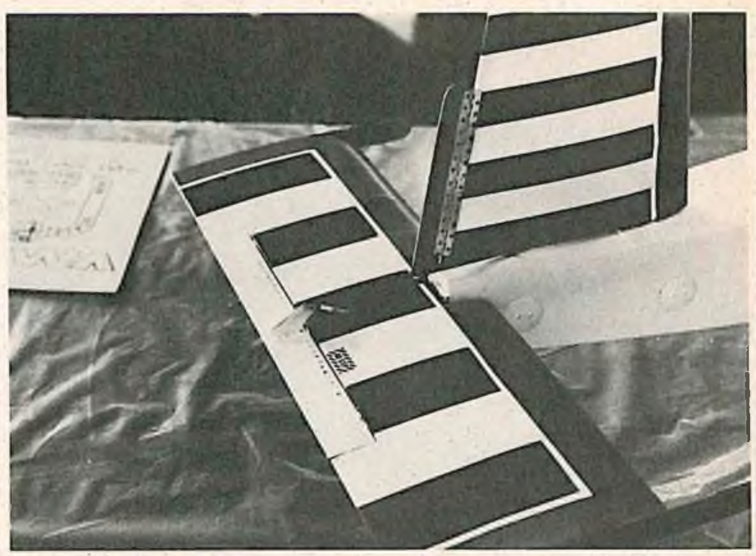


Close-up view of cockpit of Bob's CP 750.

ephen J. Sauger's model of Stinson Flying Station Wagon.

Robert L. Underwood and his Wittman D12 "Bonzo".

hn W. Roth's Evans Volksplane in scale 1:4.



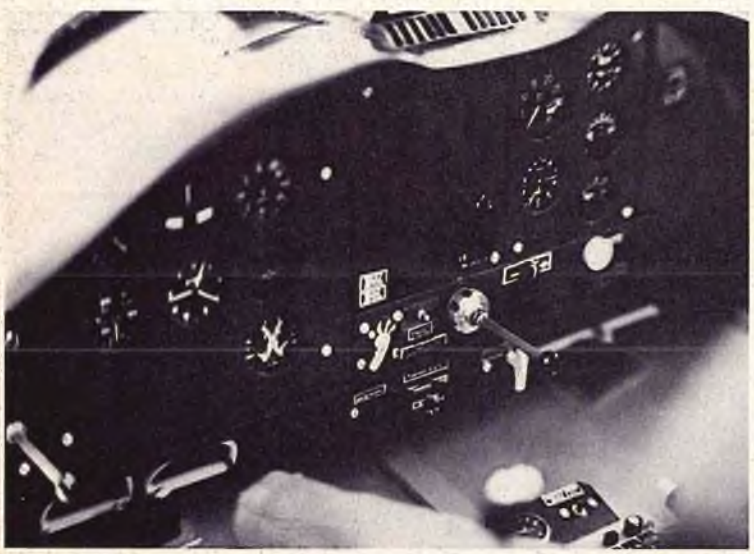
A close-up view of the tailplane of John Roth's Volksplane.

Almost a champion, Vultee BT-13A "Valiant" built by Brian Taylor was second.

Mick Reeves's model of Fournier RF4D.

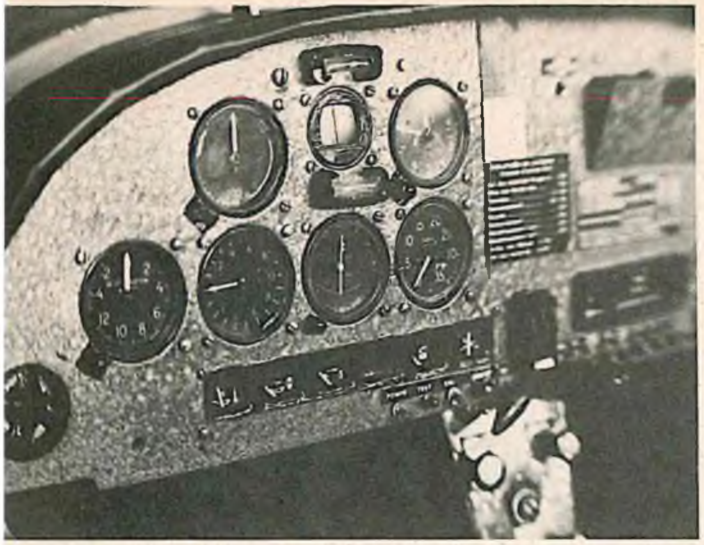
Fairchild PT 19 built by Walter Reger was 10th.

Bruno Klupp got a lot of help with drawings and pictures from Czech factory to build his model of the Zlin 42.



Cockpit in Zlin 42. Outstanding details on all models.

Pierre Koppe and his Fournier RF6B.

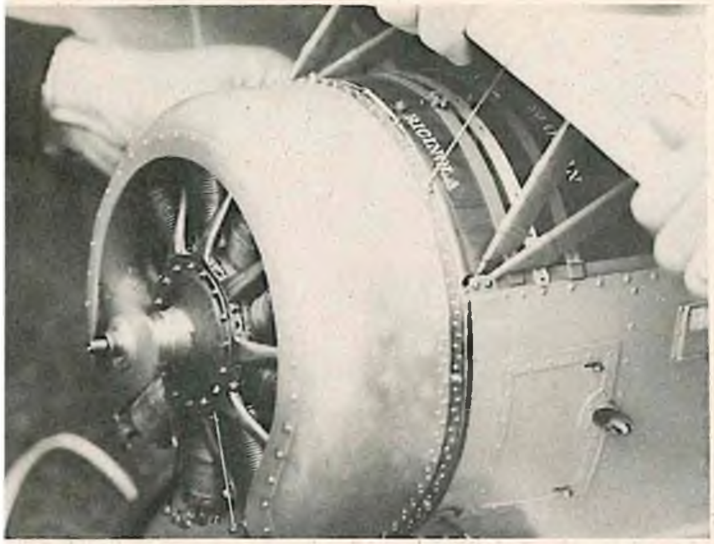


ıide the cockpit of Koppe's Fournier.

The always happy Frenchman – Jaques Matter – was not so lucky. His Caudron C 450 broke in two during flight.

ırre Koppe also entered the Stand-Off contest with his Spad ', receiving highest static points in that class.

This biplane – Tummelisa – got the third highest static points. Goran Kalderen had a smaller model of this aircraft at Lakehurst in 1974.



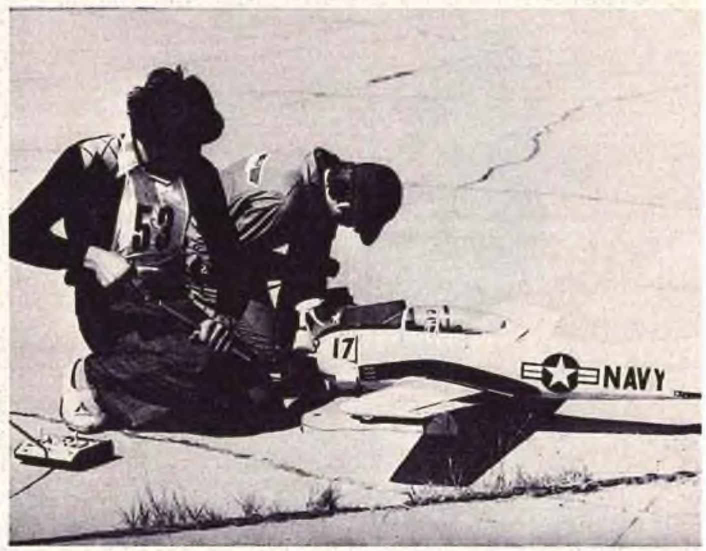
'ook at some of the fine details on this Tummelisa model.

This Stand-Off Scale model of the P-51 Mustang was built by Arvid Holmbom of Sweden.

This model of BHT-1 Beuty built by Jack Stromqvist of Sweden, was also at Lakehurst in 1974.

Brother Esbjorn Stromqvist's Saab Safir.

Hansruedi Zeller's S.E. 5a, a Swiss-made model.



Peter Gaffner pumping in air pressure in his model of the N American T 28B. Peter is from Switzerland.

A long way from home – Alan Platt and his model of a B.E. 2E came from South Africa.

Carl Plotzinsch and his interesting model of the Aero L-39 did fare too well.

RC, SCALE, F4C.

PLACE — NAME	MODEL	Country	Static Points	FLYING 1	2	3	Total
1. R.W. Nelitz	DHC-1B Chipmunk	CAN	2510.5	2023	2397.5	1710	4908
2. B. Taylor	Vultee BT-13A Valiant	UK	2442.5	2282	2144	925	4724.5
3. D. Vaughan	CA Wirraway A20-10	UK	2570	1774	—	1692.5	4344
4. R. Wisher	Piel Beryl CP 750	USA	2283.1	1429	1710	1994	4277.1
5. R. Fouquereau	CAP 20	FRA	2013.5	2252	1963.5	1910	4265.5
6. M. Reeves	Fournier RF 4D	UK	2155.6	1040	1901	2103	4258.6
7. B. Klupp	Zlin 42	BRD	2193.5	369	1828	2006	4199.5
8. J.W. Roth	Volksplane	USA	2279	1608	1743	1762.5	4041.5
9. J. Rousseau	CAP 20	FRA	1645	1973	2161.5	1659	3806.5
10. W. Reger	Fairchild PT 19	BRD	1675.5	1479	1974	1894	3649.5
11. R.L. Underwood	Wittman D12 Bonzo	USA	1790	1388	1814	1441	3604
12. T. Reichold	Colibri	BRD	1786	1467	1233	1770	3556
13. J. Stromquist	BHT-1 Beauty	SWE	1680	1288	1602	1811	3491
14. S. Sauger	Stinson Flying Wagon	USA	2215.5	125	279	1261	3476.5
15. E. Stromquist	SAAB Safir	SWE	1514	1743	1875	1859	3389
16. A. Platt	BE 2E	S. AFR.	1219	1885	1792	966	3104
17. G. Kalderen	Tummelisa	SWE	2503	576	78	589	3092
18. E. Brydges	Pitts S1 S	CAN	1599.5	108	1490	445	3089.5
19. H. Gautschi	Stampe SV 46	SCHW	1638.5	532	1421.5	1349	3060
20. J. Swift	Fokker D VII	CAN	1247.5	643	1254	1675	2922.5
21. P. Koppe	RF6B Fournier	FRA	1626.5	—	1291	—	2917.5
22. R. Liehmann	Verner W-01 Broucek	CSSR	1436	1162	1064	1383	2819
23. H. Zeller	SE 5a	SCHW	1028	1674	1352	1473.5	2702.5
24. P. Gafner	NA T28B	SCHW	824	958	1130	1111	1954
25. K. Plotisish	L-39	USSR	2302.3	—	—	—	—

CL, SCALE, F4B.

PLACE — NAME	MODEL	Country	Static Points	FLYING 1	2	3	Total
1. J. Ostrowski	Lockheed P38 Ligntining	POL	2692.1	1911	2224	3006	5698.1
2. V. Yougov	YAK-18 PM	USSR	2815.2	2676	—	2530	5491.2
3. L. Podgorski	Tupolev TU-2	POL	2103.9	2814	2850	2439	4953.9
4. V. Borzov	IL-10	USSR	1987	1553	2718	1656	4705
5. M.D. Gretz	Zlin 526A Akrobat	USA	1641	1453	1956	2811	4452
6. M.J. Newnham	Avro Lancaster Mk 1	AUSTR	1632.5	—	2601	2665	4297.5
7. M. Krivoutschev	IL-14	USSR	1978.3	2006	—	2256	4234.3
8. R. Burnstine	Boeing F4B-4	USA	1847	996	—	2010	3857
9. C. Faix	Hurel Dubois HD34	FRA	1302	—	2057	—	3359
10. S. Gaudynski	Dewoitine D520 S	POL	1170	1516	—	1587	2757
11. V. Willson	Zlin 526A Akrobat	UK	1205.5	1120	1463	—	2668.5
12. R. Barboyon	Caudron C-440 Goeland	FRA	837.5	—	1382	—	2219.5
13. C. Burnstine	Douglas 025C	USA	1214.5	—	—	—	—
14. J. Matter	Caudron C450	FRA	1100	—	—	—	—

STAND-OFF

PLACE — NAME	MODEL	Country	Static Points	FLYING 1	2	3	Total
1. F.C. Coulson	Curtis Hawk P36A	UK	1725	1242	992	1259	2984
2. K.A. Elofsson	Bu 181 Bestmann	SWE	1330	961	1195	1198	2528
3. N. Akol	Miles Magister	TURK	1875	424	—	630	2505
4. P. Koppe	Spad XIII	FRA	1910	3	—	552	2462
5. A. Holmbom	P-51D Mustang	SWE	1515	671	858	783	2373
6. J. Rousseau	Potez 60	FRA	860	1305	1333	1357	2217
7. L. Carlsson	Bu 181 Bestman	SWE	1330	858	99	691	2188
8. H. Bjorkqvist	NA T28B	SWE	1035	935	706	928	1970
9. I. Alfredsson	Liberty Sport	SWE	1085	—	—	630	1715
10. K.E. Tell	Liberty Sport	SWE	1130	480	—	319	1610
11. S. Lindfors	Waco E	SWE	1035	20	—	—	1055
12. J. Lyrsell	MFI 9B	SWE	1280	—	—	—	—
13. H. Berghofer	DK Tiger Moth	BRD	1275	—	—	—	—

HELICOPTER

PLACE — NAME	MODEL	Country	Static Points	FLYING 1	2	3	Total
1. M. Heid	Bell Jet Ranger	BRD		346	338	396	7
2. P. Pelikan	Bell Jet Ranger	SWE		188	328	343	6
3. U. Johansson	Gazell	SWE		188	226	412	6
4. M. Bisum	S67 Black Hawk	BRD		197	166	230	4
5. I. Fransson	Bell Jet Ranger	SWE		16	—	—	—

his belly tank during a succeeding flight which cost him valuable points.

The Burnstine family lives in Danville, Illinois.

The American Team

As a whole, the U.S. Team fared quite well in the severe competition, the team taking third in both radio control and control line. Former World Champion, Bob Wischer, from Milwaukee, Wisconsin, was fourth overall with his new model of the Piel Beryl C P 750.

"My model is not all completed yet," says Bob, "there are several details that are not yet ready."

A special feature of Bob's model is that radio equipment is hidden in pilot dolls!

John W. Roth from Virginia, who was second in 1974 with his model of the Volksplane, ended up in eighth place with the same model this year. That is, in a way, a measure of how the competition has changed in only two years time. Others who

text to page 158

1ST ROW: (L) Aero L-39 built by Carl Plotzinsch, USSR. (C) Stephen J. Sauger and John Roth starting the Stinson Station Wagon. (R) John Roth's model Evan Volksplane. 2ND ROW: (L) Overall side view of the famous Volksplane. (C) Pitts S1S built by Earl Brydges of Canada. (R) West Germany's Toni Reichold's model Brugger MB-2 Colibri. 3RD ROW: (L) Tummelisa, built by Sweden's Goran Kalderen, in the air. (C) Another view of the Tummelisa. (R) A flying shot of the Vultee BT-13A Valiant built by Brian Taylor, England. 4TH ROW: (L) Brian Taylor's Valiant. (C) The C.A. Wirraway built by David Vaughan of England. (R) Rene Fouquereau and his model of the C.A.P. 20. 5TH ROW: (L) C.A.P. 20 built by Jean Rousseau of France. (C) Pierre Koppe, France, and his Fournier RF 6B. (R) The French Team. *(World Championship text continued on page 158.)*

CHEETAH

Full throttle, flat out, this Half-A machine flies as good as it looks, equaling its big brothers in performance, as well as eye appeal. By Ken Eubanks.

● In these days of the energy crisis, this is one pattern ship that doesn't require a gallon of fuel for an afternoon of flying.

"Cheetah", as everyone knows, is Southern for "cheater", which is what this design does best. If you want a fast, sleek pattern ship, but hesitate to lay out the cash for a good 60 engine, a 4 or 5 channel radio, and $50.00 worth of balsa and hardware, then cheat! Cheetah uses a Tee Dee .051 running flat out — who needs throttle?

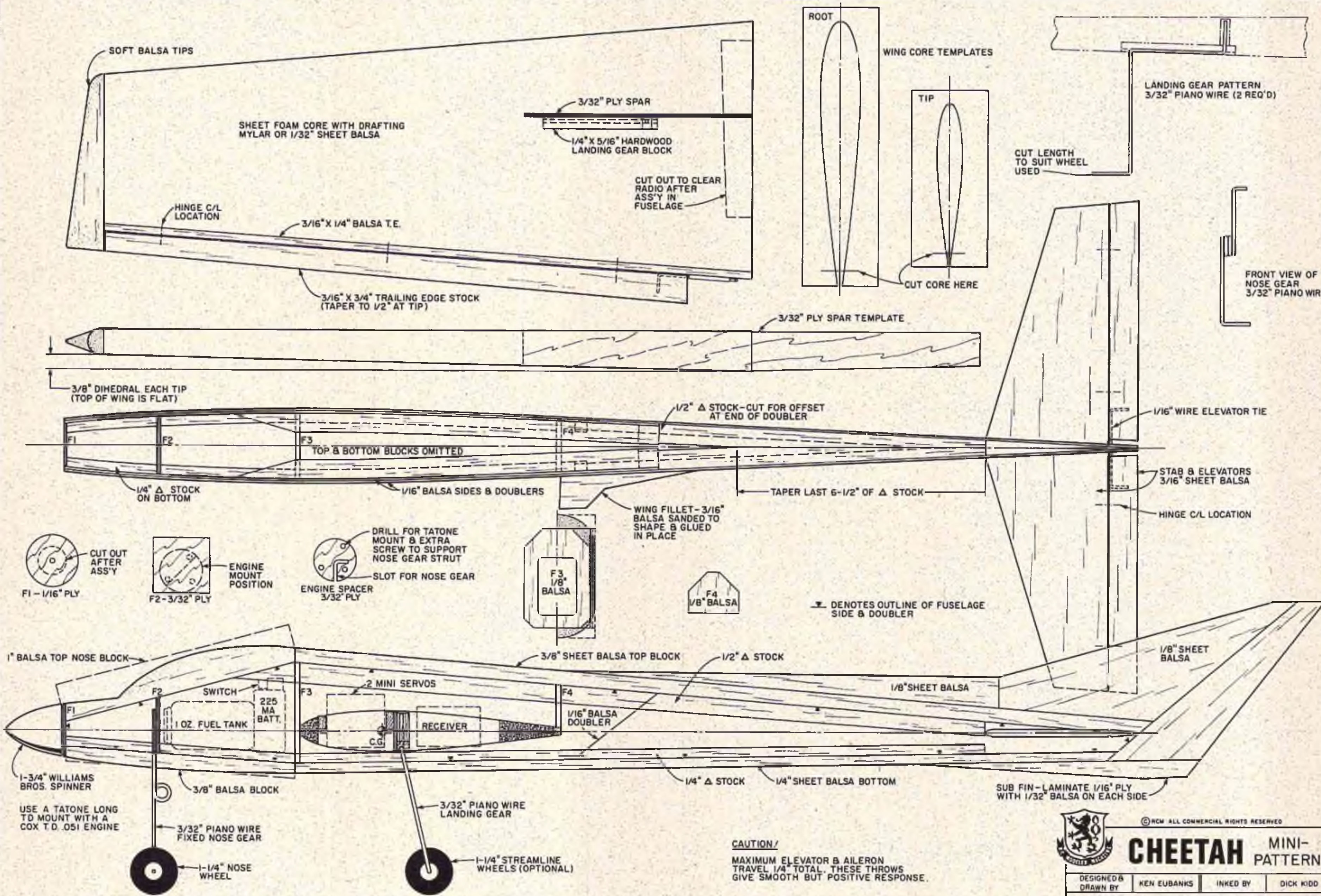
Probably the least necessary of the four necessary controls is rudder, another channel Cheetah doesn't have. The main use of rudder is during ground handling, and without throttle, ground handling is something else Cheetah doesn't have. The plans show a tricycle landing gear which is optional and is good for protecting the belly on landings. Cheetah will take-off from a smooth runway, and the wheels don't slow it down appreciably, but the small wheels don't roll very well in grass. If you fly off grass, you can forget the landing gear and install a skid as shown in the photographs.

Now that you know what Cheetah doesn't have, I'll tell you what it does have. Elevator and aileron control is really all the control necessary on the Cheetah, and it's definitely a handful. Some of you may want to put in throttle and rudder, but the power lost through an exhaust restrictor throttle and the extra weight of two more servos would seriously affect Cheetah's high speed performance. At 1 pound, 7 ounces, Cheetah's performance is nothing short of fantastic. Keep it simple and stay with aileron and elevator. Stop and think now, have you ever considered trading your two-stick transmitter for a single stick? Build a Cheetah and you have an automatic single-stick conversion, and you don't have to worry about a rudder knob.

The prototype Cheetah uses a Dorffler receiver and decoder available through C & C Avionics, 6831 Hubbard Drive, Dayton, Ohio 45424 in two or four channel kit. Two D & R Bantam or World Engine S-9 servos and a 225 mah flat battery pack, also available from C & C, complete the guidance system. If you plan to use another flight pack, it's important to check its fit before starting construction. It may be necessary to fatten the fuselage a bit to accomodate your particular radio.

If you went to Toledo and have a sharp eye, you may have seen the prototype Cheetah on the original design table hiding under the wings of the 1st and 2nd place ships. Although Cheetah did not place in the competition, and was not the most impressively unusual design, I feel Cheetah represents a new, practical design concept in that

FULL SIZE PLANS AVAILABLE — SEE PAGE 189



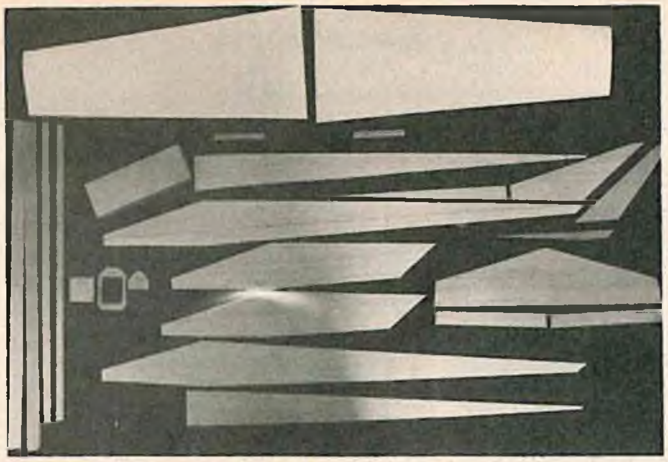
CAUTION!
MAXIMUM ELEVATOR & AILERON TRAVEL 1/4" TOTAL. THESE THROWS GIVE SMOOTH BUT POSITIVE RESPONSE.

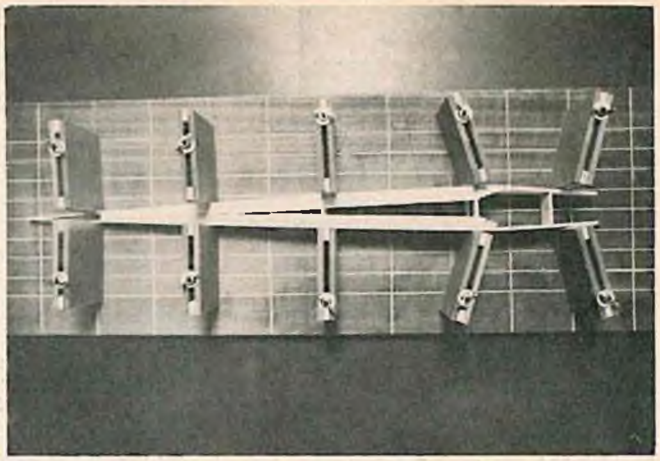
CHEETAH MINI-PATTERN

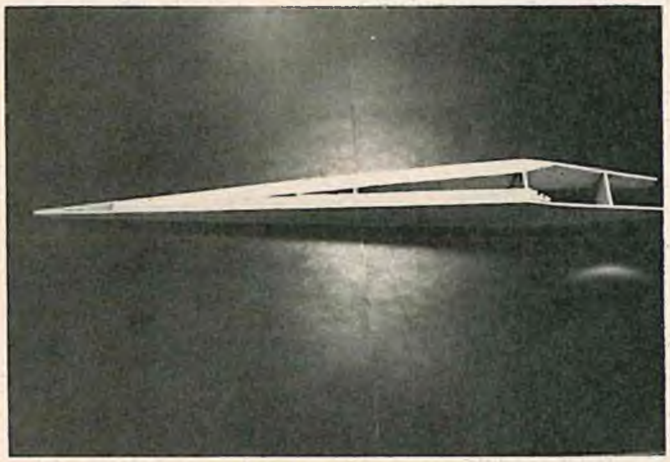
DESIGNED & DRAWN BY	KEN EUBANKS	INKED BY	DICK KIDD

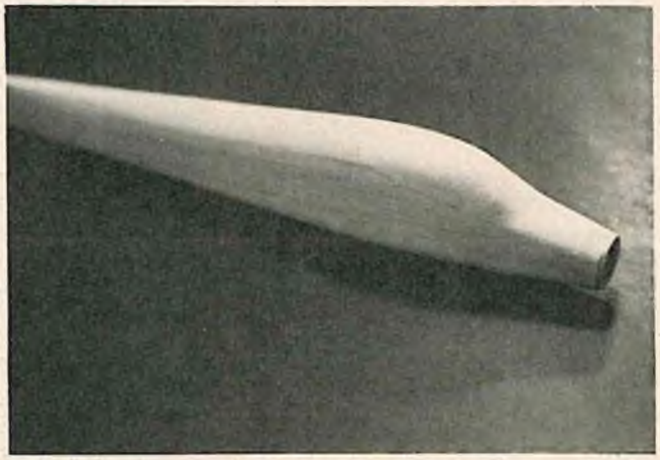
0 1 2 3 4 5 6

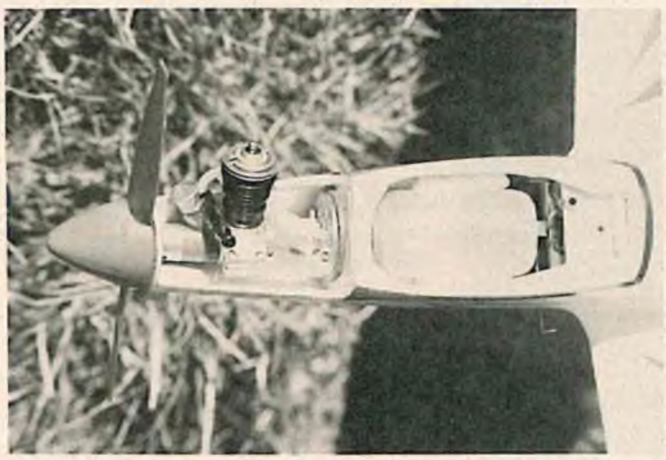
PLAN NO. 662

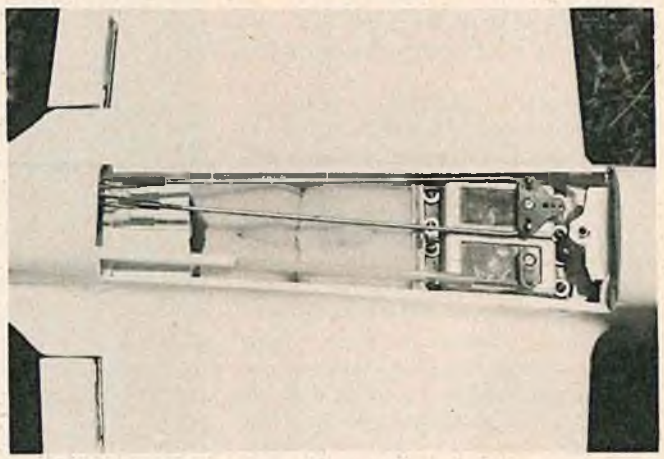

Make yourself a Cheetah kit first.


The RCM fuselage jig used during construction.


The basic Cheetah fuselage structure.


A bit of sanding, and it begins to shape up.


The Tee Dee engine and tank installation.


It's tight, but the radio does fit.

it is a compact, inexpensive high performance design that fills a need.

My inspiration for the Cheetah, aside from being economical, was a season of flying aileron and elevator Jr. Falcons. These little screamers have been popular in our club, the Dayton Wingmasters, for several seasons for club pylon racing. If you don't build a Cheetah, at least try a Jr. Falcon with zero incidence, a Tee Dee, ailerons, and elevator — it'll surprise you. Cheetah uses the same basic set-up and size, but is designed for smoother maneuvers and has sexy curves instead of boxy corners.

Now go out and buy yourself a pint of fuel and build yourself a Cheetah. Better get a fifth of your own fuel to celebrate the maiden flight — you'll be pleasantly surprised.

The prototype Cheetah uses a foam wing sheeted with .0035 thick drafting Mylar. This material has a frosted finish on one side and is slick on the other side. The slick side is sanded to break the glaze, then Formula II Hobbypoxy is used to stick it to the cores. The frosted side gives good adhesion with K & B Superpoxy. Mylar is strong, cheap, and easy to use, but with epoxy it gives a slighly wavy surface in comparison to balsa sheeting. Perhaps contact cement would be better.

Cheetah's fuselage is built up of 1/16" balsa sides, triangular balsa corners, and 3/8" and 1/4" balsa sheet top and bottom. This gives a heavy, ugly box, but then the transformation begins. Carve and sand to the outline shown on the plans and round the corners and you'll be inspired to go on.

The tail feathers are simply 1/8" and 3/16" balsa sheet sanded to sharp airfoil sections.

One note of caution- - - although Cheetah is small and relatively easy to build, it is not recommended as a beginner's airplane. Keep control throws to no more than 1/4" total movement. This little beast not only looks like a high performance pattern airplane, it acts like one too!

Begin fuselage construction by cutting out the sides and doublers from medium 1/16" sheet. Draw the thrust line on the fuselage sides for future use. Make sure the sides are identical and glue on the doublers — don't forget one left and one right! Use Titebond to glue the 1/2" and 1/4" triangular stock to the fuselage sides. While the glue is drying, cut out the formers and install the blind nuts in the firewall (F2) for mounting your long Tatone Tee Dee mount. When the sides are dry, taper the 1/2" triangular stock to allow bringing the tail together. Epoxy in formers F3 and F4, being sure to maintain alignment. Next, epoxy in F2 and pull the ends of the tail together. Make F1 by cutting out a 1⅜" diameter disc from 1/16" plywood. Drill a hole through the center to match the engine's prop screw. Remove the cylinder and piston and mount the crankcase in the fuselage without the 3/32" spacer. Install F1 on the crankcase and pull in the fuselage sides, trim to fit, and glue in place. In this manner, when the spacer is installed behind the engine mount, there will be 1/32" clearance between F1 and the spinner, and then the spinner will be aligned with F1. Install Gold'N-Rod for the elevator and glue on the top and bottom blocks except the block to be used for the front hatch. After these blocks are dry, remove the engine and temporarily cement the hatch block in place with a small amount of airplane cement.

Now the fun begins. This is best done in your living room, because you don't want all those shavings and balsa dust all over your airplane factory. Carve to rough outline, then use an idea I got from a fellow Wingmasters' member. Cut very coarse sandpaper in long strips about 2" wide and, while holding the fuselage between your knees, pull the sandpaper across the fuselage back and forth just like shining you shoes. This method really eats through balsa and results in uniformly rounded corners. When you're happy with the shape, go to progressively finer sandpaper to obtain a smooth finish.

CHEETAH
Designed By: Ken Eubanks

TYPE AIRCRAFT
Mini Pattern
WINGSPAN
36 Inches
WING CHORD
5⅞" (Average)
TOTAL WING AREA
216 Square Inches
WING LOCATION
Mid-Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
3/8 Inches
O.A. FUSELAGE LENGTH
31¾ Inches
RADIO COMPARTMENT AREA
(L) 6" X (W) 1½" X (H) 2"
STABILIZER SPAN
13 Inches
STABILIZER CHORD (incl. elev.)
3 Inches (Average)
STABILIZER AREA
38.25 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
3¼ Inches
VERTICAL FIN WIDTH (incl. rudder)
3½ Inches (Average)
REC. ENGINE SIZE
Tee Dee .051
FUEL TANK SIZE
1 Ounce
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
Two
CONTROL FUNCTIONS
Elevator & Aileron
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Foam, Ply & Balsa
Empennage	Balsa
Weight Ready-To-Fly	23 oz.
Wing Loading	15.3 Oz/Sq. Ft.

Break the engine-tank hatch block loose and hollow and trim to clear the engine. Install a 1/8" dowel in front of the block to mate with the hole in F1 and install the screw hold-down to hold the hatch in place.

Cut out the rudder parts from hard 1/8" sheet and epoxy together on a flat surface. Cut out the stab-elevator from medium 3/16" x 4" sheet. Sand the rudder and stab-elevator to a smooth symmetrical airfoil and separate the elevator from the stabilizer. Cut the stab slot on the thrust line and epoxy the stab and rudder in place while holding in correct alignment. Assemble the sub fin from 1/16" plywood with 1/32" balsa on each side and cement in place. Set the fuselage in a safe place and handle it as little as possible because the rudder tip is particularly susceptible to hangar rash.

The wing starts with making accurate templates. I've always used conventional shaped templates, but got a very good idea from a friend and WORKS member. Instead of using male templates with the cutting wire going around the outside, make rectangular templates with the airfoil shape cut in a hole so the wire goes inside the template. This way the wire is easier to control when going around the leading edge.

After cutting cores, cut a slot 3/32" x 12" for a plywood spar at the thickest point of the airfoil and sheet with your choice of materials — mylar, 1/32" balsa, cardboard, or whatever. Cut the plywood spar to fit and slop epoxy in the slots and on the spar and align carefully. It is not necessary to epoxy the center joint full length because a good part of it will be cut out later to clear the servos and receiver.

Now go back to the fuselage and be careful of hangar rash on the tail. Line up your wing root template exactly on the thrust line reference referred to earlier and trace around it to locate the cut-out for the wing. Cut on the line and slide the wing in place. Epoxy the wing in place after checking the alignment and trimming the slot if necessary. Saw through the fuselage with a thin bladed saw just behind F3 and ahead of F4, then cut horizontally through each side just under the wing to form a belly hatch.

Cut out enough foam to clear the servos and receiver and install the hardwood servo mounting blocks. Make the aileron horns from 1/16" piano wire and brass tubing, and epoxy to the trailing edge of the wing, being careful of their placement. This is one of the crowded areas, so be sure to leave room for free movement without interference with the elevator control rod or hatch hold-down. Install the hold-down dowel in the belly hatch rear and the screw hole in front of the hatch.

Cut out the rear wing fillets, sand, and Titebond to the fuselage and wing trailing edge. Carve, sand, and epoxy the wing tips in place. Cut the ailerons from 3/4" trailing edge stock and sand.

Fill any thin areas in the engine compartment with scrap balsa and coat the inside of

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INSTALLING NYLON HINGES

REPRINTED FROM THE ASSOCIATION OF RHODESIAN AEROMODELLERS NEWSLETTER

● After seeing some of the control surface installations in some of the models at the field, and hearing what some people think of nylon hinges, I feel I must produce an article on the correct installation of nylon hinges for RC aircraft.

First, there are numerous types of nylon hinges on the market. The most common amongst our flyers is the ordinary knuckle jointed hinge such as Kavan, Du-Bro, K.D.H., Graupner, etc. These are flat hinges swivelling around a steel pin. Each leaf of the hinge has either holes or ridges on them for gluing purposes. Another type of hinge is very similar but has a shoulder on each leaf adjacent to the pin. These are more difficult to install (extra notches in the woodwork), but eliminate any chance of glue getting into the working parts. Still another type is the single flexible polypropylene type which I don't use at all, and there are other types such as the Robart type that requires only a hole to insert, plus others with nylon swivels, etc.

In this article, I will concentrate mainly on the first type I described which is the most popular, with a brief discussion of the others afterwards. For a good efficient, strong control surface hinging, there must be at least three hinges on each surface — rudder, each elevator side, aileron, etc. On strip ailerons use four or even five hinges, depending on the length of the aileron. These hinges must lie in perfect alignment and the control surface gap must be zero.

Let us talk about an elevator to tailplane hinging. The same will apply to any other control surface such as rudder or aileron. The rear face of the tailplane must be square and the front face of the elevator must be chamfered to a point. (Figure 1.) The angle

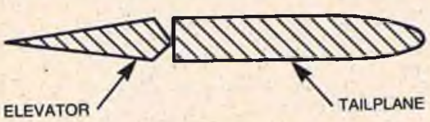

FIGURE 1

of the chamfer should be a little more than the deflection required. (Figure 2.)

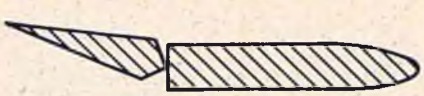

FIGURE 2

Draw a center line along the rear face of the tailplane. This must be dead center and dead straight. The centering can be done with special jigs or by measurement. Be careful and check that the tailplane is not warped and has a curve in it. If it is curved slightly and cannot be straightened, draw the center line straight, otherwise the control action will be stiff. (Figure 3.)

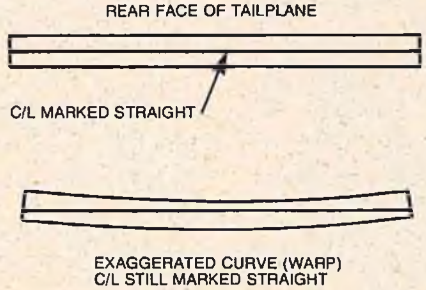

FIGURE 3

The center line of the elevator is marked in the same way before chamfering. The hinge positions are now marked on the tailplane and the slots cut. My method of cutting the slots is to insert a blade in the positions marked to make a slit, then use an X-Acto keyhole saw blade to open the slot to the correct width and depth. If you haven't got an X-Acto keyhole saw, use a broken-off junior hacksaw blade. Make the slot so that the hinge slides in snugly all the way up to the knuckle.

With all the slots cut out on the tailplane and the hinges pushed in place, line up the elevator and mark the positions of the hinges on it. Now proceed to cut the slots in the elevator. Remember that the edge is chamfered and the center line is the forward sharp edge. Make these slots a little bit deeper to include the thickness of the knuckle of the hinge. Now cut a section out by the slot so that the knuckle can fit in. (Figure 4.)

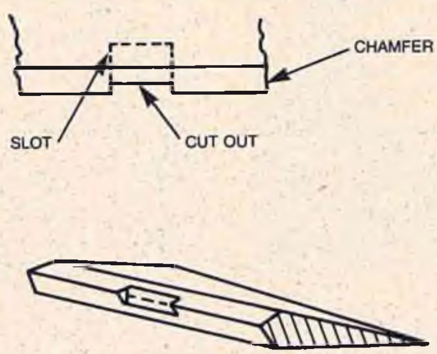

FIGURE 4

Now push the elevator onto the tailplane so that there is no air gap between them. (Figure 5.)

You have now completed the hinging. Do not glue the hinges on yet. You can install the radio and pushrods and check the operation of all the controls while the surfaces are just pushed on.

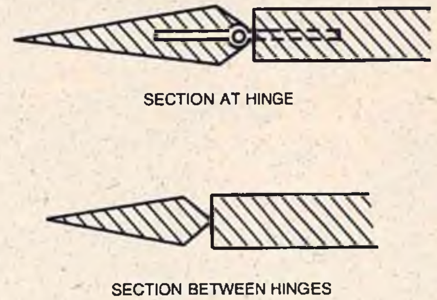

FIGURE 5

After the model is completed and painted, or covered with Solarfilm, the hinges can be permanently installed. First of all, smear a bit of vaseline on the knuckle joint to protect it against the glue. I use epoxy for gluing the hinges in. If you are in a hurry and going to use 5 minute epoxy, just do one surface at a time (3 to 5 hinges), but if you are using a slower drying epoxy, mix enough for all the hinges. First glue the hinge on the tailplane only. Apply small amounts of epoxy into the slots with a toothpick and smear a bit onto the surface of the hinge. Ensure that all the holes in the hinges are filled with glue. Push each hinge in up to the knuckle joint and with a clean toothpick, clean off any excess epoxy. Do not put the elevator on yet but let the epoxy dry completely on the tailplane. The hinges will all be aligned properly as all the knuckles will just be touching the rear surface of the tailplane. (Figure 6.)

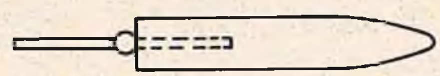

FIGURE 6

When the glue is dry, flex the hinges. This will break off any dried glue on the knuckle. (It won't stick, remember the Vaseline.) Now dry fit the elevator and check for operation. If OK, remove and glue up the same as before, pushing the elevator on all the way. Remove any excess glue and allow to dry. When dry, flex the surface to remove any dried glue on the knuckle and the job is done. Incidentally, I never pin the hinges. As long as there is glue through the holes or in the ridges of the hinge, they will never loosen. I have not had a failure yet.

As to other types of hinges, the method is the same with slight differences. The hinges with shoulders need further cutting of the fixed and movable surfaces to incorporate the thickness of the shoulder. The flexible polypropylene type needs to have careful attention when lining up. They usually have

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The sense  . . . and nonsense of cyanoacrylate ADHESIVES

Pacer Industries is not a newcomer to the hobby industry. They have experience in manufacturing R/C kits and accessories. Since many of their personnel are R/C enthusiasts, it is no surprise to find them performing research and development in the hobby adhesive fields. We wish to thank them for supplying their expertise and technical data to RCM so that we might make this article complete and comprehensive.

In the past several years the hobby industry has seen many new significant advances that have made life easier for the model maker. Such as the development of 5-minute epoxies, heat shrinkable plastic films for covering, and the most recent, the application of Cyanoacrylate adhesives for balsa wood. This adhesive produces a high strength joint on balsa in a matter of seconds. As the adhesive technology becomes more sophisticated, it is important to understand the basic properties by which these adhesives work in order to take full advantage of their optium characteristics. Our technical staff here at RCM has been using Cyanoacrylate Adhesives (hereafter referred to as CA's) for over a year and a half on many construction projects. This experience, coupled with technical information supplied by Pacer Industries, Chemical Division, has provided us with a detailed understanding of this adhesive.

Because this adhesive is new and essentially different, our correspondence has shown that many questions on application techniques, strengths, and many myths that need to be answered. We shall attempt to answer these questions as non-technically as possible. However, there may be some PHd's in chemistry out there who might have other ways of explaining the details. Note: The technical data contained in this article is from Zap adhesive; we have also used Jet, Hot Stuff, etc.

What is a CA? The modern day CA's are the result of several chemical firms conducting extensive research and development of different monomers. Unique features of this adhesive are fast setting time, unusual strength, and an uncanny ability to bond similar and dissimilar materials, such as nylon, plastics, woods, and metals. CA is a colorless single part non-toxic adhesive that has a rapid setting time. Chemically speaking, it is a compound of Alpha Cyanoacrylate monomer in a liquid state. CA's polymerize (transition between liquid state and solid state) on contact with minute trace quantities of moisture which are present in most materials, as well as air. This moisture, acting as a catalyst, causes molecular cross linking reaction. On certain grades of balsa wood you can, by generation of smoke, see the cross linking occur. Now what you have is a hardened resin which has a strength much greater than most basic materials used in model construction.

There are two basic types of CA available commercially today, they are the ethyl monomer and the methyl monomer. Generally speaking, the ethyl monomer is used for non rigid substrates such as balsa wood, rubber and plastics. The methyl bases are used when joining rigid substrates such as steel and aluminum. Both monomers will adhere to rigid and non-rigid substrates, but setting times and ultimate strength will vary. While we are on the subject of setting time and ultimate strength, we have found a distinct difference between the two. On low strength balsa wood, setting time and ultimate strength should be identical. On higher strength woods and plastic, the initial setting time can be around 10 seconds and ultimate strength may occur from 10 minutes to 12 hours later, depending on the

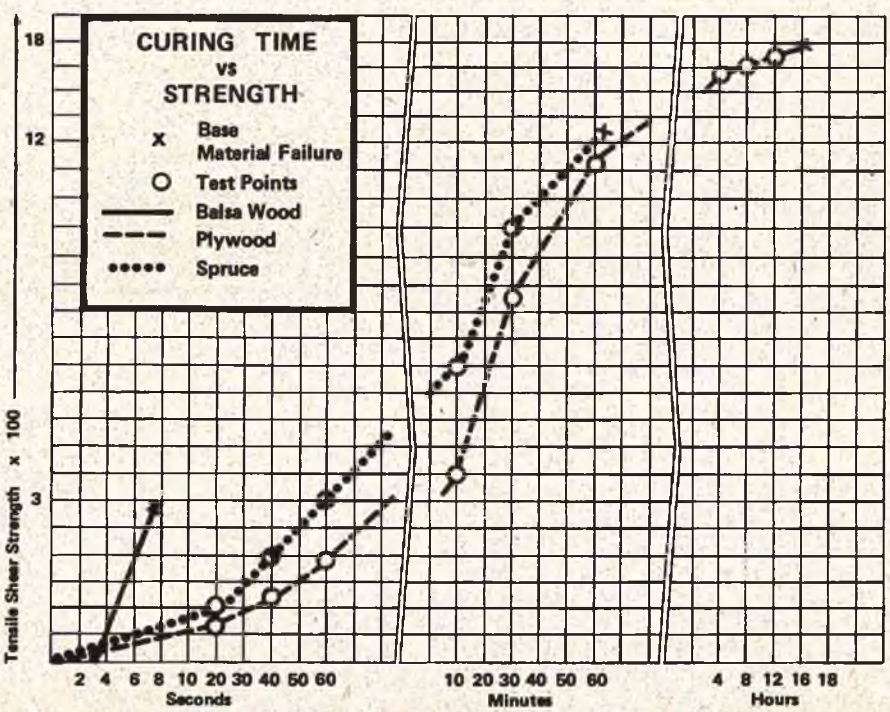

Figure 1

strength of the material being bonded. See Figure #1.

For the model maker the ethyl type is generally the most suitable because of its fast speed and its strength exceeds most of the materials used in model construction. (See figure #2.) Both ethyl and methyl CA are available in different viscosities, varying from very thin with 2 or 3 cps, to medium 50 to 100 cps for general industry use, or very thick 800 to 1200 cps for specialized applications. Setting times vary directly with the viscosity of the adhesive with the thinner material setting in seconds and the thicker material setting in minutes. For the model maker this means that, when using the thinner material, parts can be pre-placed, accurately aligned, and the adhesive wicked into the joint. The thicker material is commonly used by placing the adhesive on one surface and mating the other surface to it, obviously useful for lamination, etc.

Pacer Industries has informed us of a new cyanoacrylate based adhesive they are developing. This adhesive known as X30 seems to fill the gap between the setting time of 5-minute epoxy and their rapid setting Zap. This material will have an average of 30 seconds setting time but will be of a viscosity comparable to white glue. While we here at RCM have not used this material extensively, it does seem ideal for applications where we wish to apply the adhesive to one surface, mate it to another surface, and still be able to position it. But the setting time is still fast enough to allow for hand clamping. We feel this is a good compromise between the very rapid adhesives and the epoxies in that the parts do not have to be so closely fitted. Also a very small amount is required for excellent strength.

We have heard a lot of comments on the cost of the adhesive. For anyone who has used this material it is easy to imagine the difficulties associated in the precise formulation required in manufacturing and the high cost involved in handling since it bonds anything to anything. But when it is considered that only a very small drop is necessary to create a bond and that there are several thousand small drops in a bottle, a model maker can accomplish a joint for a fraction of a cent in a very short time. And since time is considered money in many cases, CA can be considered very economical and only slightly more expensive than other adhesives.

With most adhesives, surface preparation has an effect on bond strength and this is true with CA's also. When using spruce or other hard woods it is best to sand with medium grit sandpaper on the surface to be joined. This not only allows a close fit, but removes any acids or sap which may interfere with bond strength. In the case of plastics, nylons, and metals, surface sanding with fine paper can remove any injurious oxides. So far as metals or glass are considered, a solvent such as acetone will properly degrease the surface. If wood surfaces are oil soaked solvent should also be used.

We have received many questions regarding application. We will deal with the two most important aspects of application first. They are, number one, a closely fitted joint with as much contact area as possible. Number two, frugality of applied quantity. This is literally the key to successful application. In other words the formation of a very thin adhesive film between the two well-mated surfaces is essential. The thinner the film, the faster the set and the stronger the bond. It is somewhat difficult to convince new users to apply the least amount of CA. Conventional adhesives such as white glues and epoxies have been used with the theory that if a little is good, a

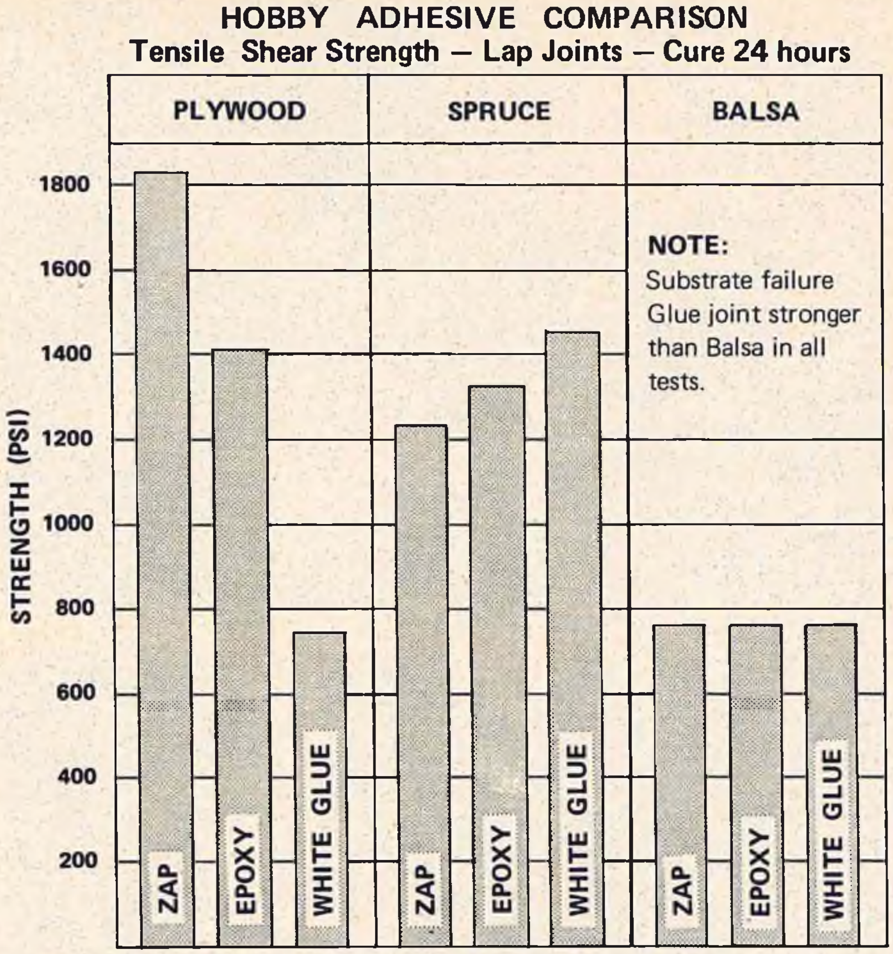

Figure 2

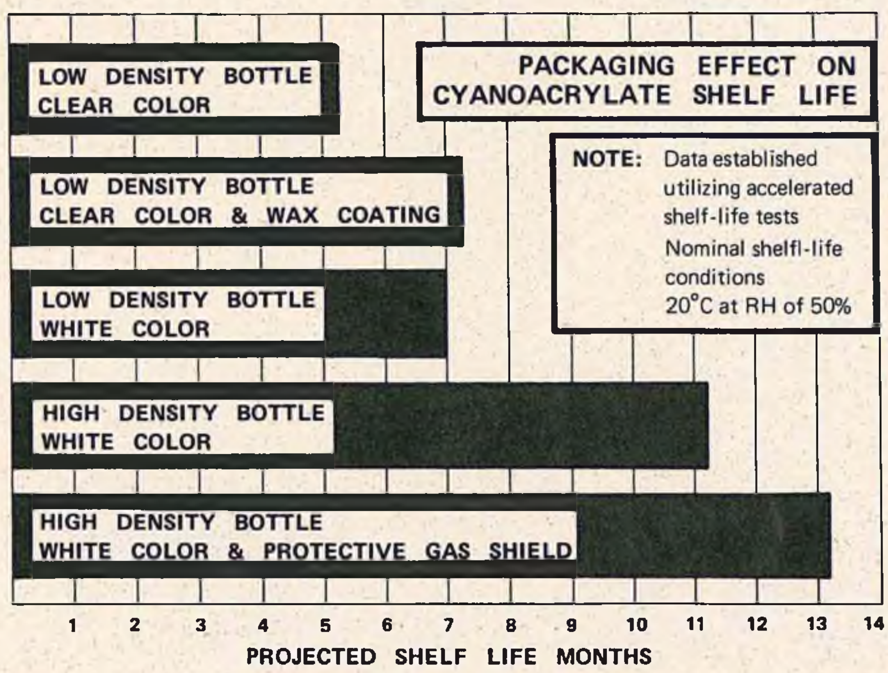

Figure 3

Zap being filled by automatic gas transfer filling machine.

Pacer engineer testing the cyanoacrylate bonds on a tensile testing machine.

lot is better. In other words, when in doubt, hell for stout. But setting time and bond strength suffer drastically when this philosophy is used with CA.

Most of the CA's evaluated by RCM have used a small teflon tube, to make it possible to apply one drop at a time. While one drop at a time application is necessary, the small tube is prone to clogging. This clogging sometimes occurs more frequently than other times. This phenomenon was discussed with the people at Pacer. We have received the following explanation. In order to obtain a small drop, the ID of the tube must be of a small diameter and the adhesive may not readily flow back into the bottle. If prevailing humidity conditions are 40% or more the CA will polymerize and plug the end of the tube in varying degrees. Pacer reported that they were aware of this problem and at the present time were unable to eliminate it. Their research department has taken the following steps to make the problem easier to live with. They increased the OD and wall thickness of the tube to make the end easier to clear. This also makes it easier to insert into the bottle, as it will not bend or pinch shut. They are utilizing a type of teflon tube which has a greater infinity to bonding CA. We have also noted that, recently, they have included extra application tubes in every package, which we find extremely convenient. A good technique to clear the tube is to slightly squeeze the bottle after use. (Be careful.)

We have received several comments that CA materials seem to thicken or harden in the container over an extended period of time. In other words, this material does have a shelf life. This is explained on the directions or labeling on most of the products we have used. We have found that the thickened material still has excellent bond strength. It was more difficult to apply when we tried to wick it into joint. The material seemed to work great for lamination of plywood to balsa in fuselage sides, etc. So, if you have encountered the thickened material, do not throw it away but use it as quickly as possible. Pacer has provided us with the following factors that effect shelf life.

PHYSICAL PROPERTIES OF ZAP ADHESIVE

Liquid Adhesive	
Appearance	Colorless liquid
Specific Gravity	1.01
Viscosity at 25°C	1-5 cps.
Flash Point (°F)	176
Soluble in	MEK, Acetone
Cured Adhesive	
Melting Point °C	145
Hardness (Barcol)	85
Maximum Cure Time	12 hours
Temperature Range °C	-75°C to 80°C
Soluble in	Acetone, Dimethylformamide

Figure 4

At the date the material is manufactured a time clock begins to run. The speed of this clock can be increased or decreased by the following factors. Increased — High temperature, direct sunlight, high humidity, poor packaging or improper handling after refrigeration. Decreased — This clock can be slowed to a virtual standstill if the material is stored under refrigeration at a temperature of 40°F ± 2°. Allow CA to return to room temperature prior to opening as moisture condensation can occur within the bottle when the contents are cooler than the surrounding atmosphere. If stored with cap off, leave tube in place. If stored with cap on, **remove** any adhesive on the threads with a paper towel, otherwise cap will remain on permanently.

Extensive research in packaging technique has been done by Pacer and other major companies and figure #3 displays the effectiveness of packaging on shelf life. Pacer made these points. The bottle should be filled under environmentally controlled conditions (low humidity). The bottle should be of a high polyethelene, which is more resistant to moisture in the atmosphere during storage. A colored bottle also helps to restrict light rays. Zap is packaged with an inert protective gas of a very low moisture content (.00025 parts per million moisture). This gas shield is in effect while the product is on the dealers shelf or on the modelers workbench before it is opened. Our experience has shown CA's do last for a period of months on the workbench with the applicator installed. We have replaced the cap without removing the CA from the threads and what they say is true. The bond formation between the bottle and the cap is stronger than we are when trying to remove the cap again.

The RCM staff, and I, found the easiest way to introduce anyone to this sophisticated adhesive has been to mentally visualize the adhesive as being a liquid pin. In other words, where we have normally used a pin to clamp parts in position while adhesive dries we have applied CA. Using our hand as a clamp we have a joint in a second. With the time savings that this provided we began to realize the real capabilities of this adhesive as a construction tool. One of the most troublesome, pin consuming, finger irritating tasks is the attachment of leading edge planking. A combination of CA and white glue greatly simplifies this construction. The trailing edge portion of the leading edge planking was installed to the spar with CA the full length of the wing (our fingers thanked us since this is normally a skin irritating experience to push a pin in the spruce spar). After the spar portion of planking was attached, white glue was applied to the ribs the full length of the wing panel. Then by pressing the planking over the ribs and to the leading edge and using our hand as a clamp applied CA. It wicked well into the joint and gave us a strong bond. And, presto — no pin holes to fill.

Another example of multiple adhesive use was found during assembly of plywood stiffeners to fuselage sides. I used the normal procedure of applying white glue to the two parts to be laminiated. Instead of pins or clamps, this assembly was tacked in place around the edges with CA and I proceeded in construction immediately while the white glue dried. The actual use of CA in construction is only limited by your imagination, such as stiffening balsa leading edges when they should be hard instead of soft.

On the very few occasions I have had to repair a model (heaven forbid) CA's are literally fantastic. It is simply a matter of aligning the pieces as they originally were, hold in place by hand, and wicking CA into

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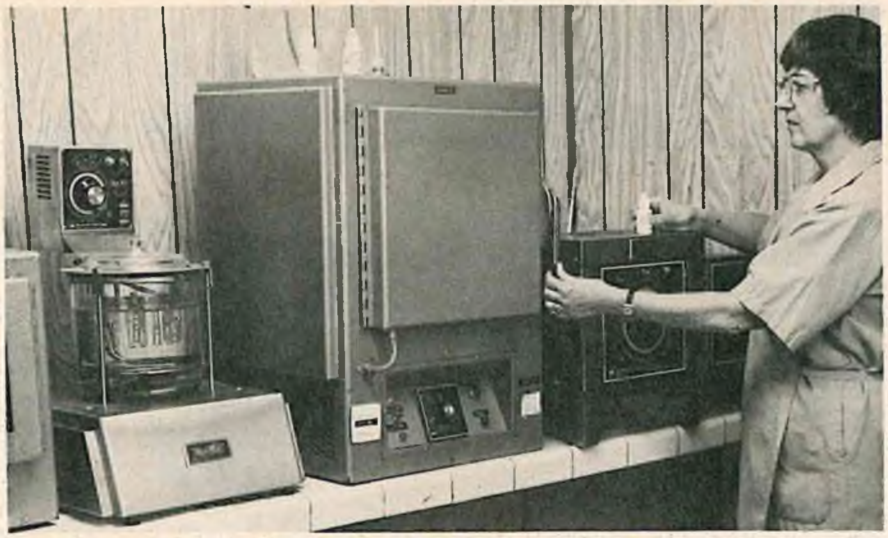


Pacer Industries Quality Control Laboratory.

TECHNICAL SPECIFICATIONS
CYANOACRYLATE ADHESIVE

	Material	Fixturing Time in Seconds		Tensile Shear Strength (PSI)	
		ZAP	X-30	ZAP	X-30
General Hobby Wood	Plywood-Plywood (Birch)	10-30	25- 40	1800	1897
	Spruce-Spruce	15-35	30- 45	1210	1250
	Balsa-Balsa (Medium Density)	4- 8	10- 30	350*	370*
General Materials	Steel-Steel	20-40	60- 90	2485	2528
	Aluminum-Aluminum	30-60	75-160	1150	1230
	Copper-Copper	20-30	25- 45	2414	2627
	Neoprene-Neoprene	3	5- 10	650*	568*
	Rigid PVC-Rigid PVC	5-10	10- 30	1400*	1250*
	Nylon-Nylon	15-30	20- 40	781*	781*
	ABS-ABS	15-30	20- 14	1420*	1491*
	Natural Rubber-Natural Rubber	3- 5	5- 10	454*	487*
	Phenolic-Phenolic	20-40	100-130	800*	875*
	Rigid Vinyl-Rigid Vinyl	10-25	20- 40	925*	940*
	Plexiglas-Plexiglas	10-20	50- 80	1100*	1250*
	Steel-Neoprene	3- 5	8- 20	650*	635*
	Aluminum-Neoprene	10-15	20- 40	520*	485*
	Aluminum-Nylon	15-25	25- 40	600*	595*

Note: The above data was taken at the condition of 20°C ± 2°C and Humidity of 60% ± 2%. Cure time 12 hours.

*Substrate failure.

Figure 5

No pins sheeting method

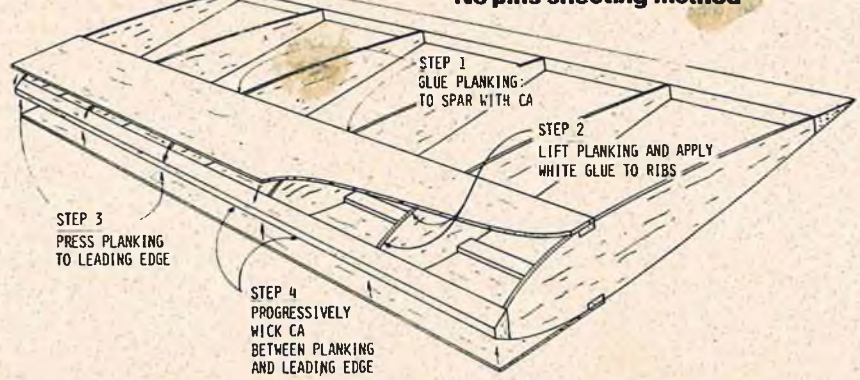
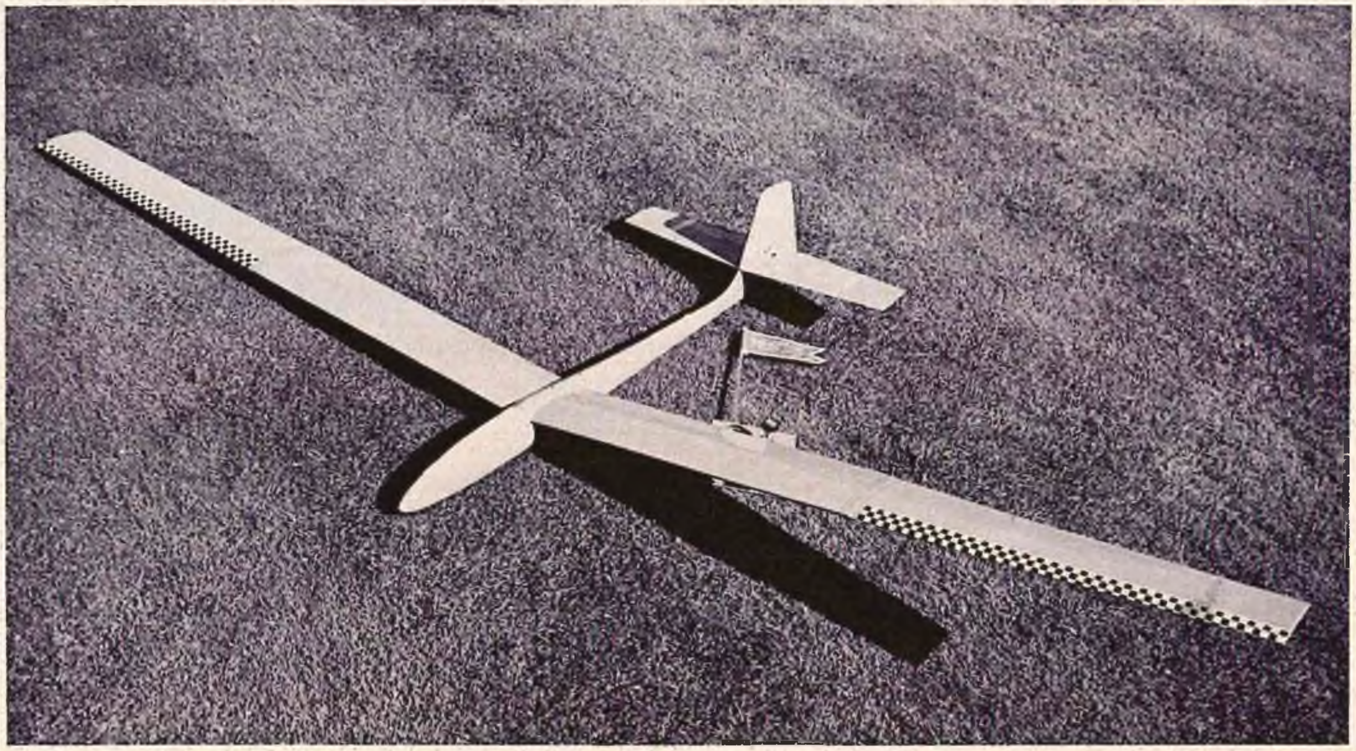


Figure 6

SUNDAY FLIER

BY KEN WILLARD



The Topsailer is a typical thermal design with ten foot span. Polyhedral was added later to improve turning ability.

● Most of you Sunday fliers are not aeronautical engineers, aerodynamicists, structures specialists, electronic whizzes, or engine experts — any more so than Sunday boaters are marine architects, oceanographers, or hydrodynamic theorists. Principally, you're all out there for the sport, relaxation (?), and the challenge to do something different and to get away from the everyday humdrum of earning a living.

Yet, Sunday fliers do seem to be a bit different from Sunday boaters — I mean R/C fliers, of course. After building a few kit models, and attaining a reasonable degree of proficiency in flying skill, you want to do more. Specifically, you get an urge to design your own model. Did you ever note the slight — and sometimes not so slight — tone of pride when you ask a modeler, "What kit is that?" and he replies, "It's not a kit — I designed it myself."

You'd like to try it yourself, but you're hesitant. "I couldn't do that; shucks, it would take years to learn."

Baloney.

Look — you've built easy kit models, then tougher ones, then busted them up, repaired them, and flown them again. Haven't you?

With that experience in back of you, you have already learned a lot about structures — where to build it strong, how to assemble a wing to a fuselage (don't be afraid to copy various structural details from kits — everybody does it), and how to stick in a radio receiver. Those things are not the hard part. What discourages most modelers is the prospect of trying to get the right relationships between the wing size, fuselage length, tail surfaces, and angular settings — along with some of the finer points like wing sections, dihedral, taper, "washout," and all those secrets of the top designers.

There's one thing, common to all designs, that's no secret — although not always understood — and that is the basic design requirement to adhere to the laws of aerodynamics. If you do this, you can come up with a good design, and call it your own. True, there are many variables, but, if you stay within certain limits, your design will fly, and fly well.

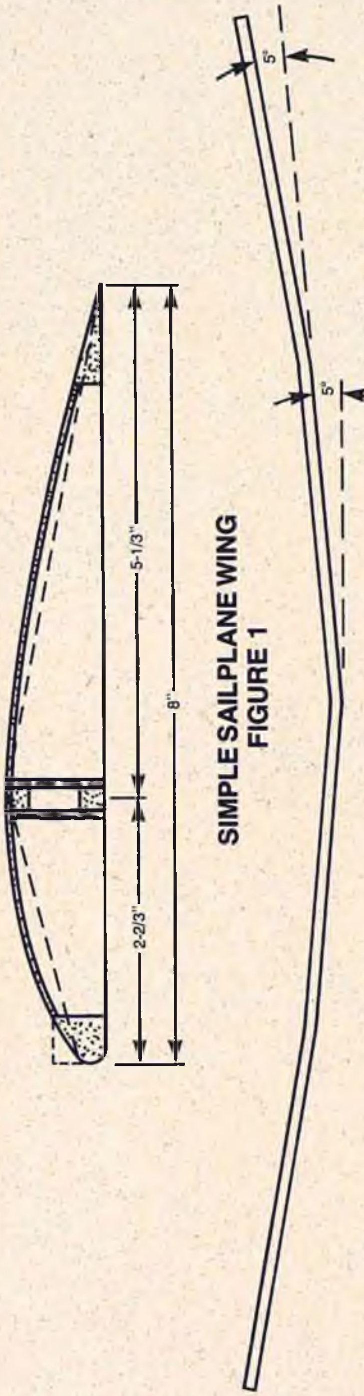
What are those limits? Depends on what you want your model to do. Rather than go into a lot of mathematical analysis, here are some basic dimensions, areas, and angles for you to use in designing a simple, yet effective, thermal glider — or sailplane, if you prefer.

Since a thermal sailplane rides vertical currents in the air caused by temperature variations, it's usually a good idea to make it fairly big, so you can easily see it as it gets higher and higher. How big? Oh, eight to twelve feet in wingspan is the usual rule. Smaller ones work, but if they get over seven or eight hundred feet high, they get pretty small, and you can't tell what they're doing.

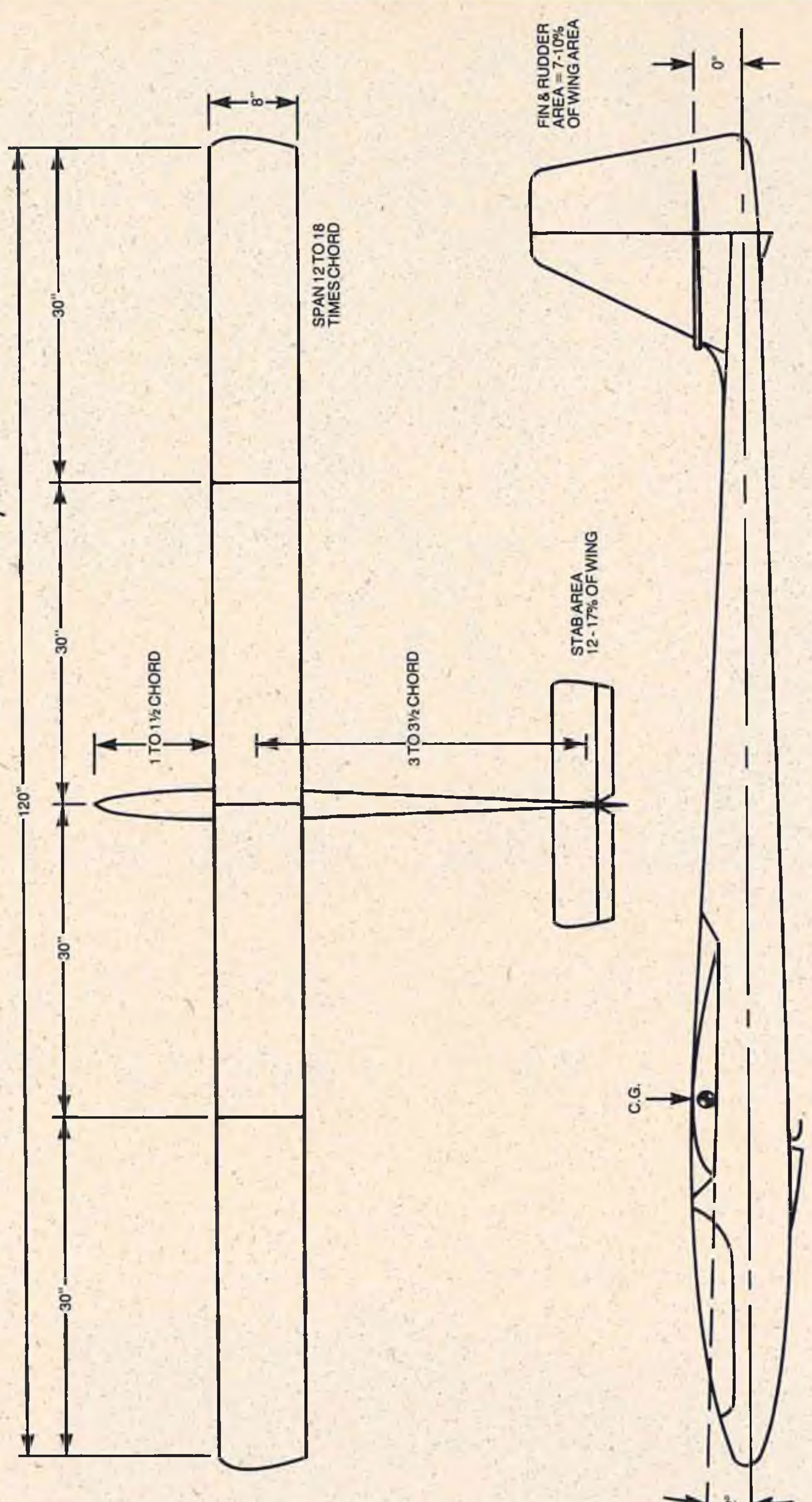
So, let's strike a mean. How about a ten foot span job? That's 120" and if the wing is made up in four panels, each panel is 2½' long — a convenient size to work with before joining, and gives you some leeway in using the standard 36" lengths of balsa; or spruce — for the spars.

If the span is 10', how "wide" should the wing be, or, as most of your know by this time, what should be the "chord", which is the distance from the leading edge (forward edge) to the trailing edge (rear edge) of the wing. Rough rule — make it 1/15th of the span, in this case, 8". It can be more, and it can be less; you'll get arguments in favor of both, but if your wingspan is fifteen times the chord, that's an "aspect ratio" of fifteen. Another way to figure aspect ratio is to divide the square of the span by the area of the wing — but that's mainly for wings that are tapered, or elliptical, or some other shape. For this simple design, let's stick with a "board wing", — one that has a rectangular planform.

How "deep" should the wing be at its thickest point? And, where should that point be? And, how should the wing curve — both



SIMPLE SAILPLANE WING
FIGURE 1



SIMPLE SAILPLANE LAYOUT
(NOT TO SCALE)
FIGURE 2

on the bottom and the top, from the leading edge to the trailing edge?

Make the wing depth about 1/8th of the chord — in our case 1" thick. And have that point about 1/3rd of the chord back from the leading edge. As for the curves on the top and bottom, make the latter with no curve — just a straight line (all right, you purists, a curve of infinite radius). For the top surface, come straight up from the leading edge of the bottom, about 1/4th of the maximum thickness — 1/4" in our case, draw a straight line from there to the point of maximum thickness, and another one from there back to the trailing edge. Now, gently round the leading edge thickness and fair it back to the thickest point, and gently curve the straight line from there back to the trailing edge.

Wasn't that easy? A quick look at the drawing (Figure 1) shows what you come up with, and now all you need is a structure that will hold that shape — ribs, spars, a leading edge, a trailing edge, and joiners to hold the panels together.

As I said earlier, the structural design is not going to be covered — just the aerodynamic parameters. The drawing of the airfoil shows a fairly standard structure

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Hit song superstar, Gary Wright, in his elaborate recording studio.

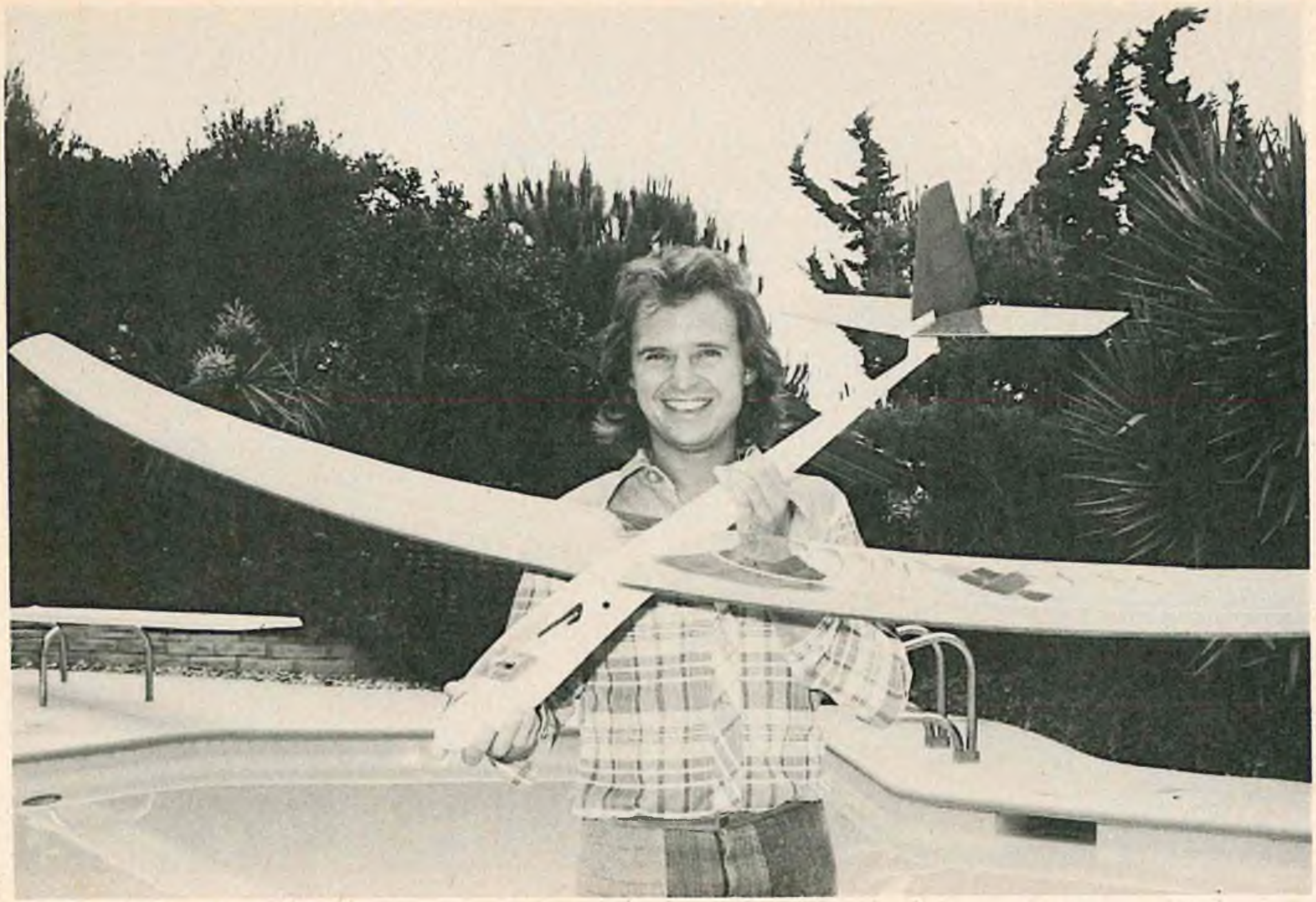
SILENT FLIGHT IS A GOOD TUNE FOR THE MUSIC MAN

A low pass for RCM's photographer.

● Gary Wright is one of the hottest names in the music business today. The Golden Discs on his studio wall signify that over a million copies of his albums, "Dream Weaver" and "Love Is Alive" on Warner Bros. label, have been sold. This youthful artist writes, composes, produces and creates the special effects for his music which is entirely performed on keyboard instruments.

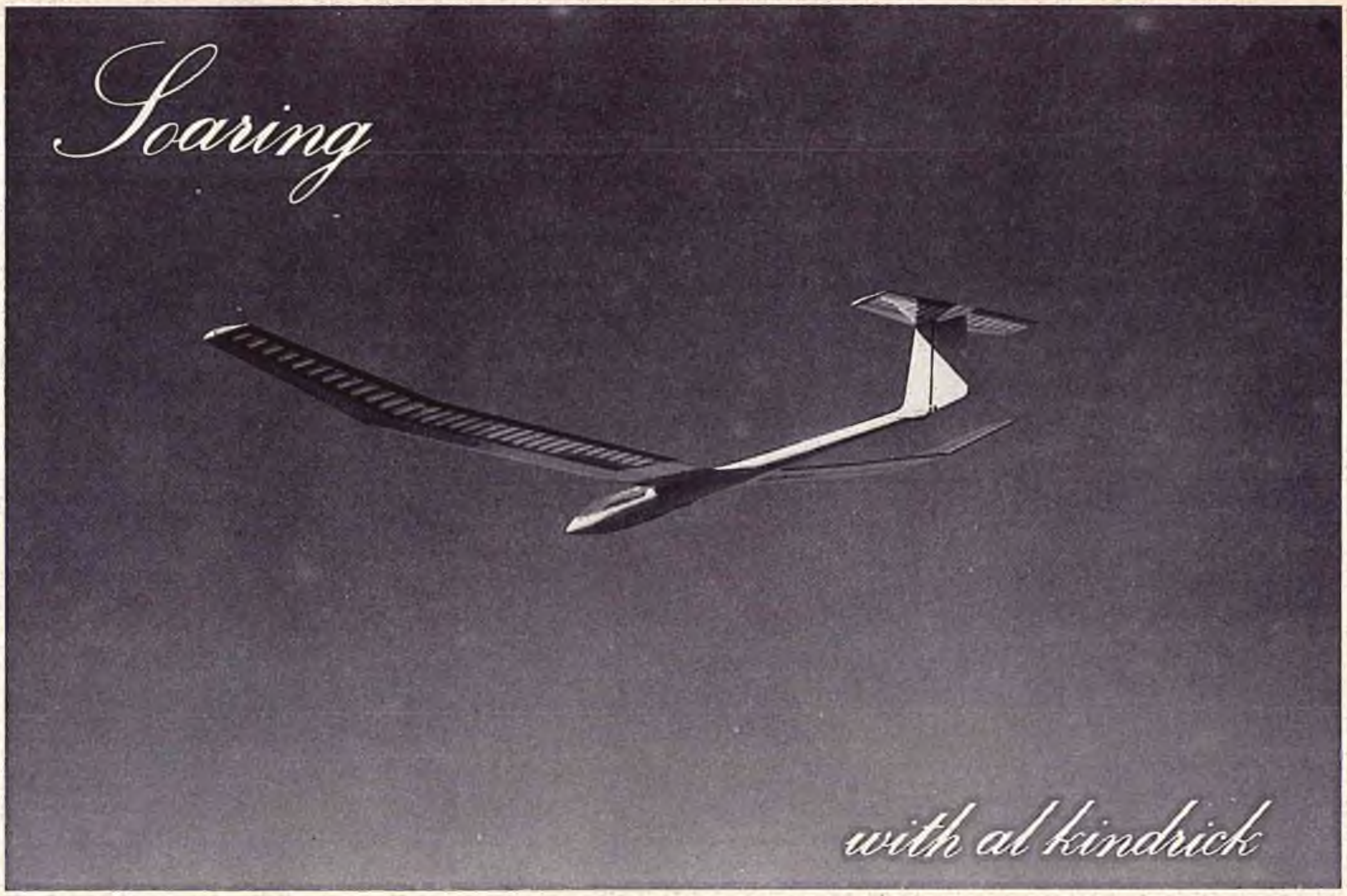
What does this person whose career is based on sound do for relaxation? Would you believe that he enjoys the thrill of silent flight with his radio controlled Hobie Hawk sailplane? Only a short distance from his home on the Palos Verdes Peninsula in Southern California are a couple of fields overlooking the Pacific Ocean where the bluffs provide the necessary up-currents for slope soaring. These are the places that Gary Wright can escape the pressures of the hectic and highly competitive rigors of the music business.

R/C sailplane enthusiasts already know about the fascination of silent flight. Now you can convince your youngsters that it is not an old fogey sport after all - - - they can relate to Gary Wright, pop music super star. □



Gary Wright and his Hobie Hawk.

Gary's smile tells the story.



● The Fifth Annual North/South Challenge Meet was held at the Buena Vista Recreational area, Taft, California on March 28, 29, 1976.

This recreational area is a boom to the tenter, camper, or mobile home enthusiast. Hot showers were available, super clean restrooms, and aquatic sports and boating on Lake Webb. The large grassed area and open spaces makes it an ideal spot for sailplaning and family fun.

As for the contest, 130 flyers logged in Saturday morning in about 45 minutes, as pre-registration was required. Recording scores and setting of flight groups was handled very easily and quickly with an individual file for each pilot.

During the pilot meeting Saturday, the winds came up and clouds started rolling in. Five rounds of ten minutes duration were flown in four man heats, each pilot launching at 5 second intervals. Pilots who achieved a ten minute max received 100 points, second best 75 points, third best 50, and fourth best 25 points.

This was a true man-on-man type of competition and it was stiff; short winch lines, Lake Webb to the West, open country to the North, East and South. Landing spots were three concentric circles, utilizing a 25 foot radius, 10 foot radius, and 3 foot radius. A landing in the respective circle was 1, 2, or 3 points. From the center, a 30 degree triangle formed pie shaped sections with the arcs of the concentric circles. A landing in the pie sections meant 2, 4, or 10 points, depending upon the size of the triangle. Very few pilots made the 10 point landing, due in part to the prevailing 18-20 mph crosswind.

Sunday morning showed us the true Taft Lift, real "Hat Suckers", that allowed many more maxes than Saturday. Landings were also tighter and no one really knew who was going to win the marbles until the last few flights of the day.

Rick Pearson should be commended for a fine, well run and planned contest, especially the scoring system. Throughout the two days of flying, every pilot knew exactly what the standings were.

The North was victorious by a slim margin of 2318 to 2313. Next years competition will be hosted by the North and we will be looking forward to it.

Behind the contest director are a lot of people who make it happen, we "lift our lids" to the following:

C.D. — Rick Pearson; Scoring — Tom Williams, George Noritake, David Peltz; P.R. Man — Kelly Pike; Registrar — Rick Norwood; Transmitter Impound — Barbara Henon, Ed Slobod, Jim Miles; Asst. to C.D. — Terry Kaplan, Pat Potega, Kelly Pike; Launch Master — Dick Shilling; Winch & P.A. — Loren Blewett; Landing Judge — Mike Regan; Scale Judge — Taylor Collins; Winches by — $(SC)^2$ Flying Clubs and Marks Models.

Top Fifteen Pilots — (1) Rick Pearson, (2) Marvin Qualls*, (3) Dave Thornberg*, (4) Bob Gerbin, (5) Mark Smith, (6) Stan Scharvosch*, (7) Doug Boyd*, (8) Greg Alten*, (9) Rick Walters*, (10) Bob Watts, (11) Fred Weaver*, (12) Roy Stowers, (13) George Noritake, (14) Peter Rambo, (15) Lorin Blewett. * Pilots from North.

Scale Winners — (1) Don Edberg, Duster; (2) Terry Kaplan, Glasflugel 604; (3) John Baxter, Diamant 18.

And a special thanks to Frank Stramler, Director of Kern County Parks and Recreation, for the flying site.

• •

Happenings and Things

Reading over the many newsletters, it seems that there is a common problem of getting the majority membership to club meetings and all functions. The members who do participate, wind up with most of the work. One source of energy that remains un-tapped is the budding youth. Most teenagers are eager to participate and learn, but just need to be asked. Give them a chance with good leadership, and you will be pleasantly surprised. I once participated in a contest where the C.D. was 16 years old and it was one of the smoothest and most trouble-free contest in which I have ever flown.

• •

We're sorry to hear Rod Smith had to step aside as President of the N.S.S. Larry Fogel has since taken over the responsibility and will need all the help he can muster up. So all of you pilots give him your ideas and information and help make the N.S.S. even better.

• •

The summer contests are pretty well over by now. The L.S.F. Contest in Santa Rosa

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1ST ROW: (L) Tom Williams and Kelly Pike at registration desk prior to start of North-South Challenge. (C) The pilots waiting area. (R) Ed Slobod at the transmitter impound area. 2ND ROW: (L) The traditional pilots meeting before the shoot-out. (C) Contest Director, Rick Pearson, at the morning pilots meeting. (R) The glider guiders waiting for their turn at the winch. 3RD ROW: (L) Terry Kaplan, with his Soarcraft Glasflugel 604, captured Second Place in Scale (C-top) Don Edberg and his Duster was the champion in the Scale event (C-bottom) Paul Parzik with four Javelin II's. (R) John Baxter took 3rd in Scale with this Diamant 18. 4TH ROW: (L) Dick Schilling served as launchmaster. (C) Pilot Rod Smith, timer Keith Kendrick, and observer Mark Smith. (R) Tom Williams and Terry Kaplan at the scoreboard.

PAT YOUR HEAD...RUB YOUR BELLY!

BY STU RICHMOND

● So you're learning to fly R/C! Great . . . welcome to the world's greatest sporting hobby . . . one that cuts through all economic levels . . . cuts through all religious beliefs . . . cuts through all color barriers . . . and cuts into all pocketbooks sometimes deeper than our families think it should.

The thrill of flying your own miniature radio controlled airplane is tremendous. It is a major achievement when you finally learn to control it **successfully** every flight.

There is a **learning curve** that accompanies the will to fly these sophisticated creations . . . some people spend a lengthy time "getting up on the curve" while others seem to ride their learning curve higher and higher and win the admirations of their peers and the trophies at the contests . . . proof of achievement!

This article will end with name-dropping . . . and deals with **non-technical ideas that you must consider now** .

While starting to learn to fly, you will learn basically to maintain visual orientation with your model while you learn to control it in its roll and pitch axis . . . that is, control its roll or leaning to both the left and to the right . . . and control its nose-down diving and its nose-up climbing. This will be like learning to pat your head & rub your belly simultaneously. **you will learn this successfuly** with perserverence and a skilled instructor! But before you start to climb up the learning curve you **must** consider the answer to the following question . . . "will I learn to pat my head and rub my belly with my right thumb **only** , or should I learn to pat my head with my **right** thumb and learn to rub my belly with my **left** thumb . . . should I have the pitch and roll controls both on the right hand control stick (known as a Mode II transmitter) or should I have the roll control on the right stick for my right thumb and have the pitch control on the left stick for my left thumb (known as Mode I transmitter)?"

Only **you** can answer the above question. It is a case of personal preference only some like short blonds and some like tall redheads some like big airplane models and some build only smaller models. **Re-read the above question.**

Most radio manufacturers build two stick transmitters such that you can remove the back and make the minor mechanical change yourself between modes, usually the re-positioning of a spring, a screw and possibly a molded nylon part. All two stick transmitters for four or more channels of control are **factory assembled into the Mode II configuration. If it can't be easily changed over to Mode I don't buy it!** You can also order your transmitter on Mode I or possibly have a well-experienced dealer change it to Mode I for you.

I am associated with a company that sells a great number of radio systems and I'm personally appalled at how few modelers consider the question of Mode I versus Mode II. I have three teenage sons. I've taught all three to fly on Mode I the youngest stayed with it long enough to win a trophy to please the old man before turning back to baseball where he's very competitive and very much a winner. The older two teenagers are among the better flyers in the country as proven by their contest performances. Up until four years ago they flew pattern but they quickly learned that pattern judges just knew that little kids just **couldn't** fly those big airplanes that good, and subsequently were quite biased in awarding points. The

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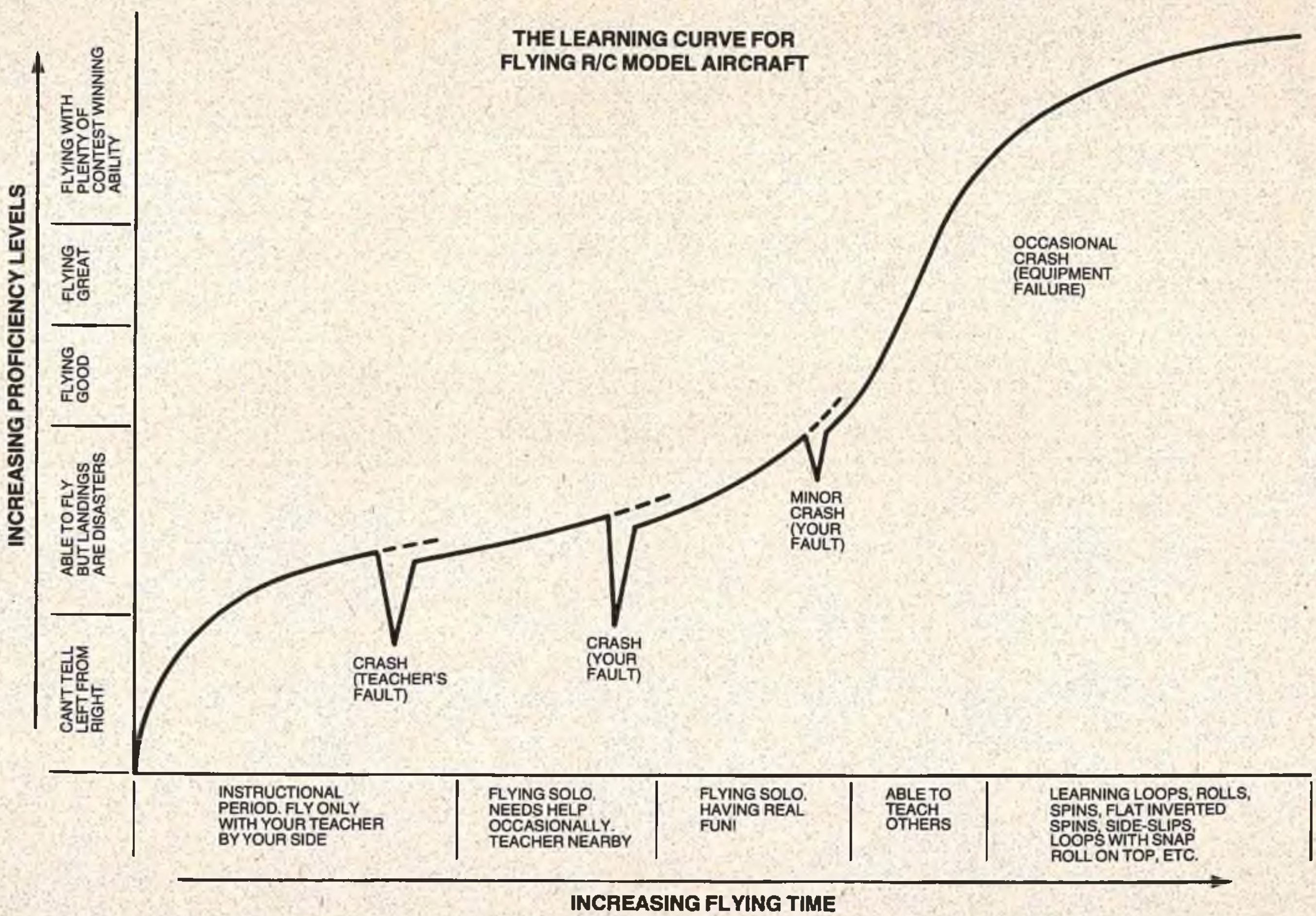
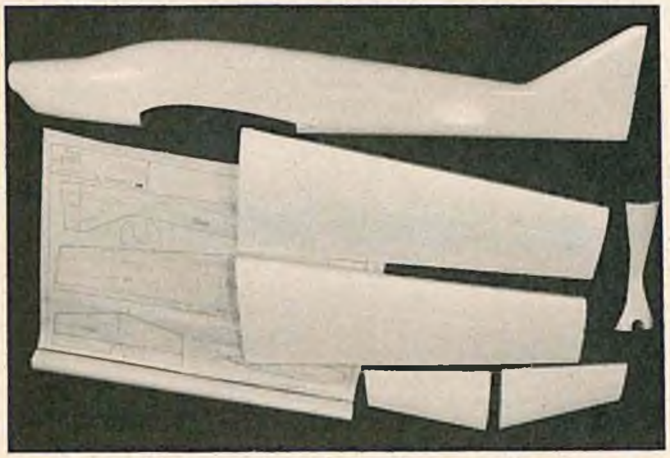


RCM PRODUCT TEST

G & B Glass Products
LIGHTNING "B"



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

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

● Lightning B is a competition pattern aircraft produced by G & B Glass Products, 221 Roslyn Avenue, Yorkton, Saskatchewan, Canada. Designed by Garry Reusch, this FAI pattern ship has a wingspan of 63½" and a total wing area of 700 square inches. Designed for .60 size engines, it utilizes rudder elevator, throttle, ailerons, and retractable gears with optional landing spoilers. The fuselage is a fiberglass unit while the wing and tail surfaces are foam cores. No hardware is included in the kit. The plan size is 30" x 32" and there is an instruction manual in addition to the plans. This aircraft is particularly suited for large retract units and has a very spacious radio compartment. This is a typical "basic" kit with reasonably good plans which are presented half-scale. The Lightning "B" is an exceptionally high performance aircraft and will perform the entire FAI pattern with ease. Take-offs and landings are unbelievably smooth even without the landing spoilers. Total all-up weight of our protoype was 126 ounces for a wing loading of 26 ounces per square foot. Ultra light 1/2 ounce glass cloth was utilized over the wing and stab and a K & B Superpoxy finish was applied to the entire aircraft. Our prototype utilized a Webra .61 engine and Pro-Line Competition Six radio. The Lightning 'B' is truly an outstanding aircraft for the serious competition flier or the sport flier who wants the maximum in performance from a competition type aircraft. □

SPECIFICATIONS

Name .... LIGHTNING "B"
Aircraft Type .... Pattern
Manufactured by .... G & B Glass Prod.
221 Roslyn Avenue
Yorkton, Sask., Canada S3N1P3
Mfg. Suggested Retail Price .... Not Given
Available From .... Not Given
Mfg. Recommended Usage .... Competition Aircraft
Wingspan .... 63½ inches
Wing Chord .... 11" avg.
Total Wing Area .... 700 sq. in.
Fuselage Length .... 54½ inches
Radio Compartment Dimensions .... (L) 11" x (W) 3"x (H) 3"
Wing Location .... Low Wing
Dihedral .... 1 inch
Airfoil .... Symmetrical
Wing Planform .... Swept L.E.
Stabilizer Span .... 25 inches
Stabilizer Chord (incl. elev.) .... 8" avg.
Total Stab Area .... 200 sq. in.
Stab Airfoil Section .... Symmetrical
Stabilizer Location .... Mid-Fuselage
Vertical Fin Height .... 9 inches
Vertical Fin Width (incl. rudder) .... 8" avg.
Mfg. Rec. Engine Range .... .61
Recommended Fuel Tank Size .... 12 ozs.
Landing Gear .... Tricycle
Recommended No. of Channels 5
Recommended Control Functions .... Rud., Elev., Throt., Ail., Retr.
Basic Materials Used In Construction:
Fuselage .... Fiberglass
Wing .... Foam core
Tail Surfaces .... Foam core
Hardware Included In Kit .... None
Plan Size .... 30" x 32" (1 sheet)
Building Instructions on Plan Sheets .... No
Instruction Manual .... Yes (2 pages)
Construction Photos .... No
Mfg. rec. flying weight .... 112—128 ozs.
Wing loading based on rec. flying wt. .... 23—26 oz./sq. ft.

RCM PROTOTYPE

Weight, ready to fly: .... 126 oz.
Wing Loading .... 26 oz/sq. ft.
Covering and finishing materials used .... K & B Superpoxy
Engine Make and Disp. .... Webra .61
Muffler Used .... Yes
Radio Used .... Proline Comp. 6
Tank Size Used .... 12 ounce

Quarter Midget

BY
DON DOMBROWSKI
AND FRED REESE

NMPRA
NATIONAL MINIATURE PYLON RACING ASSOCIATION

QUICKIE 200

RACING AT RANDOM

The starter drops the flag and the Half-A Enduro begins using a LeMans type start.

● In our last article we mentioned a 30 lap 1/2A Enduro race to be held in El Segundo, California, by the North American Eagles. If you 1/2A pylon racers are looking for a change of pace, along with a lot of laughs, this event may be for you.

The airplanes and course used in the event are standard 1/2A racers as per RCM's rules (200 square inch wing area, constant chord wing, T.D. .051 power maximum, etc.). The procedures used are straightforward and seem to work very well. The race heats are set up using the Formula I matrix system which was in the column two months ago. The airplanes, start, boxes and callers are placed at the starting line. The four pilots stand across the runway about 100 feet away. When the starter drops the flag the pilots have to run to the start line, connect up the glow plug, fire the engine, launch the airplane and, if one of the older folk hasn't collapsed due to a heart attack or been knocked down by a speedy youngster, there are 3 or 4 airplanes in the air trying to complete the 30 laps in one piece.

The reason I mentioned "in one piece" is because of what happens next. There is a one pit stop requirement in the rules which means you have to shut down your engine, land and refuel at least once before you complete 30 laps. This is where the pilot and his caller have to have their act together. The funny part of this act is listening to the caller who now becomes a back seat driver trying to convince the pilot to land on the runway within two feet of where they are standing. Well, as expected, it never works out that way, so off goes the caller chasing the airplane down the runway mumbling some unkind words to himself. What really makes the caller feel good is that his partner is back at the starting line with a fuel bulb in one hand and battery in the other yelling "Come on, double time, move it, etc."

Now, if everything goes as planned and, you guessed it, it normally does't, the airplane should be back in the air in about 10-15 seconds. Somehow, though, little things like a glow plug to change, a broken prop, or a slight repair because the caller tripped and fell on the airplane running back from his retrieval mission, causes a frustrating delay.

The race ends when the first airplane to complete 30 laps crosses the finish line. At

Dan Schafer, Dick Kaplan, and Jim Kelly doing a 50 yard dash to the start line during an Enduro pit stop.

that time, the lap counters record the completed laps of the other flyers. If you didn't make a pit stop before the first man completed 30 laps, you are penalized 10 points. The winner at the end of the day is the team that has the most completed laps (maximum 30 per heat).

It was a fun day and more laughs than a barrel of monkeys. Congratulations to Dan Schafer (the originator of the rules) and the North American R/C Eagles for a fine change of pace to 1/2A racing.

☆ ☆

The following was taken from the MARA Newsletter, edited by our good friend George Zink, and which we feel, also, is the most important thing in winning races.

SECRETS OF WINNING PYLON RACES

If there is one thing more important than any other ingredient in racing, that one thing is consistency. Going up for every heat and coming down with points and an aircraft in shape to race in the next heat is roughly 90% of the race.

Given the present system for scoring points, where speed counts for nothing except a point tie, the object of the race has got to be getting as many points as you can. To get that 4 in your heat, you need to finish first and, of course, speed will help. But you still have to finish.

I was curious as to how many points a racer might expect to get by simply finishing a race. One of the measures might be to simply get the average number of points for every completed flight. It is a simple matter to just add all the points in the race and divide by the number of heats completed. I went back into some of our old race results and found that, for the last 10 races, the average number was above 3 for 9 of them. #10 was 2.79 and was a QM race where 1/2 points are deducted for dead engine landings. Further, just getting this average number of points for all your heats would place you as high as 2nd and, more often, 3rd.

So much for the factor of consistency. The hard part is getting to be consistent. You don't learn Karate by reading Karate books or watching Bruce Lee movies, and you don't learn to be consistent unless you commit yourself to the work and the practice it takes.

Many things contribute to being consistent, and paying attention to all the small things will get you a lot more flying, a lot more often.

Take just starting the engine for example. Get prepared by doing the job you have out on the line, back home when you are checking over the aircraft and making it ready for the race. Clean out the tank and replace the fuel lines and filter. Make sure there are no pin holes in the system and that everything works right the first time. Make sure the engine is in securely and the mount is in good condition. Get a half dozen new glow plugs and put them in a caddy where they stay clean and available. You should be using a fresh plug for every heat in the race. Put your used plugs in another box and use them only in practice.

Get a good glow plug battery, preferably one with an ammeter in the line. You will soon get to depend on the reading of the ammeter to find troubles in the glow system. Needless to say, everything to do with the starting procedure must be in good condition and tested before you get

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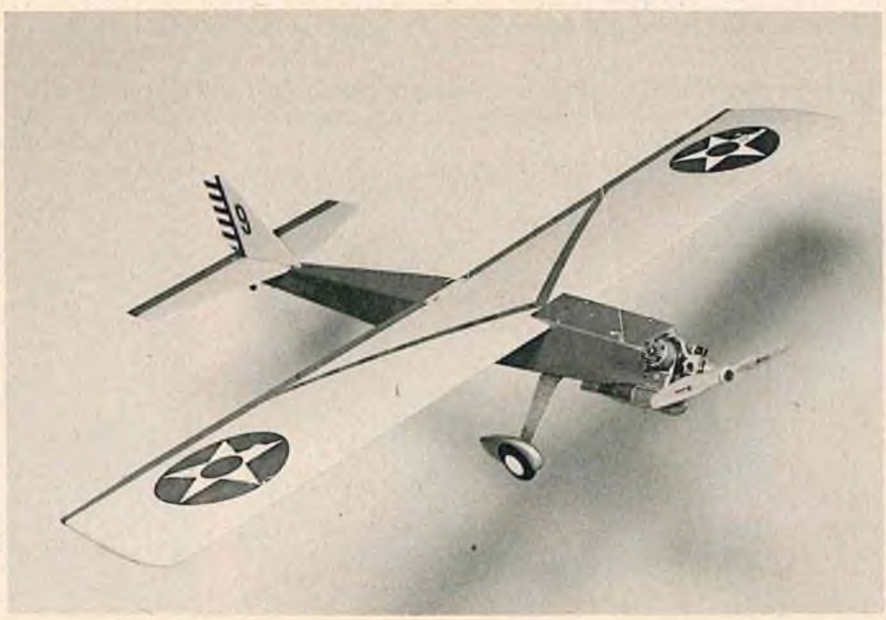
The Quicker F500, newest entry on the Formula 500 scene.



POWER BOATING

BY DAVID THOMAS

Gazelle with Taipan Goldhead and coved-out Super Tigre Mag III carb. If you look carefully, you will see that the throttle is less than half open, but the cooling system is already working with the boat at a standstill. Note also the throttle linkage going through the tank.

● I was talking last month about rudders, and I said that I only use one shape, and that it is good for everything. Well, I guess we had better go back and look again at that, because I have just come up against a bit of a funny thing. I am running a very special Stidwill Jaguar this year, and I find that, in a very fast turn, and in choppy water, the boat has a tendency to dig its nose in, and spin through 90-180°, which can be pretty annoying in the middle of a race. The cure has been to angle the rudder forward, as shown.

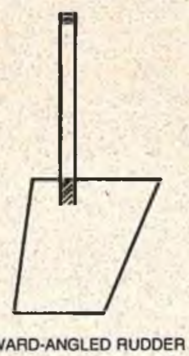


FIGURE 1

This seems to have the effect of pulling the stern down when rudder is applied, and thus keeping the nose up. Thus, no more problems.

If you have been following these articles, then you are now in a position where you have the hull, complete with bulkheads, engine mount, propeller shaft, and rudder tube. Most boats use a water-cooled motor, so the next thing to do is to provide some means of cooling. This is simplicity itself.

First of all, take a length of brass tubing, about 3mm inside diameter, and heat it to red hot throughout its length, in a hot flame. Now let it cool down by itself, and you will find that you can bend that tube just about any way you like. At one end, bend it through 90°, and then cut it, as shown.

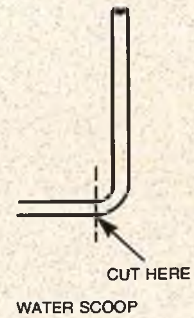


FIGURE 2

Now then, put a prop on the shaft, turn the boat upside down, and drill a hole on the left-hand side, about 5-10mm behind the prop, and two-thirds of its radius out from the center line of the hull.

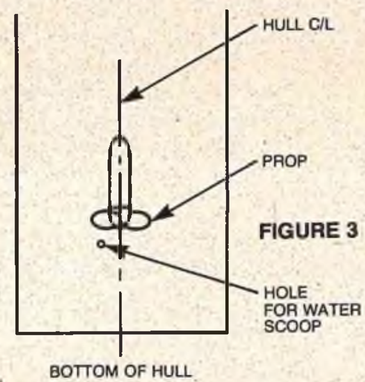


FIGURE 3

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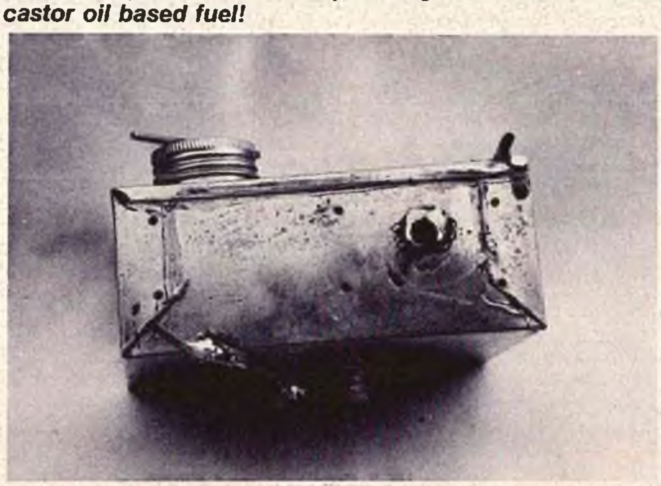
Fuel tank, showing sump, filler and brass tube soldered to the filler cap - - - useful when your fingers are covered with castor oil based fuel!



This photo shows the ideal position of the water-scoop with relation to the propeller. Attention to details during construction make the running of the boat a lot easier.

BEGINNING RC FLIGHT:
FOR INSTRUCTOR AND PILOT

BY MIKE CORBETT

● It pealed out of the sky into a splash of white balsa pieces and film--the wing bounced up for a final pirouette and settled back. It was over. Another would-be pilot had totaled his pride and joy.

This scene is re-enacted with disparaging frequency at flying fields across our land. With just a little help, many of these pilots could be flying and enjoying our unique sport instead of plowing their dollars and effort into the ground.

In the interest of saving some good planes from biting the dust, and some good pilots-to-be from getting discouraged and giving up the sport, I'd like to share some thoughts on the training of RC pilots. In the last three years I've adopted the teaching of RC flying as a sort of second hobby. I get almost as big a kick out of helping a guy (or gal) through those first flights as I do out of flying myself. The beginning pilots' reactions are curious and varied: One man may be cool, matter-of-fact; another, obsessed with details; yet another, loose and "don't give a damn if it flies or not." The most common, and colorful reaction, however, is the guy who approaches that first flight in a cold sweat, breathing shallow, and somewhat rubberlegged.

Beginners often ask what combination to start with, and there are many to choose from. I usually advise to start with at least three channels. I lean toward the high wing foam trainers for rank beginners as fewer mistakes can be made in construction (usually), and they can be repaired at the field with five minute epoxy for more flight time. The main trouble I've found with the foam planes is lack of a forward hatch, which makes installing fuel lines and tank maintenance a pain for beginners. Pinched fuel lines are a common problem at the field.

The best way to learn to fly is with an instructor. In fact, the biggest mistake a beginner can make is to try to learn to fly alone. Let an experienced pilot check out and trim your plane. Let him take it off and land for you until he thinks you're ready. Visit the flying field or hobby shop and find out who the local instructors are. It's worth it to seek out a good instructor and even pay him. Believe me, if he cracks up your plane, it's a sure bet you would have too.

For the fairly experienced RC'er who would like to get the beginner off to the best possible start, the following comments may be of benefit.

Preflight The Airplane And Radio.

Step 1.

Adopt this as an inflexible rule. If the beginner already has the wing strapped on, make him take it off so you can inspect his installation. If he hesitates tell him you always check out any airplane you fly. **Always.** Check everything. Here are a few things I've found on pre-flights: loose servos, screw missing from servo output arm, binding controls, plastic pushrod unsecured at one or both ends, balsa control horns, fuel tank in rear of cabin, no foam packing, etc. You can add to this list I'm sure. This is not to mention the common errors like servos hooked up backward, or to the wrong channel. Don't forget to check the balance. It should be about 1/3 of the way back on most wings. Don't fly tail heavy aircraft. Refer to RCM May 1973 page 12, "Preflight" and RCM February 1976 page 22 "Why Crash?" for good articles on pre-flighting.

Step 2.

Range check the radio. Look at the transmitter needle. Ask something like, "Did you have it on charge all last night?" You need to find out how recently it was charged. One fellow told me it was fully

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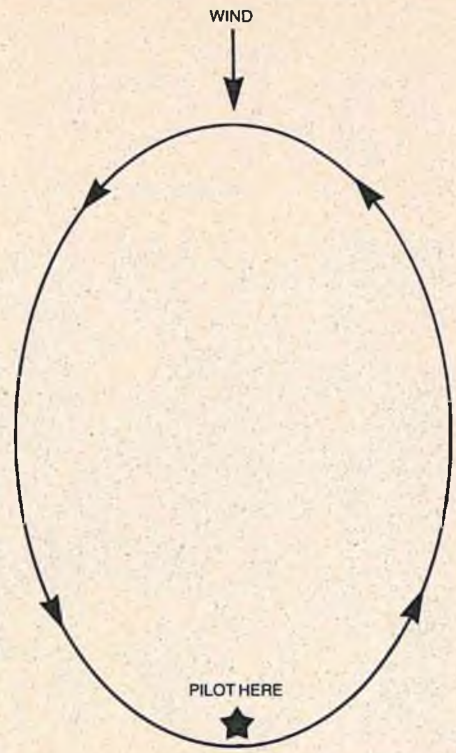


FIGURE 1
OVAL PATTERN

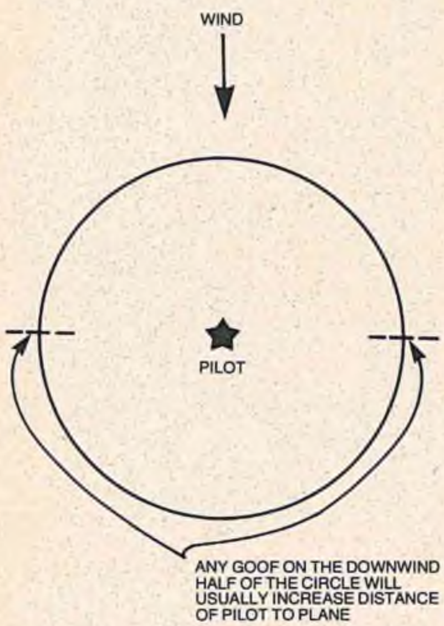


FIGURE 2

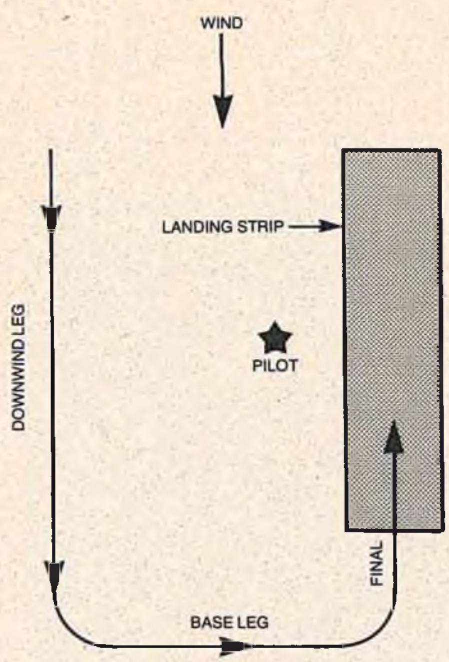


FIGURE 3

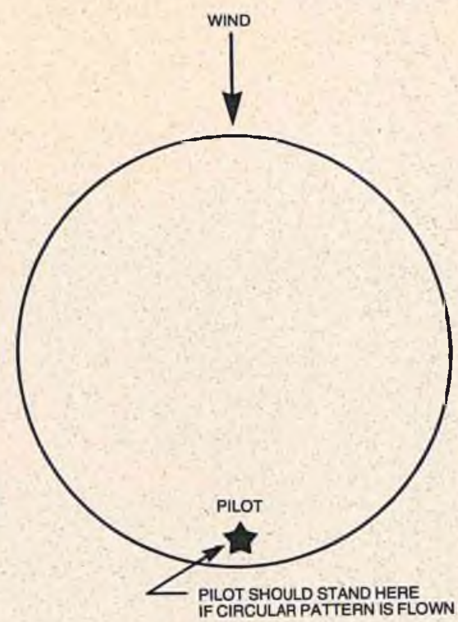


FIGURE 4

NRCHA

BY DON DEWEY (N1A)

Some of the entrants at the recent Shreveport Sharks Helicopter Contest.

SHARKS HELICOPTER CONTEST

The Shreveport Area Radio Kontrol Sharks held their first Helicopter Contest on Sunday, May 9, 1976, at the Shark's flying field in Bossier City, Louisiana. While they did not intend to pre-empt Mothers Day, by the time they discovered their "goof," too many plans had been made to call off such an important event. Nevertheless, some brave souls left home to join in the contest from as far away as Texas and Arkansas, as well as other areas of Louisiana. The winners in the three categories, Novice, Intermediate, and Expert ranged in age from 14-49 and were as follows:

NOVICE:

1st — Robert Wilcox, Little Rock, Kavan Jet Ranger.

2nd — Larry Henry, Alexandria, Kavan Jet Ranger.

3rd — Mark Moore, Shreveport, Revolution (Mark is only 14 and has been flying his dad's Kavan for about 6 months.) He had his Revolution about 2 weeks before the contest.

INTERMEDIATE

1st — Keith Kreth, Little Rock, Kavan Jet Ranger.

2nd — George Brooks, Bossier City, Kavan Jet Ranger.

3rd — Wendell Moore, Shreveport, Kavan Jet Ranger.

EXPERT

1st — Hubert Bickner, Houston, Original design.

2nd — Kirk Krest, Houston, Kavan Jet Ranger.

RAMS CONTEST

Despite an overcast day with light drizzles in the morning, the Radio Aero Modelers of Seattle held a helicopter contest this past June. After one round of competition the thirteen competing helicopters were lined up on the runway for pictures. First Place in the competition was taken by Alan Piercy flying a Bell Huey Cobra, while Second Place went to John Smith and his Schluter Heli-Baby, with Mike Dailey flying a Kavan Jet Ranger to capture Third. There were nine .40 powered helicopters in the contest, and four .60 powered machines. All were fixed pitch with the exception of a Kavan Jet Ranger and a Graupner Bell 212. All in all, there was one Kavan Jet Ranger, one Bell Huey Cobra, one original design, six Heli Baby's one Rev-olution, one Bell 212, one Shark .60 and one RCM Runway Sweeper.

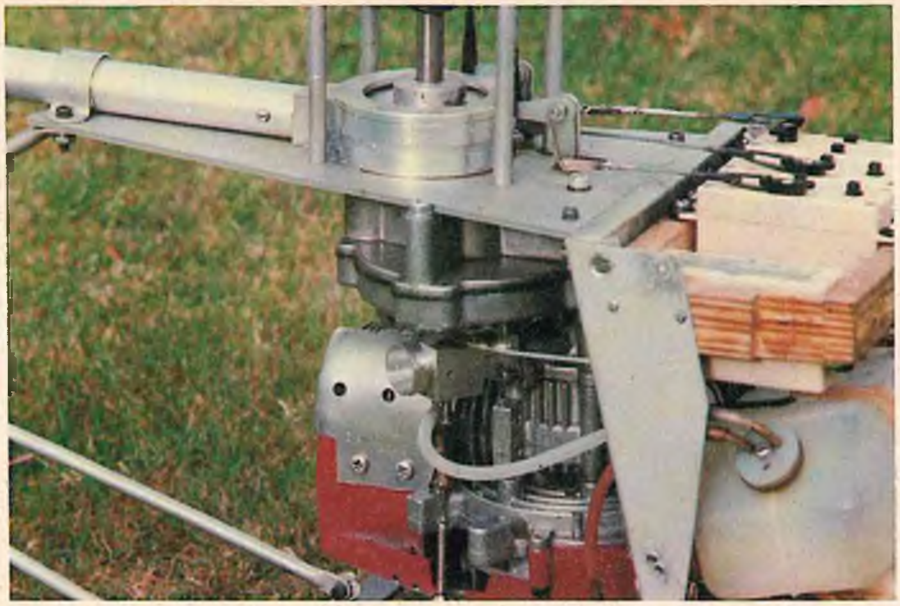
Congratulations to the Rams for their recent helicopter event.

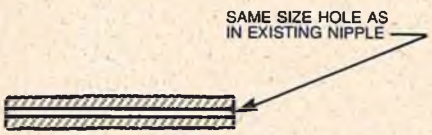
Wendell Moore's scale Kavan Jet Ranger, seen at Shreveport, included blinking lights, fuel warning system, gyro, working door, instrument console, and drapes.

HELICOPTER TWIN TANKS

With helicopters, it is often difficult to locate a single fuel tank at the Center of Gravity but, with a twin tank set-up, they can be located on each side of the main rotor shaft thus providing a proper balance of the helicopter from a full to an empty fuel tank. Brian Usher of Ottawa, Ontario, Canada, suggests this simple method to enable a twin tank hook-up to your carburetor. The modification has been made to a Perry Aeromotive carburetor, but could also be used with others.

First, remove the existing fuel nipple from the carburetor and replace with a screw modified as shown in the sketch. Run a thin, plain nut down the screw to lock in place on the carburetor. Next, buy a standard aluminum in-line fuel filter and remove the gauze filter. Drill and tap a hole through one side only and screw it into the new screw in the carburetor as shown in the photograph. Finally, take apart, clean, and re-assemble using any of the structural adhesives to bond the two halves of the filter together. It is recommended that the two fuel lines should be the same length.





DU-BRO SHARK MODIFICATIONS

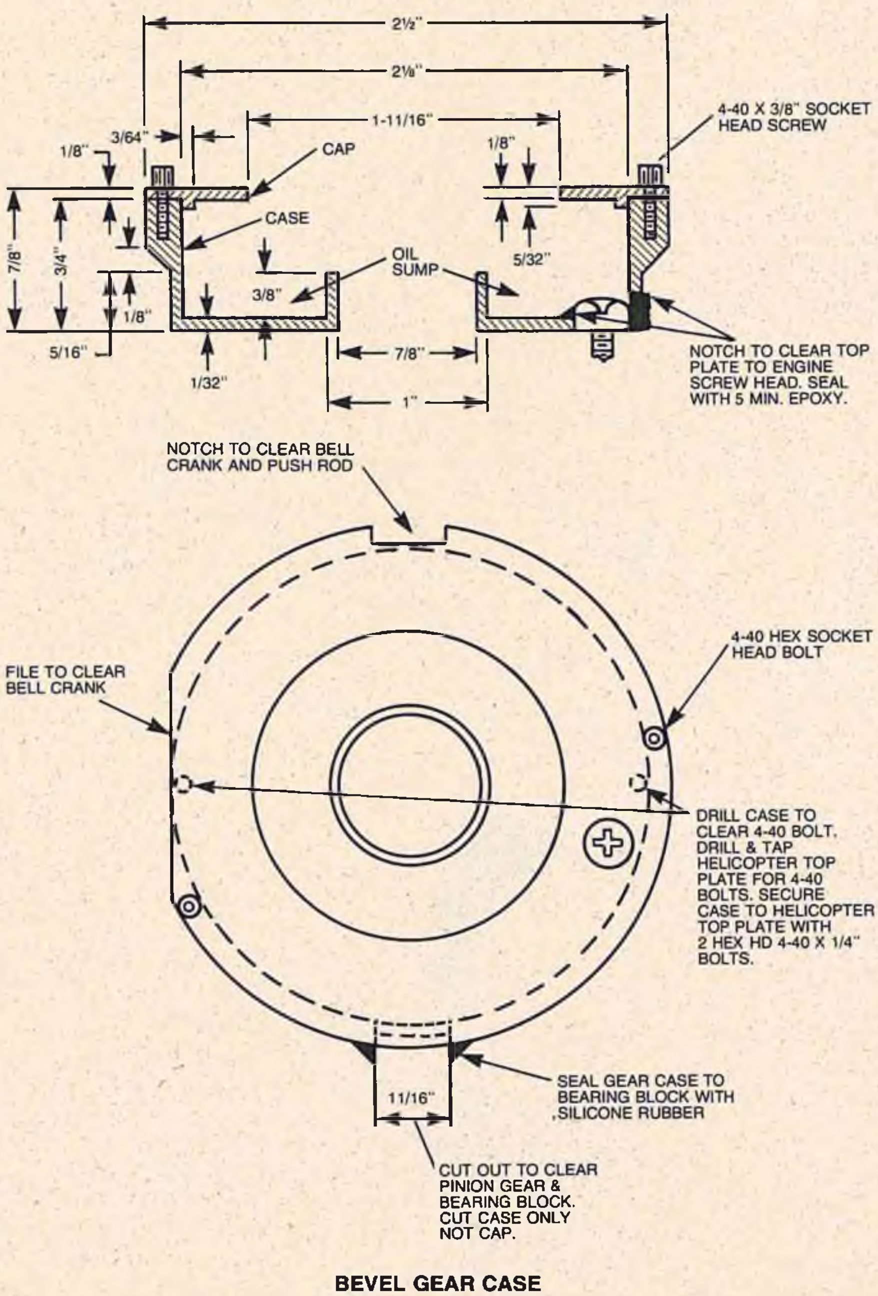
Alonzo Richardson of Burlingame, California, recommends the following modifications for older model Du-Bro Sharks using the O & R engine.

First, to prevent excessive wear on the bevel gear, try the following: First, the pinion gear teeth are hard and have sharp corners at the top edge of the teeth. These edges cut the soft bevel gear and soon wear out. Use a Dremel grinder with a rubber abrasive wheel to take the edge off the sharp corners at the pinion gear tooth tops. Don't worry about the bevel gear since it is soft and will not cut the hard pinion gear.

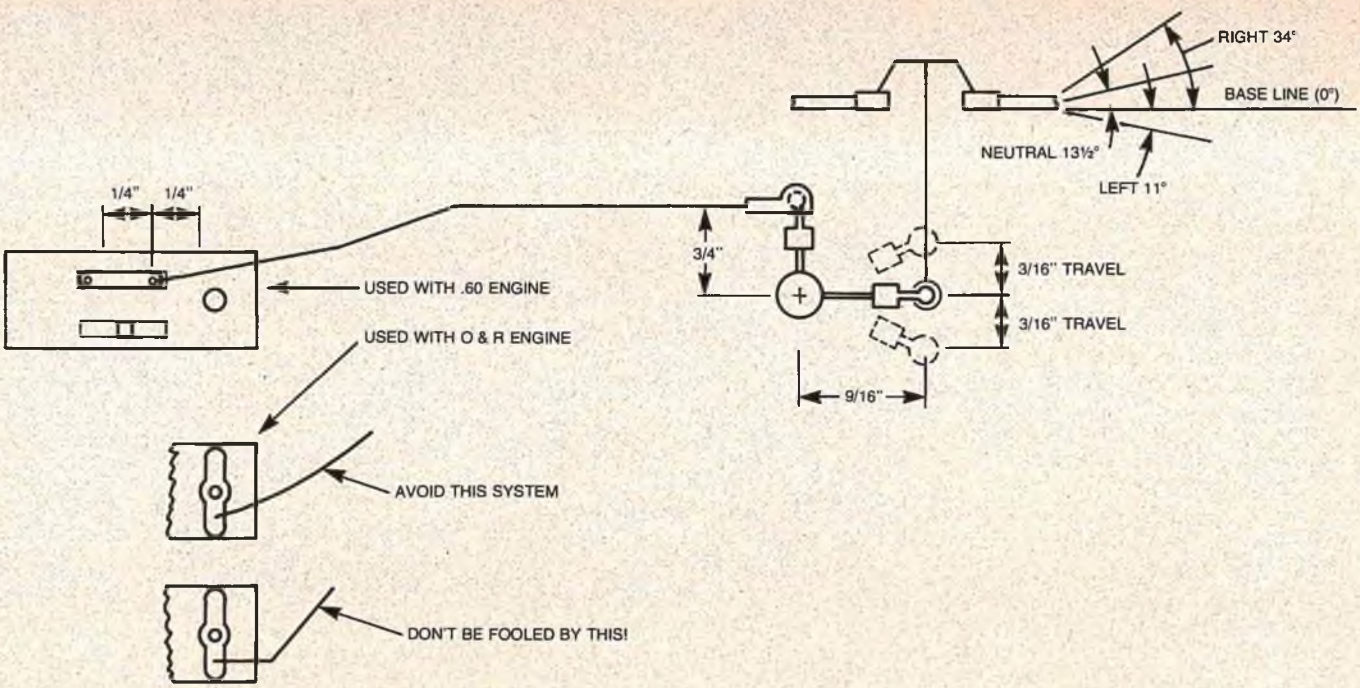
Next, try using Never-Seez mixed with oil as a lubricant for the bevel gear and the tail gear box. Never-Seez is a combination of bearing lubricant combined with extremely fine graphite powders plus some metallic oxide. As it dries out, a little oil will bring it back to its proper consistency. You will find it listed in the yellow pages, or you can write Never-Seez Compound Corporation, 2910 South 18th Avenue, Broadview, Illinois 60153.

Also, to be sure of having a good supply of lubricant at the bevel gears, Alonso fashioned a gear box as shown in the photograph. The fit at the bearing block was rough and a seal from the gear box to the bearing block was made with silicone rubber. One of the engine mounting bolts interfered with the box so a hole was cut to clear the bolt. Five minute epoxy was used to seal the bolt hole. The entire gear box was turned on a small lathe, although it would be quite possible to make it of plastic or other material from pieces cut to shape then epoxied together. The longevity of your gears will be greatly improved with this gear box cover since Alonso's are now nine months old and look as good as new.

Alonzo also mentions that the servos that

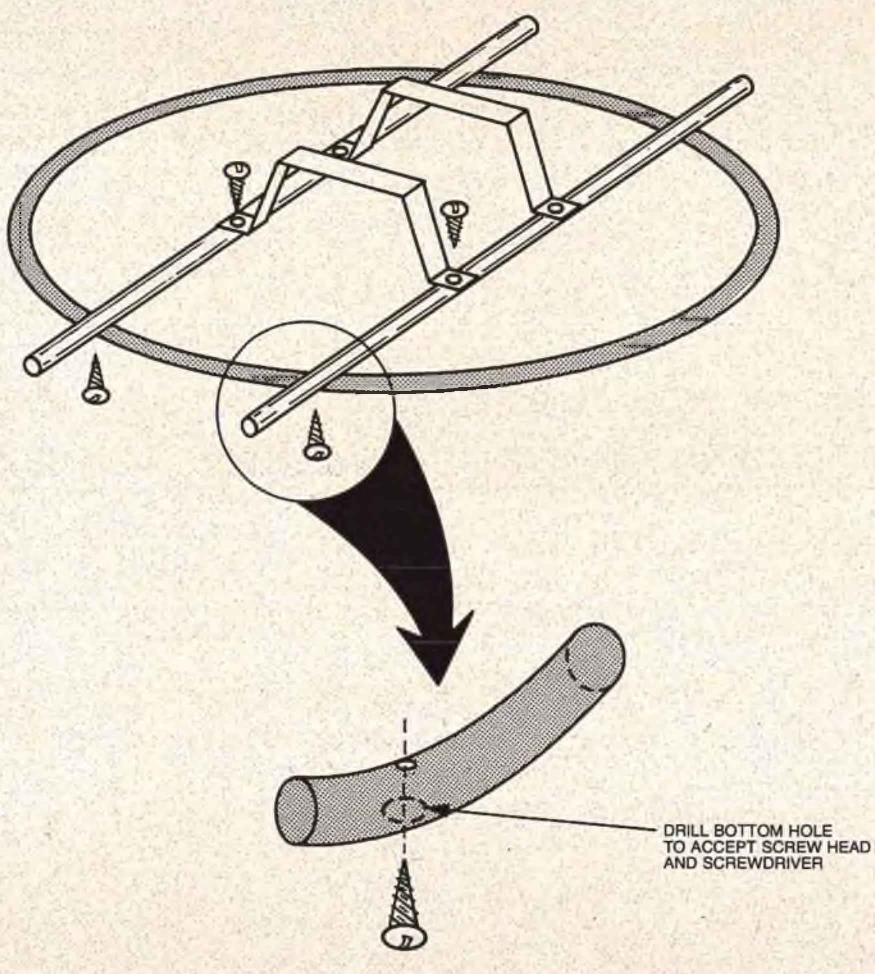


BEVEL GEAR CASE



control the tail pitch control on the Shark are mounted on the extreme left of the servo tray. The control cable, or rod, travels at an angle to a point where it is close to the tail boom. With such a set-up, the control change is greater on one side than the other. In other words, you have more right than left or, alternately, more left than right. By adding a control cable guide straight behind the point of connection at the servo, you can get equal travel and equal control. This is illustrated in the sketch.

Alonzo's last comment concerns the method of mounting the wheels on the skids. The original side mounting imparts a twist to the skid with each landing. The skid-to-strut bolts soon work loose or break. Alonso fashioned a fork that sticks into the skid, thus centering the wheel and skid. This eliminated the strut-to-skid mounting problem which, when loose, can cause enough noise to create radio problems.



HULA HOOP TRAINING GEAR

Most R/C helicopter training gear has a disadvantage of being direction-specific in its protection of the model. In order to provide stability and protection in every direction, even off grass fields, try a Hula Hoop. Replace the model skids with centered three foot lengths of doweling. Attach your Hula Hoop to the doweling with sheet metal screws at such a point so as not to distort the Hula Hoop and yet retain the correct Center of Gravity. A 30'' Hula Hoop and 1/2'' dowels proved to be adequate for most .40 size helicopters. Larger sizes of Hula Hoops and dowels are recommended for the larger machines. If the Hula Hoop has the ball bearing noise makers inside, remove them. Also, after drilling the dowels for the self-tapping screws, wrap the dowel at the holes with fiberglass strapping tape to help prevent splitting.

REV-OLUTION MODIFICATIONS

Lee Taylor of Roseville, California, has been flying helicopters for the past three years and has recently added a Rev-olution to his stable of rotary winged aircraft. As Lee points out, his overall impression of the Rev-olution is excellent and, in his opinion, is the best on the market for general sport flying and is a hard-to-beat knock-around bird. Lee points out that the metal parts are exceptionally well done and anodized and, the tail rotor, with its high rpm, is very stable and powerful and, in fact, the best he has seen. Another plus for this outstanding new machine is the immediate availability of replacement parts which are truly low in cost.

Lee does feel, however, that the single wire tail skid provided with the Rev-olution is inadequate for all but the super pilot flying from a paved surface. We at RCM also

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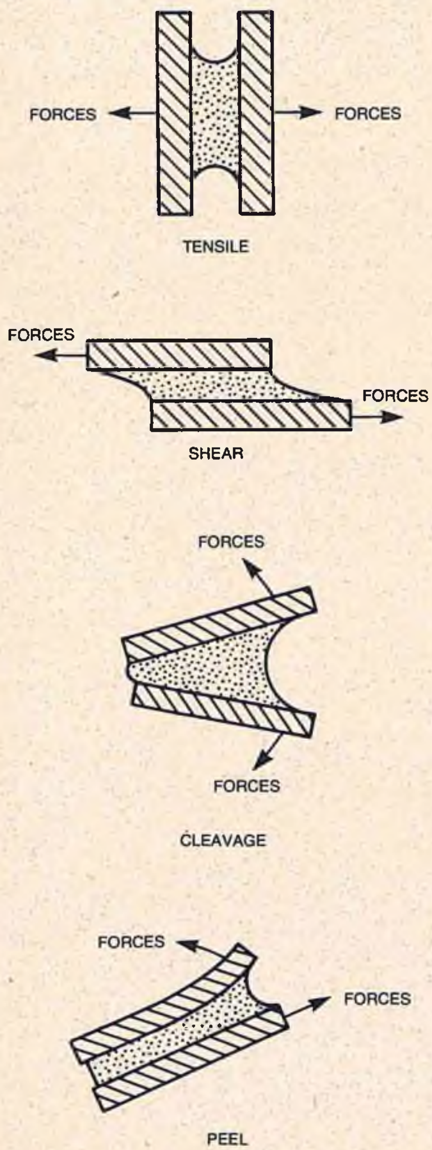
BASIC GLUED JOINT DESIGN

BY ANTHONY LAVARDERA

With the exception of removable parts, such as the engine and servos, almost all joints in our model aircraft are glued together. The strength of these joints depends on the type of glue we use and the way the joint is designed. The proper use of adhesives and the design of the joint is more a matter of common sense and experience than a firm set of rules. Most model builders make very efficient glued joints without even considering any rules — they do it instinctively.

A glued joint can fail in any one of four failure modes or a combination of two or more modes. The four basic failure modes are: Tensile, Shear, Cleavage, and Peel. (See Sketch 1.)



SKETCH 1

As we analyze these failure modes, let's keep in mind two facts about our models: One is that our models are built primarily of wood and, secondly, that the glues that we use are stronger than the wood. When a joint fails on our models, it is usually the wood that fails, not the glue. When the glue fails at a joint, it is usually because the joint was poorly made. An example of a bad joint is one with a large gap between two pieces of wood where the gap is filled with glue to make up the connection. Many of the glues we use are brittle and a bad joint of this type will crack easily under vibration and shock loads.

Now look at the joint designed to take a tension load. It should be made so that the forces are perpendicular to the plane of the glued joint and the entire area should be under equal stress. All of the adhesive area should be taking the loads equally, not just one corner.

In an ideal shear joint, the forces are parallel to the glued joint and all of the adhesive and wood should be taking the load at the same time. If the forces are not parallel, you will have a peeling type of load.

When a joint is under a cleavage stress, the forces are concentrated on a small portion of the adhesive area. The wood will usually crack in a corner and propagate along the wood.

A joint that is subject to a peel stress will bend and crack the wood very quickly and joints loaded in this way should be avoided whenever possible.

Now that we have examined the four basic ways that a glued joint can fail, let us set up some basic rules to follow.

(1) Design the joint so that the applied loads will be either tension or shear loads.

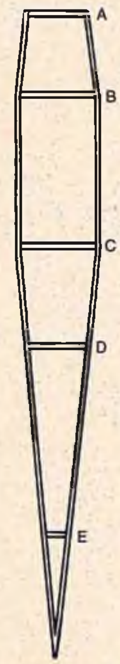
(2) Design the joint so that all of the glued area is carrying the load at the same time.

(3) Design the joint so that cleavage and peel loads are minimized.

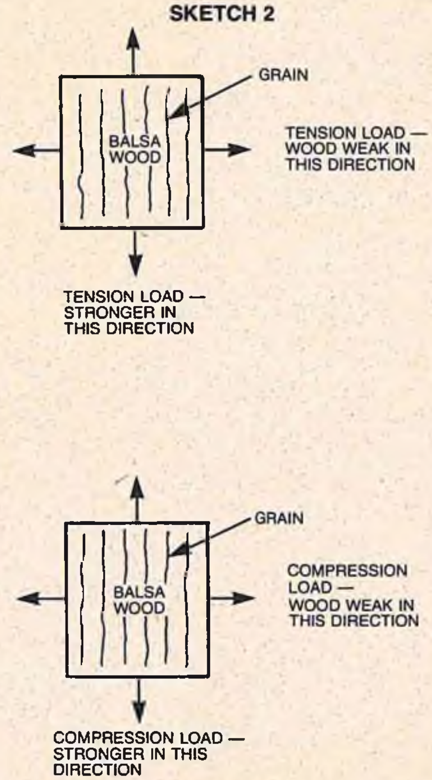
(4) Make all joints without gaps between the mating pieces.

These rules are good but you must remember that they apply only to simple applied forces. The forces acting on our models when they are flying are very complicated and it would probably be impossible to design a joint where the forces are all perpendicular and/or parallel to a joint. The applied loads on a joint are usually a combination of the different types. The loads on a joint when the model is resting on your workbench (static loads), is different than the loads on the same joint when the model is flying (dynamic loads). To try to analyze the dynamic loads on a typical joint would be too complicated for an article of this type. However, we can examine a few typical joints in our models for static loads and see what we can do to them to help take the dynamic loads.

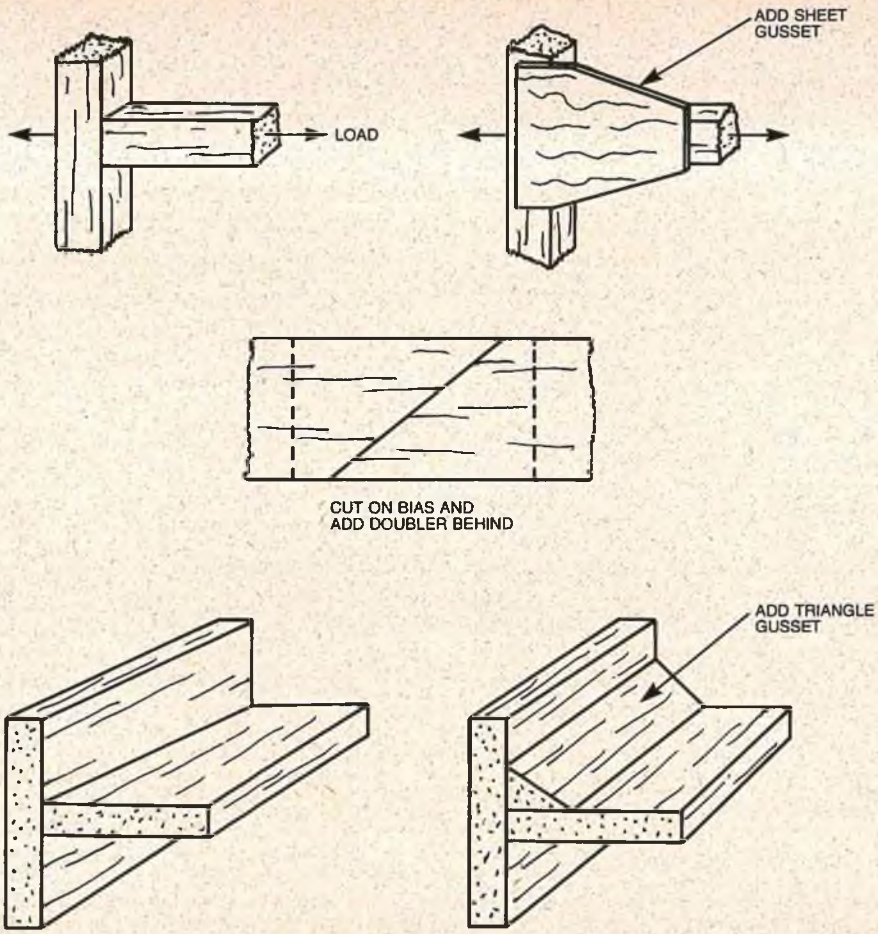
Let's look at a fuselage in plan view and analyze the stresses in the firewall and the bulkheads. (See Sketch 2.)



SKETCH 2



SKETCH 3



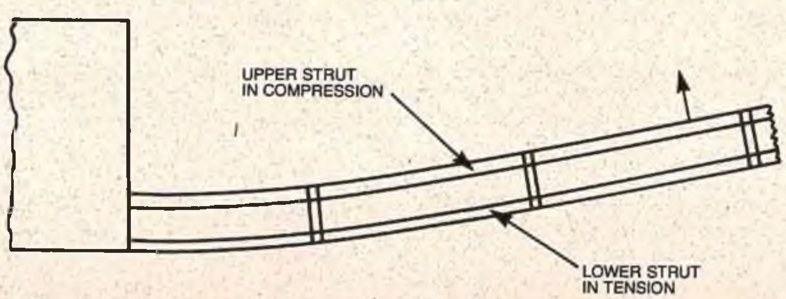
SKETCH 4

The firewall "A" and bulkheads "D" and "E" are in tension and bulkhead "B" and "C" are in compression. Since the firewall is usually made of plywood, there is no problem of the wood splitting along the grain. Bulkheads "B", "C", "D" and "E" are usually made of balsa wood sheet and its strength is dependent upon grain direction. (See Sketch 3.)

Bulkheads "B" and "C" are a particular problem because they usually have very large holes cut in them for access to the forward and rear portions of the fuselage. There is not much wood remaining to take the compression loads in these areas and it is good practice to add some wood to the top and bottom of these bulkheads to take the compression loads. The bottom of the fuselage should be closed with the wood cross grain. This will help take the tension loads from the rear of the fuselage. If the joint you are making has only a small area of wood, it is a good idea to add some gussets or doublers for additional strength. You can also cut the wood at an angle to increase the glue area. (See sketch 4.)

Now let's take a look at a section of wing under load and exaggerate the bending that takes place when the model is flying upright. (See sketch 5.)

The upper strut is in compression and the lower strut is in tension. The same thing will happen to a foam wing. The upper balsa skin will be in compression and the lower skin will be in tension. When the model is at rest on the workbench or flying upside down, the loads will be reversed. The lower strut will be in compression and the upper strut will be in tension. Connecting the upper and lower strut with balsa wood in a vertical grain direction will add greatly to the strength of the wing. It will also stiffen the wing by forming a triangular box section from the struts to the leading edge of the wing. This is known as a "D-box" section.



SKETCH 5

You can strengthen the fuselage and wing by forming closed box sections wherever possible. These closed box sections can take the dynamic loads put on the model when it is flying, better than open sections. Let's examine two box sections for strength. It will help if you can perform a little experiment with a small cardboard box. Make a rectangular box that is closed on all sides. (See Figure A.) Try to bend the box by

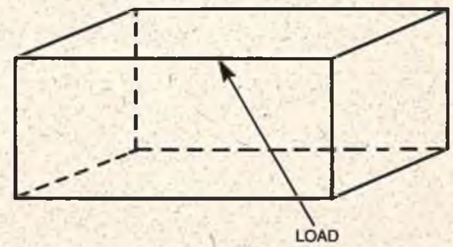


FIGURE A

pushing on the upper corner creating twisting load. You will find that the box can take a good load without deforming.

Now cut out a portion of the sides at each end as in Figure B. Again, try to deform it

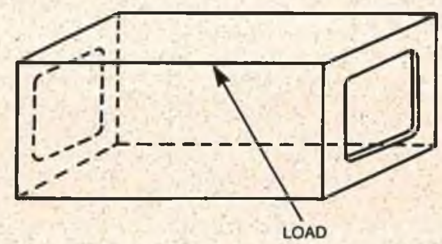


FIGURE B

by putting a load on the upper edge. It can still take a good load.

Now cut both ends completely out as in Figure C and put the twisting load on the box

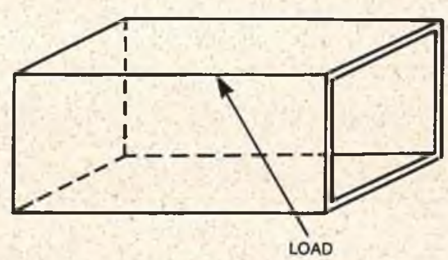


FIGURE C

again. The box will not take the load. It will deform and fold flat. Without the bulkheads there is no restraint to the twisting loads.

Now try the same experiment with a

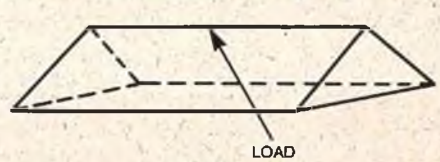


FIGURE D

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By Jerry Smith

Rhom's new self-priming gear type fuel pump. Fuel lines, filters and instructions are also part of the package.

RHOMS *MODEL 76* FUEL PUMP

● The Rhom Fuel Pump, Model 76, manufactured by Rhom Products Manufacutring Corporation, is designed specifically for model application by the same people who brought you the Rom Air Retract System. It is built to the same standards of quality side-by-side with Rom Airs and is tested in actual operation with model airplane fuel before shipping.

The pump comes neatly packaged in a plastic box. Included with the pump are: plastic hoses, two filters and operating instructions. One filter is the sintered clunk type attached to the intake line in the fuel container while the other is the conventional in-the-line screen type used in the outlet line. On the instruction sheet there is a nice exploded illustration of the pump showing all the parts. Each part bears a number which coincides with a number on the replacement parts list. Any part of the pump may be ordered directly from Rhom Products.

Rhoms fuel pump mounts directly on top of the fuel container eliminating unnecessary fuel lines. A standard fuel container cap is furnished and mounted to the pump. If you use a fuel container with a different cap, you can easily remove the original and, using it as a template, drill your own to replace it.

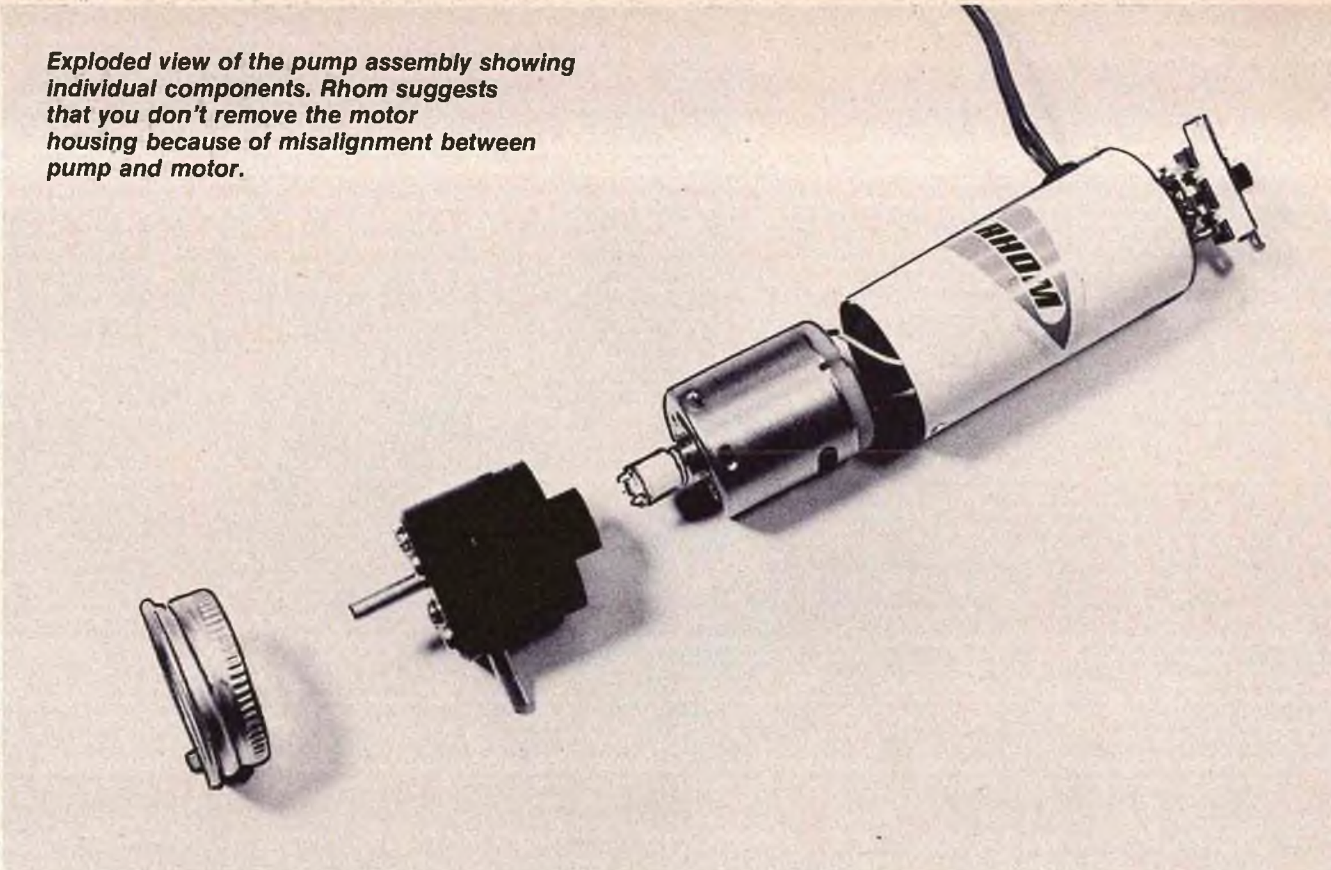
With a price tag of $24.95, which seems a bit salty, a careful examination of the unit brings out some of Rhoms quality features and why this pump carries a higher price tag then its competitors. Let's take a look at the innards of this self priming gear type pump.

The pump housing is made in two pieces and is machined of aluminum bar stock. It is quite heavy. The exterior surfaces are anodized to resist corrosion. The mating surfaces of the two housing halves are actualy lapped flat and no gasket is required to effect the seal! Four #4 machine screws hold the mounting cap and the housing halves together. These screws are torqued in quite hard and require force to remove. The brass gears are pressed on their respective shafts. The driven gear drives the other gear which, in turn, is captured by the two pump housing halves. The driven gear shaft coming from the pump has an "O" ring seal to prevent flooding. If a leak should occur, the "O" ring may be easily replaced.

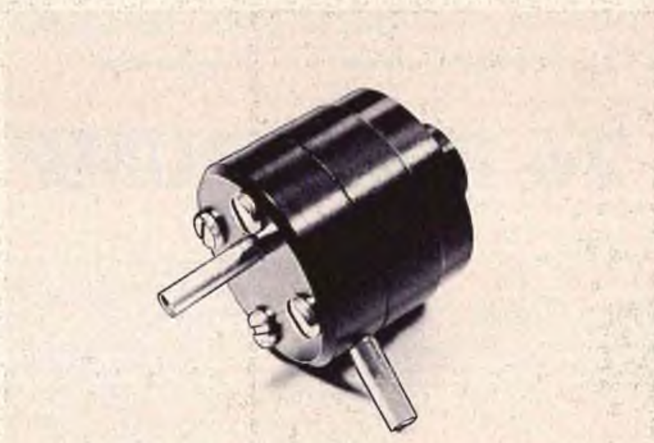
The mechanical connection between the motor and pump consists of two plastic fittings that mate very much like that of a two pin electrical connector. The male portion, on the motor shaft, retains the pins while the female portion is pressed on the gear shaft helping to retain the "O" ring in the pump housing. The pump is easy to disassemble. In fact, if you decide to remove the four screws holding the fuel container mounting cap to the pump housing, the lower housing will separate from the unit. One should use caution at this point to make certain that the lapped mating surfaces are absolutely clean before reassembling. Any sizable pieces of dirt could cause leakage or binding in the gears.

The pump mechanism retains a lifetime guarantee by Rhom and is extremely well built. After closer examination one can readily see why they make such a statement. The pump motor operates on 6-12 VDC and draws 320 MA nominal at 12V. The motor, a brush type, appeared to be well insulated and of good quality. Checking my particular pump under load at 12V, I found the current draw to be 400 MA. Other readings recorded were 10V -350 MA, 8V -300 MA, and 6V -240 MA. Rhom guarantees the motor for 1 year.

Mounted on top of the unit is a 3 way switch reversing the pump motor for the purpose of fueling and defueling. The center

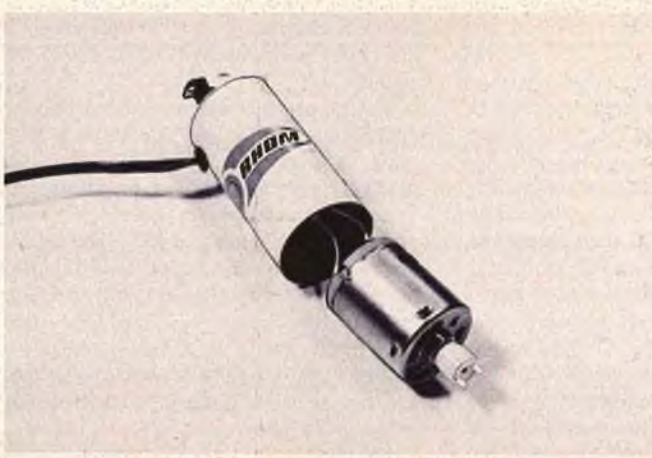


Exploded view of the pump assembly showing individual components. Rhom suggests that you don't remove the motor housing because of misalignment between pump and motor.



Rugged gear pump – the heart of Rhoms fueler guaranteed for life.

Upper and lower pump housing. Mating surfaces are lapped and require no gasket to seal. Gears and "O" ring seal are replaceable.



Motor with nylon drive connector. Motor runs on 6-12v DC and draws a minimum of current. Guaranteed for one year.

Mounting screws act as spacers allowing fuel container to be vented. Read article for other suggested venting ideas.

position of the switch is off. The switch location is very handy and makes sense from the design standpoint.

After mounting the pump on my own fuel container, I decided to give it a few tests. Wondering how much output the pump actually had I timed the filling of a 13 oz. tank. Running on 12V, it took exactly 30 seconds to fill it. That's about an ounce every 2.3 seconds. Not bad. I gave it the same test on 6V and came up with 1 minute. Just twice the time recorded for 12V.

Next, I checked the self priming feature by placing a small amount of fuel in the container. Making sure all the lines were clear, I started the pump. In no time it was pumping fuel. I found that it also does an exceptional job at removing fuel from the aircraft tank.

Rhoms method of venting the fuel container is built-in. The heads of the four screws retaining the cap and pump housing act as spacers, thus keeping the cap from sealing when turned in place. There is no gasket. This allows the container to be vented automatically when the pump is mounted in place. It also means that as long as the pump is in place, the fuel can become contaminated with moisture. To protect the quality of the fuel, Rhom recommends removing the pump when not in use and sealing the container with a solid cap. In this way, Rhom has provided you with a definite procedure.

My own personal opinion is that most modelers will not want to be bothered with removing the pump from the container after each flying session. After all, don't we pay for convenience as well as quality in a product design? It must be easy to use and not bothersome. Removing the pump from the fuel container each time would invite possible fuel contamination and insure inconvenience. Another undesirable aspect was storing the fill line in the bracket provided on top of the pump. Leaving this line open would certainly invite all kinds of contamination. Especially on a dusty flying field or, just sitting in your garage between flying sessions. I made a few modifications to remedy the above mentioned inconveniences and found it solved them all. You'll find this fix both positive and simple.

First, **pierce** (not drill) the top of the fuel container with a Tatone Stick-a-Tube tool. Next, install the Tatone rubber grommet in the hole. Push a short length of 1/8" brass tubing into the hole in the grommet. Now Zap or Hot Stuff around the edge of the grommet and fuel container. Push a short piece of fuel line on to the brass tubing. Now, instead of parking your filter on that fancy little bracket on top of the pump, as suggested by Rhom, insert it into the fuel line protruding out of the container top. Next, cut and fit a gasket to effectively seal the cap mounted to the pump.

You now have a completely sealed fuel container when not in use. The pump can remain in place at all times and the fuel container is vented only when the pump is in use. It also eliminates the possibility of the

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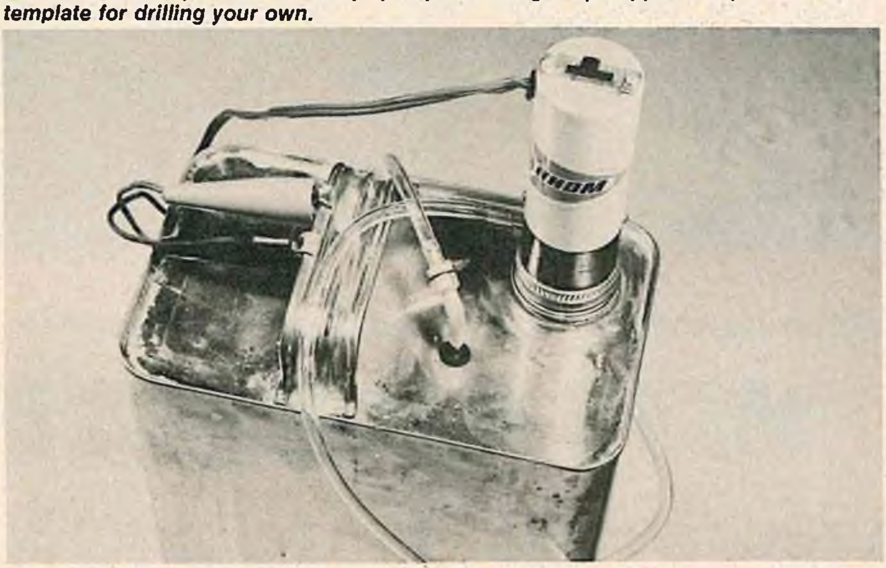
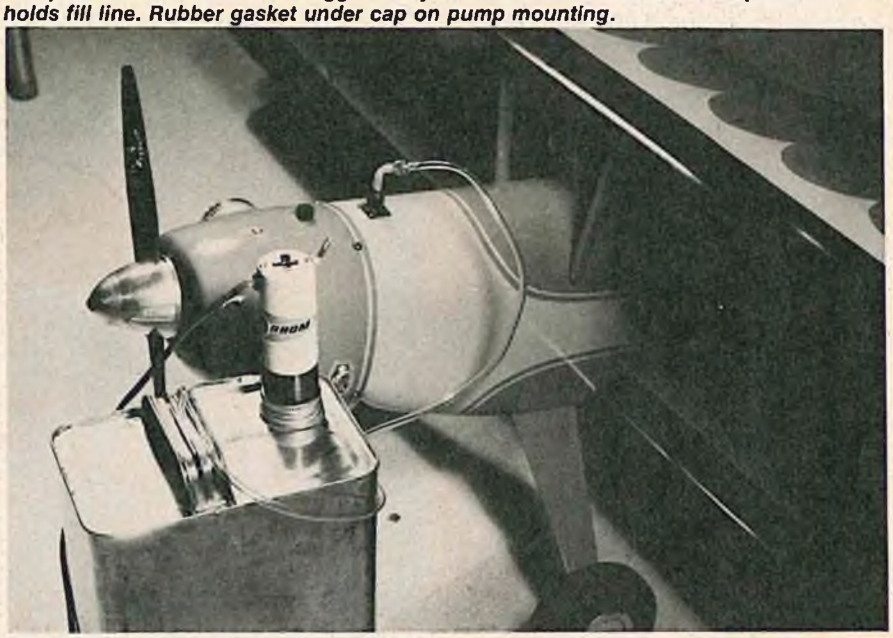
Fuel container cap drilled to accept pump mounting. Cap supplied may be used as a template for drilling your own.



Pump mounted and vented as suggested by author. Tatone stick-a-tube in top of container holds fill line. Rubber gasket under cap on pump mounting.



Rhoms fueler in action. Handy mounting and self-priming features make this pump worth owning.

RCM REVIEWS THE PEERLESS-KYOSHO

BY GRADY HOWARD

DASH 9 AMPHIBIOUS DUNE BUGGY

● The Dash 9 Dune Buggy was a new experience in building for me as I have never built anything that wasn't meant to fly. I might add that it was a very pleasant experience!

The materials in the kit are of a high quality and the parts fit to each other with precision. The instruction booklet is written in Japanese, but there is a leaflet with English translation. The exploded views in the booklet are very precise and you should study them carefully before starting the actual assembly.

All parts are packaged in plastic bags with labels noting the parts numbers that are in each bag. Just a word of caution here: Some parts for assemblies are in different bags, so to build a certain sub-assembly you may have to open two or more bags. Be sure to keep the labels in the bags to identify the remaining parts in the bag.

The Dash 9 is designed around an Enya .19 engine. Building is fast and fun, but not nearly as much fun as the driving of the Dash 9! The speed on a smooth surface is very fast and I would estimate about 25 mph. Over grass and up and down hills the Dash 9 is a sheer pleasure to handle. High speed spin out turns are possible on grass, gravel, asphalt, and dirt. With the low Center of Gravity the Dash 9 is almost impossible to turn over.

In the water, if calm with little or no waves, the Dash 9 moves very smoothly.

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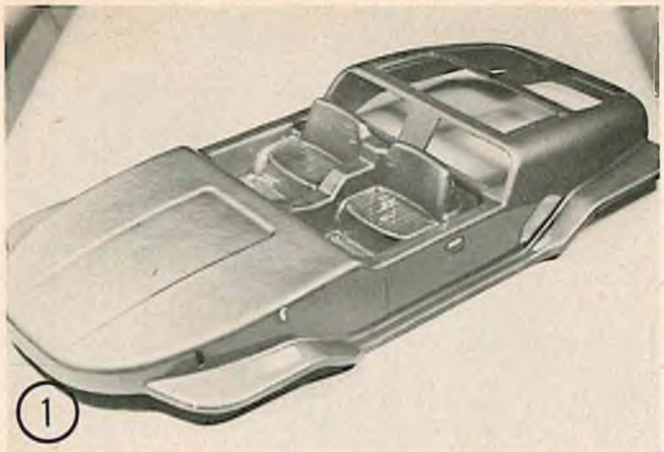
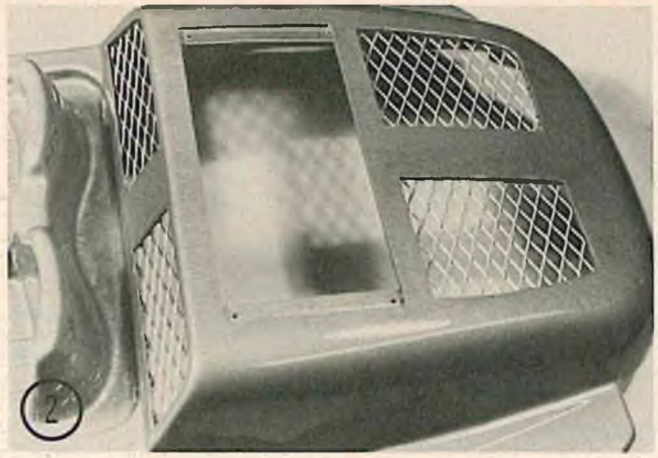
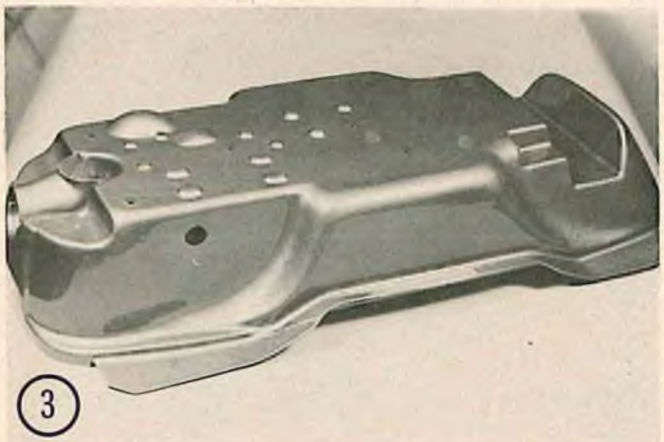
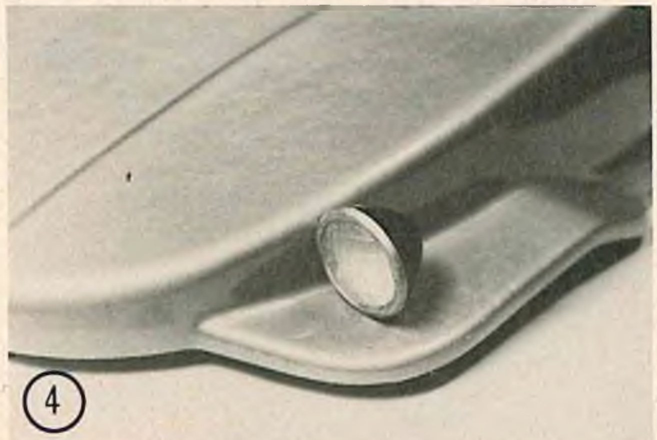
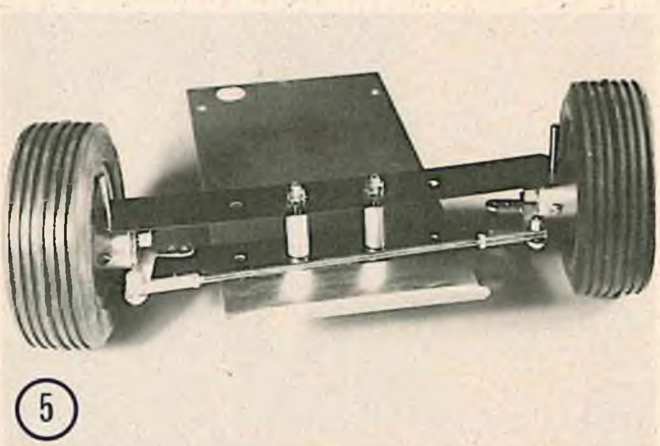
The Dash 9 Dune Buggy kit as unpacked.

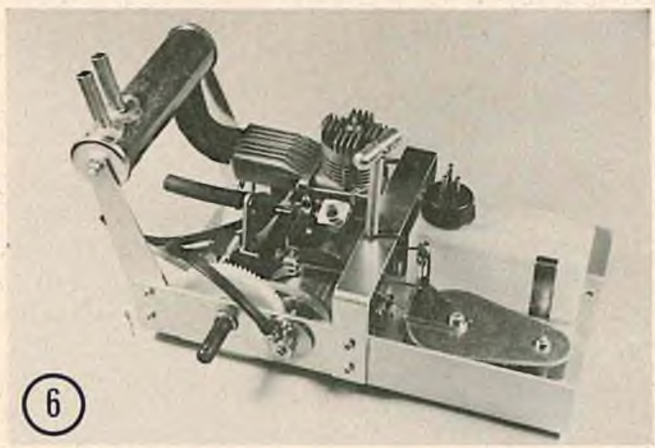


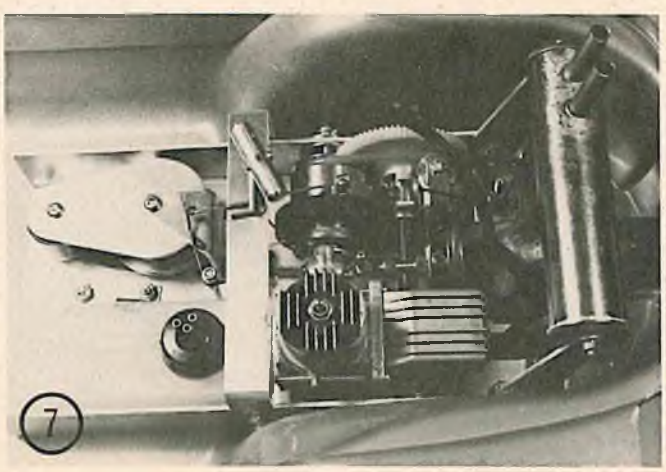






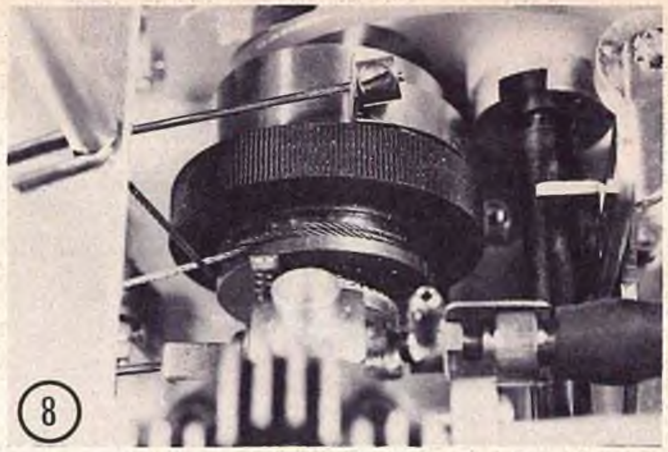


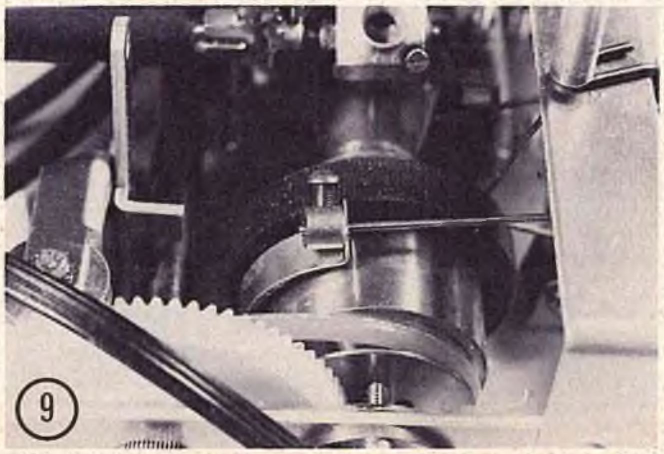


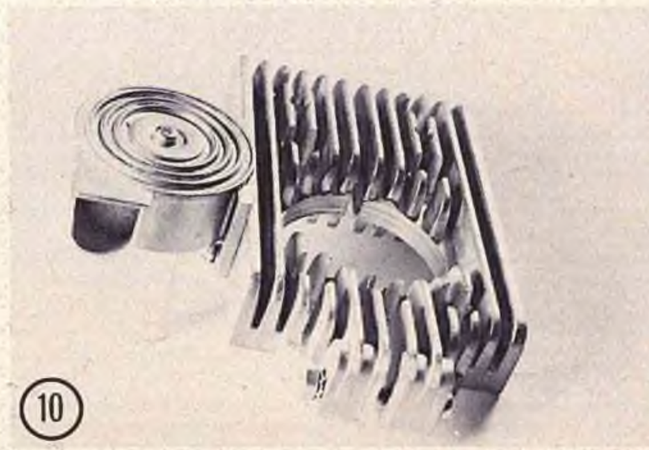


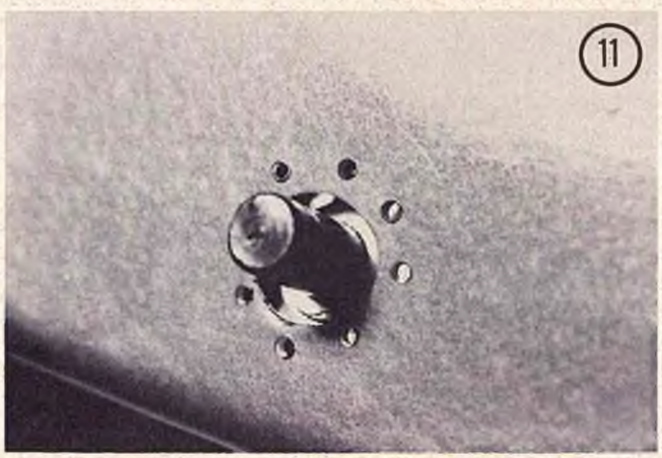
(1) Body top half showing cooling cut outs. (2) Grill wire glued into place. Note flanges glued in for rear cover when large heat sink is not used. (3) Body bottom half serves like the hull of a boat. (4) Headlights glued into place on fender. (5) Front end assembly. Suspension is by the two leaf springs. Note tie rod for easy toe in and out adjustment. (6) Complete drive assembly ready for installation into body. (7) Drive unit installed into body.

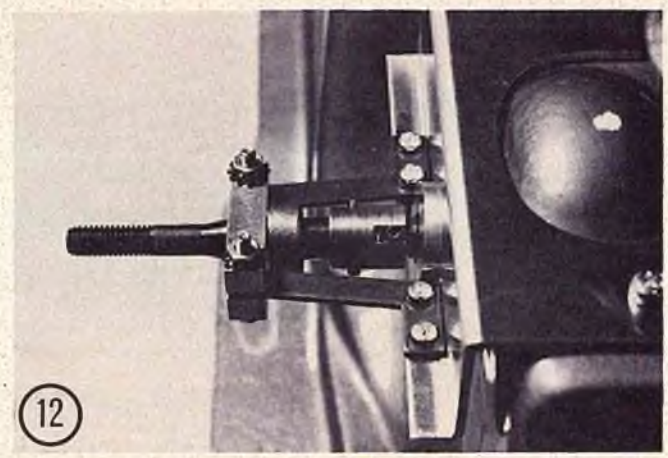
(8) View of recoil starter cable and flywheel. (9) View of clutch bell with pulley and belt for driving the water propeller. Note drag brake on clutch. This is hooked to throttle servo and stops clutch on low motor. (10) Heat sink with air filter attached. Tube from air filter goes to carburetor intake. (11) Drill small holes in body where rear axle water seal is to be glued on. This makes for a more solid glue joint. (12) Rear drive axle and suspension springs. (15) Cirrus radio installed forward of plastic bulkhead. Seal bulkhead with silicone rubber to keep oil from engine out of radio compartment. Radio installed with double stick servo tape. (14) Finished Dash 9. For some idea of the size, compare it to the Cirrus transmitter.

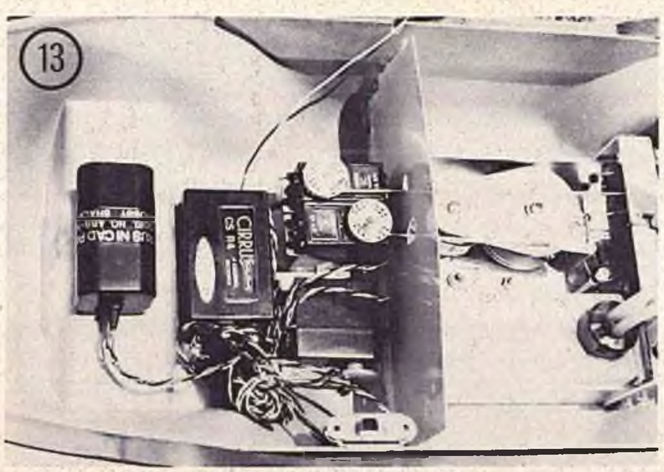












The Goldberg Family with "outsiders" Hobie Steele (L) and Susan Steele (in front). L-R: Carl Goldberg, Bob and Doris Rich, CG Ambassadors of Goodwill and Trans-continental RC flyers. Dan Lieberman, Vice President, and Roger Christy, Plant Manager. (Team Member Bob Sutalski also works for Goldberg but was unavailable when this photo was taken.)

HOW KITS HAPPEN

A GLIMPSE AT THE AEROMODEL INDUSTRY. BY HOBIE STEELE.

● Most of us don't concern ourselves with how that kit got in the box or how the wood and accessories we use find themselves on the dealer's shelf. But when you think about it, we must all respect the thought, time, engineering, and money that comes before the box of wood ends up sitting on our workbench. I became curious about the aeromodel industry so, after our annual "R/C Rites of Spring" at Toledo, Susan and I spent a day in the Chicago area visiting friends in the aeromodel industry at the Midwest REV and Carl Goldberg plants.

What we saw was the tip of the iceberg since even a giant in this business is one of many.

I guess that's what makes aeromodeling the great sport and industry it is. Unlike some American businesses, no fat cat Chairman of the Board can dictate what we're going to fly next year or convince us that we want what they want us to want with a multi-million advertising campaign. Kits are produced by the dozens in some plants and by the thousands in others, but we can buy what we like with no pressure to try the "latest, super sleek, high style, 1977 model" to keep up with the Jones'. Of course trends change and manufacturers adapt to meet modelers desires and requirements. And, of course, new materials and techniques bring about vast changes in designs. But virtually all model kits are produced by companies headed by modelers who are also businessmen - - - not as in most industries where business comes first and the product is simply a means to the end: maximum profit. Of course "our" manufacturers try to make a profit, and foolish they'd be to spend their time and capital while their children go hungry. But on an hourly rate, few manufacturers are overpaid and nearly every kit on the dealer's shelf is a solid value for the modeler's buck.

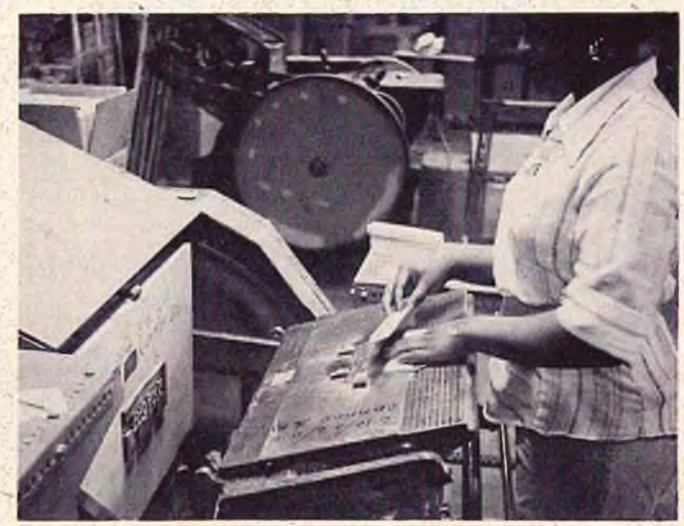
Any explanation of the way a kit happens will necessarily be an over-simplification, but basically, one begins with a design, engineers it for available raw materials and manufacturing techniques, produces it, packs it in the box, and off it goes to a distributor. Say it quickly and it doesn't sound like much at all, even though hundreds of man hours and thousands of dollars must be spent before the first part is cut.

Balsa comes from the tropics in squarish "logs" to an importer in boat load lots. Some logs are processed into sheets and

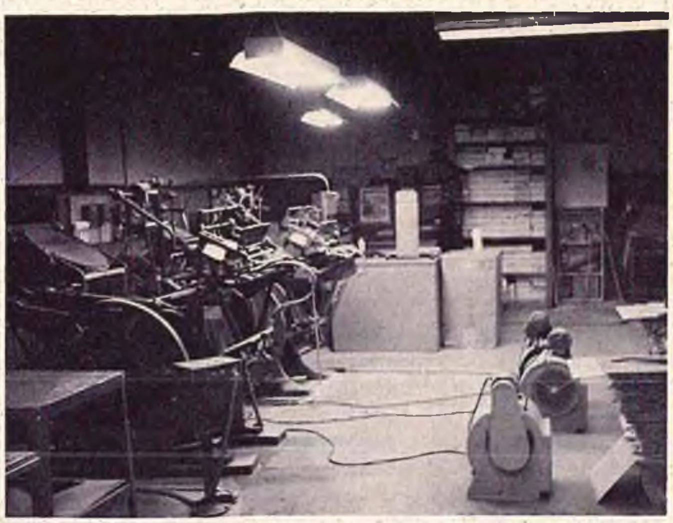
LEFT: Bandsaws similar to this are used to cut balsa and other materials into sheets which are then sanded to close tolerance and cut to length. Bob Vojslavek, REV's president, shows his is "powered by HP".

RIGHT: Jim Newman (left), and Ed Rogala of Midwest, in a pleasant planning session over Jim's drawing board. Sign in background sums up a typical day in the industry!

"Stripping" section of Midwest produces cork model railroad roadbed and other hobby products.



Die cutting press is hand-fed by operator at Goldberg. Steel rule die is vertical on left side while balsa to be cut is placed on platen under operator's fingertips.



Midwest's die cutting presses on left while water-soaked and cut sheets are forced-air dried on right.

Kit packing area "cleared for action" to pack a run of up to several thousand kits.

strips by the importer but most is sold to industry where the balsa is cut into sheets of appropriate thickness, width, and length for the intended purpose. This can involve several separte operations including a final sanding to maintain the close tolerance and smooth finish we all expect. Inspection and grading is necessary to assure the proper density (weight) of wood for a particular part. For example, wing spars or fuselage formers may be a denser and heavier grade of balsa than that designated for sheet stabilizers. The wood is also graded according to how it's sliced from the tree (quarter grain, random cut, and the like). Sheet balsa selected for certain kit parts are then placed in bins or boxes specifically for that part to await machining, die cutting, or packing in the kit if no further work is required on a part such as wing sheeting. Each bin or box is marked with a number which indicates how

ABOVE: Packing small kits, the proper number of parts are taken from each bin on right and placed into boxes by employee. RIGHT: Foam ARF's are assembled from pre-molded parts.

many of that particular part is required for each kit.

Die cutting is done with steel rule blades which resemble a steel tape measure that has one edge hollow-ground to razor sharpness. These blades are fitted into plywood dies to meet the excact specification for the required part like wing ribs or fuselage sides. Careful layout of the part, not only to fit when the aircraft is assembled, but also to allow a minimum waste of precious balsa is essential, and planning requires a good deal of engineering time before the die is made. Dies are affixed to the "business end" of die cutting machines (which may be heavy printing presses, platen presses, or inertia punch presses). Some parts are fed, die cut and extracted from the presses automatically, while others are hand fed. To prevent crushing, thicker balsa sheets are soaked in water prior to cutting, then crefully forced-air dried before packing into kits.

Plywood parts are cut to specified size and shape for each kit while some balsa and ply parts are machined on high speed shapers and sanders or band sawed to the necessary shapes.

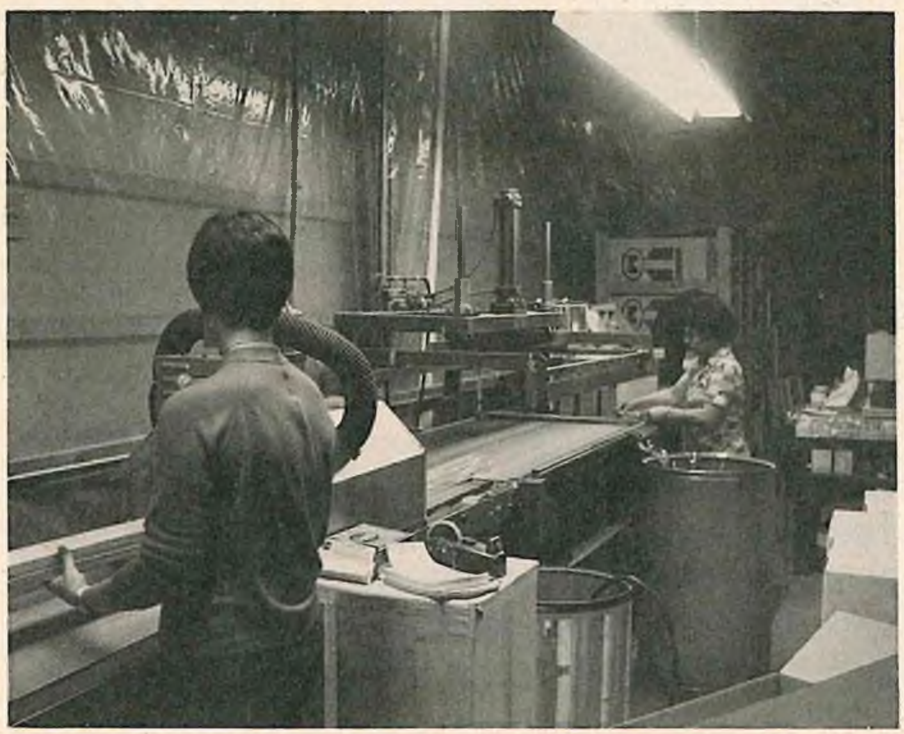
Spring steel wires for landing gears are bent on jigs for accuracy while sub-assemblies, such as hardware packages, wing or fuselage parts, may be pre-grouped before final packaging.

When kit packing begins, the decks are cleared for action. All boxes of parts or sub-assemblies are arranged along tables convenient to printed, empty kit boxes, as employees begin packing a "run" which may be as few as 100 kits to as many as 2,500 kits or more. The packed kits are checked for completeness of all parts and sealed to go into larger boxes for shipping to distributors.

The constant checking and quality control from beginning to end of kit production assures that every part has been included. Actually it would be so obvious should a part such as a cowling or other large item be omitted from a normally tightly packed box as to make it impossible for the modeler to buy a kit with such a part missing. Not that a

to page 100

RIGHT: Heat shrink plastic is used to wrap balsa sheets and small kit boxes. BELOW: Midwest Products' Frank Garcher tends business in the front office.



The finished product provides a neat and efficient reference library.

MAGAZINE FILE BOXES

YOU CAN MAKE YOUR OWN HANDY REFERENCE FILES FOR ALL THOSE BACK ISSUES OF YOUR FAVORITE MODEL MAGAZINES!

BY PAUL DENSON

The professional library of the Balsa Dust Factory finally overwhelmed the whole shop. All magazines prior to 1970, except those few that had a particular or sentimental meaning, were taken up to Russ Berrera's Model Airplane Museum at San Marcos, California, for filling in the blanks in his library. The five remaining years of seven magazines become quite a problem themselves. Have you ever been inundated with magazines? It was time for organization. The purchase of binders was financially not within the limits of my budget, so other avenues were explored.

The magazines must be stored vertically to save space. They must be filed annually for easy reference and must be separated according to publisher or title. The magazines must be readily available and easily removed. The material of the file box must have great strength and minimum expense.

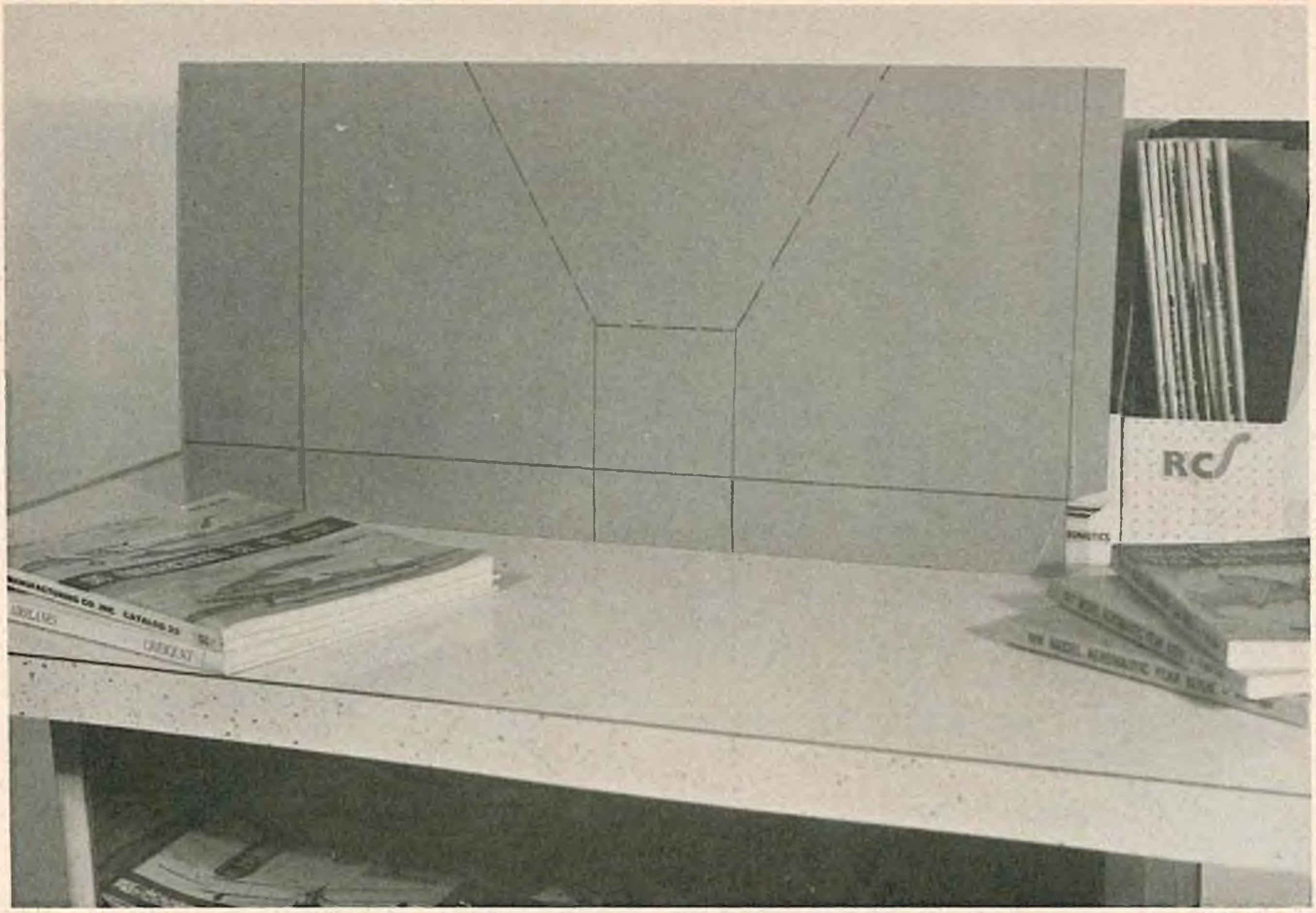
Particle board was considered but was found to be too expensive. Corrugated cardboard was also considered but not tried. I still think it would work and is available free from most any supermarket. Many boxes are large enough to make a file if you engineer the previous folds into the file box.

From a stationery store I purchased No. 25 chipboard in 26" x 38" dimensions; they were 50 cents each a few months ago. It's about 5/64" or just under 2 mm thick and is extremely durable with no corrugations, and takes a number of cuts with a single-edge razor blade to cut through.

I cut the pieces in half and had two pieces 13" x 38" then cut off one edge so the dimensions were 13" x 27". Keep the scrap pieces for they make good cutting boards to protect the top of your workbench. I used my sabre saw to cut out the corner and separate the bottom flaps. The other cuts should be made with a razor blade and a metal ruler for neatness.

The plans show a layout line (solid) and a broken-fold line, running close and parallel. This fold line is offset 1/8" to allow for the thickness of the material when folding. For example, the small flaps on the bottom fold inside the large ones. At the back corner, the narrow flap glues inside the back.

To make the folds, score the fold line about half way through with the razor blade



ABOVE: Chipboard is cut to size and marked for razor cuts. BELOW: Sides are folded and prepared for gluing the back panel.

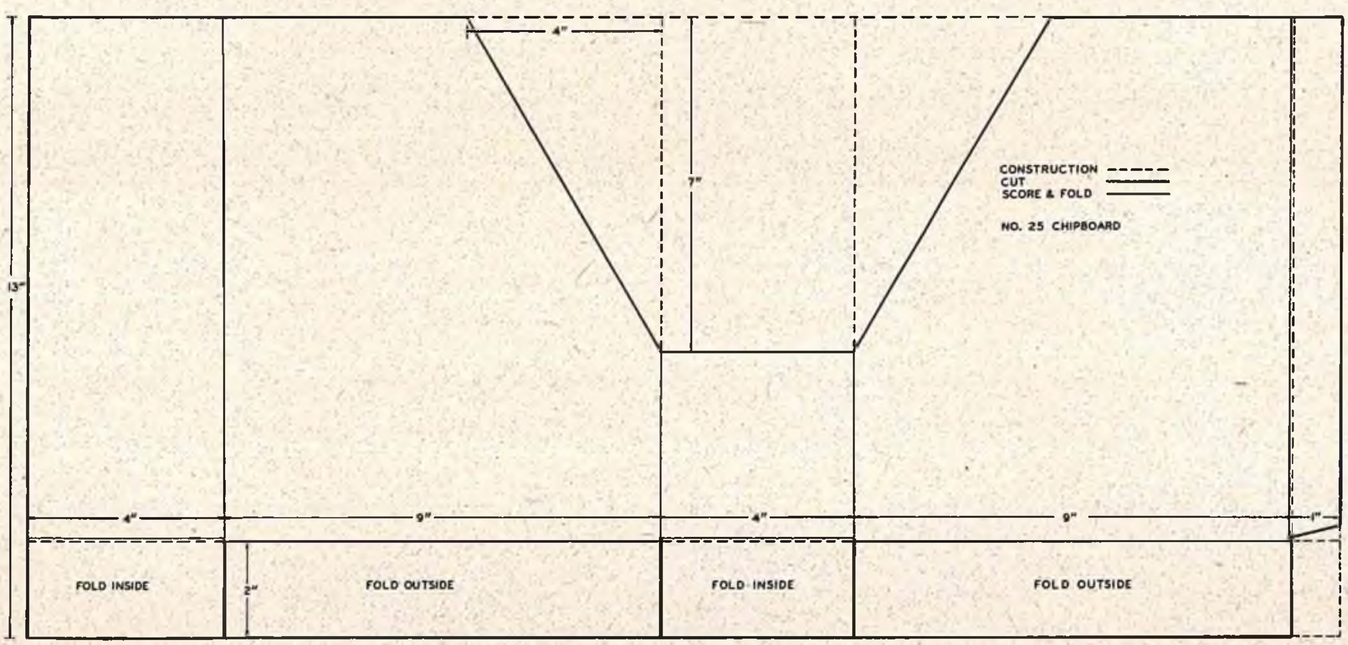
The bottom panels are folded under and glued.

before attempting to fold; this way it will fold perfectly down the scored line. Make your folds and put white glue on the back and bottom flaps. Weights hold the bottom flaps down; a clothespin at the top and masking tape the rest of the way down hold the back together till the glue dries.

When dry, you may decorate as your taste and pocketbook dictates. They may be painted, covered with MonoKote, Solarfilm, Coverite, Silk, tissue, or as us poorfolk do — use as it. White tape was put on the ones in the picture so the logos would show up. The one in the foreground is decorated with black and white with gold stars shelf paper. The logos to identify the various magazines were cut from the inside of older issues.

The boxes for the magazines on the lower shelves are not now presentable, the pup spent her vacation at home trying to destroy the set! When we got home, not one magazine was out of its container — they're tough.

These file boxes will hold one year of the thicker magazines and two years of the thinner ones. □



FOR OLD TIME'S SAKE

BY RANDY CARMAN

The ultimate old timer! Jack Hill, of the Old Time Eagles, epitomizes all the good qualities of the typical old time flyer.

The hard working staff of the Central Jersey Radio Control Club: Marianne Clark, Jim Clark, Randy Carman, and Steve West.

● Oh, what a beautiful morning, oh, what a beautiful day; we had a wonderful contest, there was just one fly-away!

It certainly was beautiful on June 27th for the Central Jersey Radio Control Club's SAM Champs Warm-ups in Piscataway, New Jersey. Thermals were booming, faces were smiling, the sun was shining, but, unfortunately, the wind was blowing 15-25 knots. That didn't seem to hamper the activities, though.

The flyers, spectators, and crew began arriving around 9:00 a.m. Tents covered the pits (keep those crystals cool, fellas!). Marianne Clark, the CD's spouse handled, with her usual aplomb, the normally hectic registration of 26 contestants with entries in several classes. Following a short pilots' meeting, CD's Jim Clark and Steve West, gave the go-ahead and flying began. Even at 10:00 a.m. the air was rising. Waves of thermals passed over the field at regular intervals. High tide, you might say!

The wind played havoc on the ground — planes were being whipped about, tents were blown down, registration forms were flying (one took first in the Unlimited Class with a five minute flight). Mike Lachowski, a local lad, had a bit of a run-in with the gusts — his Bowden Trophy Winner was badly bruised on landing when Ma Nature decided to interfere. A busted tail section and landing gear were the end results.

Mike was not the only casualty at the contest. Hugo Mercoli, another Jersey boy, bounced his Buzzard with subsequent damage. Jack Van Dusen, a Pennsylvanian, really bonked his rudder-only Coronet straight in, full bore! Ouch! It was a sad sight to see Jack forlornly carrying the wreckage off to his car. The winds aloft clipped it and without elevator it was lost! Stu Murray, from Massachusetts, lost his Flagship — the one fly-away. He attributed his loss to radio failure. Andy Anderson, a Jerseyite, had a close call. His Playboy Jr. landed nose down in the parking lot, only bending the

Don Lamkin's rare find - - - a Forster .99 that swings an 18/4 prop! Additional details in this month's column.

landing gear — Phew! Don Lamkin, a south Jersey modeler, busted his Forster .99 powered Powerhouse's landing gear upon returning from his first flight. That Forster is a beauty — the kind you won't find at any engine swap meet! The original throttle control and points set-up (see photo), according to Don, were an experiment when R/C was in its infancy. Isn't it gorgeous? How much would you want for it, Don?

The day was not strictly devoted to mishaps. There were plenty of good moments, too. The best air to be had this year was provided by the Central Jersey Club — it's rumored they have an "in" with the person in charge of contest weather. Flights were averaging well over five minutes and several max's were recorded. In the Texaco event, the ever lucky Cliff Schaible, logged over 20 minutes with his electronic ignition powered Lanzo. He naturally took First Place, but only by a space of 23 seconds. Hugo Mercoli gave Cliff some stiff competition.

Flying was halted at 5:00 p.m. and the scores were tallied. Jim Clark doled out the very Bicentennial trophies — red, white, and star-spangled — to the winners:

Class A

1st — Dave Jaggie, 2nd — Tom Acciavatti, 3rd — Jack Van Dusen.

Class B

1st — Joe Beshar, 2nd — Don Hatman, 3rd — Leon Shulman.

Class C

1st — Hugo Mercoli, 2nd — Steele Anzese, 3rd — Ted Patrolia.

Antique

1st — Esio Grassi, 2nd — Howard Carman, 3rd — Joe Lachowski.

Texaco

1st — Cliff Schaible, 2nd — Hugo Mercoli, 3rd — Gary Montana.

Joe Beshar, Sam President, thanked Jim and the Central Jersey Club for a great day. It was a well run meet, strong on safety and loaded with fun! There's something about these old timer meets that's so conducive to a good time - - - relaxation, no hassles, just plain fun!

Many thanks to the Clarks for bringing their motor coach's facilities to the field. It was a savior for many who are unaccustomed to bushes! My soapbox is available for comments.

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We received a letter from Russ James, SAM #1038 of Fresno, California. The man has a tremendous idea — to keep old timers alive, start passing on the fun of model airplanes to the youngsters in the neighborhood. He's teaching the tricks of the trade to a group of boys between the ages of 9 and 14. How 'bout teaching some girls, too? Keep up the good work, Russ! Take a hint fellow SAM's!

•

Two more contests for your calendars:

September 26th, SAM Chapter 23 and the Clayton R/C Club will co-sponsor the Eastern States Old Timer Champs at Franklinville, New Jersey. Warren Avis, the CD, informed us that the classes will be A, B, C, Antique, Texaco, .020 Replica, and a new invention, the 3-Minute Precision event! Whew! That's going to be a full day! Contact Warren for details at: RD #2, Box 261, Franklinville, New Jersey 08322. Phone (609) 629-7210.

October 10th is the scheduled date for the South Shore Old Timer's (SAM 16) annual meet in Massachusetts. If it's anything like last year's, don't miss it! Classes will include A, B, C, Antique, and Fuel Allotment (all classes eligible). Contact Tom Acciavatti for the particulars at: (617) 696-1229.

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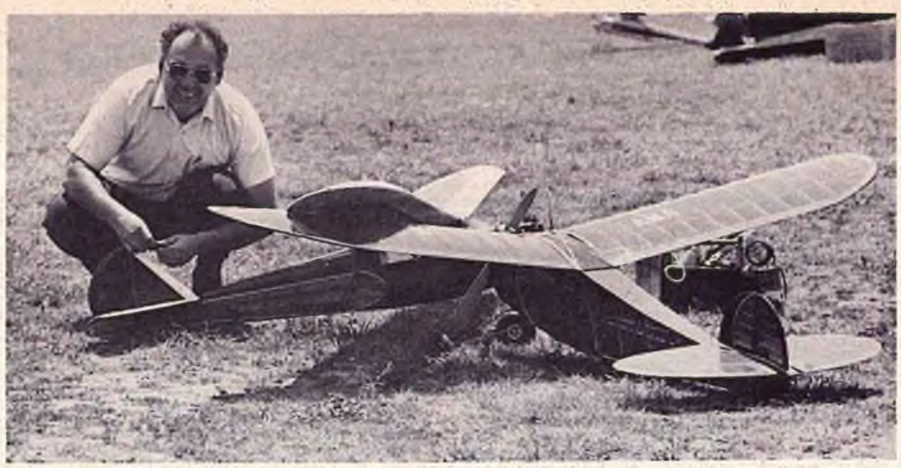
That's it for now. Don't keep those cards and letters — send 'em to me! Let's hear from you gals, too! Till next month - - - happy landings! □



TOP PHOTO: Don Lamkin shows off his rather large pair of birds, the Cloud Cruiser and the Powerhouse. ABOVE: The winners! Rear (L to R): E. Grassi, J. Lachowski, H. Carman, S. Anzese, L. Shulman, G. Montana, H. Mercoli. Front (L to R): T. Patrolia, T. Acciavatti, J. Beshar, C. Schaible, D. Jaggie, J. Van Dusen. LEFT: Marianne Clark takes a break from her paperwork for a quick snack, and some mugging.

INSTALLING ENGINE MOUNT RAILS ACCURATELY

BY BEN B. STRASSER

There's no doubt that using hardwood rails to mount an engine offers a good, solid support for the engine. And, they say that the more solid the engine mount, the more power to the prop. Probably the most critical part of installing engine mount rails is getting the top surface of them aligned flat and parallel to each other so as not to put any twist in the crankcase of the engine when it is bolted down in place. The other thing to worry about is getting the rails installed properly to get the right amount of down thrust needed for the ship.

Here's one way to get the job done with only a little extra effort that I learned from Lou Stanley. Since he didn't have the time to get the idea in writing, I did.

The hardwood engine mounting rails used for many planes runs from the nose to the front of bulkhead #2. Bulkhead #1 is usually plywood that has been notched out for the rails. Since these notches locate one end of the rails, all you have to worry about is aligning the back end properly. A prepared template cut out of scrap balsa, pinned to the front of bulkhead #2, will do the job. Or, with some planes the template could just be glued in place and left there!

Interested? Here's how to go about it.

We assume that you have the fuselage assembled with the bulkheads all glued in place. Either the top or bottom of the fuselage in the area of the fuel tank compartment should be open to give you access inside when you're gluing the engine mount rails in place. We recommend you use Bridi Hobby's Super Stik or other such aliphatic resin glue for the best hardwood/balsa bond since this type of glue penetrates into the wood very well.

(1) Using the plans for your plane, measure the distance from the top (or bottom) of the rails to the top (or bottom) of the fuselage side in front of bulkhead #2. Make allowances for stringers or triangular stock shown on the plans, as necessary.

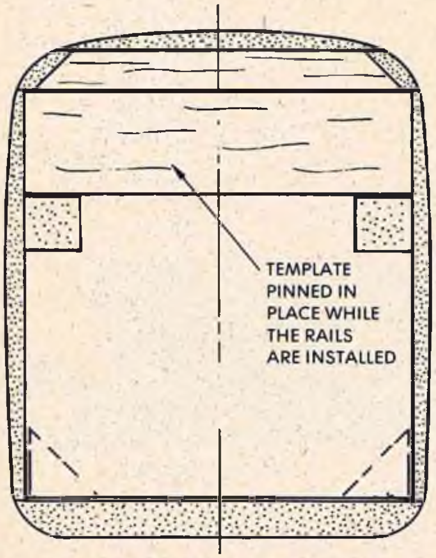
(2) Measure and cut the template from a piece of scrap balsa sheet at least 1/16" thick. (We used balsa 1/8" sheeting.) When cut out, the template should be large enough to run from one side of the fuselage to the other across the front of bulkhead #2. Take care to make sure your measurements are accurate and that, when cut out, the top, bottom, and side edges are square.

(3) Pin the template in place to the front of bulkhead #2, making sure that it's properly aligned with the top (or bottom) of the fuselage. Put glue on the sides and back ends of the rails. Also put glue onto the places on the front of bulkhead #2 that will mate with the back ends of the rails, the notches in bulkhead #1, and down the fuselage sides that will contact the rails. Let the glue sink into the wood for five minutes or so.

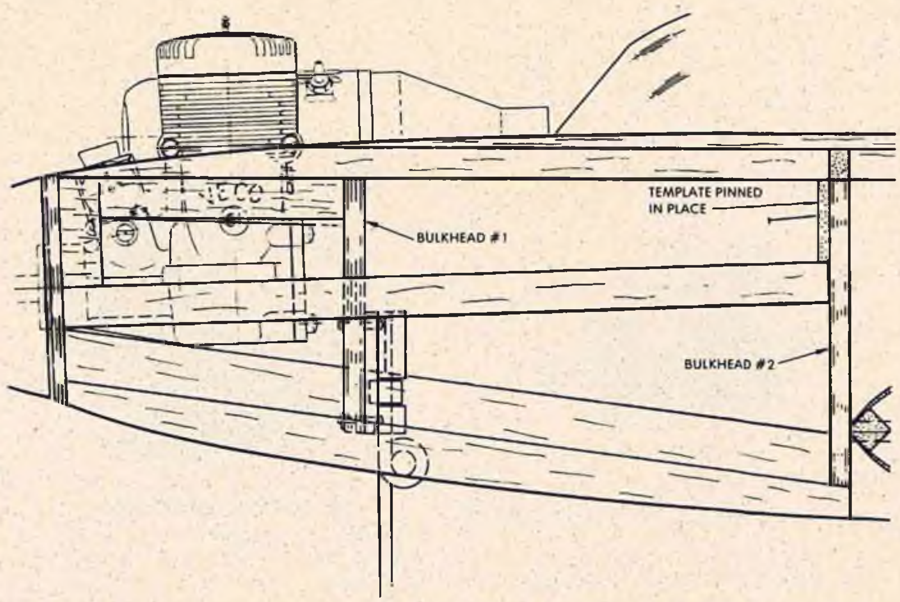
(4) Add more glue as necessary, then put the rails in place through the notches in bulkhead #1 so they butt up to bulkhead #2 and rest squarely on the alignment template. Clamp each rail to the fuselage side in front of bulkhead #2 and just behind bulkhead #1. A large clamp should also be used across the fuselage sides at the nose to make sure the rails will be pulled in to bulkhead #1. Add any other clamps as necessary to assure that the rails will glue to the fuselage sides from the front to the back.

(5) Remove the template and wipe off the excess glue. Let the glue dry. After you've removed the clamps, and even if your plans don't call for it, we recommend that you add some triangular stock down the length of the engine mount rails/fuselage sides inside the fuel tank compartment. This is just added insurance that they will offer a solid engine mount.

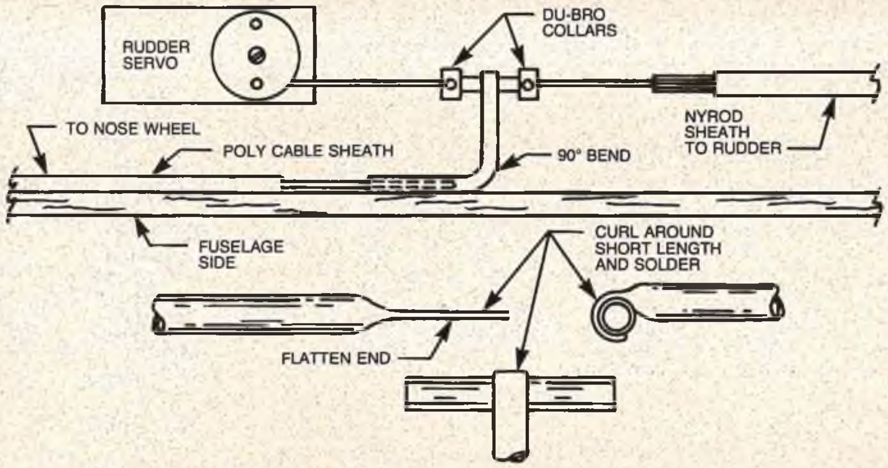
Well, that's it. Engine mount rails installed accurately and solidly in place with only a few minutes of extra work. □



BULKHEAD NO. 2
FRONT VIEW

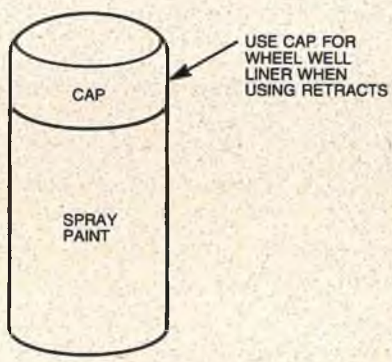


FOR WHAT IT'S WORTH

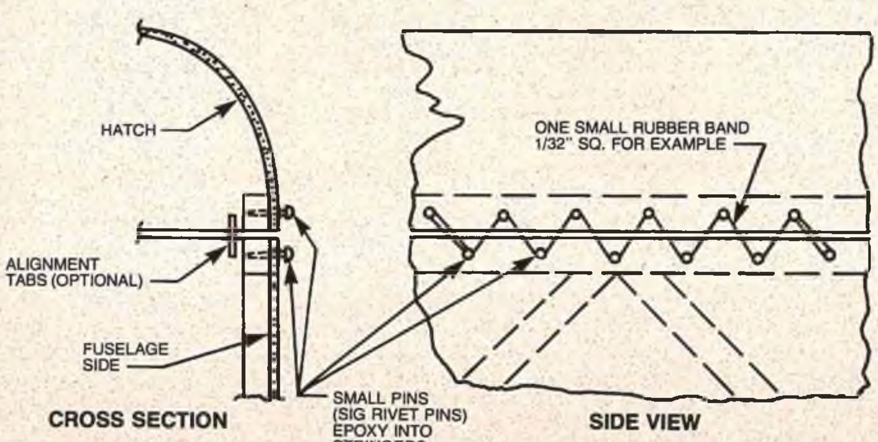


Here is a technique for routing nosegear steering cable and linkages that Tom Pekarna of Le Sueur, Minnesota, states has never failed, gets the nosewheel cable quickly against the fuselage side and eliminates cross-overs, etc. First, cut two lengths of 1/16" ID brass tubing one of which is to be 2½" long while the other is 1/2" long. Flatten 1/2" of the end of the longer piece and curl the flattened portion to match the curvature of the outside diameter of the shorter piece. Using a tubing bender spring, place a 90° bend in the longer length of tubing. Solder the curve-flattened end of the long tube to the outside of the shorter length. The flexible braided steering cable is inserted into the open end of the longer tube and soldered there. Note that by fluxing the cable beyond the portion to be inserted into the tube, it can be stiffened with solder without causing it to bind in the poly sheath. Place one Du-Bro 1/16" wheel collar onto the 1/16" rod with the threaded end. Follow with a short section of tubing and the second wheel collar. Cut the rod to a suitable length and bend the end, as desired, to engage the servo arm or wheel. Center the rudder, then the nosewheel, and tighten the wheel collars to hold the tubing into position. The poly cable sheathing can be epoxied to the fuselage side. If access to the nosewheel steering is limited, adjustments to center the nosewheel can be made by moving the wheel collars.

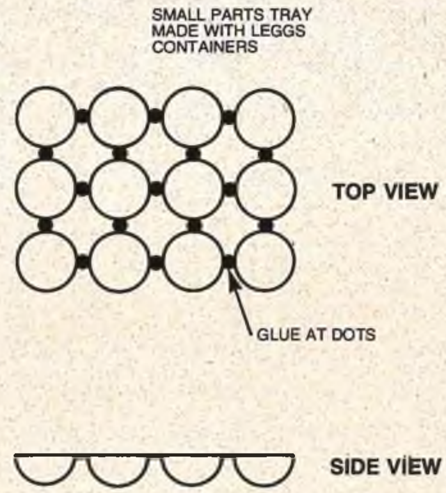
The plastic caps on aerosol spray cans may be used to make wheel well liners on planes having retractable landing gears. The caps are made in various sizes and are lightweight and easy to trim to the proper depth for the well. This idea was submitted by Dr. Richard E. Forbes of Mississippi State, Mississippi.



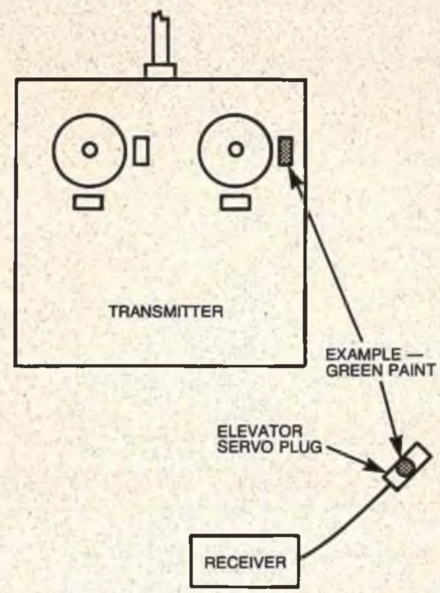
Here's an idea suggested by Alan Knight, Jr., of Woodbury, New Jersey, for holding down a hatch cover on an old time semi-scale type plane such as the PD Parasol (December 1969 RCM). This arrangement can be carried along the entire hatch separation line and, when completed, looks just like the real stitching on the old timer. In addition, it has the added advantage of being easily removed at the field.



Leroy Petersen of East Moline, Illinois, suggests a small parts tray for your shop which can easily be made by gluing several Leggs Pantyhose containers together at the round opening. The tray can be used for keeping separate different small parts.

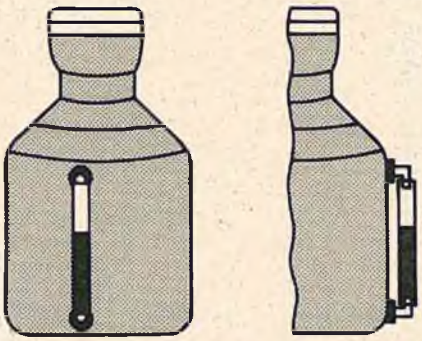


Don Coffi of Sacramento, California, suggests color coding the transmitter trim knobs with the corresponding receiver servo jacks. This modification makes for easy, fast identification of servo jacks without reference to a manual.



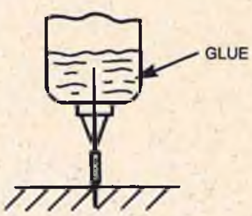
A visual indication of fuel quantity in your field box is very easily made and is neat and practical. If you are using a Sullivan tank, the only material required is two Tatone Stik-A-Tube rubber plugs, two Simco 90 degree plastic fuel line elbows and a short length of large clear plastic fuel line as suggested by Glenn Gulberg of Grand Forks, North Dakota. Glenn mounted his fuel gauge off-center of the tank to minimize the chance of splitting in the seam. Heat the area where you want to mount the plug with a heat gun to soften the tank plastic so as to make it easier to punch the hole with the

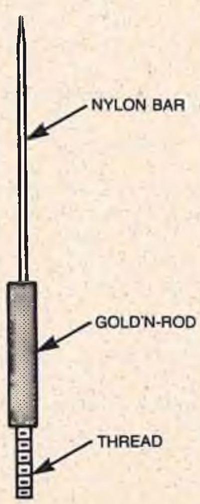
Stik-A-Tube probe. The tank is tough but you can puncture it. Insert the elbow into the Tatone plug but do not remove the flange on the elbow. Glenn used a little Silicone Seal on the elbow and also on the plug before inserting it into the tank to minimize the chance of leakage, although this may not really be necessary. When you have the two elbows mounted, cut the clear plastic tubing to fit and your fuel gauge is complete. The finished product is fool proof, professional in appearance, and you should have no reason to be caught at the field, ready-to-fly, only to find you are out of fuel in your field box.

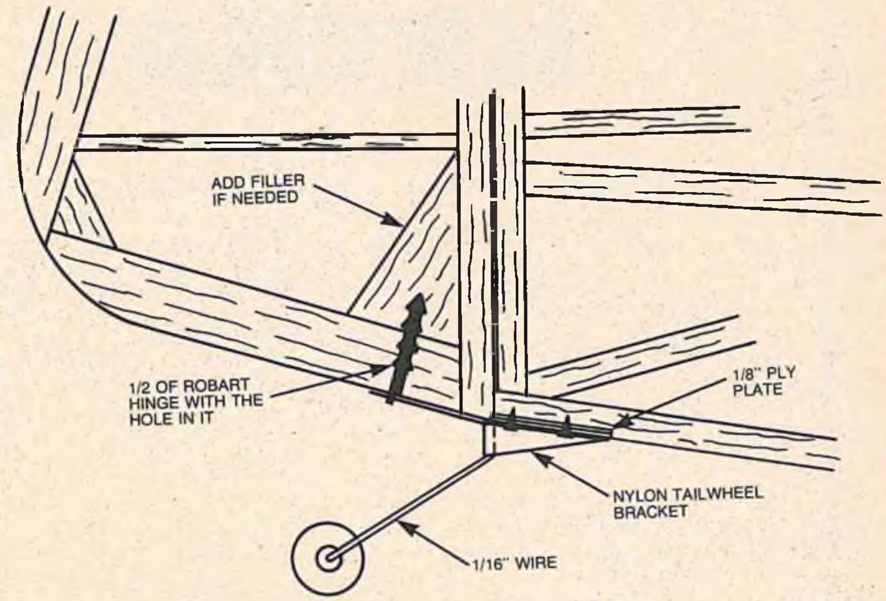


END VIEW **SIDE VIEW**

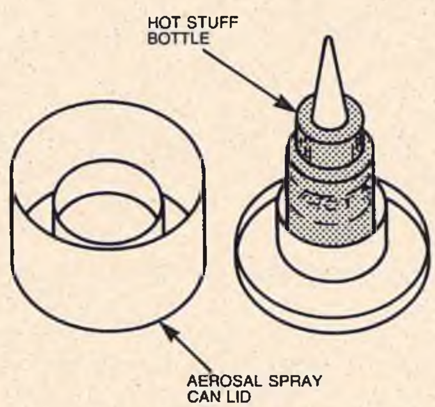
Partially filled glue bottles must be squeezed for quite a bit of time in order to make the glue come up to the spout. To save at least half an hour of modeling time on your next aircraft, keep your glue bottles inverted. Asemble the contraption shown in the sketch submitted by Otto Tutzauer of Frankfurt, Germany, and then screw one of them everywhere you use a glue bottle.







A neat and clean installation for steerable tail wheels is shown in the sketch submitted by David Whitaker of Toledo, Ohio. Instead of using straps of brass, or permanently gluing the wire into the rudder, you can use the female half of a Robart Hinge as a guide. It is very simple to install by just drilling a hole for the hinge point, filling with glue, and inserting the hinge. A piece of balsa is used as a filler for strength if needed.



You only have to find your Hot Stuff turned over once to realize you need a good way to hold that little bottle in an upright position. In the case of Hubert A. Wills of Dallas, Texas, a rudder, elevator, and aileron were glued securely together and bonded to the wood surface of the work table. Since a work bench will not fly with a "rudelron", Hubert was determined to prevent it from happening again. After several tries with other items, he used the lid of an aerosol spray can. The outer rim was later cut down for better access. The outer ring of the lid was used to store additional Hot Stuff capillary tubing and other small items while the center, smaller diameter portion of the cap, holds the Hot Stuff bottle so that it will not tip over.

Here is a way to save time and money mixing small quantities of epoxy resin or paint. Use a small paper or plastic cup and cut a piece of cardboard to fit inside as shown in the sketch. Figure A is for equal parts of epoxy to hardener while Figure B shows how to bend the partition for a ratio of 2:1 or 3:1. You can also make a three or four sided partition for mixing different colors of paint together. Remove the cardboard partition to mix. This suggestion was forwarded by Douglas B. Dorton of West Jordan, Utah.

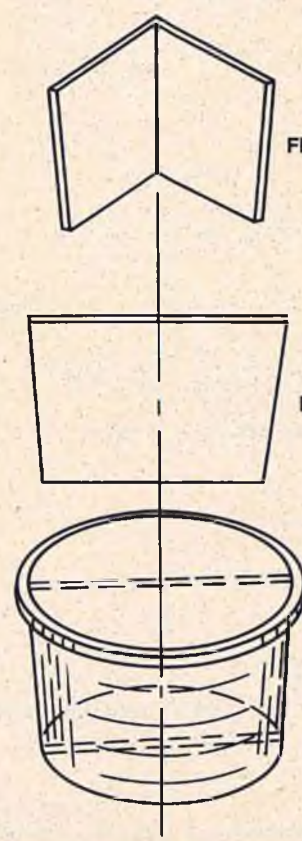


FIG. B

FIG. A

HOW KITS HAPPEN

from page 85/83

. . . . modeler could conceivably be so dishonest as to pilfer a part from a kit in the hobby shop, but one story really amused me. A manufacturer's ad broke in the model press prior to kit production and shortly thereafter he received a letter from a modeler saying that he had purchased the kit advertised, but the plans were missing and would the manufacturer please dispatch them to him. Not only was the kit not in production at the time, the plans had not yet come from the printer! Needless to say the modeler received a strong letter instead of the plans he hoped to acquire so underhandedly. It reminded me of the time, many years ago, I wrote Carl Goldberg to ask about Skylark nacelles to make a shoulder wing twin engine Falcon. Carl sent me a sketch of the nacelle construction and a nice note because I was honest with him (and because he's a fine person).

An addition to kits, packaged parts, supplies and wood are important products from industry. Bob Vojslavek of REV cuts basswood for the hobby trade in addition to the production of kits. Carl Goldberg produces innumerable supply items while Midwest manufacturers balsa and hardwoods, as well as accessories for the trade and corkwood railroad beds.

I've always respected most manufacturers in our hobby industry and it was a rare treat to be able to visit some and see all that's involved in how kits happen. Now I'm all primed to go out and give them some business - - - care to join me? ☐

DASH 9 DUNE BUGGY

from page 80

. . . . With the seals provided in the kit, there is no water leakage into the body. I did not use the lightweight foam that was in the kit for the body seal, but used wing saddle tape instead. The front wheels act as two front rudders when in the water.

Now just a few words about the construction of the Dash 9. In view number 6 showing the assembly of the clutch, the springs are shown backwards to the correct position, so don't be concerned about your springs being backward to the exploded view. Be sure to use a good grade of oil on the brass bushings where the rear axle goes through the sides and also on the brass suspension blocks outside of the body. When gluing the cork lining to the brake, be sure to put it near the top at the angle bend. This will give better friction when the brake is applied.

In cold weather you can use only the smaller heat sink on the engine head. You can then put a cover over the large cut out on the rear deck for a smoother look. For starting you can simply unhook the rear hold-down clip and lift the top forward to expose the internal mechanics.

Be sure to choose your radio with care, as you need one with good noise rejection and tough enough to handle severe vibration. The radio I used in my Dash 9 is a Cirrus Sport 4 from Hobby Shack. It has proven to be an ideal radio for this type of use as I have had no problems with metal noise or vibration.

Overall I feel the Peerless-Kyosho Dash 9 Amphibious Buggy is a great break from flying and could very well become habit forming. The Dash 9 is available from hobby dealers or direct from Peerless Corporation, 3919 "M" Street, Philadelphia, Pennsylvania 19124.

Get yourself a Dash 9 and prepare for many hours of fun and enjoyment! We did. ☐

RHOMS MODEL 76 FUEL PUMP

from page 79/77

. . . . fill line filter becoming contaminated. This method of venting provides an effective and simple solution to Rhoms venting problem. It also takes care of the safety problem of accidentally brushing the switch and operating the pump by mistake. With the fill line connected to the vent tube during storage, the pump can run with no loss of fuel from the container.

What I liked best about the Model 76, aside from the lifetime guarantee on the pump and 1 year guarantee on the motor, was that any part of the unit can be purchased from Rhom Products. Replaceable parts! This means you will have a usable fuel pump for many years. As long as there are parts available, your pump can be repaired over and over again. I particularly liked the replaceable "O" ring seal on the pump shaft and the convenient mounting on the fuel container. All these add up to a unique and desirable product that will perform to you satisfaction. □

BASIC GLUED JOINT DESIGN

from page 76/75

triangular box section, as shown in Figures D, E, and F. You will find that the triangular box can still take a twisting load without collapsing when the ends are cut out.

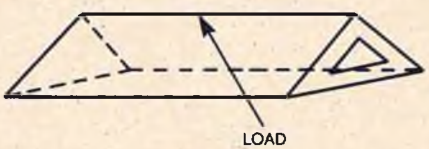


FIGURE E

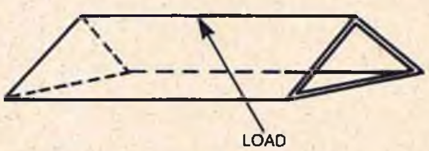


FIGURE F

The triangular box section can be formed from the two struts and the leading edge of the wing or from the trailing edge to some rear strut.

The rectangular box section can be any portion of the fuselage. If you have to cut open a section for a hatch, then reinforce the perimeter of the opening.

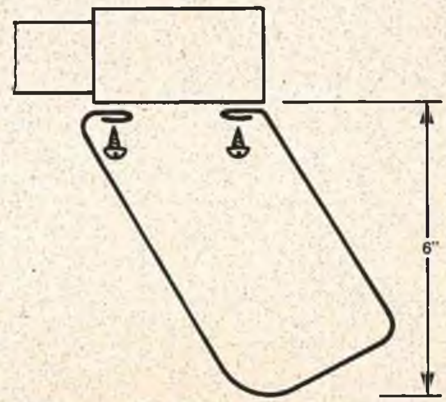
We have examined some of the more simple, obvious joints that are in our models when simple loads are applied to them. The loads on these same joints when the model is flying is completely different. If you make a good strong joint, following the rules stated earlier in the article, and try to close the rectangular sections with bulkheads and make triangular sections in the wing, the model will take the dynamic loads that are added by flight without failing. □

NRCHA

from page 74/72

. . . . . found this to be true on our own prototype and modified a Heli-Baby tail skid to replace the single wire. Lee also feels that a full-loop skid is definitely needed and made one as per the enclosed sketch.

MODIFIED TAIL SKID



Lee also experienced some minor problems with the swashplate-to-rotor head control link bending under severe loads at the link driver. This can be quickly remedied by soldering a brass tube over the link rod leaving only the threaded ends exposed. Spread the rods on the driver enough to give about 1/64" clearance and your problem will be solved.

With regards to the landing gear on the Rev-olution, they are extremely short and, while excellent in appearance, are inadequate for the beginner. Lee recommends making some longer skids possibly with some wheels on the tips such as used on the Du-Bro Shark. Since some ballast weight is needed on the Rev-olution, the additional skid length would serve as functional ballast. Also, the skid clamp brackets will have a tendency to loosen after a couple of rough bounces. This can be remedied by drilling a small hole through the skid clamp and skid and installing a small sheet metal screw through it, thus ending your loose skid problems.

Another modification to the Rev-olution, suggested by Lee and one that is applicable to virtually any of the smaller size helicopters is one that is not at all obvious and that is simply, visibility. Under low or poor light conditions, such as a cloudy day or sunset, the small, anodized bird becomes just a black silhouette and is virtually impossible to tell what it is doing at any distance. Lee had very thoroughly crash tested his since, at sunset and about 70 feet up and 30 yards away, it did a quick little weird maneuver, and he totally lost all perspective. As a remedy, Lee put some broad white trim tape down the length of the beautifully red-anodized tail boom and put white trim tape on the dark tinted canopy. In addition, the tail fins were simply rotated until one is vertical and the other horizontal instead of the inverted Vee. This gives a better perspective in the air and seemed to cause no adverse effects in the flying of the Rev-olution.

Taylor points out that the Rev-olution has excellent crash survivability. His came down in a full power dive at about 60° onto asphalt and, with the proper parts on hand, could have been flown an hour later. With the virtually unbreakable canopy, the latter was scraped up a bit but there were absolutely no cracks.

You may find that these few simple modifications, suggested by Lee Taylor, will make an otherwise excellent machine even better for knock-about every day flying.

NEW PRODUCTS

Two outstanding new products that will be of interest to the helicopter enthusiast is the Simcoe Fire Fly Strobe-Type Flasher which is designed to produce a strobe type flash with a small lightweight incandescent bulb. It uses an industrial quality socket that features easy bulb replacement, easy lens color change, as well as easy mounting. Installation is quite simple and all that is required is a 1/2" hole in any material up to 1/4" thick. Insert the Fire Fly from the inside outward and then install the lock nut to secure the system. Finally, the lens and bulb assembly is installed. Extra lenses are available in red, blue, green, and amber. The Fire Fly will operate on six or twelve volt by selection of the proper bulb.

Also, for those who would like to have an electronic siren and whooper, Simcoe's Electronic Siren creates a rising and falling sound as in real police or fire signals as well as a whooper such as used on many police and paramedic vehicles. The system operates on voltages form 4 to 12 volts DC and is small and light enough to be carried in most helicopters currently available except for the very smallest. Both items are manufactured by Simcoe in Canada and are available in the United States from International Marine Exchange, 24501 Los Serranos Drive, Laguna Niguel, California 92677. In Canada, both items are available from Simcoe Model Manufacturers, Ltd., 82 Metro Road North, Keswick, Ontario, Canada L4P 1C3.

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The Heli-Trainer, manufactured by Schluter Modellbau, West Germany, manufacturers of the

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NRCHA

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popular Heli-Baby helicopter, is now available in the United States through Model Rectifier Corporation, 2500 Woodbridge Avenue, Edison, New Jersey 08817, and priced at $69.95. With the Heli-Trainer you have purchased a device which is helpful not only for your initial helicopter training, but, after having achieved the necessary control responses, it will continue to be a valuable aid for trimming and test flying your repaired or newly set-up machine. Now you have a good chance to learn helicopter flying without any mishaps from the first rotor acceleration to untethered flying.

A particular advantage of the Heli-Trainer is to not only allow for vertical and yaw movements, but for roll and pitch as well. All movements in response to the helicopter happen in a true manner on the Heli-Trainer much the same as the free-flying chopper. This is achieved by a fully articulated suspended attachment of the Heli-Baby at its Center of Gravity. Thus, the helicopter is tethered at a neutral position free to move without any annoying tendencies. This results in true training possibilities for later untethered flying. The device can be asssembled in approximately 45 minutes and is easily moved from your shop to your yard for practice. Unwanted controls can be locked out until each control is learned, then the combination of roll, pitch, yaw, and climb can be utilized simultaneously. Even later, after you have learned to hover, you can return to your Heli-Trainer for the same type of practice while the helicopter is facing you — a most difficult position in which to fly a helicopter in free-flight.

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IT COULDN'T HAPPEN TO ME . . .

Let's list the three most unlikely occurrences in the world:

(1) A tax reduction.
(2) Raquel Welsh moves in next door.
(3) Your model helicopter flies hands-off.

Now, pick the least likely. Number three you say? Wrong! As pointed out in a recent issue of the Mid-Arkansas Radio Control Society newsletter, member Doug Wilcox's helicopter will fly that way. In fact, he could easily have won the Best Long Distance Flight award. Of course, the distance flown and the copter's wherabouts are unknown at this time!

This is actually a true occurrence. When Doug's helicopter took-off, **it took-off!** There was absolutely no control from 3 feet on up. The darn thing just said 'bye' and left. Maybe they aren't as hard to fly as we've tried to tell you. That was a rather expensive fly-a-way (would you believe whirl-a-way?) but 'ol Doug just smiled and calmly uttered that oft repeating flying philosophical phrase "#@*¢%@#"/$&*#!

It really happened.

See you next month . . . □

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. . . charged. I found out later it was fully charged, two months ago!

Step 3

Make it clear that if something happens, you are not liable. Most fellows won't hold you responsible for accidents, but it's good to have this understanding from the beginning.

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Step 4

Instruction and discussion. As a travel instructor for the blind, I am continually appalled at the number of otherwise normal people who don't know their right from their left. Have the pilot stand behind the plane and move the stick right and left on command. Tell him that while he's flying if you say, "Right" or "Left," that means he should move the stick in that direction. Tell him you may make adjustments to the transmitter while he's flying, so don't let go. It's good for the pilot to learn early that at the first sign of trouble he should chop the throttle immediately. This will give a little more time to react, make the airplane a little more manageable, and at least lessen the impact if it is inevitable.

I've found it altogether best to have the pilot always face the same direction as the airplane. This makes for some fancy twirling sometimes, and some sidestepping to avoid the antenna, but this technique does minimize one of the beginner's problems. After all, he has plenty to think about anyway.

Later, after **much** practice and stick time, he can face the airplane as it approaches. In this case, tell him to push the stick in the direction of the low wing, so as to "push" it up. Incidentally, two things I continually have to remind beginners about is to face the same direction as the airplane and keep the wings level. Tell your pilot you will be at his elbow while he is flying and to give you the transmitter. Here the buddy box system would be a big help, but most pilots I've seen are taught without this benefit.

Establish the correct terminology and vocabulary. One young man told me he had trouble remembering that pulling **down** on the stick was **up**! Start him off correctly by saying you **pull back** to go up or pull the nose up. Likewise, you **push** to go down or push the nose down. Tell him to remember the phrase "Pull up" to keep it straight in his head. One of my trainees seemed unable to fly anywhere but downwind. It turned out he didn't know what downwind meant. Another had no idea what "flare" meant. So be alert to the simple things, especially our jargon.

Now is a good time to check him out on the aerodynamics of turning an airplane. Explain that an airplane pivots at the front when turning, like a motor boat. It may help to imagine the rudder as

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ENGINE CLINIC

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Walkers mind, and free-flight the main market for 'gas engines'. Why the people involved with the engine felt the need of the throttle system is a bit of a puzzle. Maybe they foresaw things to come in the future. One problem with the throttle system on the pre-war engines was the lack of a positive method of attaching the prop drive washer to the crankshaft. The prop drive washer also served as the timing cam that actuated the ignition points. If the timing cam was not properly positioned on the crankshaft, the timing would be off. So, getting the throttle/timer/crankshaft relationship set up properly was a bit of a hassle. The timer cam was retained by a slight taper which could easily slip. This problem was changed on the post-war model by incorporating a key along with a smaller diameter crankshaft. The pre-war engines had a 9/32" diameter crankshaft, and the post-war, a 1/4" — one of the ways the engines can be differentiated.

Another feature of the engine was a solid copper head brazed to the steel cylinder. On some engines this whole cylinder was then copper plated — hence the name "Kopper King". Other engines had only the copper head with the steel fins left natural. The gas tank was molded of red Bakelite which contrasted very nicely with the copper cylinder and aluminum crankcase. The timer was completely enclosed within a small black Bakelite cover and was of very unique design in itself. The combination of colors made the engine very attractive appearance-wise.

Internally, the engine was very well made for its day. The crankshaft was hardened steel. The piston was hardened steel lapped to the sleeve. The con rod was solid forged bronze, making it a bit on the heavy side. The engine had a high compression head with the spark plug horizontally out of the left rear, for better scavenging, according to the manufacturer's literature. The manufacturers also claimed that the engine could be operated on gas only — no oil!! Needless to say there is no way this could be done and would only have resulted in disaster.

The engine did run very well and had a lot going for it. Unfortunately, the price was a bit high and it was of unorthodox appearance. It could not compete with the more popular engines that were available at the time — Super Cyclone, Ohlsson Special, etc., and, like many other engines of that era, folded from the scene.

Today the Kopper King is a very sought after collectors item. Whereas your Ohlsson's and Super Cyclones have a top cash value in the $25.00 to $35.00 range, if complete and in excellent condition, a complete Kopper King would be worth a minimum of $75.00 with $100.00 a more realistic figure. A new engine still in the original box would be worth even more. And believe it or not, new-in-the-box engines are still in existence, owned by a few fortunate collectors.

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I received a letter this past month from the Florida Flash — although after the Bakersfield pylon races, more appropriately called the "Flame-out Kid" — also know as Jim Maki who does a lot of raving in Model Airplane News each month under the byline of "Pylon Pit Patter". Jim had his share of problems at Bakersfield as many who tried to figure out the problem well know. Jim's letter tells all.

Dear Clarence:

Ever since winning a free subscription to RCM in their unannounced photo contest, I have been a faithful reader of "Engine Clinic". I really enjoy

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your column, and I think it is a true oasis of informative journalism in an otherwise mediocre magazine.

I have a question for you about my racing engine, and I hope you have an answer and will put it in your column because I'm sure it will be of interest to at least one or two people.

As you know, I was having a terrible time keeping my engine running for a full ten laps at Bakersfield. As a matter of fact, I was having trouble keeping it running for four laps . . . ten became academic. The engine is a good, strong engine and it probably holds the world's record for three lap times. Since most races in this country are based on the ten lap system, I think I may have a problem.

I changed fuel lines, needle valves, carbs, backplates, deck clearances and even callers . . . all to no avail. What do you suggest I do at this point? I am really baffled.

It probably doesn't mean anything, but I will mention it on the slim chance that it might be a clue to my problem. Several people at Bakersfield mentioned that they saw Pat Crews, or "Boom-Boom" as we affectionately call her, bending over my racer . . . could my problem possibly be air-starvation???

Sincerely,
"The Flash"
Jim Maki
Ft. Lauderdale, Florida

P.S.: Would you believe a hair-line crack in the brass tubing INSIDE the tank on the pick-up side?? Thought you would like to know, and many thanks for all your help . . . appreciated it.

Mr. Lee:

I just read your June column and I have a few questions about my K & B .61 with Perry Pump. You mentioned in your column you have seen very few actual problems with this system; most problems the fault of the owner, not the system. I hope you can iron out my problem.

My engine was purchased new with the Perry Pump factory installed. For the first couple of gallons of fuel the engine ran great, after the normal break-in procedure. The engine is installed in a Super Kaos 60, mounted upright. One day for no apparent reason the engine started quitting in flight. The fuel system checks O.K. but the engine simply will not run out a tank of fuel in the air. When the engine dies, (always at a high speed throttle position), it sounds like it ran out of fuel suddenly. It will be humming along and suddenly just goes silent and spins to a stop. The plug checks O.K. The engine runs great on the ground but can't seem to hack it in the air.

Only after this problem did I tinker with the pump adjustment. Nothing seems to help. The carb is clean, plug good, fuel is fresh 10% nitrothane, filter between pump and carb clean, needle setting not overly lean, engine not overheating. There are two other fliers in the area having the exact same problem; one with an identical engine and one with a non-factory installed system on a Webra.

Clarence, what are we doing wrong?

Russ Burnett
Champaign, Illinois

Russ, like I have said many times in this column — these engines are pretty basic in operation. As long as you supply them with fuel, and the glow plug stays lit, they are going to run (barring mechanical failure, naturally). If your engine seems to run out of fuel in the air, and the

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an outboard motor: When you give right stick, the rudder moves to the right, pushing the tail to the left, which aims the airplane to the right. Explain that an airplane in a turn tends to lose a little altitude, depending on how tight the turn, so a little up elevator is needed to hold the nose up. More on this later. Opposite rudder (aileron) will probably be needed when coming out of turns to level the wings.

The airplane should be set up for minimum control throw as beginners tend to over-control. The exception to this is if the instructor is checking out the plane on its first flight. In this case he may want more control to correct possible bad tendencies. Tell your beginner to move the stick in small amounts, smoothly. Expect the airplane to be slow to respond, so just give a stick command, hold it, and see what happens. If it doesn't happen, or happens too slowly, **then** is the time to add more of that command. Emphasize the importance of keeping the wings level. In the beginning you will need to tell him frequently to level the wings. With most beginners you will stand at their elbow while they fly, however some pilots seem to put the plane in a dive the minute they touch the stick. For this person, and also blonds and brunettes, it is helpful to stand behind the pilot and place your thumb over his thumb to let him feel the correct movements. In bad cases you may have to let the pilot place his thumb over yours. In either case, explain your control movements as you make them. "Now a little right to level the wings," etc.

A very great help for the beginner is to throttle back after altitude has been reached. This makes almost any plane easier to fly. Leave enough throttle to keep the plane from being mushy or just hanging in the air.

Altitude is an important consideration. Fly high enough to get him out of trouble, but beware of flying too high. The beginner gets confused more easily at great height because he doesn't have your backlog of visual perspective and perception in this hobby. Consequently, he makes bad decisions about whether the plane is banking toward or away from him, flying straight at him or straight away, is gaining or losing altitude, etc. Also, the airplane must make larger movements at high altitude for the beginner to notice. By then he may have over-controlled . So how high is high enough? Use your head, size up your beginner and err on the side of too much altitude rather than too little.

Until adequate stick time has accumulated, the instructor should do the take-offs and landings. Some beginners will really be impatient to do a landing or take-off. This must be resisted until the instructor thinks best. I've seen guys try to get a beginner to make a runway landing on the first flight. Bad news!

The learning sequence I've found that works best is as follows:

(1) First flight: After all the preflighting and discussion that has gone on, I count the first flight a success if he just holds the transmitter while the plane is flying. Anything else he does that's correct is frosting. Most guys will accomplish more than this, but some will be overwhelmed that their creation is actually flying and they are controlling it. This flight usually gets most new pilots over the cold sweats, trembling and nervousness.

(2) Fly a big oval around the field. The pilot should be inside one end of the oval as shown in the diagram. If he is outside the oval then at some

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point as the plane approaches him he is going to have to make a switch to keep facing the same direction as the plane. This is a small problem, but one we can do without. By flying around himself he avoids it. This pattern will keep him from getting too far downwind. I've found the circular pattern to be less satisfactory as a mistake on the downwind side of the circle puts the airplane far away from the pilot in a hurry. If the beginner can't manage the somewhat sharper turn of the oval, go to a fat oval. If you must fly a circle, have the pilot stand just inside the downwind end of the circle.

For the pilot who has much difficulty, let him try flying the plane straight upwind. Then, take the transmitter back, bring the airplane around and set him up for another straight flight out.

(3) After left circles (ovals) have been mastered, do right circles, then figure eights. One thing that seems to give new pilots a lot of confidence is doing a loop. Somewhere between right circles and figure eights, try to get in a loop. Stand close, as to do a loop at low throttle he will have to dive a little. Some pilots will then snatch back on the stick resulting in much stress on the wing. Tell him to do it smoothly.

(4) The next big deal is the take-off. This is another great confidence builder. By now the pilot should have reasonable control of the airplane in the air and a little experience taxiing. The plane should be trimmed out pretty well by now and, unless it is a tail-dragger, a straight run and a touch of up elevator will be all that is needed to take-off. Your beginner may ask: How much up elevator? The answer is a little, and hold it. Again, stand close, as some pilots will keep hauling back on the stick. It helps to use something less than full throttle, unless the plane is marginal. After a few take-offs have been made, and controlled flight accomplished, it is time to think about landings.

(5) Landings. To a certain extent, landings can be practiced safely. The pilot does this by doing what I call "set-ups". That is, he flys the downwind and base legs, cuts throttle and glides in, **but at a safe altitude!** He then advances throttle, goes around and does it again. I like to start a pilot on set-ups as soon as he has resonable control of his aircraft. Here the pilot is practicing lining up with the runway and controlling the plane at glide. As he develops confidence with

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set-ups he can lower the altitude of the final until he gets an approach he likes. There's a tendency to rush this stage. He should practice a lot of set-ups and be content to land out in the weeds for a long time rather than push for that first runway landing. An important thing to remember in landings is to keep the wings level. Avoid low altitude turns unless a collision with something is eminent.

Some pilots will do better with the airplane approaching from one side of them rather than the other, so experiment if your field permits it. The pilot may find it helpful if a landmark is pointed out for his approaches, assuming he stands pretty much at the same spot for each landing: "When you turn onto final your plane should be over that clump of trees (house, telephone pole, whatever)".

In summary, probably the biggest mistake that a beginner makes is trying to fly his airplane alone. After that is:

(1) Keeping the wings level. Unless the wings are pretty level, any elevator command is just going to make things worse.

(2) Flying into the wind, and its companion sin; flying downwind. Caution the student he will have to hold a little down stick to fly into the wind. When the nose starts coming up tell him to push it back down by pushing away on the stick. The elevator should be used to keep the fuselage level. Practice upwind flight a lot, as the wind usually blows. I've seen many beginners who thought they were doing a creditable job of flying until it came time to fly back upwind.

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(3) No up elevator in turns. Without elevator you get a turn with a shallow dive. The beginner then usually gives up elevator to bring it up, but the plane instead goes into a tighter spiral dive. Panic. The pilot should have leveled the wings first, then applied up elevator.

(4) Not facing the same direction as the airplane. This usully leads to trouble or a crash.

(5) Impatience. Understandable. But the instructor usually knows when it is best to do take-offs, landings, maneuvers, etc. Once a pilot is into landings, he's on his own.

How long will it take to teach the RC beginner to fly? Of course, there's no pat answer. Usually between 8 and 12 lessons has a guy doing pretty good and doing some landings if he's got it together. □

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Okay, now push the tube, scoop end first, into the hole, from the inside of the hull. Push it

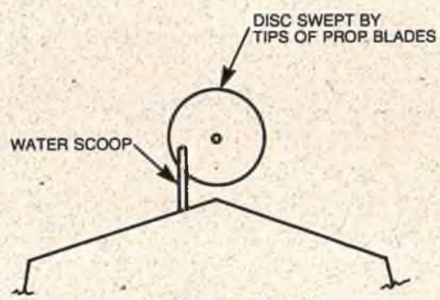

FIGURE 4

through until the hole, which should be facing forwards, is in the position shown in the diagram.

Mark the tube, take it out, and solder a washer onto it, so that it provides a firm seating for the glassfibre to hold onto.

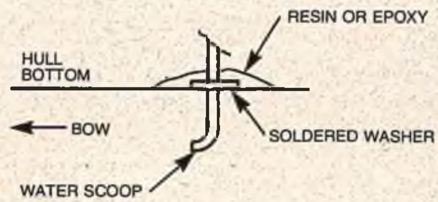

FIGURE 5

The next bit is pretty tricky, and I'll explain the reasoning behind it. A couple of years ago I was at a race, and I was doing pretty well, when sud-

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denly my boat started going round in ever-decreasing circles. Have you ever tried that? No control! When we eventually got it out of the water, I found that my nice, watertight radio compartment was full of water and so was my nice radio! It took some time to find out why. The answer was that I had made a water-scoop, and cut it off inside the radio compartment. It was connected to the engine, in the usual manner, by a piece of rubber tubing. Unfortunately, the tubing had a very small split in it, and this tiny leak, over a period of some fifteen minutes, had filled the compartment with water. You can guess that I was not very happy!

Since then I have always installed the water-scoop in such a way that there is brass tubing only in the radio compartment and, in fact, it is only the last couple of inches before the water jacket on the engine that synthetic tubing is used. Ever since, I've had no trouble with water in the radio. Now, this is a good point to remember: the more tubing, such as fuel tubing, that you have in a boat, the more chance there is that you are going to have trouble. All boats vibrate, and if that tubing gets half a chance to rub against something, and break, then you can bet your last glow plug that it will! So keep tubing runs as short as possible, and if they have to be long, then try to support them somewhere in the middle.

Now then, drill a hole in the bulkhead, right at the bottom and then start bending that piece of tube so that it goes into the hole in the bottom of the hull, and through the bulkhead, into the engine compartment. This is difficult to explain so take a look at the photo. This was why it was necessary to get that tube soft. OK? Now glass the whole thing into place.

Ideally, a correctly situated water-scoop should provide cooling water to the engine with the boat held in the water at a standstill. Take a look at the photo of my Gazelle, and you will see what I mean. I assure you there is no trick, no pump, just the prop forcing water through the system. If, when you put your boat in the water, it doesn't do the same thing, then take a pair of pliers, and bend that scoop until it does. But here's a warning; **don't ever** do this with the engine running. First you will damage the prop, and maybe the shaft as well and, in addition, there is a chance that you will either cut yourself, or a bit will fly off into your eye. So always stop that motor before doing this job. (I always have bits of advice like this handy. The boys tell me I am chicken — well, okay, but I am a live chicken, and what's more, I still have all my fingers and thumbs!)

Finally, the water has to be led out of the boat. For this, a water outlet is necessary, and this is simply a piece of brass tube, again with a washer soldered to it to provide a good hold for the glassfibre, and fixed to the side of the boat. Fix it as high up the side as you can, it helps a lot to see whether the water is coming out. A lot of engines get ruined because modelers don't check all the time to see that the cooling system is working. I do it automatically every time the boat comes past. And don't tell yourself, "Oh, the heck with it, I'll just drill a hole, and stick a piece of tubing through it — that'll be okay." Because it won't! I once did this, and the vibration gradually caused the tubing to slide through the hole, into the inside of the boat, and as it raced along, it happily filled itself up! So don't be be stupid, like me — fix it!

At this point I feel I should digress a bit. It is

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possible that some of you out there are saying, "Why does he keep on talking about racing boats. All I want to know is how to use my model on the pond on Sunday mornings — competitions are not my thing." Okay, now that's a fair comment, but let's take a closer look at that.

First of all, a question: Where did disc brakes on cars originate? Well, you all know the answer to that one — on racing cars. But you nearly all have disc brakes now, and yet few of you race! I race my boats in endurance events, and that means anything from thirty minutes to two hours, flat out. And that means about 17,000 rpm, all the time (I am one of those guys who doesn't understand the term "Slow", the left-hand stick is for stopping the boat at the end of the race!). Consequently, if there is anything to go wrong in the boat, believe me, it **will** go wrong. And most of those things that have gone wrong have been sorted out. Now you, over a year, can run up a lot of Sunday-morning hours, and things can go just as wrong. So why not use some racing methods — just like you do disc brakes — maybe you will experience less trouble on the pond. Practically everything that is applicable to racing boats is also good for ordinary sport boats, so why not take advantage?

It is a well-known fact, world-wide, that more plane enthusiasts fly for their own pleasure than in competitions. Now, this is understandable, since a plane moves in three dimensions. You can spend a heck of a lot of time, by yourself, just perfecting a loop, or a four-point slow roll, without getting fed up. I fly planes and choppers, and I never, ever, go to competitions with them. But boats are different — once you have been around the pond a few dozen times on your own, it can get pretty boring. The natural instinct, under these conditions, where the model only moves in two dimensions, is to find another guy with a boat, and to see whose boat can get round the pond the fastest. Thus, instant competition! My point is that the form of the hobby itself makes model boaters more inclined towards competitions than their airplane and helicopter counterparts. Or course, this is a lot less true of those people who build scale models, especially when they are powered by electric motors. Some time soon we'll have to take a look at the electric side of the game.

All right, let's get back to the boat, and leave the philosophy for now. The next thing to consider is the fuel tank. If you are a Sunday morning boater, then I would suggest that the best thing for you is an ordinary aircraft clunk tank, such as a Sullivan, — a big plastic one. The bigger the better, remember we are not too worried about weight in a boat. This should go in at the back of the engine compartment, and all you need to hold it are a couple of hooks glassed into the bottom of the hull, and a few rubber bands. Sure, they will rot in time, but if you change them every so often, you will have no trouble. I have been using them for years.

However, if you are going racing, or if you just fancy making the tank yourself, then here's how I go about it. First of all, take a good look at the space available, and then hunt around for a suitably sized tin. Make sure, though, that it is made of tin plate. Cut off the filler, and check that it will, in fact, fit into the boat, before you go any further.

Now make a hole in the middle of the top of the tin, and solder the whole filler spout onto it, around the hole. Next, put the tin on a block of

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wood, take a long household nail, put it down through the filler, and bang seven or eight holes in the bottom of the tin; keep them fairly close together — you'll see why in a minute. Now turn the tin over, take another tin lid — from another tin — and solder it onto the bottom, so that it covers the holes. This is the sump — the idea is that fuel from the main tank runs down from it, through the holes, into the sump. When the boat gets thrown about in the bends, the fuel will get washed to one side or the other of the tank, but the sump will remain full, so you won't get silly things happening like fuel starvation. All that's left to do now is to drill a hole in the side of this bottom lid, put a piece of small-bore brass tube in the hole, and solder it in place. And voila, one perfectly good tank for next to nothing. Don't forget, however, to drill a tiny hole in the filler lid, otherwise you will get a partial vacuum forming, and no fuel to the engine.

The only inconvenience with this type of tank is that it often goes from one side of the hull to the other — if you make it that big — and this can cause complications when it comes to fitting the accelerator pushrod to the engine. You can get around this by using Ny-Rods, Gold'n-Rods, snakes, or what-have-you. You can even use bellcranks if you desire. Now my own philosophy (there he goes again!) is that the simpler a boat is, the less there is to go wrong. So instead of going around the tank, by some complicated means, let's go through it. Yep, that's right, through it. It's dead easy. Work out exactly where your control rod has to go, cut a couple of holes in the front and the back of the tank, and solder into them a big diameter brass tube (I use 10mm). Now all you have to do is to run the control rod through the tube. Pretty simple, eh? And it has an added advantage - - - big metal tanks can add a lot to the noise of the boat, through drumming. This tube will cut down the drumming to quite an extent.

All that is left to do now is to fit the radio. And, here again, you had better sit down and do some heavy thinking. First of all, there are two possibilities — either you already have a set, so you fit that; or you are going to buy one. In that case, just what are you going to buy? One might, instinctively, and quite naturally, opt for a two channel outfit, since the basic needs in a boat are rudder and throttle. However, I would suggest that this is bad thinking and a false economy. I know, because I did exactly the same thing myself, and regretted it. Look at it this way. Okay, so you want to build boats. But who is to say that one day you might not get an urge to build a plane? In that case, there's not a lot you can do with two channels. And even if you stay with boats, you may get into the racing scene. One of the big things over here at the moment is a third servo, working the mixture control. This is great, when you really know what you are doing, because you can sometimes hit what we call the second tune on a resonator, and that is practically impossible to achieve without an "in-flight" mixture control. (And please, please don't ask me just what the second tune is, because first off I'll have Clarence Lee after my hide, telling me I am nuts and, secondly, I really don't know what it is! All I can say is that a motor running on the pipe, very occasionally, will suddenly hit some sort of harmonic of the base frequency, and then, oh boy, watch out, it really smokes! I know it exists, I have heard it myself a couple of times, but what it is, where it comes from and why, are another matter. Perhaps some expert in the field could tell

ANSWERS TO SEPTEMBER PUZZLE

```
  K       L O A D         R
D I C K       I           A
  D     S     R   R A C I N G   S
  D     T           T     D     T
        I         S       O     R
        C     S L O P E   M     I
C H I C K E N     A     V   C A P
                  R     A
S L I M   R       I     L
  I   U   E       N     V       S
  N   F   A       G   N E E D L E
  E   F   D                     T
      L   E X C H A N G E   C   T
      E   R                 Y   I
      R   S   B U D D Y     C   N
  P   S       O             L   G
  L           X       S U P E R
C A T A L O G     T
  N               A       B
                  N       E
          C L U N K       R
                          G O L D
```

AUGUST PUZZLE WINNERS

James Jensen	Don Sektnan	Barry Wilson	Nina Thienes
Bill Metcalf	Harry Schremp	Gary Fisher	Howard Crispin Jr.
Jack Lichtenberg	Chris Johnson	Roger Deicher	Dave Dibble
Keith Voelker	Herbert Boehm	Ron Brown	Percy Rogerson
Richard A. Jones	Richard Davis	Bob Engel	J.R. Fleet
1Lt. H. Norckauer Jr.	John Dankievitch	Howard Sears	Lee Held
Anthony Saponara	Richard Endress	Gary Burson	Richard C. Jones
Judith Cooper	David Whitaker	E.J. Toth	Zainal A. Ismail
John Pratt Sr.	Diane Ratcliffe	Bill Bara	Jerry Voth
David Hamlin	Patrick Mullarky	Duncan Stone	John Hultz
E. S. Hinckley	Jerry Asfazadour	Cecil Gallant	Donald Wold
Gary Westfall	Glenn Richardson	R. Wood	James McCord

Flying Near Airports? Be Careful!

Free Flight or Radio Control flying near airports, or in any situation which might involve the possibility of models being in the vicinity of full-scale aircraft operations, must be avoided—or conducted so as to eliminate any dangerous situations. Models should not be flown in the proximity of full-scale aircraft operations unless the flyer has someone else with him for the sole purpose of watching for full-scale aircraft and supervising the flying so as to prevent accident possibilities.

us.) But, quite apart from this, it is a very useful control.

My own opinion is that it is always best to go straight for a four channel outfit. Supposing you buy a two, and then you want to fly? What happens? Well, either you have to trade in your old set for a four, or you just have to go out and buy it, and keep the old one. Either way, that's money you could have spent on the hypothetical plane kit and engine.

Supposing that the radio is on hand, you now have to decide how you are going to mount it, and there is more to this than meets the eye. Sure, it's pretty easy to use a conventional set-up, but in that case, if you have a second boat, it takes an awful long time to change over from one boat to the other. There is another way, which is ten times quicker and easier although, as with everything, there are a couple of snags. You just have to examine the options and make your choice.

First of all we'll talk about the good old tradional way of installing the radio, assuming that we have just two servos, and then we'll have a look at the quick change method — but we'll do them both next time, so that you can compare more easily.

Tip Tail:

This is pretty old stuff, but since there may be some new readers around (I certainly hope so, otherwise here's one budding writing career going bust!), and since some of you may have forgotten, here it is again. A lot of people, when they want to bring their boat in after a run, particularly when they are by themselves, with no helper around, cause the boat a lot of damage at the last moment. This is because they bring the model in at right angles to the shore. You should never do this, but always come in parallel to it, or at a very shallow angle. Here's the thinking: if you come in at right angles, maybe a bit too fast, you only get one bite at the cherry. Muff it, and it's too late, your boat will hit the side, and maybe if you were going fast enough, get quite badly damaged. If you come in almost parallel, you grab for the boat and, if you miss it, it is quite easy to go around. Try this: throttle back, and come in from your right. (Develop the habit of always coming in from the same side.) Now, assuming you are right-handed, hold the transmitter in one hand, with your thumb HOOKED round the stick. Lean out as if to grab the boat, but deliberately miss it. At the same time, put some pressure on the stick with your thumb. The boat will immediately turn out towards open water, and there's no harm done. Practice this a few times and it soon becomes automatic, and then there will be no tears when you miss the catch.

See you next time round! □

RACING AT RANDOM

from page 69/68

. . . to the race.

Take a good look at the flight boxes of the more consistent racers. Notice what they carry and how accessible everything is. Copy or steal what you think are the better ideas and features of their equipment and go out and build yourself a flight box that helps you do the things you find important at the line.

* *

We have received numerous inquiries as to the status of 1/4 Midgets and if we are noticing a decline in entries in Southern California, as other areas of the country are experiencing.

Southern California, along with some other areas, have adopted what is commonly known as the $60.00 engine rule. For the first time in R/C racing history, the modeler has set a maximum

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RACING AT RANDOM

from page 140/68

retail selling price limit on the engine to be used in Quarter Midgets. Any engine that has a suggested retail selling price of over $60.00 cannot be used in this event. The areas that have adopted the rule have maintained a constant entry rate or have shown a definite growth factor.

Quarter Midgets were originated as a low cost, low key racing event by RCM, due to the increased cost and sophistication of Formula I which was out of reach for the average modeler. So, with an OS or Enya 15, and a Cassutt or Spirit of St. Louis, you could go out and race under the original concepts created by Chuck Cunningham.

As the interest grew, so did the urge to go faster and, as the speeds went higher due to the introduction of new engines, so did the price tag, to a point where the $15.00 .15 was now $100.00. At this point, the modeler said, "That's it," and the $60.00 limit came into being.

The next question is does this rule have any effect? The answer is yes, because the existing engines that had prices over the $60.00 mark are now $59.95 and the new engines coming on the market are also priced at $59.95.

The next question arising is what does $60.00 mean? Example: You could take a basic X15 Super Tigre, Rossi, or Cox .15 and add a super dooper carb made by John Doe at $19.95 because it ups the rpm 500, then add a new improved head design at $14.95. Or, how about an ABC sleeve and piston at $35.00? And, don't forget a special blueprint job for $50.00. And now you have a $60.00 engine that costs $185.00. We feel that $60.00 means $60.00. The way it comes from the original manufacturer of the engine is the way you run it. Quarter Midget's success was due to its vast difference between it and Formula I. When the two get closer together, both in cost and speed, you have two events and two **similar** events are not needed. The two should be definitely separated just like Church and State.

We feel that the NMPRA, with George Zink as head of the 1/4 Midget section, and Ron Schor as President, are the answer to maintaining the separation that is required to maintain two separate events with the same common objective of racing, but with different levels of sophistication and cost which is why Quarter Midget originated.

FORMULA 500 SCENE

The "Quicker F500" model, a relatively new entrant in F500 competition, has accumulated an impressive string of wins since its introduction in mid-1975, and has won in all 1976 contests in Southern California to date, thereby earning its name honestly. Pilots Mike Charles, Tony Lopez, and Don Bellew have each accumulated several first place trophies competing with this new design. The pilots report exceptional control characteristics throughout the course and speed range flown. According to the designer and manufacturer, Kreidel Engineering, the speed achieved by the "Quicker F500" is due to wing design and construction, as well as attention to force arrangement and clean lines. **Its ease of control has also interested the sport flyer as many are appearing at sport flying sites.** The kit features pre-fabricated balsa parts and foam core wings with 100% sheeting supplied. Plans are very complete and with excellent instructions. It is available from Kreidel Engineering, P.O. Box 1783, Whittier, California 90603 or see your local dealer. Price, less wheel pants kit, is $38.75 plus shipping. California residents add 6% sales tax. □

from page 66

. . . . lower the kids, the lower the points! They've turned to racing where the first airplane across the finish line wins! The kids are getting closer and closer to the top in Formula I racing in the Southeast and at the Nationals. They are practically terrors to beat at Fun Fly events. They are remembered in the Northeast and each has won a batch of trophies in the Florida area where there is competition nearly every week of the year. Much of their success is due to Mode I transmitters.

A great many beginning modelers do say "oh, I'm just gonna' be a sport flyer, the transmitter mode doesn't matter to me", **wrong! it does matter.** There are those who simply cannot coordinate well and easily, smoothly and precisely, their right hand's thumb to simultaneously control both roll and pitch of an R/C model airplane.

If you are currently starting to learn to fly and are experiencing the above problem of simultaneous control on one thumb, **be rational and examine your own abilities and your own progress up the learning curve.** If you are not climbing the curve with self-confidence and progress, on either Mode I or Mode II consider a change to the other mode **right away.** Choice of Mode I versus Mode II is a highly preferential subject for argument whenever the subject is raised with modelers. If your instructor is teaching you to fly Mode II (roll and pitch controls both on the right hand stick) and you don't feel "comfortable", don't be ashamed to quietly find a Mode I flyer and ask him for a brief lesson while his ship is in the air.

This writer feels that very many of the best R/C flyers . . . those who learn the fastest and progress best up the learning curve, are Mode I pilots. The most demanding flying is found on the pylon racing courses, where many Mode I flyers excel.

If you're learning to fly R/C, the intent of this article is to get you to consider learning on Mode I if you are uncomfortable with Mode II, or still better, my teaching experience says you should start learning to fly on Mode I from the beginning.

Mode II is ideal if you wish to envision yourself in the cockpit of a Piper Cub or P-51 . . . but this author believes Mode I is the way to become the **best** Sunday flyer, the **best** sport flyer, the **best** glider flyer, the **best** pattern flyer, the **best** pylon pilot.

If you are lerning to fly an R/C model that has rudder, elevator and throttle (no ailerons) with Mode I, the rudder should be controlled by the left-and-right action of the right-hand stick; the elevator should be controlled by the front-and-back action of the left-hand stick, throttle control

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PAT YOUR HEAD . . .

from page 146/66

will be front-and back action of the right-hand stick, and the left-and-right action of the left-hand stick will not be used. When you progress to ailerons, you simply plug in your aileron servo where your rudder servo was plugged in, and plug in your rudder servo so that your left thumb, moving left-and-right, controls the rudder.

Single stick transmitters are for those few flyers who wish to pat their head, rub their belly and scratch their back . . . **simultaneously!**

Reasons For Flying Mode I Transmitters, Rather Than Mode II

(1) There is no unwanted interaction between the roll and pitch axis while flying.

(2) If you're left handed, no further explanation is needed!

(3) You can hold a slight amount of "up" elevator in your model for safer hand-launches.

(4) You can hold a definite precise amount of "up" elevator in your model while landing — and the right stick can be worked as needed to keep the wings level.

(5) You can put in a "fixed amount" of aileron control to accomplish successive rolls while elevator is gently worked up and down to maintain constant altitude — often results in smoother rolls.

(6) Nervous, uncordinated people (includes many excellent modelers who fly only R/C gliders) can only foul up one control axis at a time.

(7) I always comes before II — algebraic

theorem.

Name Dropping

The following people are accomplished Mode I flyers. Several of the below named people are **very** skilled pilots of **real full-size airplanes**..

Albert Tuttle, the finest flyer on the island of Maui, Hawaii.

Phil Kraft, California, a manufacturer of a well-known brand of radio control systems for modelers.

Bob Violet, Md, international winner of pylon racing competition and innovator in RC design.

Jim Whitley, Alabama, top winner for years in serious pattern flying.

Greg Doe, North Carolina, builder of top appearance models at Toledo shows and major winner of top appearance points for Formula I racers . . . and a consistent winner in R/C racing. Youthful.

D.C. May, Georgia, one of the truly grand men of the hobby who has taught and fostered youth to learn and enjoy model aviation. A fierce competitor on the race course.

Johnny McDermott, North Carolina . . . the fastest guy in the sky at the 1975 Nationals with the trophy to prove it, plus many other significant wins. Tremendous flyer. Youthful.

Bob Brogdon, Georgia, holder of current control-line speed record and major threat around the Formula I circuit. Youthful.

Butch Schroeder, New York, fine sportsman and competitor. Youthful. His dad publishes a major model magazine.

Dr. Ralph Leidner, Florida, flies serious pattern, as well as racers.

. . . and on and on and on . . . ☐

SOARING

from page 64

should produce some new champions. Building designs and innovations have been tried and Winter building will soon begin. Let me know what to look forward to by sending pictures and sketches of your ships to RCM — We read them all!

I will attempt to publish contest and dates and any pertinent information sent in. The deciding factor is the timing; all dates and places of contests must be sent in minimum of 90 days in advance. As much information will be published as space allows. Also, don't forget to share your soaring hints and kinks with RCM's soaring enthusiasts.

Good lift. □

SUNDAY FLIER

from page 61/60

— shaped leading edge and trailing edge, with capstrips on the ribs, and spars with a shear web. If you've built a Windward, Windfree, Monterey, or any of the designs with built-up wings, you know how they go together. Just adapt it to your purpose.

So you now have four panels which, when joined together, give you the 10' wing. In the front view of the wing, I've shown a simple polyhedral arrangement that will give good lateral stability and very good rudder response to turn in those thermal currents. Also, since the wing isn't tapered, the tendency for wing tip stall is very small. The important thing to watch is that the wing doesn't twist **down** at the trailing edge tip. If there is a slight upward twist, or washout, and it is uniform on both wing tips, that's okay, but keep it to 1/4" or less.

But, "that's your design," you say. All right — here's what you do — change the ratio of the span to the chord, anywhere from 12:1 to 18:1. Taper the tip panels a bit, not too much, or tip stall becomes a problem — say from 8" down to maybe 7" or 6". You decide. And, now it's **your** design.

Not a bad looking wing, eh? But it needs a stabilizer, so it won't just rotate and float to the ground (yes, it would produce lift when doing that, due to what is called the "Magnus" effect — and we'll have an article on that subject in RCM soon). And, what size stabilizer surface should you use? And, what shape?

Take another look at some current designs. Most stabilizers are tapered - - - some uniform, some forward, some back. Do they have to be? No. That's the designer's choice. Why not make it simple — just a rectangular planform, with an aspect ratio of about four or five to one, and with a total area of about 15% of the wing area. How does that work out on our ten footer? Let's see, 120" x 8" gives 960 square inches, and 15% of that is 144 square inches. Hey — that makes a nice rectangle, 24" x 6". You could use a fixed stab of 24" x 4" with movable elevators 24" x 2". Looks about right, doesn't it? Want to give it your own touch? Make it a bit larger and the stability will improve — or a bit smaller and the stability will decrease a bit, but the controllability will increase. Just keep it somewhere in the 12%-17% range and you won't go wrong.

Next - - - how far back from the wing should the stabilizer be? Without going into a long discussion of the reasons, make the distance from the center of the wing chord to the center of the stabilizer chord equal to about three times the wing chord, maybe three and one half times, or somewhere in-between. You can make it less than three times, and that will increase the longitudinal sensitivity — or more, and the sensitivity will decrease. Pick your own figure, say three and a fifth, and then it's your design, not mine. (See Figure 2.)

Finally, insofar as flying surfaces are concerned, we come to the vertical fin and rudder area. The total area of the two should run in the neighborhood of 7%-10% of the wing area — and for good rudder control, about 2/3 of the vertical area should be in the rudder. Shape? Design it yourself. As a basic shape, take a rectangle twice as high as it is wide and go from there. Taper it, or round off the top, or scallop the trailing edge, whatever turns you on. For our 10' basic design, the vertical area could be from 70 to 100 square inches — say 90. About 8" wide and 11" high, or so. If the rudder was 5" wide, and you'd have 55 square inches of rudder — more than enough to keep a tight circle in a thermal. Or, make a sharp turn for a spot landing (but don't drag a wingtip).

So much for the flying surfaces. Now you need a fuselage to hold them all together, and at the proper angles.

The length of the fuselage, from the wing back to the tail, has already been set due to the needed distance from the wing to the stabilizer. How about from the wing forward to the nose? Long nose, or short nose? Well, a short nose doesn't resist a turning moment as much, and you can thus have a smaller vertical fin and rudder area, but because it is short, the ballast you'll need to balance the plane is greater. The longer nose seems to give smoother turns, and needs less ballast, but also needs a bit more rudder action to initiate the turn. If you'll look at an average kit design, the nose of the fuselage, ahead of the wing, is about equal to one-and-one-half times the chord of the wing. Take your pick, and vary the size of the vertical fin and rudder slightly to suit your choice — longer is larger, shorter is smaller. But not too critical when you stay within the sizes described earlier.

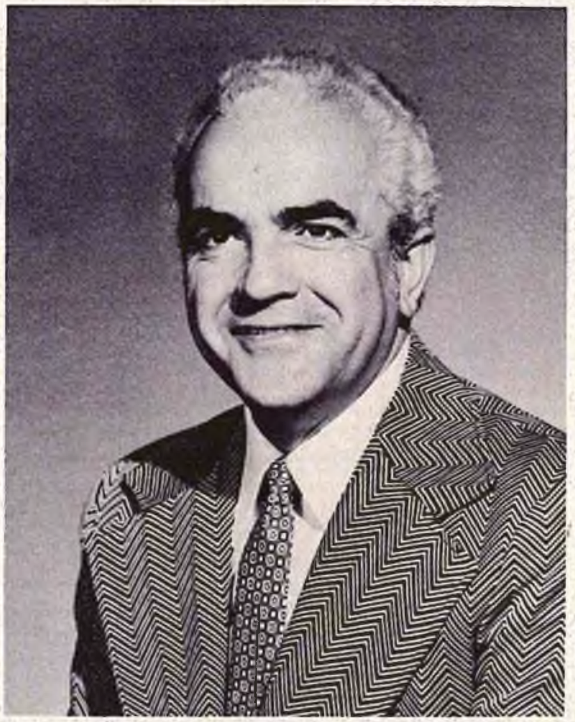
The shape of the fuselage is generally long and slim, with the "pod-and-boom" as a variation. Droop it or swoop it, drape it or shape it; just keep it reasonably streamlined, and hold the flying surfaces in the right place.

To establish the proper angular settings of the wing and the stabilizer to your theoretical line of flight, draw a straight line from the nose to the tail, just about along the centerline of your fuselage. Now draw a line that slants forward and up at a 2° angle from your reference line. The flat bottom of the wing airfoil should be located parallel to that 2° line, and the flat bottom of the stabilizer should be parallel to the reference line.

As for the placement of the wing and stabilizer on the fuselage, the usual arrangement is for the wing to be either mid-way up from the bottom or higher — one design that appeared some time ago even had the wing on a pylon above the fuselage. Hardly worth the effort — but if you want a conversation piece, that'll do it. And it is efficient.

Stabilizer location also varies — all the way from the bottom of the tail end of the fuselage to the rather widely used "T" tail, where the stabilizer is on the top of the fin. Somebody, I forget who it was, once wrote that for thermal sailplanes, the best location is the "chicken-T" arrangement where the stabilizer is about 1/3rd of the way up the fin area above the fuselage. I use it;

In Memorial



ROMANO GARABELLO

On July 12, 1976 the modeling fraternity suffered a sad loss with the death of Romano Garabello of Rhom Products Mfg. Ro, as he was known to us who had the good fortune of personally knowing him, was born in Torino, Italy on October 16, 1922. He came to the United States in 1949, got married, and started raising a family and building models. His first business venture was a successful company known as S & G Avionics where he manufactured parts for full scale aircraft and helicopters. His interest in RC flying led him to many experiments in the modeling field. He designed and built a scaled down turbojet engine model that was a masterpiece of engineering. His Rom-Aire retracts are now used universally in all kinds of model planes. His active mind was a treasure trove of ideas related to model flying. When he built a sport ship, it was always comparable to the finest scale ships we see entered in competition. He was also a very accomplished flyer. He shall be sorely missed and not soon forgotten.

Ro is survived by a wife, a son, and two daughters. Rom-Aire International and Rhom Products Manufacturing will continue as a living memorial to his genius.

works fine for me. So does another design with the stabilizer on top of the fuselage. For your design, put it where you like the looks — it'll work.

To get the right balance for your design, ballast the nose so that when you lift the plane and suspend it from a point about 1/3 of the chord back from the leading edge of the wing, the fuselage hangs level. It may not be in perfect balance at that point, but it'll be so close that slight trim adjustments will be all you'll need.

Build it strong; use a good grade of balsa throughout, and spruce spars — at least in the two center panels of the wing. You could even use plywood in the nose and forward part of the fuselage — you'll need the weight, and ballast doesn't do a thing for the strength of the model. Steal a couple of ideas from kit construction if you see some that add strength. In the end, you'll probably wind up with a model that weighs about 1/2 pound for each square foot of wing area — and that's a good round number to shoot for.

And now I've told you all you need to know for good aerodynamic design of a thermal glider. So get out your drawing board, lay out your design, and build it. Then go fly it, and after you've trimmed it out and practiced a bit, enter your club contest.

You're bound to be a winner. □

CYANOACRYLATES

from page 59/56

. . . the joint. This procedure has proven to provide repairs that are stronger than the original construction, due to the fact that the jagged edges provide much greater adhesive surface then was available during construction.

Information from Doubting Thomases has proven to be abundant. We have found the following to be of no concern. Vibration has no effect on glue joints. CA glue lines are so thin that vibration can easily be absorbed into the wood itself and not concentrated at a fillet area as with conventional adhesives. Does sunlight age the adhesive? The answer to that is no, not to any degree that would be noticeable in our hobby. Does moisture effect the joint? We have found it doesn't. In fact, Pacer Industries informs us that test joints, fully immersed in water and cycled in high humidity heat ovens, have only reduced adhesive strength 15% over a period of months of testing. Tests were run on materials used by the average modeler. Is it resistant to chemicals? It is equal to, if not higher than, most conventional adhesives.

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CYANOACRYLATES

from page 152/56

While our experience has shown CA to have a very definite place in hobby construction, let's pause for a minute and reflect on what are the desirable and undesirable characteristics. The curing mechanism of CA is non-solvent oriented so it will harden with or without exposure to air. It is colorless. Extremely light joints can be accomplished with maximum strength. Closely mated parts can be instantly bonded and instantly sanded. The almost invisible glue joint does have a significant psychological effect; in that what you can't see, you don't necessarily believe. But prove it to yourself by experimenting with wood joints and test them to failure. The major undesirable characteristic of CA is its inability to fill gaps or voids such as can be accomplished with conventional adhesives (epoxies — white glues). If intimate mating cannot be accomplished and CA is desired for use, the gap should be filled with a suitable material such as talcum powder or balsa sanding dust. We have used ZAP-A-GAP and found it very convenient. When any of these void fillers are used they must be put in place prior to the application of CA. CA is undesirable when bonding end grain on heavy plywood such as is used in firewalls, the reason being that the CA is absorbed by the inner-laminates of the plywood at such a rate that it can not cure. On highly stressed joint areas, tacking with CA is practical, however, fillets of epoxy or white glue should be used. In some applications, such as laminating of other large adhesive areas, CA's are not economically feasible. However, they can be used to hold substrates in place while other adhesives cure. We have never noticed a negative effect when CA has come into contact with other adhesives.

Many chemicals found in the home and workshop have warning labels: bleaches, insecticides, epoxies, paints, and solvents. CA's also have a warning label. Like all warning labels, they are for your protection. Please read them and heed what they say. CA, as it states in the warning, is an eye irritant. This does not mean that it can cause permanent eye damage, but that it can cause severe eye irritation. CA will bond skin tissue instantly. Caution should be taken to use protective creams on the hands or plastic gloves. Vapors created during polymerization can cause discomfort when inhaled. Use in a well ventilated area. If a situation should occur where skin tissue is bonded, remain calm, do not use sharp instruments to separate. Natural skin oils will eventually cause release. If CA is exposed to the eye, relax and after a few minutes slowly release the lid. Do not use solvents or sharp instruments around the eye. Rinse eye generously with water. See a physician, if you deem it is necessary. Precautions with any chemicals in your home or shop are necessary. These materials are not to be feared but respected. □

INSTALLING NYLON HINGES

from page 53

.... a scribed line on which it bends. This scribed line needs to be lined up very carefully so that all hinges in each surface are in the same line. One needs to drill holes also in these for glue adhesion. The Robart type, I find very useful, especially for scale type hinging when the pivot is situated well into the movable surface. (Figure 7.)

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INSTALLING NYLON HINGES

from page 154/53

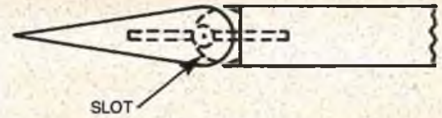

FIGURE 7

With these hinges, a rounded edge can be used for the movable surface and even a shroud can be incorporated on the fixed surface. Installation of these hinges is easy as only a hole need be drilled. Lining up is more of a problem though if the hinge is inset into the control surface. As there is only one nylon pivot in each hinge, it is wise to increase the number of hinges in each surface. □

CHEETAH

from page 52/49

. . . the engine compartment, tank compartment, and engine-tank hatch with Formula II Hobbypoxy for fuel-proofing. Cut out the engine spacer from 3/32" plywood and fuel-proof as above.

Make your fillets for the wing, stab, and rudder, using micro-balloons and primer resin, then go over the entire model and fill any dents that might remain. Now do your thing with the sandpaper all over and apply your favorite finish. I used surfacing resin (not on Mylar) and K & B Superpoxy white all over, then applied Solarfilm trim and decals from the AMA. From experience, I can recommend not using white because this little screamer is hard to keep up with if painted a light color.

Install your hinges and seal the gap in the ailerons with a strip of Solarfilm or MonoKote. It's surprising what a difference sealing the gap makes and is very important with this design. Install a standard length CG control horn on the elevator and install your radio.

Now comes the really good part that makes it all worthwhile — flying. Pick a calm day and grab the best flyer in your club. On second thought, if he's seen your Cheetah, he probably has already volunteered. Make sure your control throws are tamed down to 1/4 inch total. Fill the tank only half full (with no throttle, you can't abort if you get in trouble), fire up that little toy engine, and launch Cheetah into the blue where it really lives. Now, walk back to your hot dog pilot and listen to him tell you your Cheetah "flys as good as it looks." Reset the linkages to neutral trim and fly it yourself this time. Make the hot dog test pilot build his own Cheetah, or else he'll be constantly asking to fly yours!

Cheetah has no bad habits, other than overshooting the runway on landing because it just doesn't want to come back to earth. There seems to be no tendency to snap roll and a flared landing results in its taking off again to further overshoot the runway. Perhaps it's unfair to compare this plane to a .60 pattern ship, but that's its closest relative. Vertical climbs run out of steam, understandably and there is no rudder or throttle to drive around the runway like an R/C car, but in all other respects, Cheetah equals its big brothers in terms of eye appeal and performance.

In my airplane factory (spare bedroom) there is now a Cheetah X1.5. It is one and a half times the size of the original Cheetah with room for a .40 and retracts. The fuselage is molded glass and the wing will be foam with glass skin.

If it's as good as the small one, it'll be a winner! □

SCALE WORLD CHAMPIONSHIPS

from page 48/39

FAI SCALE MODEL WORLD CHAMPIONSHIPS 1976 DALARNA SWEDEN

. . . came with their '74 models experienced the same results.

One of the most interesting flying machines in the contest was a Witman D 12 "Bonzo". Most people did not think that this queer looking thing could fly well, but it did. So well, in fact, that Robert L. Underwood of St. Louis, Missouri, captured eleventh place with it.

Stephen J. Sauger from Troy, Michigan, had some bad luck with his very fine model of the Stinson Flying Station Wagon (1948). He received very high static points but shortly after take-off on his first flight, he developed engine trouble and subsequently damaged his model. Sauger did not give up, however. He stayed up till 4 o'clock that morning repairing his aircraft. Maybe the worst problem was to get a new matching color but finally Stephen, who is a designer with the Chrysler Corp., got the right color from a Volvo spray. That's cooperation between car companies! Anyway, Stephen's bad luck did not give up, either, and he had troubles even during the second flight but finally earned some medium-good points so that he ended up as number 14 (out of 25 competitors).

In control line, Michael D. Gretz of Montezuma, Iowa, who works for Sig Mfg., was fifth with his model of the Zlin 526 A Akrobat. By the way, Michael was not the only one with a Zlin Akrobat — Victor Willson from the United Kingdom had one, also. Of the two, Gretz received the highest static points. Ralph Burnstine was eighth and Cathy Burnstine thirteenth out of a field of 14 competitors.

The Finest Models . . .

In radio control, the finest aircraft were the ones fielded by the English team. All three members of the team were among the top ten in the static judging. The highest points of all were awarded to David Vaughen for his model of C.A. Wirraway A20-10. The specialty of the English models are the realistic weather-beaten finishes.

"Look at David's model for instance," said proud Team Manager, Edward Mellish, "it is painted with ordinary Humbrol paint — but not directly out of the can! To get the exact color after the fuel-proofer, David made a lot of experiments in mixing the original colors. And it is not enough to have the right color, the paint should also be worn-out exactly as it is on the old war bird!"

The high scale points for David's model also came from functioning lights, fuel, and battery connections with scale-like couplings, etc. The only thing that was not home-made were the main wheels. David ended up in third place overall.

Eventually, another Englishman succeeded better, as Brian Taylor took second with his model of the Vultee BT-13A "Valiant" after good flying and fourth in best scale points. Brian unfortunately damaged his model very badly during his last flight.

Bad Luck For Carl From The USSR

For the first time ever, a Russian took part in a Scale World Championship and the interest was high in seeing what he had to field. The interest increased further when one realized that the 37-year-old engineer, Carl Plotzinsch, came with a model of the jet trainer Aero L-39. How had he solved his jet engine problems? And how well did the model fly?

"I have an old modified Rossi .60 engine," said Carl, "not the new Schneurle-type, and a ducted fan. The fan, itself, is built-in in the rear of the fuselage and is connected to the engine with a long shaft. This shaft goes through two bearings. I use 70% nitro in my fuel."

Carl was awarded very high static points for his model — in fact he was fifth. But, in the flying portion, he did not fare so well. During the first flight he took off after a very long run, only to find that the power was not enough for the aircraft to climb higher. Carl tried to turn back to the runway but the model stalled, crashed, and as a result was damaged very badly. That almost totally written-off model was in flying condition again through expert round the clock work two days later! Everybody tried to help Carl with material, labor, and so on. During his second flight, the engine stopped while taxiing and, during a test flight the same evening, the model finally crashed. Carl and his model were worth a better destiny than that.

The Russian team as a whole won the control line event anyway (as usual).

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SCALE WORLD CHAMPIONSHIPS

from page 159/39

Two Other Competitions . . .

The first international helicopter competiton was announced but this ended up as only a contest between Sweden and West Germany. Mannfred Heid from BRD, who is a test pilot with the Kavan Company, won that competition with his Kavan Bell Jet Ranger.

The international Stand-Off competition gathered more people but only from Europe. Fred C. Coulson, from the UK, won with his model of Curtiss Hawk P-36A.

There was one model of special technical interest in the Stand-Off contest. The P-51 Mustang by Arvid Holmbom from Sweden had a functioning landing gear that was driven by compressed air. This system derived its power from the engine and, with a special arrangement with valves, the wheels and landing wheel covers were shut and opened in the right order.

Too Many Crashes

Beginning on the first day there were three crashes and, during the rest of the week, there were many other models that were more or less damaged. What conclusions can one draw from that?

First, too many have obviously too little flying experience with their models. Many had hardly dared to test fly their model before the contest for fear they might destroy something. This last item is understandable in view of how many hours of construction there is behind every model. Most models have taken some thousand hours or more to construct. That is one year's full-time work that can be destroyed in a single moment! In other words, every model would have costed at least $10,0000.00 if you had hired someone to do the work!

But the Scale World Championship consists of two parts, one static judging and one flying. And it is a unique combination to be good in both, and the Champion is the one who is best overall. That means that high static points do not help if you cannot fly the model.

In one way it is understandable if the Stand-Off contests become more popular. With adequate rules there is a chance that the models are less costly and that the flyers dare to practice more.

But one thing is for sure, looking at the models in the World Scale Championship starts your dreams of making a model of this kind. The only question that remains, is how do you find the time to do it? □

GUPPY

from page 29/25

the 1/4" firewall F1, plywood tank floor, 3/32" plywood brace F1A and the 3/32" forward cabin bulkhead F2. It is well to mention that the accuracy of cutting out and assembling these parts will have a lot to do with the trueness of the fuselage as a unit.

While the unit is drying we can go on with the cutting out of the remainder of the fuselage parts. 3/32" doublers are used as indicated on the plan and one is wise to stay with epoxy or contact cement when applying these to the fuselage sides. I didn't, due to a mental lapse, and ended up with sides that resembled propellers! Aliphatics have their place but applying doublers is not one of them.

Once the forward section is completely dry, assemble this section and F3 with the fuselage sides so that we end up with a very boxy unit that is easily checked with a square. Again, trueness cannot be overstressed. With everything true you will have a model that will literally fly from the building board. Do not attempt to pull the sides into contact with F1 at this time.

Our next step is installing the landing gear portion of Guppy. Of all the areas that I feel this model shines, its landing gear is one of the high points. Standard in every respect, it is, I feel, why one can brutalize this model and have it come back for more. Constructed of 3 pieces of 1/8" 5 ply plywood in the base and 8 pieces of 1/8" 5 ply plywood as brace and socket material, it is built to last. The photos will take care of the 1000 words better than I, so I'll leave this area to the builder. One word of caution: Drill the socket holes slightly oversize. Smear epoxy in the holes then press in and twirl a piece of 5/32" L.G. wire. This will coat and strengthen the sockets. Remember to remove the wire twirler!

The 5/32" landing gear wire is a must as 1/8" material is just too light. A wire bender helps a lot here as 5/32" wire is anything but easy on which to make 90° bends. This was my first experience with a friend's borrowed unit and the way it does a radius bend is something to see.

The fuelage bottom between F2 and F3 should now be sheeted with 3/32" cross grain. This will insure a square structure once the fuselage sides are pulled together at the rear. The fuselage sides are now glued to F1 using masking tape to insure positive contact.

A word of explanation may be helpful on the windscreen. Once the fuselage portion is complete, place a piece of Saran Wrap over the front portion of the cabin compartment. Tape the wing in place and glue plywood Former WS to the underside of the wing. The Former WS1 used to fair the wing portion of the windscreen into the fuselage portion is an approximate fit only. Once a fit is achieved, cut out the required number from 3/32" and 1/2" sheet. Glue in place and apply the required sheeting. Sand to a smooth transition line.

From here on the plans and photos should be self-explanatory.

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GUPPY

from page 164/29

Stab & Rudder

The tail feathers for the bird are a source of some controversy. Units have been built without the anti-warp members and some did not warp. Perhaps to shorten the discussion, I'll say that none using the extra material warped. So we'll leave it to the builder. Perhaps to help you make up your mind, let me say that a tail heavy Guppy has never been built.

A word on the stabilizer main spar. The unit is made up of two pieces of very hard 1/16" x 1/2" balsa with a center core of soft 1/8" balsa. This produces a light springy spar that can take abuse.

Covering

Covering can be of any of the available materials. The structure is quite strong enough to weather the worst, using the plastic films, although I prefer silk and dope.

Radio Installation

Installation of radio gear, while mentioned here, should be 100% completed long before the covering stage is reached. Keep it low as Guppy was never intended to do rolls and, when you have that low C.G., you'll get out of problems where others would never have a chance.

Flying

Flying this model is a ball. There very quickly develops a rapport between Guppy and the pilot that is an experience. From the moment that you increase the throttle, this bird is a joy. Heavy on the power and it leaps out. Go the gentle route and it floats off. Control is positive at all times.

Normal takeoff routine calls for about 10 to 15% flap and full power. At about 100 feet of altitude flaps up, a slight bit of up elevator and let it pull away.

Normal landings call for full flap. Feed it in all at the same time **after** cutting your power to full idle. Normal landing routines call for a very steep descent (60° to 75°) with a gentle flare out and touch down controlled by elevator only.

One can go for a more gradual descent using full flaps but in this case your control is with the motor only. Try using elevator when Guppy is on a slow approach and you'll have a very red face! She just stops flying and sits down.

In windy weather flaps should be treated with respect. Normal take-off routines call for no flaps until you have had time to become properly acquainted with one another. Too much wind and flaps on take-off and she'll back over your head leaving you at the tender mercy of your peers as you try to figure out what you did wrong.

Guppy is a fun plane, which is what it's all about. Take her out on a quiet summer evening and come home completely at peace with the world. Go to a fun fly against some pretty hot material and bring home hardware. Events like E.T.A. and spot landings are a natural.

Guppy is fun. □

RADIO SPECTRUM

from page 18/16

I'm not sure I agree that we have a problem with the receiver detector and pulse circuits detecting the R.F. without regard for the path through the I.F. amplifiers. I admit that I have suspected this, but tests I've run indicate the close-up problems are cross modulation and intermodulation of signals picked up on the an-

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RADIO SPECTRUM

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tenna. Cross modulation is probably the most severe and is caused by non-linearities in the front end. Once you have generated the interference in the front end, no amount of I.F. selectivity can take it out because the interfering signal is riding on the signal that you are trying to receive. This can be demonstrated by turning on your system and another transmitter on an adjacent frequency. Play with the relative distances between the two transmitters and your airplane until you get some interference which will show up as a slight nervousness in the servos. Turn off your transmitter and chances are the servos will quiet down even though the adjacent channel transmitter is still on. If the RF was being detected directly, they would still be wiggling. You might be able to get some direct detection, but you would probably have to lay the antenna of the adjacent channel transmitter right on the receiver. This is not a likely 'real world' situation. Now, if you're going to fly around TV or broadcast stations or radars that put out umpteen watts, that might be something else. The direct detection could be a problem.

I still like my theory on why the 72.08 receiver didn't reject the 72.32 as well as it did the 72.16 and 72.24. My theory is that the local oscillator puts out a signal at 145.07 MHz as well as 72.535. When Gary increased the signal level to 16 millivolts at 72.32, something in the receiver produced some distortion which generated a harmonic at 144.64. The difference, 430 KHz, is close enough to the 455 KHz I.F. frequency to have some response. Let's hear it from some more experts out there. What do you think?

Mr. Rabe's explanation of loss of signal at low altitudes is pretty much in agreement with our discussion in the July issue. If you're having those problems, you might go back and read that column which discussed vertical antenna. I might add that I've found that the more wiring in your plane, due to long servo cables, etc., the more important it is to get your receiver antenna vertical with respect to the "ground plane" created by the wiring. On the subject of the 27 MHz band, I understand the AMA all but rejected using the upper end. After talking to some guys who are into CB, I'm beginning to agree with the AMA. Seems there is a bunch that are already using the whole 11 meter spectrum, right up to 28 MHz. Illegally, of course.

While on the subject of interference, there was an interesting theory in Model Aviation as to why 53.1 MHz was bad in the Dayton area. Most R/C systems on 53.1 have their local oscillators on the high side, that is, 455 KHz above 53.1 at 53.555. The image then is at 54.01 which is in the 54 to 60 MHz band assigned to television Channel 2. I know that 53.1 is a problem at other locations, so if your field is near a Channel 2 antenna, pick another frequency.

☆☆☆☆

I'm sure many of our readers are unfamiliar with the K Factor, the Newsletter of the National Society of Radio Controlled Aerobatics. If you are at all interested in pattern flying, I'd advise you to write Editor Betty Stream at 3723 Snoden, Long Beach, California 90808.

The May issue presented a modification to Pro-Line transmitters that permits use of fast chargers that are set up for 8 cell, 9.6 volt transmitter packs. I might add that this mod also permits the use of the various battery cyclers and expanded scale voltmeters designed for 9.6 volts. See Fig. 1.

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RADIO SPECTRUM

from page 168/16

If any of you out there in experiment land are trying to build circuity to servo something other than position of a gear train output shaft, such as rpm or airspeed, I think you're going to love an article soon to appear in RCM by Al Irwin. Al's circuit is designed specifically for governing the rotor speed on R/C helicopters with collective pitch control. The thing that Al points out in his design is the need for negative feedback in order to build a servo with plenty of resolution and response. Everyone is aware that the output position is fed back to the reference generator to close the loop in our standard R/C servos. However, the motor voltage is also fed back to the reference generator and if you've ever broke the damping resistor, as it is called, or tried to operate without it, you found that your servo oscillated. You could cut the gain someplace to stop the oscillation, but then you'd have a slow, sloppy servo. A block diagram of our standard servos looks like Fig. 2.

In January we received a constant speed control circuit that was developed back in 1967, but never flown. A block diagram of that system is shown in Fig. 3.

The author said the input divider was required to achieve stability. What he was really doing was lowering the loop gain which means his response would have been poor. Al's circuit, which really works, doesn't break into the throttle servo loop, but puts another loop around it. See Fig. 4.

You can make the system work without the negative feedback, but nowhere near as well. Once again, I think you can learn a lot from Al's experience and many hours of R & D.

****

If you haven't crashed a model for a year or more, you're probably feeling pretty good and figure you don't need to look for trouble. Well I recently decided to go through my Dirty Birdy, which I've been flying since February of 1975, after I shook the motor mount loose. What I found was enough to scare anyone. I still had some of the old Lexan servo mechanics and sure enough they were cracked, ready to fall apart. I found insulation worn from the wire where it had rubbed on the rough fiberglass interior of the fuselage and some pretty sloppy linkages. After repairing and while testing, the aileron servo just plain stopped. It started as soon as I gave it a push and never stopped again, but I replaced the motor anyway. I also found that my transmitter output transistor

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RADIO SPECTRUM

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was really sick at high temperatures. Normal tests in the air conditioned shop didn't pick it up. The moral of the story is to stay on top of your equipment and use a little preventive maintenance. This equipment doesn't last forever, but you can help it with periodic checks.

☆☆☆☆

Dear Sir,

In the April 1976 RCM "For What It's Worth" column, it was explained how to make a 220 MAH NiCad battery charger using a car cigarette lighter plug. Could you please tell me what value of resistor I could use to make such a charger for a 550 MAH NiCad battery pack. Thank you.

The charger shown was designed to charge at a C/10 rate or 22 milliamps (ma) for a 220 MAH battery. If you wanted to charge your 550 MAH pack at C/10, you would want to charge at 55 ma. You can calculate the size resistor with ohms law.

$$R = \frac{E}{I}$$

Where E is the voltage across the resistor and I is the current through it in amps. If our car battery is 12.6V and our NiCad pack is 5.3 volts —

$$R = \frac{12.6 - 5.3}{.055} = 132\Omega$$

130Ω is a standard value. The power dissipated is:

$$P = E \times I = 7.3 \times .055 = .4 \text{ watts}$$

I'd recommend at least a one watt resistor.

With this info you should be able to calculate values for any battery pack that you might have. However, let me point out that the smaller the voltage drop, and the higher the current, the poorer the current regulation. This means that variations in the automobile battery voltage can have large effects in the charging current. Another shortcoming is the fact it takes 12 to 16 hours to get a full charge and probably 2 to 4 hours to get enough charge to risk an airplane. Till next month - - - keep 'em flying. □

FAI FLYER FIND HAPPINESS?

from page 12

going a million miles an hour!

The competition began to take its toll on men and machines. Although in a meet of this calibre you naturally would not expect any busted wings from winch stress, Bob Miller did suffer a cracked spar and discreetly retired. Low turns at the far pylon claimed three victims. Overstressing during the speed event claimed three victims. To round out the casualty list, the downwind telephone wires and tree line nailed two more unfortunates. In almost every case, the damage was not irrepairable, and nine of the twelve semi-finalists finished intact, but only four flew the whole contest without any mishaps at all.

Perhaps the most spectacular was a wing flutter incident in which Jerry Mrlik's wing cracked during a vertical entry to the speed course. Jerry coolly pulled out, set the plane on course, and flew through the traps in under 18 seconds with his wing flopping!

I haven't mentioned Dave Corven, but it was Dave who kept tightening the screws on the rest of us. Fast and smooth, his 10 foot original racked up high scores time after time. In the 5th round, Dave blew away his competitors with a total score of 2944 out of 3000! His plane was based on a Aquila fuselage, but used his own design wings and tail. The top of the wing was fully sheeted, and very smooth.

And what about the intrepid Bob Gill, the National Champ in precision for two of the last three years? Flying an absolutely unmodified Graupner Cirrus with 16 ounces of lead in it and a capture towhook, Bob was turning in tremendous scores. Sixteen seconds in speed. Fifteen distance laps. Two difficult maxes in duration, including one of 6:00 and 95 landing points. All of this serves to illustrate, I hope, that a good flyer does not need to make any modification to the outstanding Cirrus design, and most mods will turn out in the end to be ill-advised. The Cirrus was the only kit plane to qualify in this contest, and I have been told that the same thing happened at a Southeastern quarter-final.

One other sidelight about Standard versus Unlimited planes. There has been some recent agitation to merge the classes, despite the fact that Unlimited scores in duration have averaged 33% higher than Standard in the 25 or so major contests for which I have records. In the semi-finals, the **fourth** place flyer **averaged** 9 laps in the distance using Unlimited class planes; the Unlimited planes in the contest overall averaged about 7½ laps; yet no Standard class plane in either of the quarter finals or the semi-finals ever made **one single run** of nine laps! There has to be a moral here somewhere.

After it was all over, the standings told a fascinating story as shown in Table I.

These four, and possibly one or two alternates, made it to the final at Denver, where the U.S. Team will be chosen.

So what can we learn about soaring from diving through traps, turning at the round of the buzzer, and filling our planes up with lead? I think that we'll find out several things. We'll find out a lot about the true effects of ballast on thermalling ability. We'll find out about strong and reliable construction and design methods. We'll find out which gadgets are helpful and which are not. And, if all goes well, we'll find out first who the 36 best flyers are, and then who the 3 best are, and they'll go to the Internats and bring us a World Championship. □

ENGINE CLINIC

from page 114/10

plug is still good, then somehow or other it is not receiving fuel.

Many fellows have experienced the problem that you have after installing the Perry Pump on their engine, or after purchasing an engine that comes with the pump. And, it all boils down to what I said in the February Engine Clinic when discussing pump related problems. Many of you simply do not read the instructions thoroughly!

Get out the instruction sheet that accompanied the pump and read paragraph #4-c. I'll bet you that this is your problem. For those of you out there without a Perry Pump instruction sheet, paragraph 4-c reads as follows:"Always use a tank with a very flexible fuel line connected to a heavy clunk such as the Sullivan tank, so that in any extended dive from extreme high altitude the clunk will follow the fuel to the forward end of the

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tank to prevent the pump from running dry and causing the engine to quit."

It is common practice to use a piece of the silicone fuel tubing for the pick-up tube. Although the silicone tubing does flex it cannot follow the fuel to the front of the tank. With a non-pump engine, if an air bubble gets in the line it usually diffuses by the time it reaches the carburetor and seldom causes a problem. The pump, however, is similar to the old time water well pump - - - it requires priming. This you do when choking the engine for initial starting. However, if in the air the pump draws air, there is a momentary pause before it recharges itself and this, unfortunately, can sometimes result in the engine stopping. The recommended cure is the very flexible fuel line — much the same as was used in fuel tanks many years ago. The only problems with a very flexible fuel line is that it can occasionally get itself tied in a knot during a violent maneuver. This was one of the reasons for switching from the old surgical tubing of years past to the stiffer pick-up tubing. The Sullivan tubing is less susceptible to the 'knot tying'. However, there is another easy solution — not necessarily a Perry recommendation. Just connect up your muffler pressure as with a non-pump engine. Most of your top competition fliers are doing this. The slight bit of muffler pressure in the tank helps prime the pump immediately if any air is sucked into the line and you can still use the fuel line that you have always been using. Try it, I think it will solve your problem.

•

Our last letter this month was sent in by Larry Renger of Cox Mfg. Co. Although Larry's idea is intended for the Cox engines, this idea works just as well for you guys having trouble with the needle valve on your Perry carburetors backing out under vibration. This will hold true for any spring loaded needle valve that does not have a ratchet as well.

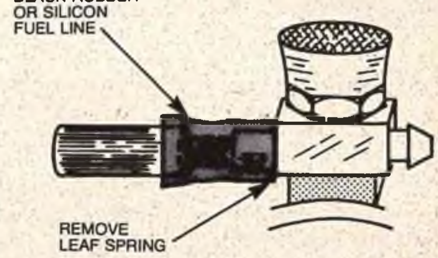
Clarence:

When running pressure fuel feed, the needle valve on a Tee Dee engine can be a bit too sensitive. Two other problems exist with the stock unit: first, it can eventually become leaky, and, if assembled incorrectly after cleaning, it can act like a ratchet drive to force the needle to turn when the engine is running.

Substituting a bit of fuel line for the spring solves all the above problems. You will find it feels a bit peculiar at first, since you must turn past your setting to compensate for its "spring back".

Best regards,
Larry Renger
Costa Mesa, California

□



VIBRATION & LEAK
PROOF NEEDLE
VALVE MODIFICATION
FOR TEE DEE ENGINES

Dentists On The Alert

You may not know it, but your dentist is on the lookout for oral cancer along with his search for cavities. If you notice anything unusual in the condition of your mouth check with a dentist or doctor right away, cautions the American Cancer Society.

Happy Numbers

For anyone who still thinks that cancer is always fatal, the American Cancer Society reports that there are 1,500,000 Americans alive today who are cured of cancer. They know that cancer is most curable when caught early and you should too.

RC DESIGN MADE EASY

from page 7

10.8". Or, if we are looking at a wing area of 400 square inches, we would find that the span would be 48+ inches with a chord of 8". You can make larger graphs for youself, and make them for any aspect ratio that you choose. If you have a pocket calculator, then you can skip all of the graphing and just go ahead and figure out any span-chord relation that you want.

Next, let's consider the side of the ailerons that we want to use. The effectiveness of an aileron is directly related to several factors. First, the location of the wing on the fuselage and, at the same time, the depth of the fuselage, and the relation of the thrust line passing through the fuselage, must be considered. If you have designed a very high sided cabin aircraft, then the aileron action very likely will be very poor.

Consider, for example, the Aeronca Champion. This aircraft must use coordinated aileron and rudder for turns. Aileron action alone will simply yaw the aircraft in the opposite direction to the turn desired. I experimented with this a year ago with a small .19 powered aircraft. It had a very high sided cabin structure with rather small wing dihedral. When I used the ailerons, all that I got was a yaw in the reverse direction. This airplane flew great on rudder, but not on ailerons.

Now, if you are going to place the wing near the centerline of the aircraft and have the thrust line fall nearly upon this centerline, you will have an aircraft that will operate very well around the rolling axis. You will note that most popular pattern aircraft have the wing well up into the belly of the aircraft with a tendency to place all of the major components along the central axis.

But, back to the ailerons. For the best all-around use, plan for your ailerons to be about 12 percent of the total wing area. Each aileron then will contain about 6% of the total wing area. In the case of our 700 square inch wing, this turns out to be total aileron area of 84", or 42" in each wing panel. If we are using a wing chord span of 64", and allow about 6" for the fuselage and wing hold-down, we then will have ailerons that are about 1½" wide x 29" long each. As the speed of our aircraft goes up, the effectiveness of the ailerons increase accordingly, so that if you are going to be using a very powerful .60 engine, than you may cut down on the aileron area. If you do stick with this 12% figure, you will be very happy with the results. I have often heard modelers talk about the quick reactions of small aircraft to aileron movement. This is more often due to the fact that the smaller the aircraft, the larger the ailerons tend to be as a percentage of total wing area, because we tend to build the ailerons from available trailing edge stock. Thus, if you were flying a .15 size aircraft with a 300 square inch wing area and strip ailerons 1" wide, you might wind up with ailerons that are 14 or 15% of the total area. This would be okay even if you were flying a Max .15, but if you were flying a Super

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RC DESIGN MADE EASY

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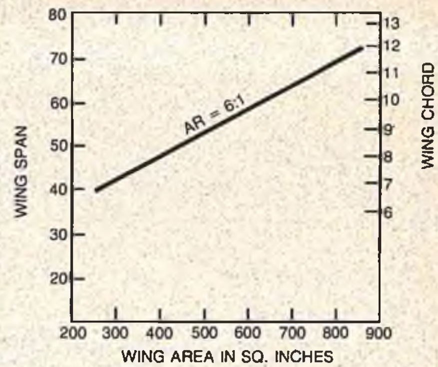

CHART 2

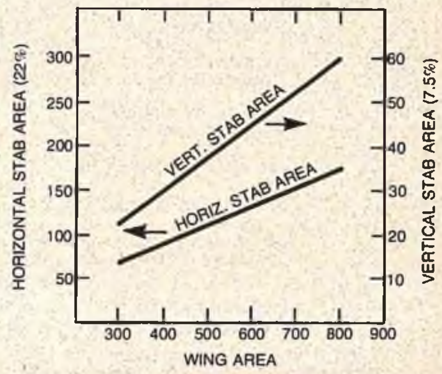

CHART 3

Tigre .15, the ailerons would be much too much, simply due to the speed. If you want to use the conventional barn door type ailerons, rather than strip ailerons on your dream ship, you would still stick with the 12% total area factor and plan to make the chord of the ailerons about 25% of the wing chord. Using our 700 square inch wing example again, we have ailerons with a total area of 84 square inches. Since we determined that the wing chord was going to be 10.8", we find that 25% of this gives us an aileron width of 2.7". Since each aileron should have 42 square inches, we find that our ailerons are going to be 2.7" wide x 15.5" long.

One more bit about wings and ailerons before we pass long to another factor of our new design. If you want to construct a tapered wing, utilizing either a swept back leading edge, or a double tapered wing with both leading edge swept to the rear and trailing edge swept to the front, all of the above relationships hold true. We simply figure out that we are working with an **average chord**. Again, for example, if we want to use a wingspan of 64" and an "average chord" of 10.8", but with a leading and trailing edge taper of 2", then we merely subtract the 2" leading edge taper and the 2" trailing edge taper from the tips, leaving a tip chord of 6.8" and add this 2" fore and aft to the root chord, and we get 14.8". You can juggle the figures any way that you want, but always keep in mind that we are working to the average.

Finally, it really doesn't make any difference how much of the total wing area is consumed by the fuselage saddle, nor need you worry about getting the area exactly correct for the ailerons. I have had many letters from readers who worried about this and that as a positive ratio. Forget it - - - work on the averages, design your ship, and then go out and fly the pants off of it.

Airfoils:

I wish that I could really get down and do a series on airfoils, as I would like to have this ihformation just like everyone else in the model design game. Some libraries have books that will give you the ordinates of many popular airfoils and, in the past, some interesting articles have been written on these sections, but it's a tough subject and one that requires a lot of research. Generally speaking, if you are going to design your own aircraft, then go out and **steal** an airfoil from a popular existing design. This is the best and easiest way to success. For good all-around use the NACA 2415 simply is great. The airfoil that Joe Bridi uses on his designs has proven to be a very superior airfoil for almost any type of aircraft. For general sport flying, an airfoil in the 15% to 18% thickness range is just about right. Again, don't pick at a nit and worry about an airfoil that is only 14.75% thick. It will do just fine. If any of you readers want to break into print, and have given a lot of serious research on the subject of airfoils, by all means, write an article and send it in. We need it.

Horizontal & Vertical Stab:

The relationship between the wing area and the horizontal stab area is very important. If the horizontal stab area is too large or too small, the flying result of the aircraft will not be good. If you go to the trouble of designing your own aircraft and then come up with a small stab, you will quite likely stall out the aircraft on the first landing, and it will whip into the ground. More to the point, the tail will quit flying first and, then when you loose your tail, you know what happens! The airfoil section of the horizontal stab is quite possibly more important than most designers realize. You will find that most of today's pattern birds sport a horizontal stab that has a rather thick symmetrical section, while most sport aircraft are flying with flat plate stabs. The flat plate stab will fly the pattern aircraft, but the thicker sections tends to smooth out the flying, and allows for better control upon landing.

Now, how about the area of the horizontal stab to the wing area? A good "average" figure is to have a horizontal stab that has an area of 22% of the total wing area. You can go up or down, but I would stick to limits of 25% on the top side to 19% on the lower end. I really feel that a 22% area stab gives you a "good feeling" aircraft at most speeds. In considering our 700 square inch ship, and applying the pocket calculator, or a slide rule or pencil and paper, we find that we should have a stab sporting 154 square inches. If we use an aspect ratio of 3:1 for this tail surface, then we would come up with a rectangular planform of 7.2" x 21.6". You can taper this section the same as we did the wing. Take 1½" off of the tip and add it to the root, and we have a span of 21.6", a root chord of 8.7", and a tip chord of 5.7". Naturally, as with everything else, you can round off these figures to suit yourself. The elevator portion of the horizontal stab will work out nicely at 20% of the total stab area or; in our case, 30.8", or roughly 21.6" long x 1.5", leaving out a bit at the rudder. You can make it wider to suit yourself and the overall appearance of the aircraft — it's up to you.

The vertical stab is also an important factor of the flying ability of your aircraft. A fin that is too small will skid about the sky, while one that is too large will make it pretty tough to do a spin. I like to work with a vertical stab area of about 1/3 of the horizontal stab area. Include in your calculations the entire area of the tail of the aircraft that could be considered vertical stab, including the area of the fuselage in and around the horizontal stab. Use a rudder area of 40 to 50% of the total vertical stab area and you will get good positive rudder

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action when you need it. Most of us don't really use the rudder much when we are flying but, in some of the maneuvers, we will need rudder, so have enough, not too little.

Fuselage:

We finally have come to the body of our new aircraft. Naturally, this is really the most important part of our design because this is where you will try to make your own aircraft look somewhat different from all of the rest, incorporating your own creative ideas.

Take a look at chart number 4. This, in very simple form, will give you all of the relations of the parts of the fuselage to each other. As you can see, we work from the wingspan that we arrived at in earlier calculations. Since we decided to use a wing span of 64", then we find that 75% of this gives us a fuselage length of 48". Note on chart 4 that I have allowed 20% of the fuselage length to the nose moment.

Now, let's stop for a minute and define what I mean by nose moment. I use the back of the prop to the leading edge of the wing as this length, and the trailing edge of the wing to the leading edge of the stab for the tail moment. Using a fuselage length of 48", this gives us a nose moment of 9.6" and a tail moment of 19.2". If you want to change this somewhat, go ahead and do it, but, I wouldn't make the nose moment any shorter— if anything, I would tend to make it longer. As an example, look at the current crop of Formula I aircraft. Quite often the nose moment is longer than the tail length. In actual practice, this type of aircraft flies more like an arrow with less jumping around at high speeds than did earlier type Formula I aircraft with shorter noses and longer tails. Most of the Formula I's are balanced at, or near, the leading edge of the wing. But, getting back to our trainer type aircraft, if you want a nose length of 25% or even more, go ahead and use it. Subtract the balance from the tail moment. If you are going to use the tapered wing that we discussed earlier, and have a root chord that is somewhat larger than for our constant chord wing, design the fuselage around the constant chord wing, and then place the new root chord over the side view, keeping the wing in the same relative position, simply deducting both nose length and tail length in same amounts as the taper.

Think about this a bit and you will see what I am driving at. In effect, we are working around the same Center of Gravity and the average chord of the tapered wing will be exactly the same, and in the same location as was the constant chord wing. If you choose a nose moment of 25% on our 48" long fuselage, then you will have a nose length of 12" and a tail moment of 35% or 16.8". Suit yourself, since changes of this nature won't hurt your aircraft a bit. The shorter the tail length, the more nose heavy the aircraft may tend to be. You may have to shift the radio equipment around a bit before fastening it down to make allowances in both your design and in the finishing process.

Center of Gravity Location:

The location of the Center of Gravity of your aircraft is a very important factor and should never be overlooked or left to chance. If you use a balance point that is 25% to 35% back of the leading edge of the wing (using a constant chord wing), you will achieve good results. Actually, I like to balance at about 25% and not much farther to the rear than this. If you have worked out a tapered planform, then you simply work around a point that is 25% behind the leading edge of the average chord.

In answer to some questions on this point, always balance your model with the tank empty. Then, when you are flying with a full tank, the C.G. will actually move forward. If you balance with a full tank at the 25% point, you will, in effect, be trying to land an aircraft when it is low or out of fuel with a balance point about 50 to 60% back. As a result, the tail area that we are using simply isn't adequate to carry the aircraft and, once again, just as in the case of the ship with too small of a tail surface, we just might have a model that has a non-flying tail. As a consequence, we may find ourselves picking up sticks, while blaming radio failure for the prang.

Landing Gear Location:

The proper location for the landing gear is really rather simple to find. On a three wheeled type aircraft, the nose wheel location is quite usually dictated by the location of the firewall, while the main gear is located about 1" to 1" behind the Center of Gravity. By bending the main gears back just a little bit, you add a certain amount of spring to the landing gear action and thus take some of the landing load off of the wing structure.

For locating the wheels on a tail dragger type of aircraft, keep the leading edge of the wheels in front of the leading edge of the wing and, if you can put the wheel axles just under the leading edge of the wing, you will have an aircraft that will not dump over on landings. Also, keep the tread of the wheels as wide as is practical. If the tread is too narrow the aircraft will be easily blown over when it is taxiing on the runway. Nothing is more frustrating than to be taxiing out for a take-off, turn too sharply, letting the wind get under the wing tip, and over goes the model complete with broken prop!

Well, there you have it, a simplified method that is very much tried and true for designing your own RC aircraft. You could take this same information and keep on scaling up until you came up with a full size, man-carrying aircraft, and you would find that everything would fall into just about the same locations. In case you haven't noticed, the design of most of the new full scale aerobatic aircraft is closely following the design of successful RC aircraft. Take Phil Kraft's Super Fli, for example. I read a review of it in one of the aviation magazines and the reviewer/pilot thought that the wing was too thick, until he tried it, and thought that several other things were not as they should be - - - until he tried flying it himself and then he suddenly discovered that it is really a super aircraft.

Go ahead - - - design your own dream ship, and who knows, one day in your garage you may even come up with a full size home-built. □