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FEATURES

OCTOBER

THIS MONTH'S COVER is a happy and proud John Simone, Jr. as he recently became the National AMA Helicopter Champion. The helicopter is his Rev-Olution II manufactured by American R/C Helicopters. Ektachrome transparencies by Fred C. Braitsch, Jr.

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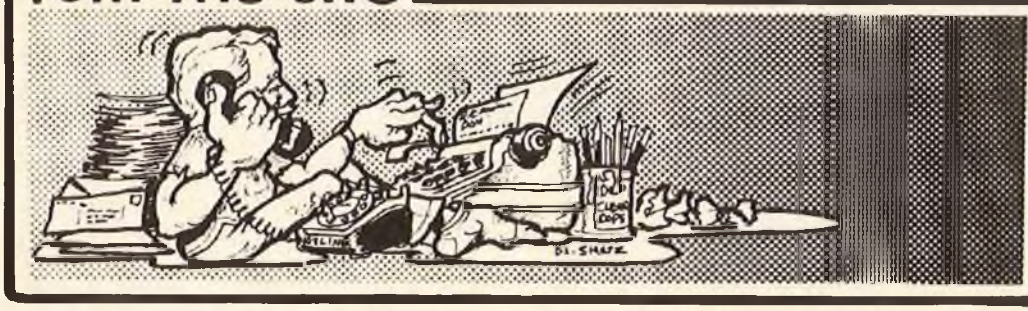


DON DEWEY

Time is a respector of no man, waiting not so much for a second for any of us, slowly, inexorably, letting the leaves of life's calendar fall one by one until the name of each and everyone of us finally appears on the number deemed to be ours.

So it was recently with Bob Baldwin and Ed Manulkin. Both were long time friends of this writer, and in fact, to every one of us in modeling. Ed Manulkin was President of Sterling Models and Bob Baldwin, designer of the famous Delta Hustler, ran the woodshop at Midwest Products Company. The credits they established in modeling are so numerous that it would be beyond the scope of this magazine to even begin to enumerate them. Rather than that, we would like to say goodbye to two very good friends that the modeling world will sorely miss - - - and to both of them this issue of R/C Modeler Magazine is respectively dedicated.

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The following is a reprint from the General Aviation News:

As a part of a joint NASA-Beech Aircraft Corporation program, Beechcraft research and development engineers have completed a series of aircraft spin and spin recovery tests utilizing a radio-controlled (R/C) scale model aircraft.

NASA, at the request of the manufacturers, is conducting extensive research into stall/spin characteristics of general aviation aircraft and data provided by the Beech test is aimed at establishing the use of R/C model aircraft as a valid method of evaluating spins and spin recovery.

Under a NASA contract which provided for construction of the model, instrumentation, spin testing and comparison of results with spin tunnel and full-scale flight tests, Beech Aircraft first flew a precision 1/6 scale model of the Beechcraft U.S. Navy T-34C in June 1975.

"The T-34C was an ideal choice for the program" according to R.R. Tumlinson, Beech Aircraft's chief of aerodynamics. "Spin tunnel tests had already been conducted at Langley Research Center in Virginia and more than 1,200 spins had been flown on an actual T-34C prototype. The T-34C also has many common design characteristics with general aviation aircraft.

"With the results from previous tests in hand, we had the data base with which to compare our R/C model spin test results."

The actual R/C model, with its instrument load, weighs 18 to 20 pounds, three times the weight of hobbyists' models of the same scale. The scale model T-34C is constructed of balsa wood, foam and fiberglass laminate and has a 1.5 horsepower engine. It carries instrumentation on board for measurement of angle of attack and sideslip angle and for monitoring commands from the ground control transmitter.

Measurements taken during flight through wing boom-mounted flow vanes are transmitted to the ground where they are recorded along with corresponding ground control commands, on an oscillograph. A 16 mm motion picture camera films each flight to provide detailed visual analysis of spin and recovery techniques.

"We believe that our tests have furnished us with a number of positive results," Tumlinson said. "It has shown us that a particular airplane may spin in several attitudes but we need additional tests to cover all of the attitudes required for a complete correlation.

"Once that correlation is established, we think R/C models will furnish manufacturers with a useful and needed technique that can be used to determine spin and spin recovery characteristics early in an aircraft's development stage."

Beech will continue testing of R/C models under a follow-on contract from NASA as part of the agency's Stall/Spin Program for general aviation aircraft.

This new, rapidly developing technology is providing valuable experience and techniques which are now being applied to other Beechcraft projects and, in the end, stand to benefit all of general aviation.

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Cunningham On RC

CHUCK CUNNINGHAM

Several things are fresh on my mind this month, one of which was triggered by a letter (which I will get to later), and the other pushed along by making test flights on my new super bipe, the Lazy Ace. This past Saturday afternoon my intrepid (?) companion, Helmer Johnson, and I made the test flights on the Lazy Ace, and this 1,824 square inch beauty flew perfectly "right off the drawing board". As soon as I can get the plans done and into the capable hands of Dick Kidd, who will make them understandable, we will be bringing it to you. But, the point is that it flew extremely well on the five test flights that were put in last Saturday, and the reason that it did was *care*. So, as a logical follow up to the design series that I have been presenting to you, let me give you a few thoughts to insure that the test flight of your new dream ship is just as good as the maiden flight of the Lazy Ace.

We will skip all of the items that I have presented to you earlier, thoughts on designing according to the "rules of thumb", or building carefully without warps, or radio installation, etc., and give some thought to prior planning for that first test flight in order that it may be in a success.

First, go over the radio installation one more time. Are all of the servos firmly (but not tightly) fixed in place? Are all of the servo arms bolted to the servos, or did you push the arm over the operator on the servo and forget to fasten it with the small screw? How about the pushrods - - - do they flex, or bind? How about the control horns, are they firmly mounted? Okay, how about standing at the rear of the aircraft and operating all of the controls; is right rudder really right rudder? And, if it is a trike geared ship, does the nose wheel turn to the right when a right rudder command is given to the radio? How about the throttle linkage, does it bind on the packing around the fuel tank or the battery? If it does, slip a piece of NyRod over the pushrod to the engine.

So on down the line. Is the fuel tank installed so that the fuel line and the breather are not kinked? Try sucking on the fuel line - - - if it draws free and easy it's okay, but if you suddenly get a "hollow cheek" look than you know that the lines have a kink in them. How about that engine, is it broken-in and do you have the idle set correctly, and are you going to be sure that when the aircraft lifts off it is not running too lean, or, almost as bad, too rich?

Chuck Cunningham's Lazy Ace Bipe.

Hey, how about your radio - - - have you charged it, and also, have you range checked it since installing in your new bird? Is the antenna mounted on the fuselage on the side away from the engine exhaust? And, is the switch also mounted out of the way of the glop and goo that spews from your muffler?

Speaking of that, how about some muffler designers giving thought to an exhaust pipe that will carry the gunk clear back to the tail? The exit on the muffler must be larger to keep the back pressure from building up. I once fixed a piece of garden hose to a muffler and ducted the junk clear back to the tail, but this was done in the cool weather and the engine didn't overheat. Last Saturday at 102° , I felt kinda shakey even running a muffler on a test flight because of overheating.

But back to the project at hand. If you have double checked all of the above items, then the next step is to see just how good your building really was. Is the tail glued on perfectly straight? Is the wing mount also correctly aligned? Check the landing gear, does it track straight ahead? Is the prop balanced, is the motor firmly bolted in place? Do the control surfaces have the proper amount of throw? To figure just what is the correct amount of throw on a new design takes a bit of experience, but, I would rather have just a bit too much, than not to have enough when I need it. You have to learn to have a soft touch on the sticks anyhow.

When finishing a new bird, whether it's a new kit or your own design, it's a good idea to keep a scratch pad on your workbench and make notes to yourself on the things that haven't as yet been done. You don't need to put down "build the wing" when you're working on the fuselage, but as you come to it make a little note such as, "put a keeper on the aileron control". This is really important, and easily overlooked in the excitement of finishing up a new airplane. I usually keep a list in my pocket when I am completing a new design, and, quite often while sitting at my desk in my office, get a flash as to what I need to do to complete the aircraft, so out comes the piece of paper and on goes the note. Then, when I'm burning the midnight oil trying to finish the bird for the following weekend, out comes the notes, and it's just that much easier.

Now that you have checked over all of the things that you think are important, check one more item that will often make or break a new aircraft. *Check the balance point.* Does it balance where the plans show, or if you're building your own design, does it balance where you believe that it should? If you have no other point of reference, balance the aircraft (less fuel) on a point that is located at 30% of the wing chord. After the test flights you may want to move it forward, or aft, but this is a safe location for the CG on almost any model aircraft.

And, the last idea is to have a good knowledgeable flying buddy go along with you to eyeball the things that you have already checked. Helmer and I have been helping each other over test flights for many years, and it pays off to have another modeler along to keep you from making a dumb mistake. If you have followed the above advice, and have given some thought to what it takes to complete your bird and get it into the air successfully, then you're ready to try out your new aircraft, and you should have just as much fun as I did with the test flights on the Lazy Ace. It's not only the design that makes for a good aircraft,

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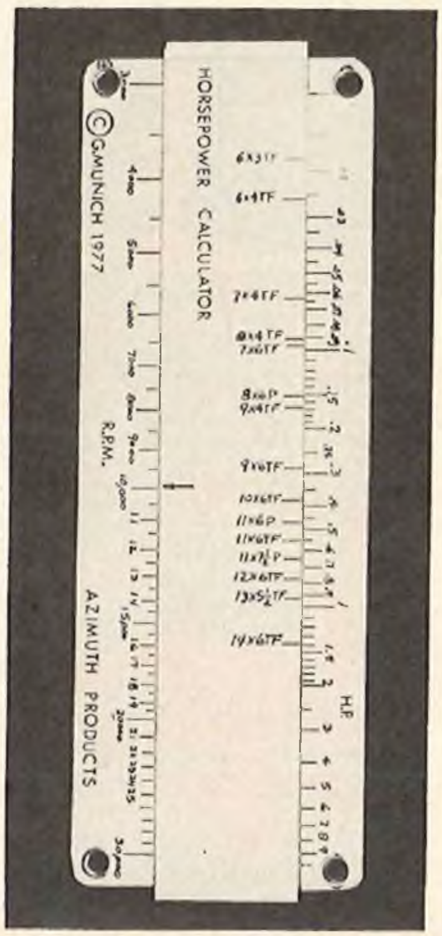
Engine Clinic CLARENCE LEE

Before getting to the letters this month I have a "neat" little item to bring to your attention that I am sure will be of interest to many of you. Gus Munich has come up with a slide rule calculator to tell you how much horsepower your engine is developing. Many of you have wondered how much horsepower your engine might be developing but have had no way of knowing other than the manufacturer's claims. Horsepower is checked on a torque stand dynamometer which few fellows have access to. Although Gus's calculator is not nearly as accurate as a torque stand dyno, it will give you a close idea as to how much horsepower your engine is putting out. A good tachometer is required. To use, you simply choose a propeller from those listed on the calculator slide. Check the engine rpm and then line up the slide arrow with the measured rpm and read the horsepower



opposite the propeller being used. Gus has chosen propeller sizes most commonly used on .049 through .80 size and larger engines — a 14/6 being the largest prop size. I would like to have seen a couple of the more popular .60 size propellers included on the slide as only the 11/7½ Power prop and 12/6 Top Flite are used. However, these are good comparison sizes that will tell you how much power your engine is developing.

The Horsepower Calculator is available direct only from Gus Munich, 24 Skipper Dr., West Islip, N.Y. 11795, and the price is only $4.95 postpaid in the U.S.

Dear Sir:

I recently purchased an O.S. SR-60 with pump and carburetor. On the break-in stand we could not richen this motor up by turning the needle valve nor the pump setting to the very maximum.

I returned the motor to the company and they put a new pump and carb on it. This seemed to take care of the problem. Then the motor was run approximately eight times with the rich setting, on a test stand. I then put this in a Wavemaster and it had extreme power but would surge and quit at different times. After reading your article in RCM, I screwed the inverted slide valve screw to the bottom as you recommended and this eliminated the surging problem. My problem is that I can fly all day without the motor surging or quitting, but I found on loops the surging occurs again to the point of killing about 50% of the time. I, therefore, removed the pin from the carb as you suggested; this did not seem to change the surging on loops. It will do rolls, fly upside down, all with no problems – just problems on the bottoms of the loops. I have installed a new gas tank with new lines and checked it thoroughly. I also had a friend, who has been in RC for years, check the tank installation so I am sure it is all right. I have also tried running it rich and lean and it still has the same problems. Any help you can give me would be appreciated.

Thank you,
A.J. Lowery
Butte, Montana

Since your engine runs okay through all maneuvers except loops, I would guess that "G" loads are causing your tank to change position which, in turn, is probably pinching the fuel line. Many modelers mount the receiver/battery pack above the fuel tank and, again, under "G" loads the pack could squeeze the tank causing a surging situation. Also, be sure you are not using a heavy filter with excess fuel line that, under "G" loads, is moving and pinching the line.

Dear Mr. Lee:

First of all, thank you for all your expertise in the past. Your article in the June 1976 issue of RCM, as a follow-up of the April 1975 one, came just in time to prevent fooling around too much with my new Perry pump. I think I've got the idea now, all is working to my satisfaction – thank you.

Let me bother you with a problem that has not been addressed yet in the ongoing pump discussions. I have a OV 10 Bronco under construction, which is going to be equipped with two HB .61's (the Austrian licensed built Veco/K & B .61 sold by Graupner). In order to achieve some of the scale aspects, I will have to reverse the direction of rotation of the starboard engine. The question: Does the normal procedure, turning the cylinder case 180° and turning the front casing 90° counterclockwise (seen from the front), have any considerable effect on the Perry pump/regulator operation and, if so, will it influence the starboard engine performance to such an extent that I should not use the pump/regulators for my twin counter rotating engined Bronco?

Your answer to my question will be appreciated.

Sincerely yours,
Horst Weidemann
West Germany

Reversing the direction of rotation of an engine will have no effect on the performance of the Perry pump. The pump diaphragm is actuated by positive and negative pressure differential in the crankcase caused by the up and down action of the piston. This is the same whether the engine is running clockwise or counterclockwise.

Dear Clarence;

Question: Carbs in General. Wouldn't

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ENGINE CLINIC

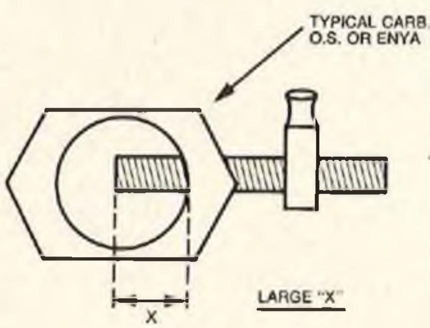
from page 10

we get more power if there was less "spray bar" blocking the venturi?

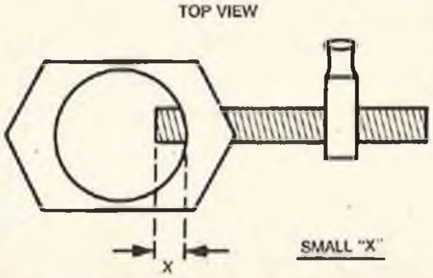
What is the optimum distance "X"? Is there a critical "X"?

Thanks,
John Novotny
Mt. Laurel, New Jersey

TOP VIEW



TOP VIEW



Increasing the size of the intake will result in a power increase, but at the expense of reliable fuel draw. With the introduction of the Perry pump and pump carburetor, larger venturi sizes can be used resulting in more power. The same holds true for the Robart Super Pumper. Moving the spray bar closer to the venturi wall does increase the area slightly, but not enough to make any noticeable difference in the rpm of the engine. To achieve a noticeable rpm increase, the venturi would have to be drilled larger, but then fuel draw would suffer unless a pump was used.

As far as your "X" dimension — this is not critical. The end of the spray bar tube should not extend much beyond the center line of the venturi when all the way in and, if backed out, should protrude slightly beyond the venturi wall. A minimum of 1/16" would be a safe figure.

Dear Mr. Lee;

I have an O.S. Max .30 R/C engine with about 3 hours running time without a muffler and no fuel tank back pressure and I am having carburetion problems.

The engine made approximately 10 flights at 10 minutes per flight in a Fledgling with good results, but still runs hot. The last time I had it in the air, the engine would die if it was idled and accelerated. The engine will also die if left in idle for a few seconds.

It seems to be idling rich and cooling the glow-plug because it will work fine as long as the glow-battery is attached. We changed the glow-plug twice and had no improvement.

I tried adjusting the idle air screw on the O.S. carb for a leaner idle and that didn't help. I disassembled the carburetor, washed it in alcohol, and reassembled it with identical results. I've checked the fuel tank, replaced the fuel line, and used a different fuel supply. No matter what I do, I get the same results. I have not disassembled the engine. The engine runs very hot on the ground (fuel boils in carb when primed).

What would you suggest for a solution?

Sincerely,
Donald L. May
Terre Haute, Indiana

The O.S. Max .30 was never noted for its super idle and the carburetor on the engine leaves a lot to be desired. You did not say what you are using for fuel or make of glow plug. Both of these contribute considerably to a reliable idle and acceleration. First off, be sure you are using an idle bar glow plug — either the Fox or K & B. Second, be sure to use a good commercial fuel such as K & B 500 or Dukes Mix. Many times "home brew" fuels will cause many problems. You say you are not using a muffler, but are you using anything in the way of an exhaust restrictor? No engine will idle and accel-

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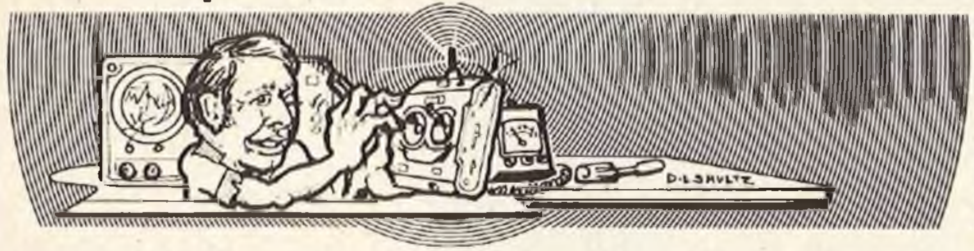
Radio Spectrum

JIM ODDINO



I just returned from the Masters in Springfield, Ohio, and here it is time to meet another deadline. All the talk at Springfield was tuned pipes, bearings, rods, crank shafts, etc. I guess this is the year of the engine, and everyone is forgetting their radio problems. In fact, there were very few of these with the only complaints I heard being a bad cell in a receiver pack and a bad servo. Probably the most notable thing was the fact that some of the guys were flying Futaba airborne systems or servos with their American made transmitters. Fred Kugel had some problems during practice, but Steve Helms tuned the receiver and everything was fine after that. So, if you do buy an airborne set that is not manufactured by the same company that did your transmitter, it sure pays to find someone who can tune it for you. I know Fred and some of the other guys got away without tuning for some time but it could have been disastrous if it had picked the Masters Contest to start acting up.

Not much else to report from there, but if you are thinking about a new competition system, it looks like you better plan an additional channel for mixture control because these new high performance engines are kind of touchy. I'm sure the servo manufacturers don't mind.

We've received a number of letters from people who are trying to beat the extra servo cost, weight, and volume problem. Here's one:

Dear Jim,

I would like to eliminate the standard servo/limit switch combination for operating auxiliary equipment. Do you have a simple circuit for activating a small relay directly off of one of the receiver channels? This relay might be either the magnetic or solid state type and maybe you could incorporate a standard servo amplifier to operate the relay.

Thanks,
Charles R. Fleishman, Jr.
Long Beach, California

I recently reviewed an article that was submitted on this subject, which for all I know could have been published last month. (These long lead times are quite confusing!) However, I thought I would tell you how I would go about it, if I were going to build myself an electronic switch to drive a relay or, for that matter, other types of electrical loads.

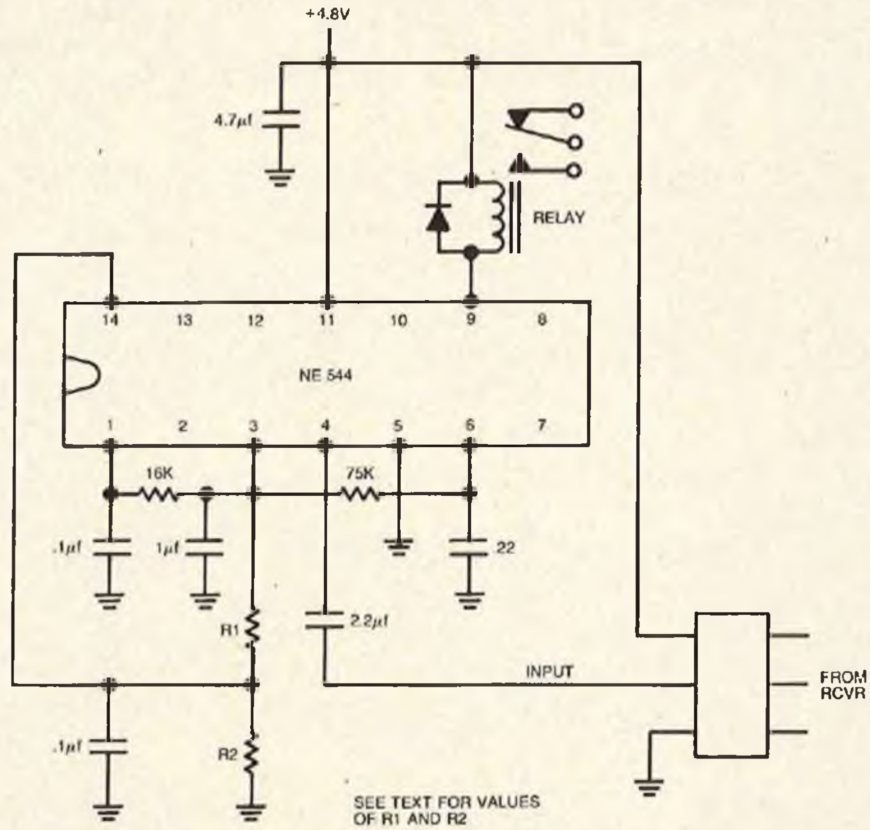


FIGURE 1

I would start with a standard servo amplifier integrated circuit as suggested. I think you could use any that are on the market but, after receiving a jillion letters trying to find the SN21919, I suggested using in the motor speed control, I'm going to talk about the Signetics NE 544, which I'm sure you can get from Ace Radio Control. You could build a circuit with discreet components but the IC is designed to provide all the functions you need, i.e., reference generator, comparator, pulse stretcher, Schmitt trigger, output transistors, and even throws in a voltage regulator all in one package. If you're looking for small size and weight, it is going to be hard to beat. The circuit will look like Figure 1.

Let's review what we are trying to do before we go into the circuit description. I'm sure some of you don't need this and are ready to start soldering, but for those of you who aren't quite up to speed, let me fill you in. Let's say we want to turn some lights on by remote control and all we need to do is close some relay contacts to do this. We could use a servo, linkage, and mechanical switch but this is: expensive, bulky, and heavy. The circuit shown consists of one IC, four resistors, six capacitors, and a relay. It should be possible to have a unit weight of less than one ounce.

What the circuit does is convert the information coming out of the receiver, which is in pulse width format, to control the relay. Most systems have a pulse width that is controllable from 1.0 to 2.0 milliseconds. If we design our circuit to switch at 1.5 MSEC, we can turn the lights off by switching to 1.0 MSEC and on by switching to 2.0 milliseconds or vice versa. We could also have more than one of these circuits on each channel if we set them up to trip at different points such as 1.25 and 1.75 MSEC. We could turn the lights on by switching from 1.0 to 1.5 and blow the horn by switching to 2.0. Then, by combining two or more channels, you could command many, many on-off functions. I'm sure those of you building battleships can think of many things you would like to activate.

The trigger point is controlled by the .1μf capacitor from pin 1 to ground, the 16K resistor from pin 1 to pin 3, by the voltage at the junction of R_1 and R_2 (pin 14) and by the voltage regulator output on pin 3. The trigger time can be calculated from the following:

$$T = R\,C\,LN \frac{V_3}{V_3 - V_{14}}$$

If V_{14} is set to 1.5 volts

$$T = (16K)\ (.1\mu f)\ LN \frac{2.5}{2.5-1.5} = 1.47\text{ ms}$$

I would recommend adjusting R_1 and R_2 to get the desired voltage at V_{14} and leave the other values fixed. Values of R_1 and R_2 can be calculated from the following:

$$\frac{V_{14}}{V_3} = \frac{R_2}{R_1 + R_2}$$

R_1 plus R_2 should be kept in the range of 5K to 50K and V_3 is a nominal 2.5 volts. If we want V_{14} to equal 1.5 volts:

$$\frac{1.5}{2.5} = \frac{R_2}{(5K - R_2) + R_2}$$

$$R_2 = \frac{5 \times 1.5}{2.5} = 3K$$

$$R_1 = 5K - R_2$$
$$R_1 = 2K$$

If you don't like the math you can cut and try or you can substitute a trimpot for R_1 and R_2 and find the spot by plugging the circuit into your elevator channel. Adjust the trimpot until the relay trips, then take it out and measure the resistance from the wiper to each end and substitute the closest resistors you can get. This should put the trip point about in the center of your pulse width range. A slick way to build this circuit might be to buy an Ace servo kit without the motor and gears and use the feedback pot in place of R_1 and R_2 and put the relay in place of the motor for a neat little package. I'd like to point out that you don't need the relay for loads less than 500ma and you can use a power transistor instead of the relay to drive greater loads. In that case, the output circuit would look like Figure 2.

Many of you may recognize that this device with one of the many buzzers available could be used as a downed aircraft locator, or as a range checker. So, for those who've requested these items, there you are.

★ ★

Dear Mr. Oddino,

Is it possible to include a code in the

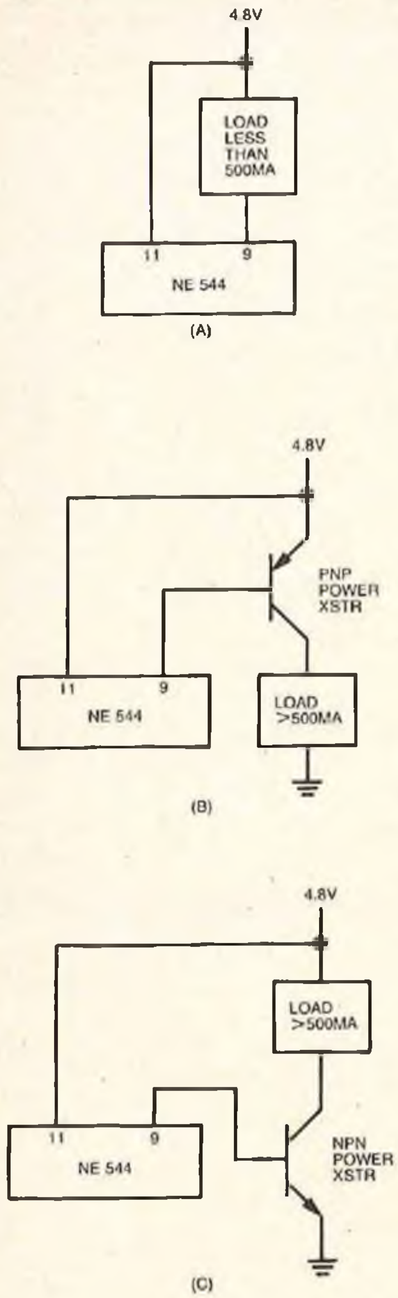


FIGURE 2

reference pulse so a receiver will reject all but the information sent by the transmitter sending the correct code? If it can be done, why hasn't it? With this system, more than one flyer could use a particular frequency at the same time.

Ray Wellbaum
Canoga Park, California

Jim Oddino:

Since we boat racers need only two channels and only have three such channels on 72 MHz, why couldn't we take four 8-channel sets on say 72.160 like Ace's and suppress six of the eight channels on each set and effectively have four boats running on the same frequency? If the four CW's would somehow interfere, then why not one Tx with the four pairs of channels brought out on cables a-la the "Buddy Box" system?

Tom Herron
Trenton, New Jersey

I lumped these two letters together because they kind of touch on the same subject. I hope I can give a satisfactory answer. We have two choices when it comes to transmitting more than one channel of information during a given period of time. We can use the frequency domain as is done in commercial radio and TV where each station has its own frequency assignment, or we can use the time domain where we sample the information in each channel and transmit the samples sequentially in time but at a high enough rate that it appears to be continuous. In RC we actually use both of these techniques. Each transmitter is on a different frequency spaced far enough from the next closest so it doesn't interfere, but each channel in the transmitter is sampled such that aileron and elevator commands are not actually sent simultaneously. It is only through the magic of electronic switching and the memory built into the servo that it appears to be simultaneous (and, for all practical matters, is).

The signal that comes out of the encoder which contains the information we want to send is called a baseband signal. It must be placed on a carrier wave to be transmitted. If we could get two carrier waves on exactly the same frequency, the two baseband signals would mix and we would need a new decoding scheme to get them apart. The problem is worse because two carriers are never on exactly the same frequency and this results in beats which further mask the information we're trying to receive.

So the first rule is only one carrier in any assigned frequency spot. Now we can do a number of things to get additional channels. We can have sub-carriers which are usually audio frequencies or frequencies up to 70 KHz in telemetering systems which can be modulated in a number of ways to transmit information. We might put as many as ten sub-carriers on one carrier and then twenty time-shared, or commutated, channels on each sub-carrier. The problem gets into a science called information theory which boils down to — the more information you want to send, the more bandwidth you need. The FCC limits our bandwidth which pretty much dictates what we can do. The old reed sets used sub-carriers which were audio frequencies in the 200 to 400 Hz region. Reeds are mechanical filters with very narrow bandwidths, meaning if the transmitted signal was five Hz off frequency it would be rejected. This is nice from an interference standpoint but you can't get lots of information through a narrow bandwidth. For example, the 400 Hz telemetering sub-carrier has a bandwidth of 370 to 430 Hz. If we were to use an FM sub-carrier at 400 Hz and another at 560 Hz and so on, it would work, but the size of the discriminators would be unacceptable. Some early proportional RC systems did use FM sub-carriers but they were up at 3500 and 7000 Hz in order to make small discriminators. These systems were actually illegal and could never meet the requirements for type acceptance that we have today. My old Space Control would mess up the whole CB band and I think I had a neighbor move away just to get away from me working on that rig. Okay, so sub-carriers are not practical; our solution is to go to time division. Send out the information one channel at a time and when you finish all channels start all over. Now to answer Ray — Yes, we could put a code out that says this next bit of info is for airplane number one and when that was complete, put out another code that corresponded to airplane number two, and so on, but that is more complex than required. Tom has hit on a solution that will work just like he suggested. Have one transmitter with four control boxes each with two channels. All four receivers would need eight channel decoders (no problem, normal IC used has eight channels) and boat number one would use channels one and two, boat number two would use channels three and four and so on. This system will work fine for boats, cars, sailplanes, or other two channel devices, but you probably don't want to have more than eight channels total because the time to update information starts getting long which means the servos will start moving in little steps instead of smoothly. The idea is technically feasible but would require a club or some other group to get together and work it out. Let me know if anyone tries this or needs any more help because it might be a solution to a problem I know they've had in airplane racing. That is groups of guys getting on the same frequency so they don't have to race each other. With this set-up they could all be on the same frequency.

★ ★

Dear Jim,

I recently read in another model publication that it is not a good idea to leave your Nicads connected to the charger even though the charger is disconnected from the wall outlet. Something to do with the charger drawing current from the Nicads and thus draining your batteries. Any truth to this?

Sincerely,
Jim Kitchen
Yuba City, California

I would agree that it is not a good idea to leave them connected. The rectifier in the charger should block the current, but even the best has some leakage. Whether this current is significant versus the internal self-discharge of the Nicads is anyone's guess. However, I can't think of any good reason to leave them connected, so don't.

★ ★

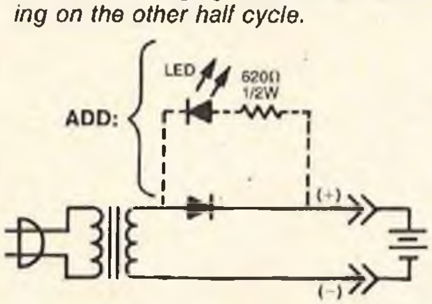
Ever have trouble with a starting battery being low after taking it off the charger? Read on.

Dear Mr. Oddino:

I have a cheapie Western Auto trickle charger (12 volt, 1 amp) for my flight box starter battery and have had trouble making a good connection on a couple of occasions. The only way I found out was by having a weak battery at the field (when it should have been charged). For years I have been meaning to put a load-current sensing circuit in the thing to light an indicator to tell me if the wires from the charger are indeed making contact with the battery. I have been putting it off, until last week I started to the field, and, when reaching to disconnect the alligator clips from the battery, I found that one had apparently popped off when I stumbled over the flight box the night before. So, instead of being on charge all night, it had actually been on charge (connected) for 15 minutes!

So I set about to come up with a charging indicator circuit that would not reduce the charging current too much. After fooling around a few minutes I found a simple solution that I thought you might be interested in for your column.

The charger is nothing more than a step down transformer with a diode in series with the secondary. During alternate half cycles (when the diode is back biased) no charging current is delivered to the battery anyway so this is the time to sense if the battery is connected. The relatively large inverse voltage across the diode at this time is used to power a LED if there is a complete circuit through the battery. The amount of current (for the LED) drain on the battery is small compared to the amount of charging current it is receiving on the other half cycle.



The best circuits are the simplest circuits! Any general purpose LED will work and with a half watt 620Ω (or therabouts) current limiting resistor, total cost is only about 50¢ or less! Wish I had thought of it a long time ago.

Sincerely,
Les Logan
Norfolk, Virginia

★ ★

Dear Jim:

I own a 1975 Orbit Sport 5-channel system. It is one of the many 5-channel radios with a switch for the 5th channel (i.e., for retracts). In the two years that I have had the radio, I have never used it, but would have liked a proportional 5th channel.

It appears that the switch is a SPDT type and merely switches in or out a resistor to simulate a control pot. I don't know the value of the resistor as I didn't want to stick an ohm meter where it didn't belong. Can a positionable unit (such as a throttle or aux. channel lever) simply be substituted? The main stick assembly is a D & R single stick (plastic pots, separate pots for trim). I would appreciate your help.

Sincerely,
Martin Remick
Ithaca, New York

The answer is yes, although I don't have any late model Orbit schematics so I can't give you a step-by-step procedure. What you want to do is make the fifth channel the same as the others, so if you can trace out the schematic you shouldn't have much trouble. If you don't want to tackle it yourself, I'm sure one of the repair outfits like Millcott Corp. would be happy to fix you up.

★ ★

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Sunday Flier

KEN WILLARD

For the past six weeks or so, your old Chief Sunday Flier has been the Chief Sunday Spectator. In one of those freak accidents, I broke the little finger on my left hand, and wouldn't you know it, it was so banged up it took an operation to get the bones and tendons back in place, where they were held by a wire through the finger until the bones knitted together again. So, with my left arm in a cast - - - to keep the tendons in place at the other end of the hand, I've been going around to various events just to watch. Didn't get much sympathy; one of the guys referred to the break as my "bi-annual pity scheme" to get out of competing. (Two years ago I broke the wrist on the same arm - - - that's why he was kidding me.)

But it was interesting to watch all the various events which came along - - - this being the busy contest season. First off, there was a "Quickie 500" race. This event was originally meant to be a "low budget" event for guys who had neither the time nor the money to go into Formula I. Somehow, though, it didn't work out that way. No matter what you do, somebody will find a way to go faster than you thought any particular design class should. The fastest time in the Quickie 500 event turned out to be 1:29, or a little over 100 mph course speed. On the straightaway, speeds were probably up around 120 mph.

So - - I'm not too sure that the Quickie 500 is for the Sunday Flier. Same goes for 1/2A racing, where the straightaway speeds are now up in the 80's.

Next I was a spectator at the Pioneers' Annual Pattern Contest. It was very similar to all other pattern contests; for the knowledgeable R/C enthusiast, a fine show of precision flying. For the average spectator, after the first few flights, dullsville, with everybody doing the same thing over and over as far as the maneuvers were concerned. This could be changed; an informed public address announcer who keeps up a running comment would go a long way towards spicing up a pattern contest for the audience. It might annoy the contestants - - - like tennis fans annoy the players with their noise - - - but it certainly would heighten the interest of the crowd.

The most exciting event during the contest was the show put on during the lunch break. Carl Nicholas, Tom Purkes, and Ken Jackson, of the Cordova Model Masters Club, flying three Bridi Dirty Birdies, took off in formation and proceeded to put on the best demonstration of R/C formation flying that I have ever seen. Their V-formation loop absolutely brought the crowd to their feet - - - and I was applauding just as hard as anyone. Most people react to formation flying - - - the blue angels, the Thunderbirds, and other show teams have long been the highlights of full scale aviation events. And from what I saw of these young men, it won't be too long before competition between formation teams will develop into a top draw event at R/C contests. It is thrilling to watch.

Also thrilling, but in an entirely different way, is Formula I racing. The Pioneers had all the West Coast speedsters at the Pioneers-P.A.L. R/C Airport in Santa Clara on June 18th and 19th, and I was there watching - - - a little nervously, I might add. Formula I is very exciting to watch, but I don't think I want to sit in a crowded bleacher seat. Even with freedom of movement gained by standing apart from the crowd is hardly enough to give you a chance to avoid one of the racers if it goes out of control — and they do. It happened twice at this one event. Fortunately, no one was hurt, but it scares me a little to think what could occur. I think they've done a great job of providing for the safety of the flagmen and pylon judges, but more thought is needed on behalf of crowd safety. But then, maybe part of the excitement is knowing that you'd better be on your toes.

At the Pioneer races, Bob Smith set a new record of 1:12.5 for the 2½ mile course. One hundred and thirty-four miles an hour course speed - - - probably 150-160 on the straightaway! And consistent? Every race Bob won was with a time of under 1:20, except one race when he cut a pylon. Unbelievable - - but I saw it. If you haven't been to a Formula One race, then the next time you get a chance, go. And be wary, and you'll see a really thrilling event.

A week after the Formula races, I had another interesting experience - - totally different. I had received a letter from John Worth asking me if I could help him by meeting the Japanese World Championship Aerobatic Contestants at San Francisco airport and assist them through customs, since they had a very close connection to make. I called George Brokaw, District Director of Customs, told him the story; he was very cooperative, notifying Wayne Ray, the Inspection Supervisor, that the team would be arriving and would have some big boxes. And boy, were they big! Take a look at Tetsuji Okumura's in the photo — they were just able to get it on the luggage carrier. Also note how well identified it is — no question about where it was going.

As luck would have it, the arrival date in San Francisco was Monday, June 27th - - - and I was scheduled to give a talk to the Memphis R/C Club in Memphis, Tennessee, that night, so I had a close connection to make as well. I enlisted the help of Bill Mowry and Hank Pajari, president and vice-president respectively of the Pioneers, and we all went up to San Francisco Airport to meet the Japanese team. Unfortunately for

Tetsuji Okumura's huge container for his R/C airplanes.

Bill Mowry, on left, greeting the Japanese Aerobatic Team on their arrival in the United States.

me, I had to leave just as the team arrived, but Bill and Hank talked with them and welcomed them to the United States on behalf of the AMA.

Everything went smoothly. Customs were very helpful, and the team made their connection with time to spare. Only one small problem; John Worth had told me that one of the members spoke fluent English. All Bill and Hank could say was that that depended on your definition of "fluent." But, with a lot of laughing and hand waving, it was determined that the team members all had new original designs for this year's contest, and were looking forward to it with great anticipation. By the time you read this, you will know whether their hopes were realized. Messrs. Okumura, Yoshioka, and Naruke (I hope I have their names right) had been practicing daily for many months, and they were ready.

As I said, I had to catch a plane for Memphis. Just made it in time. Joe Harris, secretary of the Memphis R/C Club, met me at the airport, and we proceeded to Marshall Robilio's restaurant (he's a club member) where we had a delightful evening. I showed the movies of the flight tests of the Lockheed Harassment RPV, which I had been participating in down at Yuma Proving Grounds, then we had a question and answer period plus general bull session, and the next day we went out to their flying field and did some Sunday Flying - - - even though it was Tuesday. Great fun — and what a layout they have. It's one of the better R/C fields that I've visited. And here's an aside observation. My broken finger wasn't entirely healed, but as I watched Joe Harris giving instruction to Harold High, I was fascinated by the flight performance of the Bridi RCM Trainer. It was the .60 size version, but Harold had a .40 in it - - - Schneurle ported (whatever that means — I gotta talk to Clarence Lee and find out).

Now I couldn't operate both rudder and ailerons, since the transmitter was Mode I, with rudder and elevator on the left gimble. But I wondered - - - how would it fly just on rudder and elevator? The model has very little dihedral, actually slightly less than the plans call for. But I tried it anyway. And I can truthfully report that the performance on rudder and elevator was as good as any design I've seen which was specifically intended for that type of control. And, when you add ailerons, it is truly a great trainer design.

Well, that ended my sojourn as a Sunday Spectator. Came home, started to work on a new design, and read the mail. Letters are still coming in on the great controversies aboout downwind turns and torque effect, but I figure we've just about beat them to death. **Summary:** One — airplanes, flying in a steady state, constant rate turn, in uniform (as opposed to gusty) wind conditions, will

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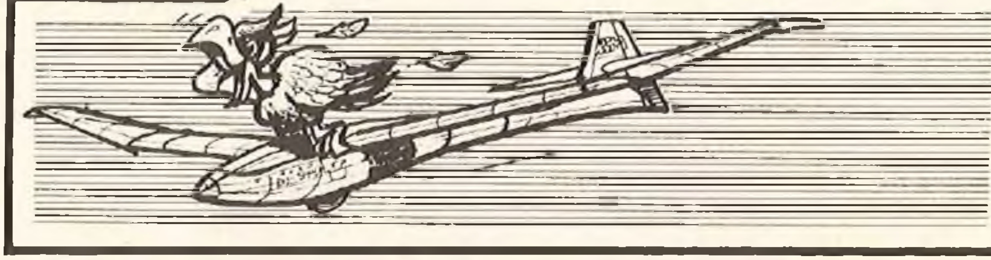
Soaring AL KINDRICK



I would like to start off with a "thank you" to all of the flying clubs who took the time to send in a copy of their contest scoring sheets. Information is being listed and a useful, universal scoring sheet will be available within two months.

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Mike O'Reilly, on right, was the guest of Cliff Rausin of Exportations, Ltd., and Erwin Schreiber of Techni-Models.

Flying at one of our local clubs this June, we were honored with an international flyer in our presence. This was Mike O'Reilly, team manager of the Australian Soaring Team that competed in the First World Controlled Soaring Championships, held in South Africa this spring. He was visiting Southern California as a guest of Cliff Rausin, exporter of radio control equipment.

Mike piloted his modified Multiplex LS-1 Sailplane, guided with an MRC Model 776 radio, to a very respectable Fifth Place in individual standings, and with his teammates, Eddie Meester and Stefan Smith, took third place as a team. Eddie also flew a modified Multiplex, while Stefan flew a Modified Maestro. In Mike's whirlwind visit to California, he mentioned the delightful climate and the abundance of flying sites.

As he left our flying site, I asked him what control functions he used on his sailplane, he turned and said, "Al, you only need two, rudder and elevator".

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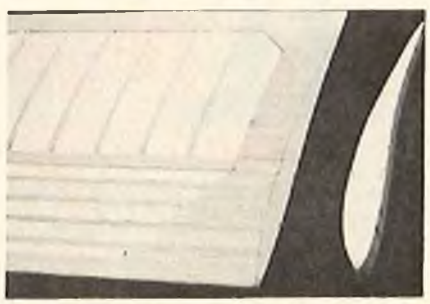
Australian team of Mike O'Reilly, center. Stefan Smith on his right, and Eddie Meester on his left. This team finished third at the Soaring Championships in South Africa.



Hi Johnson's "Exoskeleton" foam core. Airfoil shown is the JD 100.

From Hi Johnson Products, comes a new method of wing construction, Hi calls it "Exoskeleton".

The photo shows a version that can easily and quickly be constructed. On heavier wing sections the spar grooves are cut in; on lighter wings the spar is planted on the surface. Turbulator spars, leading and trailing edges, leading edge sheeting or rib caps, your "Imagineering" is your guide.

Hi can supply any modeler with a foam core for any popular sailplane, such as the Paragon, Windrifter, Aquila, Olympic, etc., with wash-in or wash-out, and with any taper at the root or tip. This foam core will upgrade performance, according to Hi, by his exotic airfoils. As an example, his 1000 sqare inch J-Bird wing, ready to cover, weighs 10 ounces! A two panel wing will have two 48" long sections, his polyhedral wings will have four, 2' sections.

One feature of this type of construction, is that the foam is below the level of the spars, caps, sheeting and turbulators, so a higher temperature film covering can be used without the fear of melting the foam.

The best thing to do, if you are interested in experimenting with airfoils, is to write Hi Johnson at 11015 Glenoaks Blvd., Pacoima, California 91331, and ask for his catalog on replacement foam cores.

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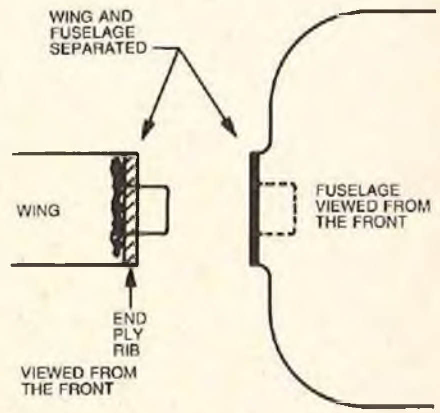
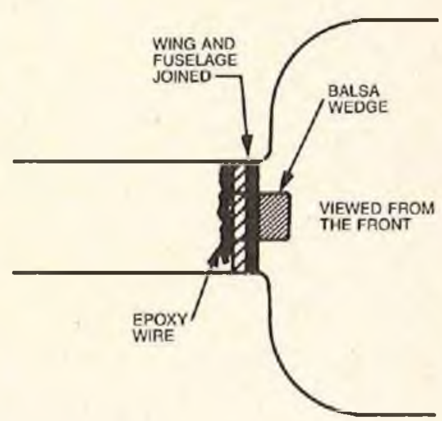
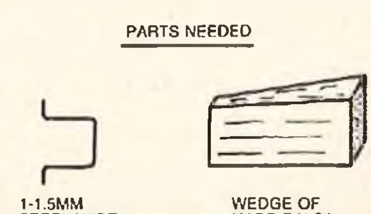
Many good ideas are sent in each month, and it is very hard to pick out one or two that would really help the







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SOARING

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sailplaner. I picked out two this month that have a lot of merit, and are very simple to install.

The first is from Ralf Markwort of West Germany. It is meant to replace the inter-connecting rubberband between wing panels that passes through the fuselage. It consists of a ⅂⅃⌐ shaped, .030 to .050 diameter music wire loop epoxied to the root rib of the wing panel. This wire loop would pass through a slot on the fuselage side and protrude 1/2" to 3/8" past the inside wall of the fuselage. After both wing panels have slid over the wing wires and are seated against the fuselage side, a hard balsa wedge is placed between the inner fuselage wall and the wire loop. By pushing with your thumb it will pull the wings against the fuselage sides for a firm, gap-free fit. The balsa wedge is strong enough for all types of flying, including slope, but in the event of a hard or abrupt wing pressure, the balsa will shear without damage to the wing.

This is very helpful where there are connecting aileron, spoiler, or flap linkages that could be affected by a wing panel that could move on wing rods and cause control surfaces to move.

This device would not be limited to new wing construction, although this would be the best time to install it, while you are building that new bird. A wing already built would have to be slotted on the root rib. The wire hook could be sprung closed, inserted into the slot and, when released, the hook bent on the upright legs would catch against the inside of the root rib. Epoxy could now be applied to the slot, and the loop is there to stay.

•

The other idea is from Brian Foster of North Carolina. Brian has had spoiler problems along with the rest of us. Here is how he solved his problems:

"After two contests with my new glider without spoilers, I have decided to install them. As before, I had trouble getting them to go down and stay down. In the past, I have tried rubberbands, lead weights, and springs all having their set of problems in either installation or use. Have you a better system you say? You bet your sweet wings I do - - - "Magnets". They work great, are easy to install, and have no working problems such as too strong, fatigue, too weak, too light, or wearing out. No more hanging out when you least need them to be. This is a very simple system and can be installed in 30 minutes or less on any existing spoiler system.

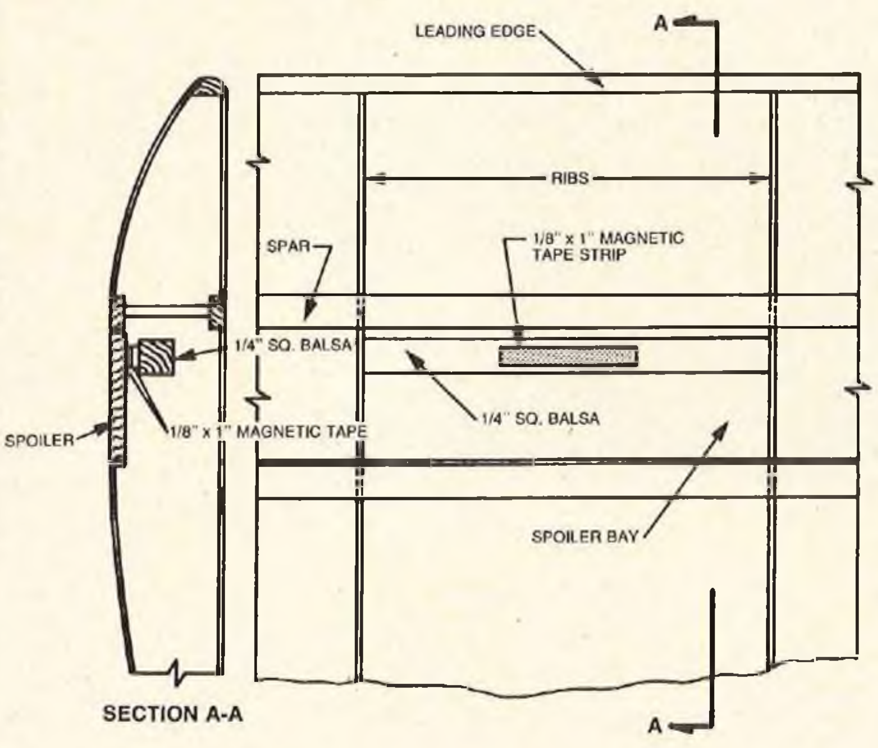
"You begin by placing a piece of magnetic tape about 1" long and 1/8" wide on the bottom forward edge of the spoiler. Then place another piece of the same size on some 1/4" square balsa between two ribs. Be sure that they match flush with each other before applying adhesive to the 1/4" square balsa. The magnet will pull the spoiler down with a positive "thump", but shows no resistance to the servo when activated. This system gives you complete proportioned control no matter what the altitude of your aircraft.

"The magnetic tape can be bought at any craft or hobby store for about $1.00. Try it, I am sure you will like it."

•

Here is another one from the pen of Frank Lepple, editor of the Pasadena Soaring Society Newsletter:

"Late in the afternoon of May 31, one of the P.S.S. members was making a final approach and just as he started to turn on final it appeared that something fell off his sailplane. The plane landed safely and investigation proved that all the parts were still attached. The falling object was the result of a mid-air with a bird. That's right, real feathers! The unconscious little soarer was located and the pilot promptly administered artificial respiration and heart massage. After about five minutes the little gray flyer was revived and flew away to warn his pals to beware of the big blue and white Albatross with no feathers. That's the



MAGNETIC TAPE STRIP INSTALLATION

The sailplane of Jack Deffenbaugh wouldn't land without the necessary body english. Jack's plane was still airborne when picture was taken.

way it happened. If you haven't guessed by now, the pilot was Craig Foxgord, intrepid aviator and heretofore unknown aviculturist. Four P.S.S. members witnessed this unusual event."

•

My parting shot this month shows Jack Deffenbaugh making a very definitive landing of his sailplane. If it wasn't for the body English, it would have never landed. His timer, Don Prosser, seems unexpressive over the whole thing. I found out later that Don has timed for Jack before.

•

My personal congratulations to the RC Soaring winner from the NATS in Riverside, California, and the LSF Soaring Tournaments across the nation. And we "Lift our Lids" to the people that worked so hard to put on these fine events.

Good Lift. □

Our Armchair Ace reminisces about the old days in competition and how little times have changed.

ARMCHAIR ACE

BY HOBIE STEELE

I was just settin', thinking about competition after one whale of a fine TV flick about the Good Ol' Boys - - - those Southern Chauffeurs who drive the NASCAR race circuit.

The story was about the struggles of "Jr. Jackson", a particularly good, if undercapitalized, ol' boy's rise from moonshine runner to stock car champion. "Jr." finally made it, but it took his skill and gumption, combined with a wealthy sponsor, to put him over the top. As in aeromodeling, the largest cubic dollars don't always win, but it sure gives a head start on most of the competition. Like — it ain't no disgrace to be poor, but it's awful unhandy!

I remember back about '61 or '62 when I took a notion to try my hand at aeromodel competition. Down in North Carolina, the hotter cow pasture pilots were flying Don Brown's Multiplex. Blake Honeycutt had a "Swampey" 404; Harld Coleson in Atlanta just got one of Phil Kraft's brand new digital units. A few die-hards like Austin Leftwich were just starting "pylon racing" (one at a time) using Walt Good's TTPW which was supposed to stand for Two Tone Pulse Width, but many said it meant: Too Tedious to Piddle With. Many, like Ed Kamirski, were flying 10-channel reed outfits — and winning.

In those days, aerobatic events were broken down into Classes I, II, and III. Class III was similar to today's Pattern with "full house" ships (*sans* retracts) much like today's breed, if slower. Class II was REM — no ailerons — and a hold-over from the days of "Mickey Mouse" which derived several functions from a single channel signal which was pulsed electronically or mechanically.

Class I was rudder and throttle, any way you wanted to get it. It was supposed to be for beginners and po' boys. With only two controls, Class I began as rubber band escapement operated single channel radios which may have had a 3-position throttle operated by "quick-blip" on the (only) transmitter button. But as I approached the competition scene, Class I was opened up to throttle and rudder (only) equipped aircraft using any RC gear you wanted. This looked like a good starting place so, being a methodical sort, I laid my plans.

Beginning with Jack Port's 10-channel reed, bang-bang (no proportional — all or nothing), Controllaire Tx and Rx, I added two Annco servos to each of a matched pair of Carl Goldberg's Falcon 56's powered with K & B and Veco 35's. The combination felt right and with two aircraft exactly alike, any mishap wouldn't put this aspirant aerobat out of business for long.

Now most folks flying Class I back then weren't using such a "sophisticated" approach; they were still flying escapements. This included a mighty good friend named Charles Sully who had won Class I the preceding year at the All Dixie Championships in Spartenberg, South Carolina. Sully, as we all called him, had probably mentioned this win once (or thrice), but it seemed to me that he brought up this example of his Class I aerobatic prowess interminably, *ad nauseum*. Well, that's how it seemed to me and I think that may be why I chose to enter Class I Open Competition at that time.

Now Sully was truly a good friend, therefore I was determined to challenge him in Spartenberg that year and beat the living hell out of him!

But like any combination of competition hardware, all would be of naught without practice - - - and practice, I did. There's a price to pay for competition success, so every chance I got, I worked at flying the Class I pattern. No more boring holes in the sky doing a maneuver when I felt like it; every flight was a pattern flight consisting of take-off (scale-like with only throttle — no elevator — to control up and down), 90° left turn, 270 right, straight (and level) flight, horizontal "8 around the transmitter", 3 Inside Loops, Cuban 8, Rolling 8, Stall Turn, Immelman, Tail Slide, and Touch and Go, followed by traffic pattern approach and landing perfection. It wasn't easy to do well with only throttle and rudder control, but I learned to, including the Rolling 8. This maneuver consisted of two Inside Loops — one under the other — to make a downhill sort of Vertical 8 which was easy to do with rudder.

Now Sully didn't have the Rolling 8 in his repertoire, so I figured this would surely put me ahead of him at the Spartenberg meet. Except . . . except, by golly that could give him an *excuse* for my beating him. No excuses, I had to whoop him fair and square, so I took Sully out to the local ARCS field and *taught* him the Rolling 8. We went over it and over it until he had it down pat.

Then we made the Spartenberg meet — and I beat the tar out of him! The fruits of success were sweet and I went on to win two more major contests in Asheville and Atlanta that summer.

My winning was a result of paying the price — both in equipment and in practice. Even though my aircraft were more or less trainers, they were well equipped and well powered and well ahead of most of the competition I had to face. Granted, my expense in money and labor was minimal by today's standards, yet it was right high class in the early 1960's. Class I aerobatic success wasn't assured to the pilot with the highest cubic dollars invested, but it darn sure wasn't the beginners' event it was supposed to be. Neither is Class A Pattern (or 500 Class racing) today.

At 39 (go ahead and chuckle, Rhett) I've been thinking of getting back into competition flying - - just for the fun of it. The Class A Pattern is easy enough even for a rusty aerobat like me and I thought of working out with one of my trusty EarlyBirds until I could maybe place above last in some of the local contests. But, discussing the prospects with a couple of local pattern pilots, my

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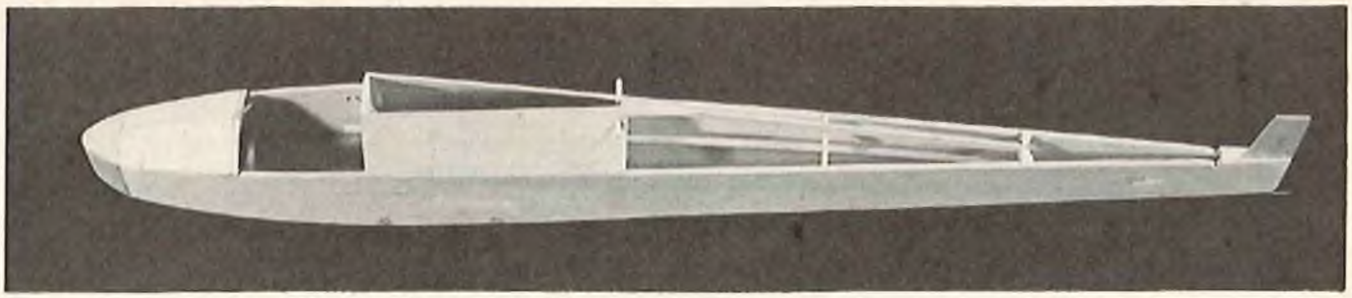
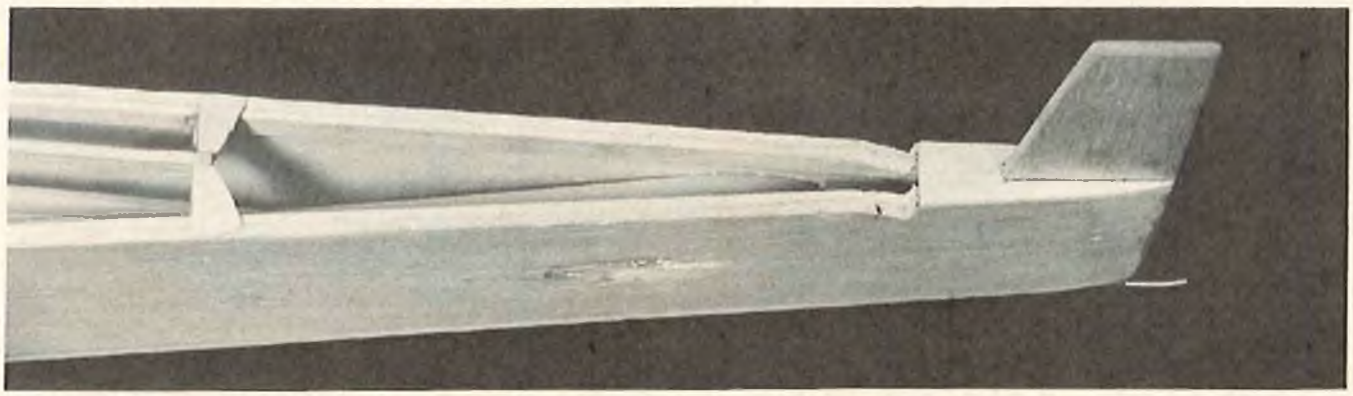
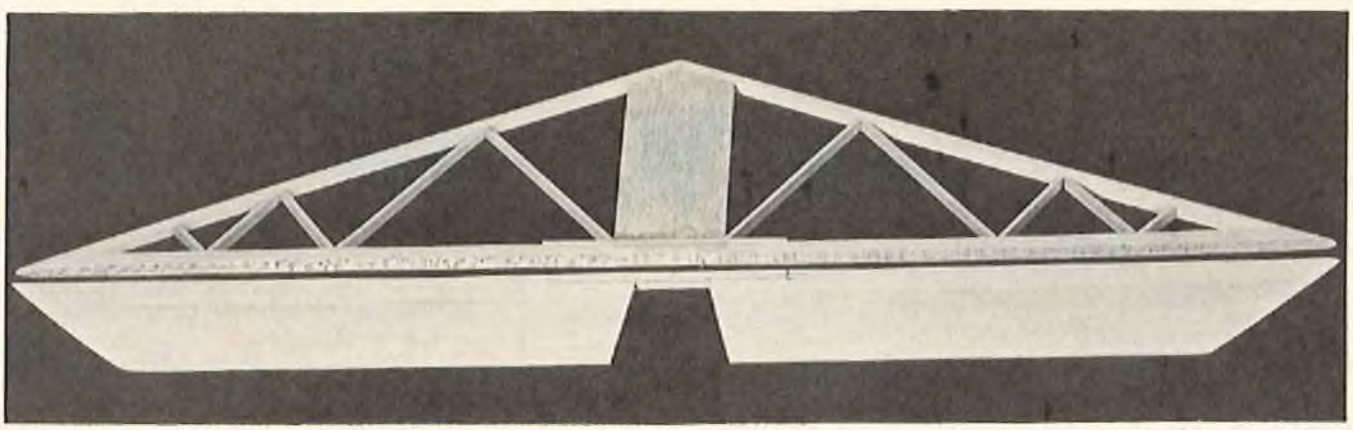
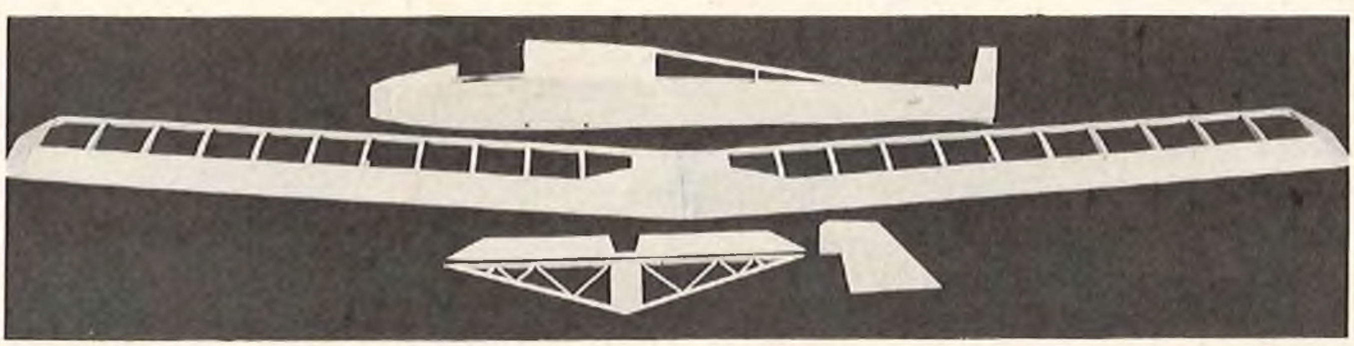

Top view of Cadet basic fuselage construction.


Side and bottom view showing forward planking.


Aft end of fuselage showing vertical fin and pushrod exits.

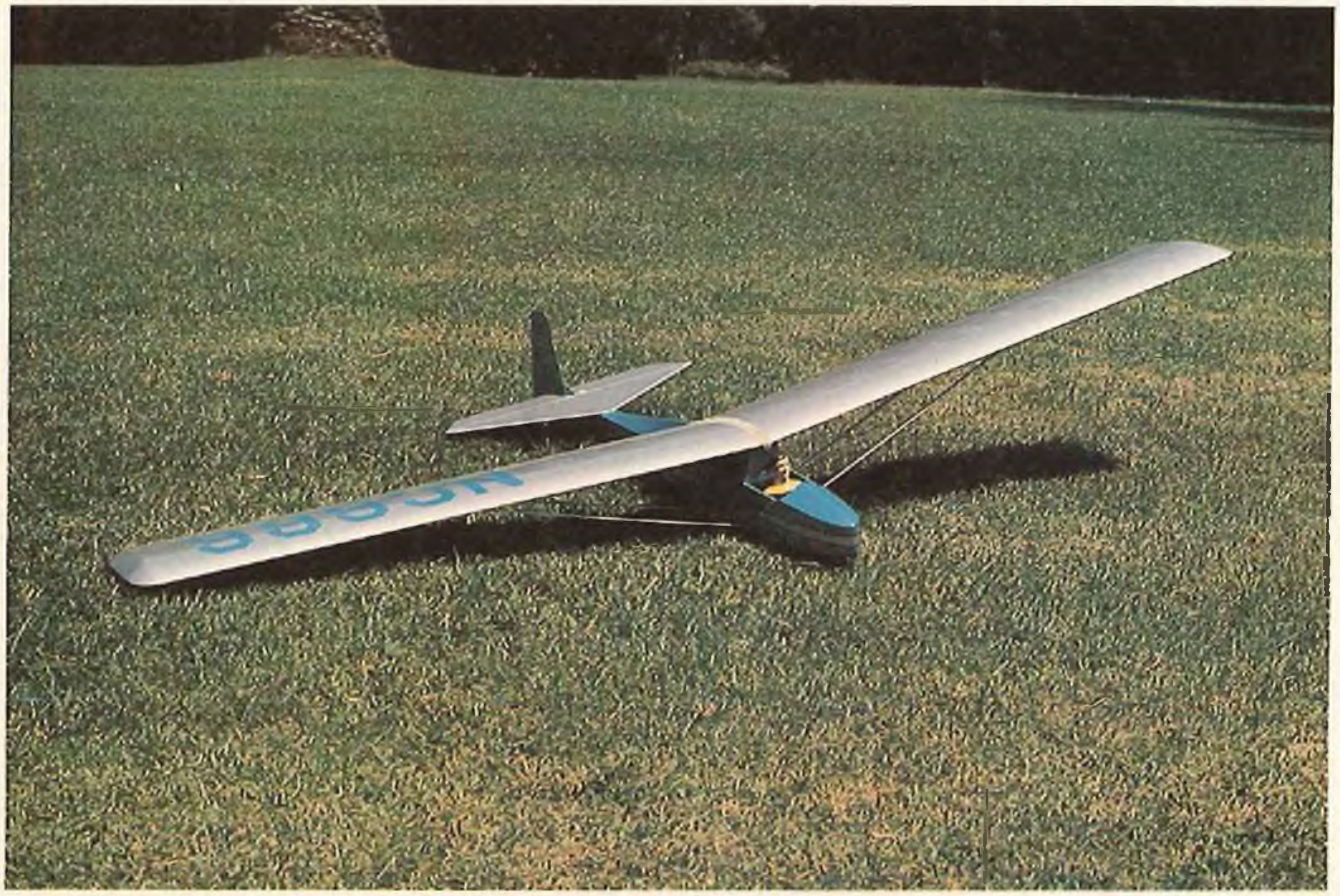

Fast building stabilizer and elevators.


The completed framework ready for covering.

CADET UT-1

By Lee Renaud

With the interest in Stand-Off Scale sailplanes growing by leaps and bounds, the Cadet UT-1 is a natural for competition or general sport flying.



This two-channel sailplane is a Stand-Off Scale model suitable for general sport flying or a quickly built competitive ship. With interest in Stand-Off Scale sailplanes increasing, this simple design will let you fly another event with a minimum investment in time and materials. The nostalgic design also provides a welcome change from the sterile appearance of the modern fiberglass sailplanes. Despite the small size and simple construction, the Cadet tows very well on hi-start or winch, and will turn in outstanding thermal flights. Control response is excellent and the overall performance is similar to most non-scale designs of this size. If you are looking for a fun ship with a different look, clean off your workbench and order the full-size plans. A visit to your local hobby shop will provide all the materials without straining the budget.

The Cadet was an off-shoot of the glider training program established by the U.S. Armed Services during World War II. The design is an American version of the famous British Kirby Cadet, used extensively in England before and during World War II.

The Cadet UT-1 was first flown in May 1943, at Meriden, Connecticut, and was built in Brooklyn, New York. The design of the Kirby was modified to suit American requirements, both structurally and aerodynamically, but overall performance was quite similar. Maximum glide angle was 14.7:1 at 31 mph, and the stall speed was 25 mph. Sinking speed was around four f.p.s. at the 30 mph speed. Red line air speed was 65 mph, certainly not a high performance ship by today's standards.

Construction was all wood except for the struts, fittings and control systems. With an empty weight of 276 pounds, and a maximum gross of 450 pounds, the wing loading was only 2.6 pounds per square foot. The Cadet completed a test program of nearly 200 flights, and an Airworthiness Certificate was granted in November 1943. A company was formed to manufacture kits of the Cadet, but the venture became a casualty of V-J day, along with many similar enterprises.

Horizontal Tail Assembly:

Notch the elevator leading edge for the 1/8" x 1/4" spruce elevator tie. Epoxy the tie in place and pin the elevator in place over the plan. Cut the stabilizer outline from 3/16" x 1/4" strip and pin in place over the plan. Be sure the joints fit tightly for maximum strength. Install the trailing edge reinforcement and 3/16" sheet center rib, then cut the rest of the ribs from 3/32" x 1/4 strip and glue in place. Let the completed stabilizer dry thoroughly before removing from your work surface.

Mark the hinge locations and install the hinges temporarily to check alignment. Remove the elevator and bevel the leading edge to permit free movement, then cut out the section behind the spruce tie. Reassemble to check that the movement is smooth without any binding. Mark the location for the horn mounting screws and drill the 3/32" diameter holes. The horizontal tail is now ready for sanding and covering.

Fin And Rudder Assembly:

Glue the rudder parts together over the plan and install the 1/8" x 1/4" anti-warp strip. Mark the hinge positions on the fin and rudder and install hinges temporarily. Remove the rudder and bevel the leading edge section that contacts the fin trailing edge. Drill the horn mounting holes, check the hinge action, and the fin and rudder are ready to sand.

Wing Assembly:

Pin the trailing edge in place and use two or three ribs as spacers to locate the leading edge before pinning in place. Lay the bottom spar in place and glue the ribs in position, using the shear webs to locate the ribs. Cut and install the 1/16" bottom center section sheet, making certain that it is pressed tightly against the work surface. Install the top spar, checking that the top edge is flush with the top of the ribs. Now you can install the spar shear webs. Be sure that the webs do not extend above the top spar.

Install the leading edge sheet, checking carefully that it is tight against the top of the leading edge and spar. Then, add the top center section sheet and the cap strips. Cut the tip gussets and install. Now build the second panel in the same manner. Let both panels dry completely before proceeding to the next step.

Remove any excess stock protruding beyond the tip rib and install the tip blocks. Note that the flat side of the block is on the bottom surface of the wing. Carve the blocks to final shape after the glue is dry. Shape the leading edge and sheet to the cross section shown on the plans, using a small plane. Be sure that both panels are identical. Now sand the wing panels all over, using a rigid sanding block. Cut and install the covering supports for the strut, attach points and sand flush with the rib surfaces. Don't install the strut fittings yet.

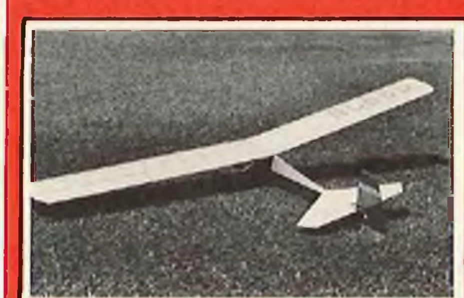
Prop up one of the wing panels so that the tip rib is raised 3⅜" above the work surface. Block sand the end of the panel, hand-launch glider style, to get the proper angle of the center joint. Repeat this step with the second panel and check the fit of the center joint. With one panel flat on the work surface and the tip rib of the second panel raised 6¾", the center joint should fit tightly. When satisfied with the fit, join the panels with 5-Minute epoxy. Don't move the wing until the epoxy is thoroughly cured, and use pins or weights to hold the panels securely.

Sand off any excess epoxy around the center joint. Install the .070" x 3½" music wire trailing edge reinforcement

CADET UT-1
Designed By: Lee Renaud

TYPE AIRCRAFT
Stand-Off Scale Glider
WINGSPAN
62 Inches
WING CHORD
6⅝ Inches
TOTAL WING AREA
409 Square Inches
WING LOCATION
High Wing
AIRFOIL
Eppler E-385 (F.B.)
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
3⅜ Inches
O.A. FUSELAGE LENGTH
34½ Inches
RADIO COMPARTMENT AREA
(L) 9⅝" X (W) 2⅜" X (H) 2½"
STABILIZER SPAN
16 Inches
STABILIZER CHORD (Incl. elev.)
4-3/16" (Avg.)
STABILIZER AREA
59 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5 Inches
VERTICAL FIN WIDTH (Incl. rudder)
4" (Avg.)
REC. ENGINE SIZE
NA
FUEL TANK SIZE
NA
LANDING GEAR
Skid
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder & Elevator
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply & Spruce
Wing	Balsa & Spruce
Empennage	Balsa & Spruce
Weight Ready-To-Fly	17 — 20 Oz.
Wing Loading	6.5 Oz/Sq. Ft.



with 5-minute epoxy. Wrap the joint with 3/4" wide nylon tape using Duco or similar cement to secure the tape. Rub in several coats of glue for added strength and to fill the weave of the tape. Cut a slit through the covering support, and epoxy the strut attach fittings against the side of the rib, with the round section of the Klett hinges just touching the covering supports. Your wing is now ready for final sanding and covering.

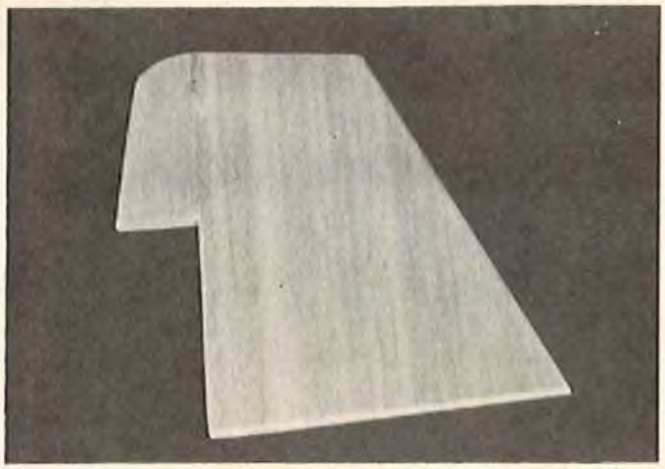
Fuselage Assembly:

Glue the 1/16" x 1/4" spruce stringer and verticals in place on the fuselage sides. Be careful to make a right and left hand side. Install the nose doublers and mark the side assemblies for the former and crosspiece locations. Tack glue a scrap of 1/8" x 1/4" strip into place at the aft end of the sides to act as a temporary tailpost. Glue former F-4 in place, and cut and install the aft 1/8" x 1/4" crosspieces. Add former F-5 and the top stringer and gusset, then install the 3/32" sheet aft bottom. Note that the forward portion of the bottom is slit to allow it to conform to the vee shape of F-4.

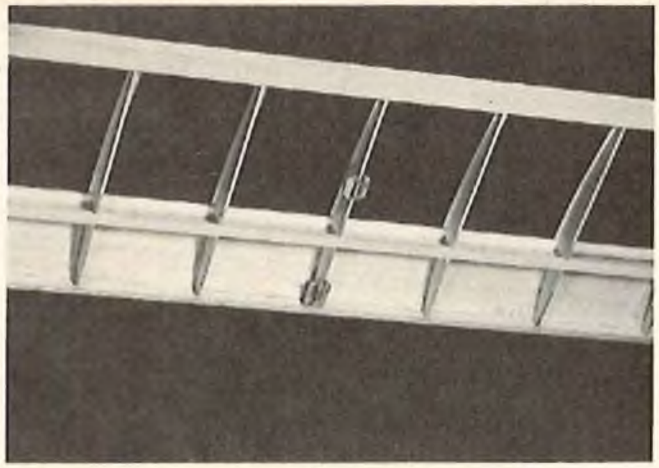
Install formers F-3, F-2A, F-2B, and F-1, working from F-4 forward toward the nose. Use masking tape to hold the sides tightly against the formers and check alignment carefully over the top view on the plans. Be sure that both sides curve evenly and that the fuselage is not twisted. Let this assembly dry thoroughly before continuing assembly. While you are waiting, assemble the wing mounts and glue the 1/16" plywood tow hook mount to the ply forward bottom, and install the blind nut.

Check the operation of your radio system and notch the fuselage sides for the pushrod outer tubing. Install the outer tubes, epoxying securely to the sides as well as F-3 and F-4. Install the 3/32" sheet receiver compartment floor and back. Epoxy the servo rails in place and temporarily mount the servos to check pushrod action. It's a lot easier to correct any problems now before finishing the assembly of the fuselage. Be sure that you can easily install the receiver and battery pack with the servos in place.

Install the 1/8" ply wing hold-down plates F-6 and F-7, using 1/4" triangle stock reinforcements. Next install the wing mounts on each side of the fuelage, trimming the spruce cap flush with the top stringer. Add the 1/4" sheet fillers at the stab leading edge, trimming so that the stab fits flush behind the fillers. Notch the top edge of the sides so that the elevator tie clears in full down elevator. Install the 3/32" top nose sheet, beveling the edges for a good fit at the center and against the sides. Use a sanding block to bevel the lower edge of the sides to match the vee shape of the formers and install the 1/16" plywood forward bottom. Glue one side in place with 5-Minute epoxy and let dry. Check fit the second side and correct any prob-



The rudder is of simple two-piece sheet balsa construction.



View of underside of wing showing strut anchor locations.

lems before installation. Trim any excess flush with F-1 and glue the noseblock in place. Drill 3/16" diameter holes in the sides and install the tubes across the fuselage for the strut retaining bands. This completes the basic fuselage assembly.

This is a good time to lay out and drill 3/32" diameter holes on the wing center line for the mounting bolts, then to temporarily strap the wing on the fuselage. Drill through the wing hole into F-7, checking carefully that the wing is centered on the fuselage. Remove the wing and enlarge the aft hole to 5/32" dia. and tap a #6-32 thread in F-7. Install the wing using a #6-32 x 3/4" long nylon screw in aft hole only. Use a thread or stick to trammel the wing so it is perpendicular to the fuse., then drill thru into F-6 when you are sure that the wing is properly aligned. Enlarge the hole thru the wing and tap the hole in F-6. Remount wing and check alignment carefully. Correct any problems before continuing.

Cut the spruce struts to length and bend the end fittings from #17 common pins. Install the wing attachment fittings and hook the struts onto the attachments in the wing. Check that the strut ends clear the fuselage sides by 1/16", trimming the length, if necessary. Bend the fuselage attachment fittings and glue to the struts. Wrap the strut fittings with nylon tape or thread to reinforce the ends of the struts. Remove the struts and the wing.

Carve the noseblock to shape and block sand the entire fuselage. When you are satisfied that all contours are final, remove the temporary tailpost and glue the fin in place between the sides, checking alignment carefully. Add the 1/16" sheet cap to fill the space around the fin. Trim the excess sheet and sand flush with the sides. You are now ready to final sand and cover your Cadet.

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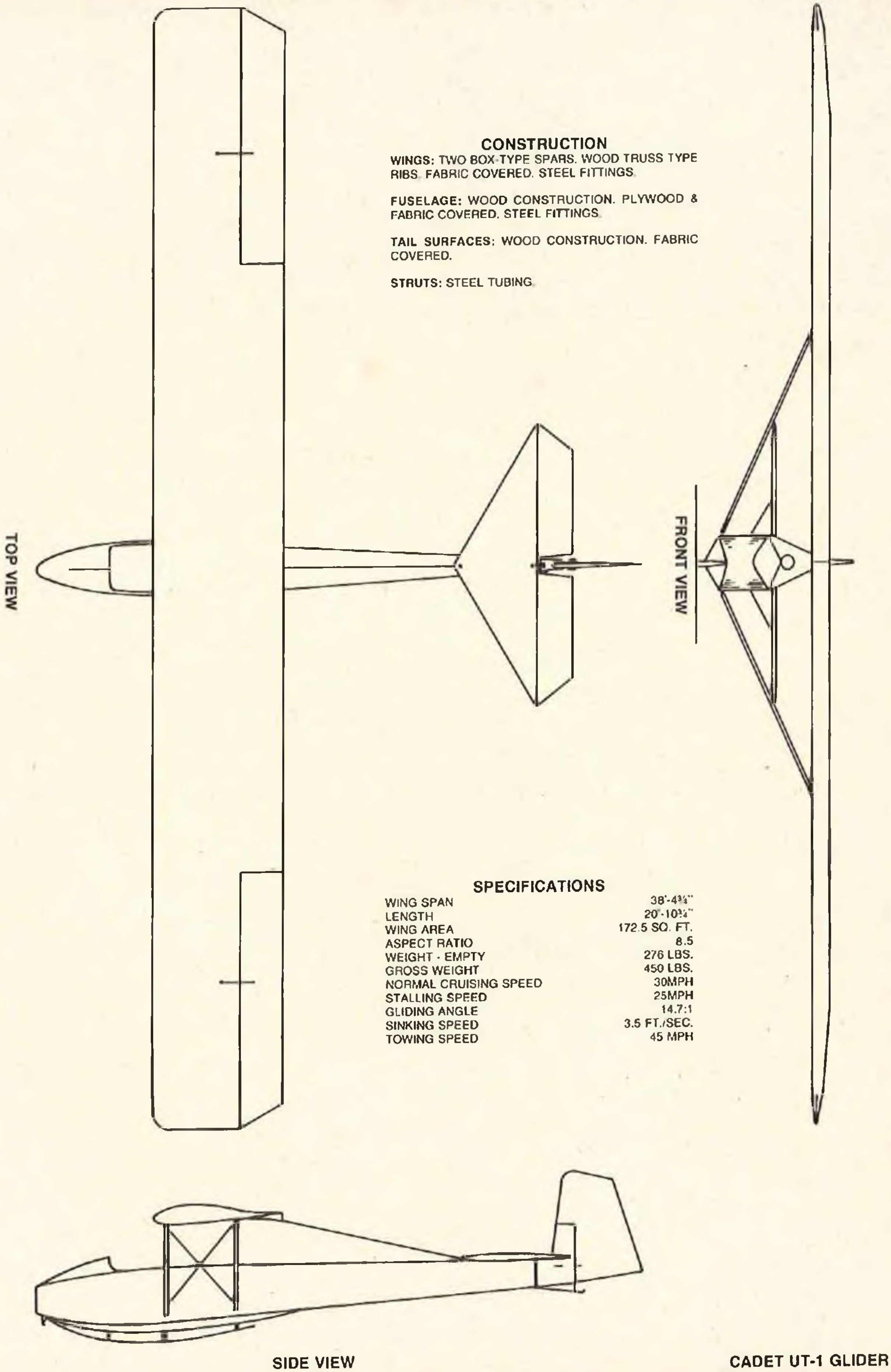


CONSTRUCTION

WINGS: TWO BOX-TYPE SPARS. WOOD TRUSS TYPE RIBS. FABRIC COVERED. STEEL FITTINGS.

FUSELAGE: WOOD CONSTRUCTION. PLYWOOD & FABRIC COVERED. STEEL FITTINGS.

TAIL SURFACES: WOOD CONSTRUCTION. FABRIC COVERED.

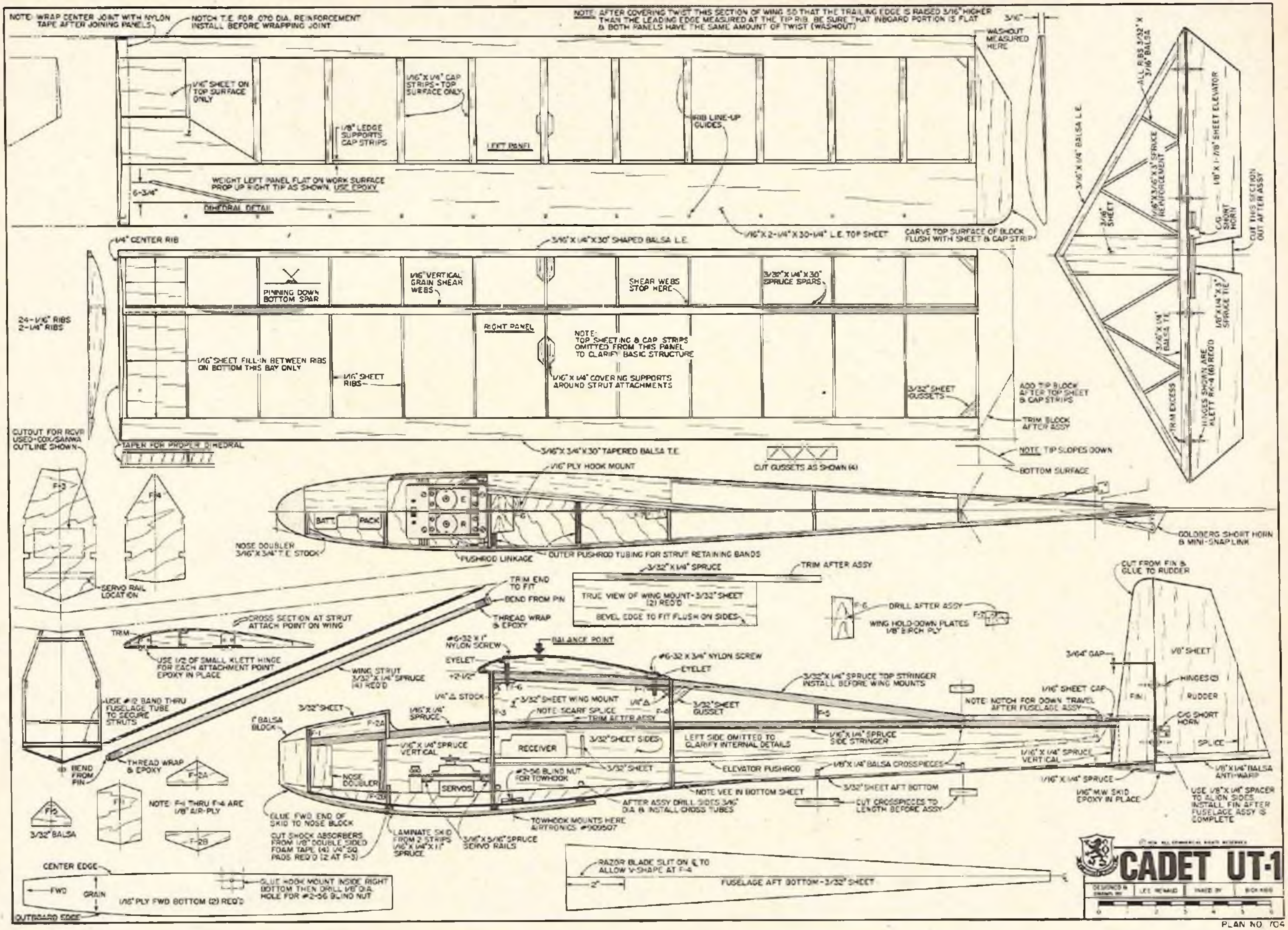
STRUTS: STEEL TUBING.

SPECIFICATIONS

WING SPAN	38'-4¾"
LENGTH	20'-10¾"
WING AREA	172.5 SQ. FT.
ASPECT RATIO	8.5
WEIGHT - EMPTY	276 LBS.
GROSS WEIGHT	450 LBS.
NORMAL CRUISING SPEED	30MPH
STALLING SPEED	25MPH
GLIDING ANGLE	14.7:1
SINKING SPEED	3.5 FT./SEC.
TOWING SPEED	45 MPH

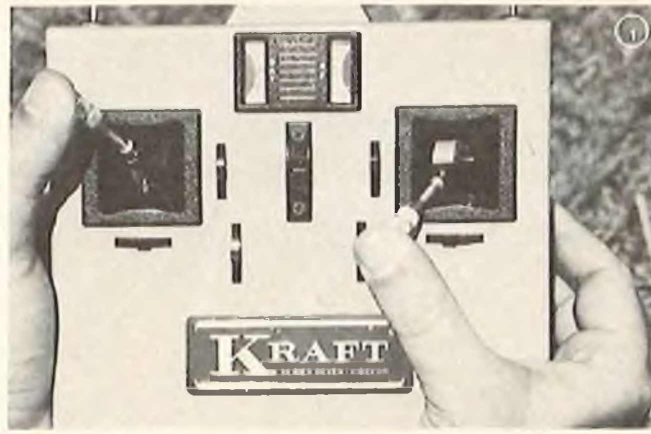
CADET UT-1 GLIDER

FULL SIZE PLANS AVAILABLE — SEE PAGE 189



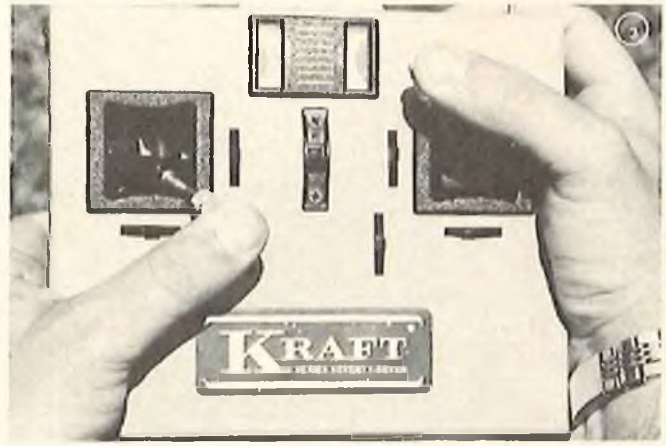
HOT DOG FLYING

By Ed M. Moorman

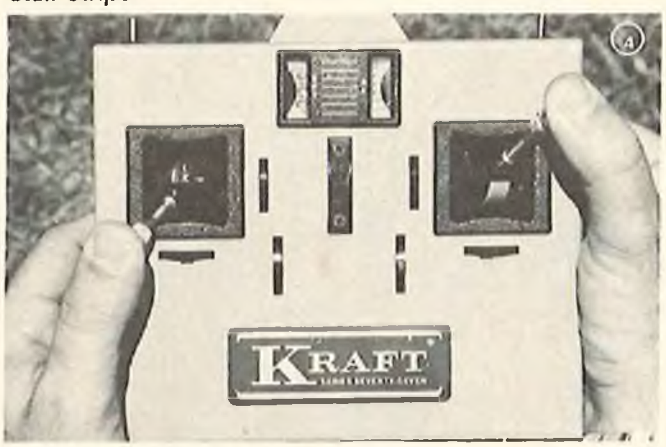


Snap Roll

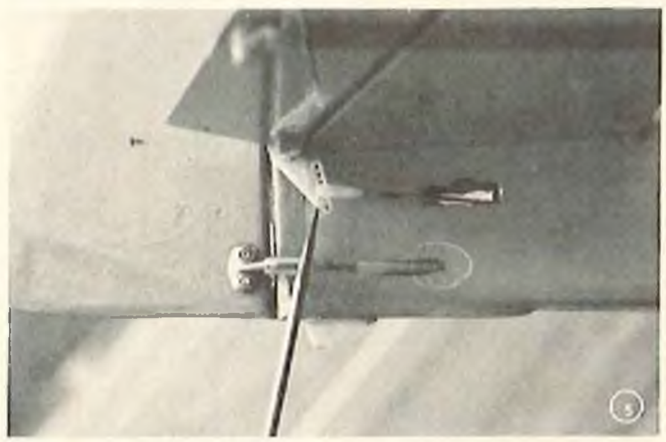

Stall Strips

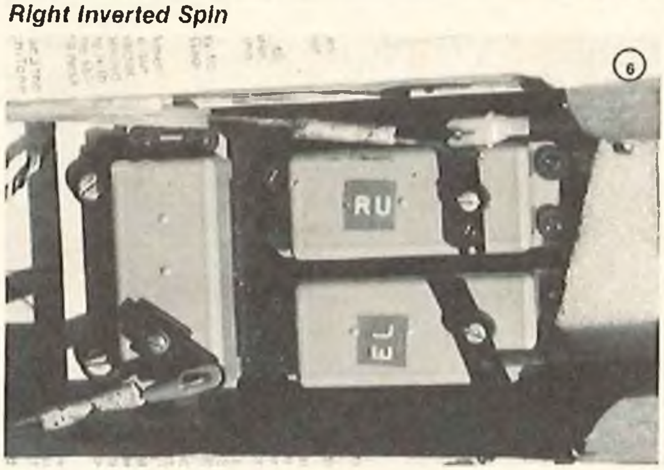


Left Inverted Spin



Right Inverted Spin


Differential Elevator Horn



Offset Elevator Servo Arm

Left Inverted Snap Roll

Would you like to be a hot dog flier? Do you have a desire to wow the crowd with inverted and flat spins, snap rolls, and Lomcevaks? If you are ready to move away from those huge pattern maneuvers to the fun and fast crowd pleasers just read on. I'll go through each maneuver with a description of it and photographs of the stick positions required to perform it.

The first thing you need to do snap and spin maneuvers is a capable airplane. A strong, high-performance sport plane is what you are looking for. It should have the following characteristics: Rearward CG (tail heavy), a sharp leading edge on the wing, and lots of elevator and rudder movement. A couple of good planes to start with are the Alley Kat and the Super Kaos .40.

Next, you need to make a check to see if your plane will snap roll. To make this check, take your plane up, level off at spin altitude and pop in spin controls except leave in full throttle. See Photo l. If the plane does a series of rapid rolls and then falls off into a high speed spin you are in good shape. That was a snap roll. If, on the other hand, your plane did a slow spiral-like roll, you need to make a few changes. Land and check your rudder throw. You'll need at least 30° . (I prefer 45° on my planes.) Try this set-up and if she still doesn't snap move the clevise progressively closer in on the elevator horn to give you more movement and try the snap again. If you are still having trouble getting a snap roll, add stall strips to the leading edge of your wing. See Photo 2. These strips cause the air to separate from the wing faster giving you a high speed stall which you need for a snap roll. To recover from a snap roll just release the controls. Be aware that the conditions that cause a plane to snap will cause tip stall on landing. Bring her in a little faster or be prepared to pick up the pieces.

Once you get your plane to snap you can add a couple of maneuvers to your

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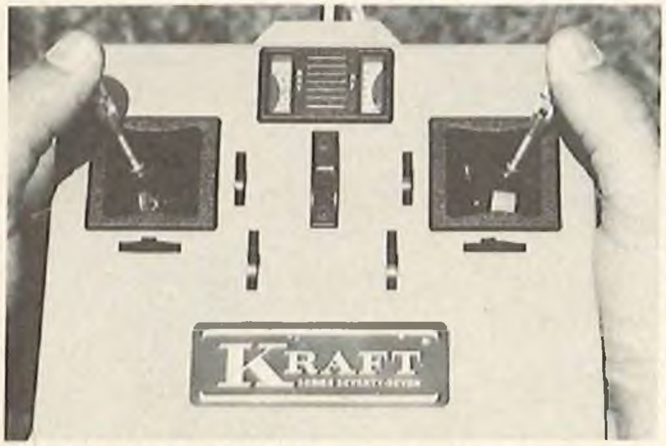
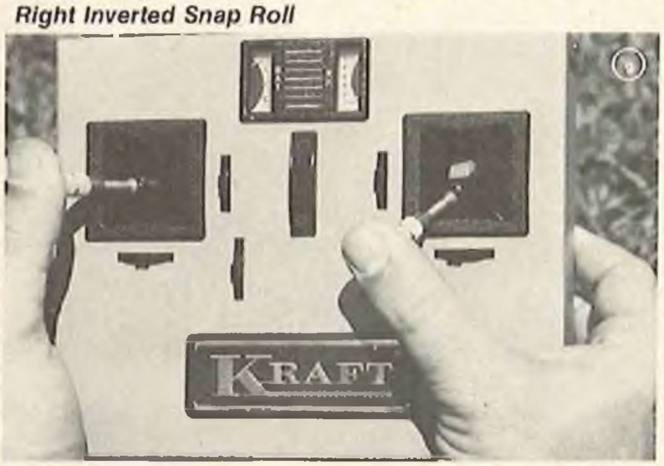


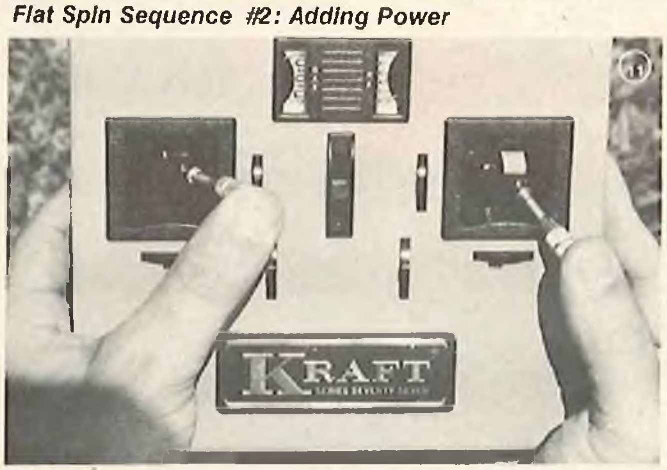
Right Inverted Snap Roll

Flat Spin Sequence #1: Normal Spin



Flat Spin Sequence #2: Adding Power

Flat Spin Sequence #3: Opposite Aileron



Lomcevak Sequence #1: Snap Roll

Lomcevak Sequence #2: Opposite Corner

Kathie Wickman of Greenbelt, Maryland, showing off the Dart.

CULVER DART

ABOVE: *Full size "Dart" owned by David S. Foulke of Spring House, Penn. He has spent about 2 years on this major restoration. It is pictured before its final paint scheme.*

Tom Mountjoy is the same born again tail-dragger who gave us the Seabee Amphibian construction article in our January 1977 issue of R/C Modeler. Tom has again wrought the unusual with this rendition of the relatively unknown "Culver Dart." While the Dart has been overlooked for years by the sophisticated model builder, its high wing factory companion, namely the Monocoupe, has enjoyed immense popularity.

Photos By Tom Mountjoy

CULVER DART

Designed By: Tom Mountjoy

TYPE AIRCRAFT
Stand-Off Scale Low Wing
WINGSPAN
59 Inches
WING CHORD
12 Inches
TOTAL WING AREA
576 Square Inches
WING LOCATION
Low Wing
AIRFOIL
Semi-Flat Bottom
WING PLANFORM
Constant Chord
(Elliptical Tips)
DIHEDRAL, EACH TIP
4½ Inches
O.A. FUSELAGE LENGTH
38¼ Inches
RADIO COMPARTMENT AREA
(L) 9½" X (W) 6½" X (H) 3"
STABILIZER SPAN
18 Inches
STABILIZER CHORD (Incl. elev.)
7½" (Avg.)
STABILIZER AREA
135 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
9½ Inches
VERTICAL FIN WIDTH (Incl. rudder)
6" (Avg.)
REC. ENGINE SIZE
.35 — .45 Cubic Inch
FUEL TANK SIZE
8 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., & Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage .... Balsa & Ply
Wing .... Balsa, Ply, Spruce & Basswood
Empennage .... Balsa & Spruce
Wt. Ready-To-Fly .... 96 — 112 Oz.
Wing Loading .... 13 — 18 Oz/Sq. Ft.

To you fans who are following the current fad of looking up your ancestors, let me say right here and now, the little Dart has its share of "Roots". Back in 1935, Al Mooney, then Chief Engineer of the Lambert Aircraft Company in St. Louis, Missouri, created the Dart as a low wing stablemate to their Monocoupe. Al is the same Mooney who followed with such well-known designs as the Culver Cadet, Mooneymite and the current line of Mooney Mark 20 and 21 airplanes. All are high performance low wings and are direct descendants of the "Culver Dart".

When the Dart was originally designed in late 1935 at the Lambert factory, it was known as the Monosport "G". Towards the end of 1937, sportsman Knight Culver Jr., then a salesman at Monocoupe (name changed to Monocoupe Corp. in October 1936), took the opportunity of buying the manufacturing rights to the Dart for $30,000. For the transaction, he was given the prototype airplane, parts for three more, plus all the tooling. Culver incorporated as the Dart Manufacturing Company and moved the whole works to a hangar factory at Port Columbus, Ohio in the spring of 1938. It was rumored that Culver lured Al Mooney to Columbus with a deal he could not refuse.

In early 1939, the Dart firm changed its name to Culver Aircraft Company. The forty-ninth, and last, Culver-built Dart was delivered in 1940. By this time, Mooney had completed certification of another revolutionary design — namely, the Culver Cadet (RCM plan #454).

While I have never owned a Dart, your author did own a Culver Cadet back in 1945. It was the many enjoyable hours of flying in the Dart's offspring that spawned the inspiration resulting in this construction article.

Back in July of 1938, there was an epic 50 thousand dollar race between a

Culver Dart and a Monocoupe 110 Special, but that is another story. (What a great idea for an R/C old timer event!) It was a photo finish with both planes averaging 163 miles per hour — an unheard-of speed from a 145hp engine in the 1930's!

If model builders are reluctant to tackle a scale airplane design, there is usually a good reason. In the case of the Dart, I believe the reason was basically that the airplane is short-coupled and, therefore, somewhat tricky to fly. Rumor had it that the real Dart suffered from the same characteristic, which also accounted for its outstanding aerobatic ability. The popular Pitts Special is a prime example of the same type configuration, with world aerobatic trophies to prove the point.

In order to make this model of the Culver Dart a good R/C flyer that anyone can enjoy, and without detracting from its appearance as well as aerobatic maneuverability, I have lengthened the fuselage by 3.5" and added 1/2" on the height of the vertical tail. This is the only deviation from a true two-inch scale version of the real Dart. If anything, the airplane model takes on a more graceful and pleasing appearance. I am certain there were times when the Culver people wished they could have done the same thing without going through the expense of getting a new type certificate!

Constructing the Fuselage

This model has been carefully designed in order to keep the overall construction basically the same as that of the real Dart. You will find balsa sheet to represent metal covering back to the aft cockpit bulkhead. From there on, you have fabric covered stringers.

The first step after cutting out all the bulkheads is to glue each one in its proper position on the 1/2" square balsa rod. Make certain the rod is straight and from rather hard balsa. The rod acts as a jig that controls how true your fuselage will be when you finish.

When gluing the 1/8" x 1/4" stringers, do the side ones first, alternating from side to side in order to hold the proper alignment. Notice that the side stringers run the entire length of the fuselage. Also, that from the aft cockpit bulkhead to the firewall, there is a 3/32" relief cut made on the outer side to each stringer to accommodate the balsa side panels to be added later in that area.

The aft (top) stringers are positioned next. Be sure to use hard, but good bending, balsa in order to maintain the proper curve to this section of the fuselage. These stringers are secured right on top of the bulkheads and are equally spaced as shown on the plans. The top one goes on first.

Using 3/32" medium grade balsa, cover the outside of the forward section of the fuselage. The inside of the cockpit from the firewall to the aft cockpit bulkhead is lined (between bulkheads) with 1/16" plywood sheet. This forms a strong box-type construction to protect your radio gear from unscheduled landings.

In fabricating the cockpit and firewall bulkheads, you will see that the plywood in each case is backed up with balsa. This is done to save weight, to have the thickness required for the proper scale appearance, and to give a more secure glue joint. Stay away from warped plywood.

After framing up the fuselage, you are now ready for the test of your balsa carving ability. The bottom section between the firewall and the leading edge of the wing is made from balsa block. Use a good grade of carving balsa, not too hard or soft. After carving the outside of the block to the desired shape, hollow out the inside to a wall thickness of about 3/8". The last major step is to cut the relief radius for receiving the leading edge of the wing center section. Your receiver and batteries will fit snugly in the hollowed out area when you come to the home stretch.

Do not glue the above masterpiece in place until the last stage of total construction. Having it removable will allow you to install your fuel tank and engine mount with a minimum of difficulty. In addition, this block controls your wing alignment.

You will probably wonder about that 1/2" balsa rod going through your cockpit. Leave it there until the fuselage is complete, then cut out as shown. Leave just enough in the rear cockpit area for mounting your pilot platform, which is made from 1/16" plywood.

Wing Construction

One of the interesting features of the Dart is the wing, which is truly a thing of beauty. In the good old days, the Dart was known as "that handsome little plane with the elliptical wing."

It is a good idea to study the wing plan carefully before starting construction. There are two areas that require special attention. One is the center section (because of the landing gear mounting structure), and the other is the taper on the bottom surface of the outer wing panel. Note that the top surface of the wing is a straight line.

After cutting out all of the wing ribs, you are ready to assemble them on the front and rear spars which are made up of top and bottom beams. The front beams are made from 1/4" x 3/8" spruce and the rear ones are the same size in hard balsa. Since the lower beams are rather complicated, a full size layout of the spar assembly has been included in the plans.

Assemble the ribs to the lower beam first and then add the top beam, thereby completing the spar structure. The Dart wing is purposely designed strong because it is fully cantilever as well as aerobatic.

The wing tips are cut from a light grade of balsa block with hard balsa used on the leading and trailing edges. After the wing has been fully framed, you are ready to join the two halves. If the spar beams have been accurately cut, the proper dihedral will be automatic. However, it is still advisable to measure the dihedral against that shown on the plans.

As you can see, the landing gear main strut is well forward of the front wing spar. This location requires an added box reinforcing structure from the main gear longitudinal back to the front spar. This is done to transfer the landing load back to the wing spar where it is normally found. Because the wing rib cut-outs accommodating the landing gear are sizable, it is recommended that the cuts be made after the wing is roughly assembled. Once the 1/16" plywood reinforcement is secured in its proper location, the structure is quite adequate.

The final steps involve covering the leading edge with 1/16" balsa sheet, prior to adding the capstrips to the bottom and top of each exposed rib.

Tail Surface Construction

If you're in a hurry, and can find just the right grade of 3/8" balsa sheet, the tail surfaces can be made solid. However, because the Dart stabilizer is relatively large, and to avoid tail heaviness, I preferred to build up the various surfaces. To simulate the real fin and rudder, I chose not to cover these surfaces with balsa sheet. Since the stabilizer is large, and to prevent warpage, it should be framed up, then covered with light 1/16" balsa. The elevators can be cut from 3/8" balsa sheet, although here again — to keep them light — I made a core from 1/4" sheet (complete with lightening holes) and then covered with 1/16" sheet. An X-Acto hole cutter blade in your drill motor does a nice job, if kept sharp.

The main spars of both the fin and stabilizer are cut from 3/16" basswood or spruce, as these two members carry the load. The rudder spar can be made of balsa to keep it light. I found the Goldberg hinge cutter works very well with basswood.

As a final step in completing the tail assembly, be sure to sand a well rounded, fine taper, to the leading edge of the stabilizer. This will give a more graceful appearance to an otherwise large flat surface. On airplanes designed in the 1930's, many of their tail surfaces were fabricated from welded tubing, with little effort (or expense) given to an airfoil cross-section.

Engine Cowling Construction

The engine cowling is straightforward and constructed mostly of balsa. The nose section is shaped from two rings of 1/4" balsa sheet stock glued cross-grained for added strength. The inner structure and rear ring is made from 1/8"

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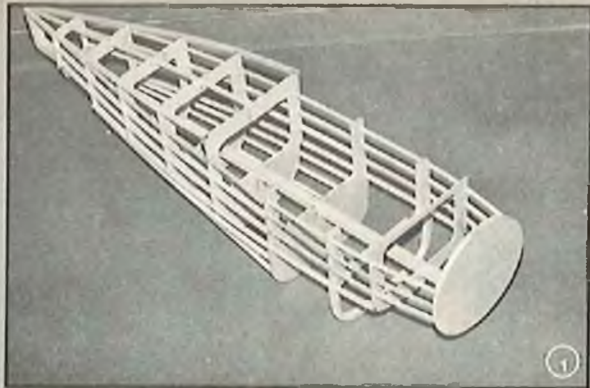
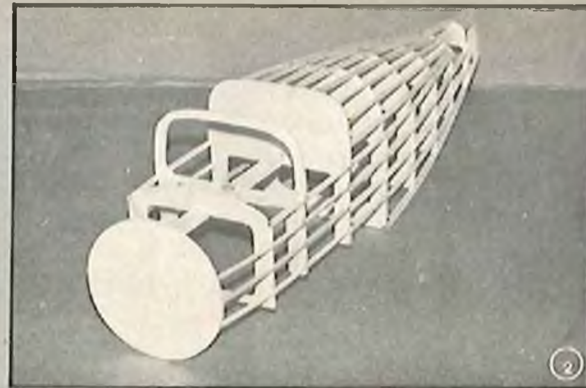
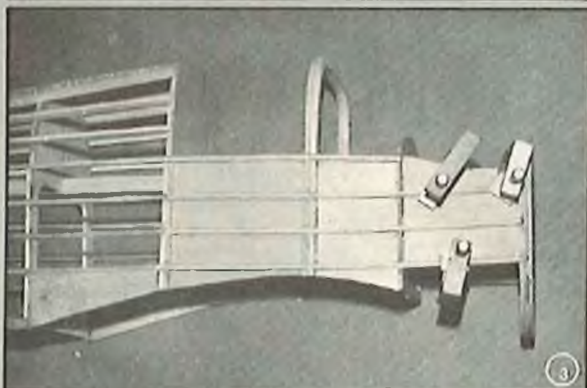
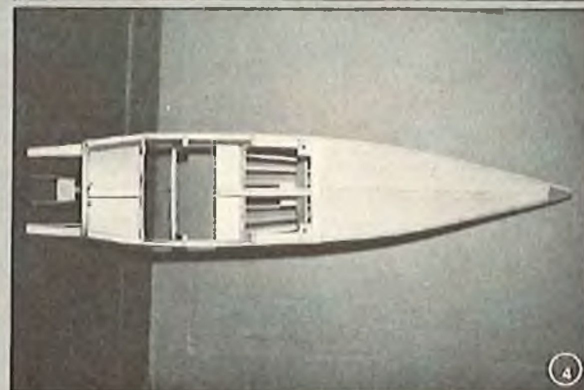
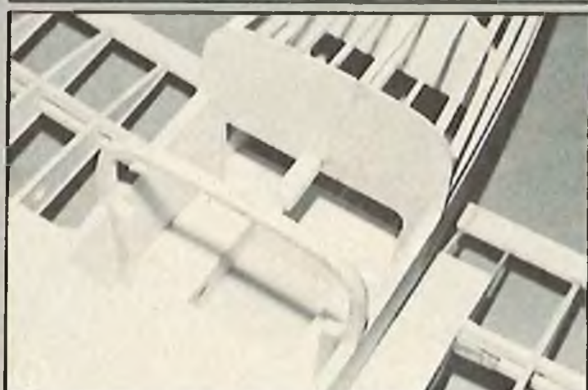
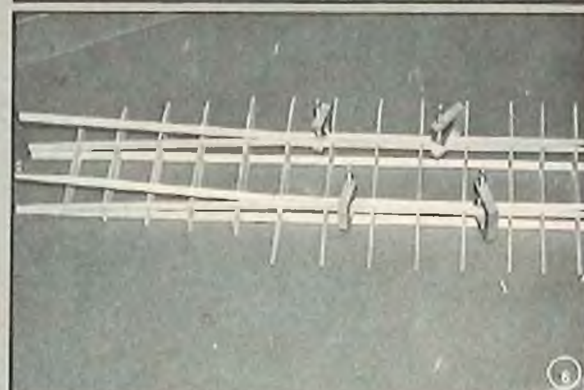


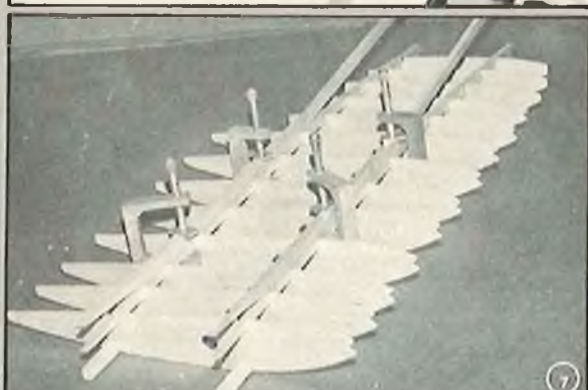


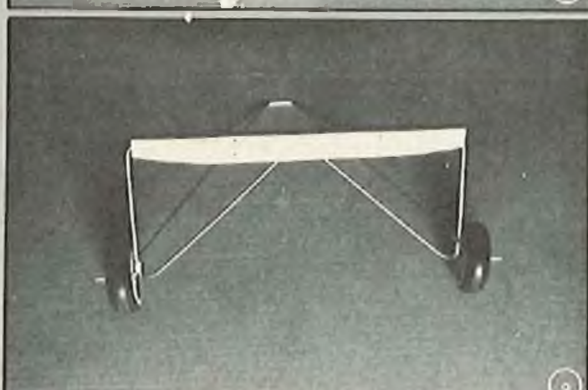






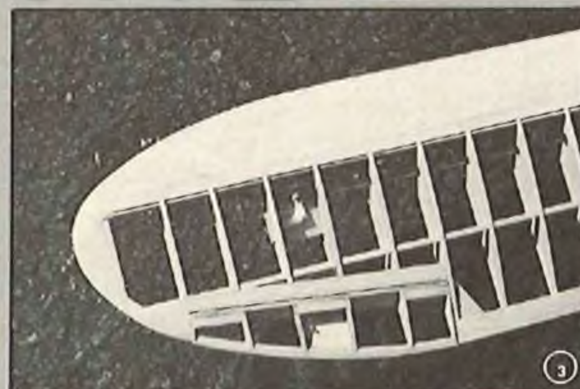


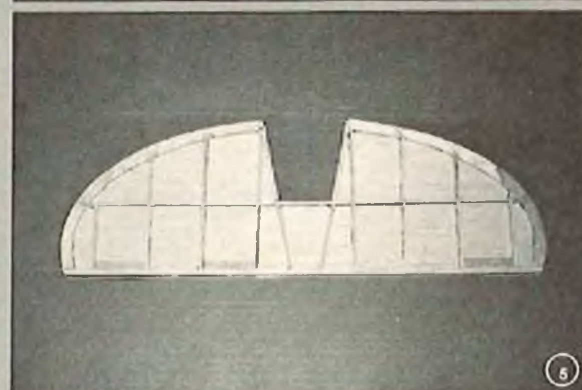


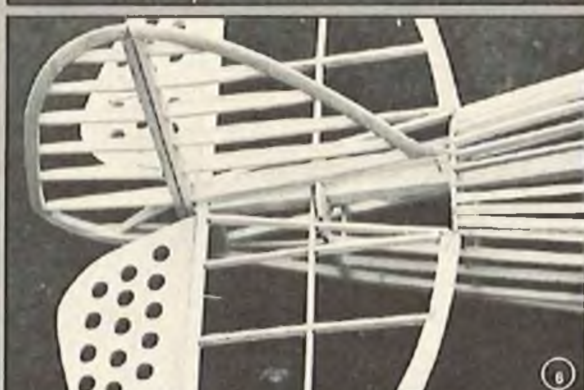


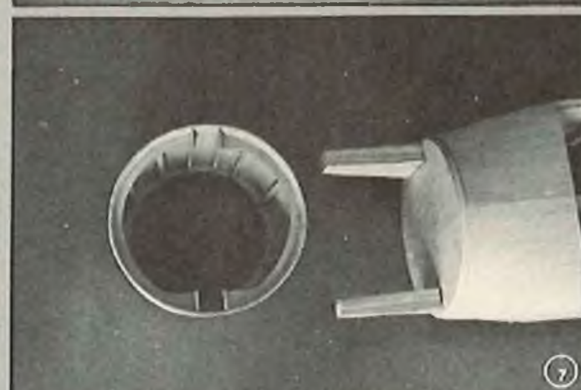
(1) Bottom view of basic fuselage structure. (2) Top view of basic fuselage structure. (3) Glue 1/16" ply doubler inside fuselage. (4) Bottom view of fuselage showing 1/16" balsa sheeting (5) 1/2" sq. balsa & bulkhead cut out in cockpit area. (6, 7, 8) Wing panels built by clamping spars together. (9) Main L/G block ready for installation.

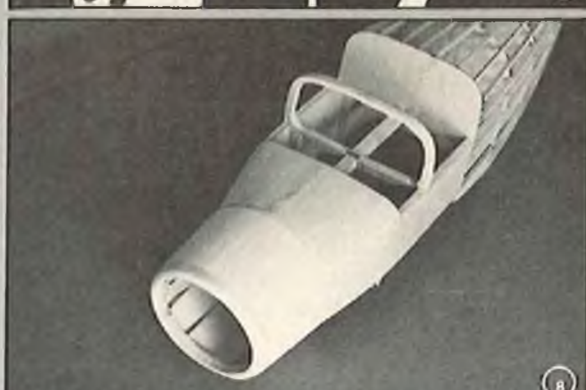
(1) L/G block installed (2) Rear leg of L/G in place. (3) Completed wing showing bellcrank & linkage. (4) Lower nose block is part of wing saddle. (5) Stab saddle showing top side sheeted. (6) Tail surfaces pinned in place before sheeting added. (7) Completed cowl & mounting beams. (8) Cowl in place. (9) Basic framework (not completed).

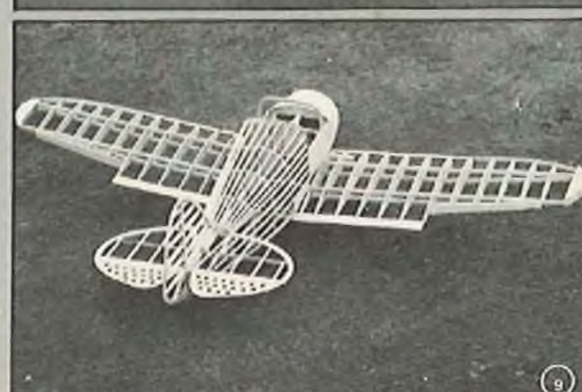


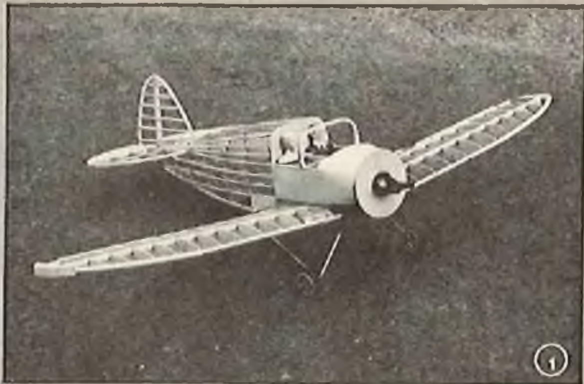


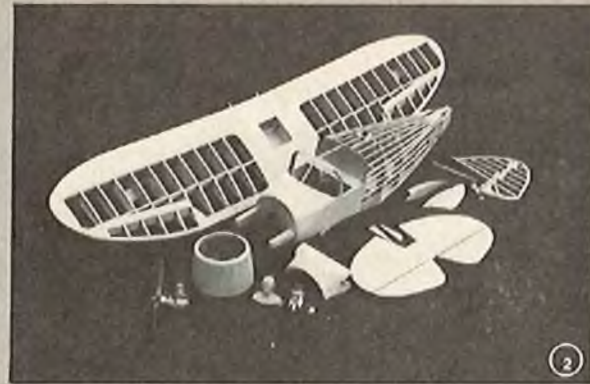


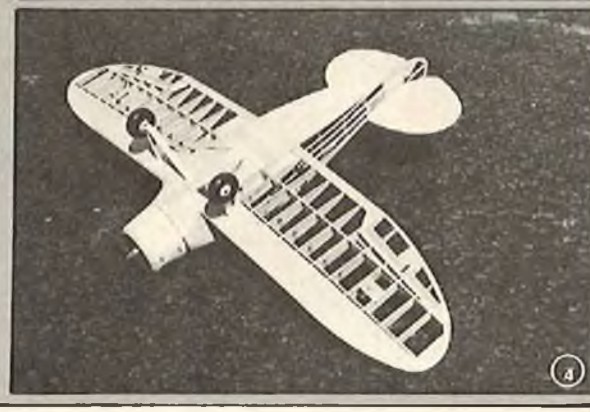












(1) Basic framework (not completed). (2) Completed airframe ready for covering. (3) Completed airframe assembled. (4) Bottom view of completed airframe.

plywood. The sides are made with a double layer of 1/16" balsa sheet for ease of bending and also for added strength.

The best way to describe the cowl mounting supports is to follow the plans. If you do not mind removing the propeller each time you remove the cowl, leave it in one piece. It will slide on and off the mounting guides with ease.

To get away from removing the propeller, I split my cowl horizontally so that the bottom half remains in place most of the time. For simple maintenance and test flights, I remove the top half by taking out the two bolts on either side. Cut the cowl only after you have it complete and fitted to the mounting skids. I lined the inside with light fiberglass and Hobbypoxy glue, Formula 2. The last step is to provide a 1/2" hole for the glow plug lead and a clearance hole for the Semco exhaust extension.

Landing Gear

The Dart landing gear is what they call a tripod design. It is rather leggy because small doughnut airwheels were used to cut down drag. For the model, make the two front struts from 5/32" music wire and the rear support from 1/8" wire. The front struts are streamlined with a basswood fairing which is held permanently in place with 15 minute epoxy.

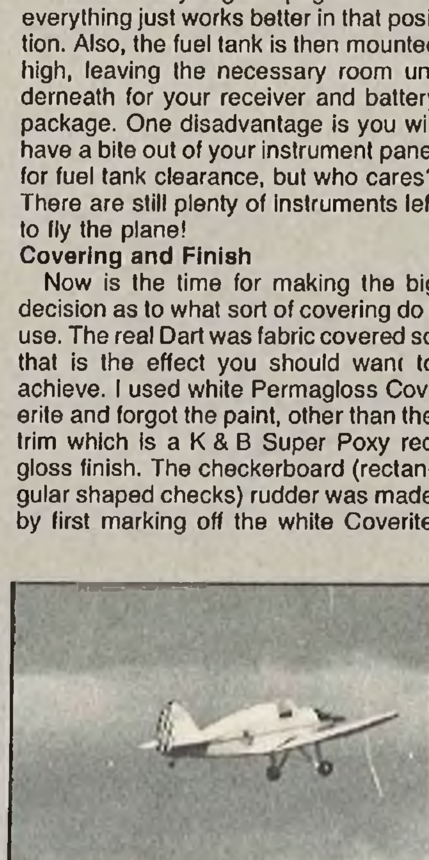
Engine Installation

The selection of engines runs from .35 to .45 cu. in. Anything larger will require a hole in the cowl for cylinder head clearance. The plans show an OS .40 which is a good compromise. I used an ST .35 with a Kraft mount and an 8 ounce fuel tank.

I mounted my engine upright because everything just works better in that position. Also, the fuel tank is then mounted high, leaving the necessary room underneath for your receiver and battery package. One disadvantage is you will have a bite out of your instrument panel for fuel tank clearance, but who cares? There are still plenty of instruments left to fly the plane!

Covering and Finish

Now is the time for making the big decision as to what sort of covering do I use. The real Dart was fabric covered so that is the effect you should want to achieve. I used white Permagloss Coverite and forgot the paint, other than the trim which is a K & B Super Poxy red gloss finish. The checkerboard (rectangular shaped checks) rudder was made by first marking off the white Coverite



surface with a red felt point pen. Make certain the ink is washable. I cut the checks from red Goldberg DJ Multi-Stripe, 6" wide material. Be sure you remove the clear protective coating from the top surface of the Multi-Stripe before you cut up the little pieces. Use the rest of the material for cutting out the 5" numbers.

The Dart can be covered with two rolls of Permagloss Coverite, but you will have a seam at about the center rib on the bottom of each wing panel. No problem with a *hot* iron.

Most of the Darts, as they were delivered from the factory, had paint schemes wherein little or no imagination was used. The fuselages were usually dark red or black with light colored wings, such as yellow. The fuselage had from one arrow stripe to three smaller stripes. The scheme I chose was taken from a recently rebuilt Dart which the owner apparently uses for old timer racing exhibitions against such notables as cousin Monocoupe, the Davis D-1K, and others. In other words, it is an authentic paint job for contest judging, not to mention it is attractive and you can see it in the air.

Flight Controls

As you will notice on the plans, even though the Dart is a low wing, I mounted my servos upright. I like to see what is going on down there, and I don't like to remove the wing if I need some adjustment. The Dart cockpit canopy is re-

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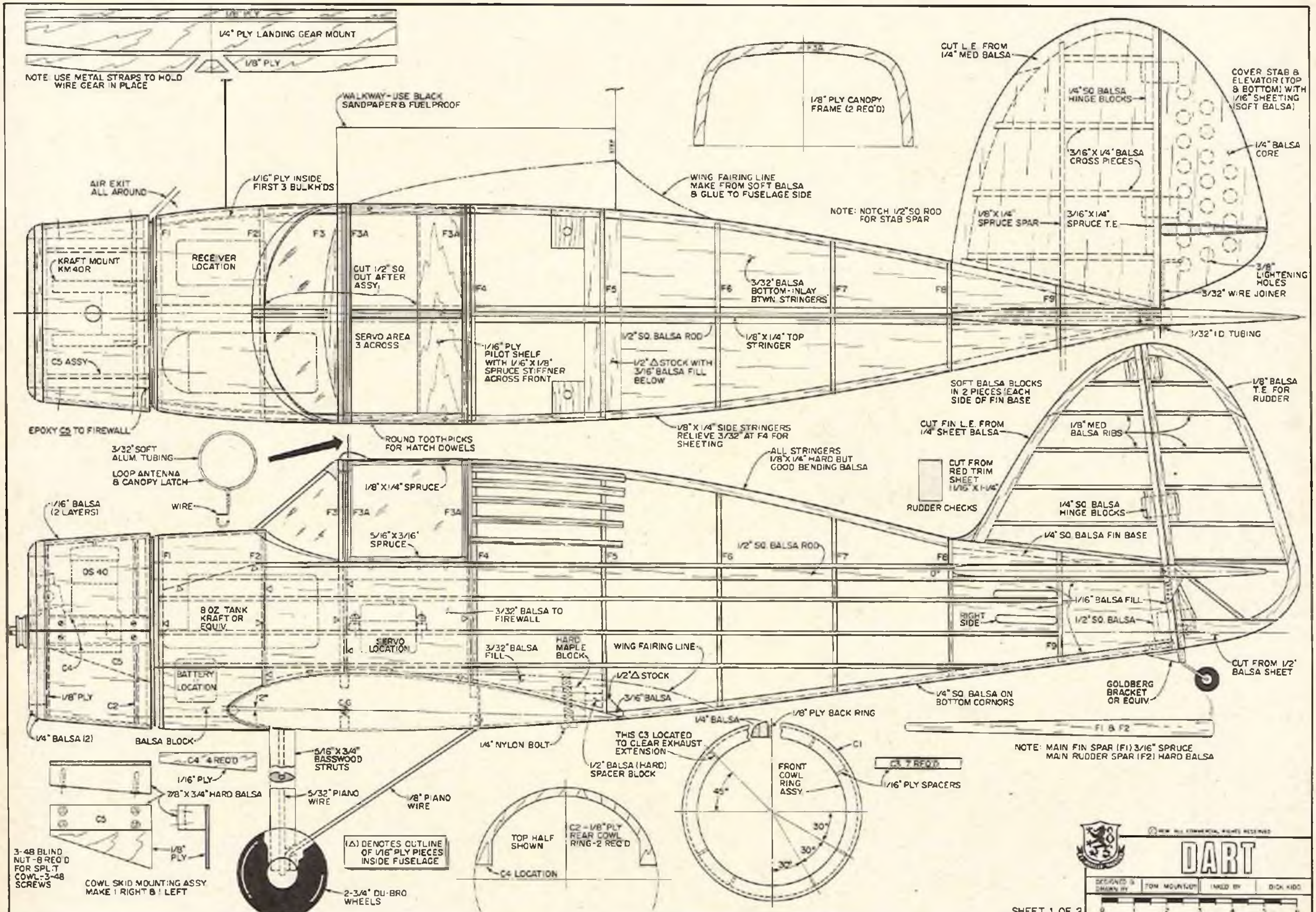
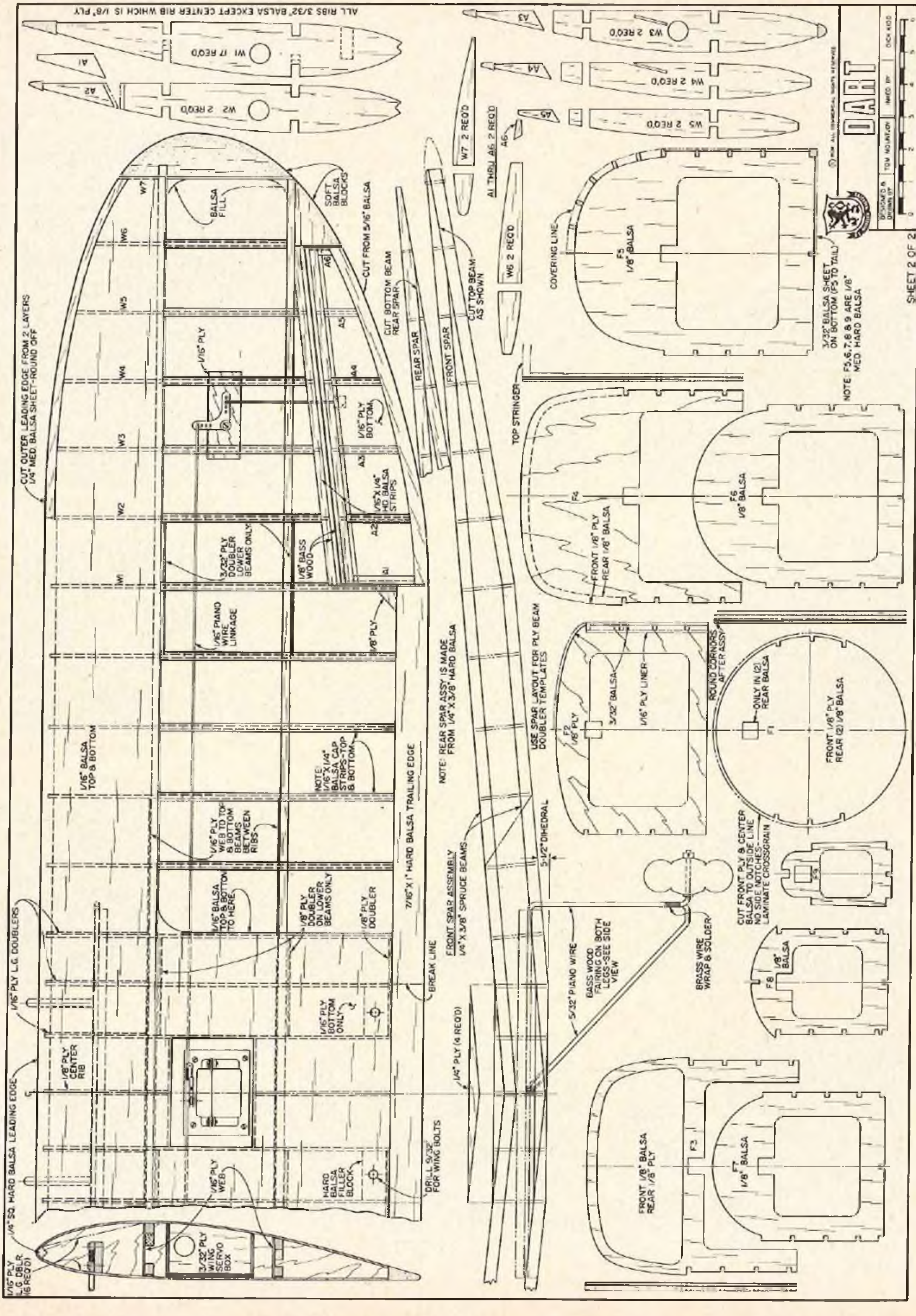
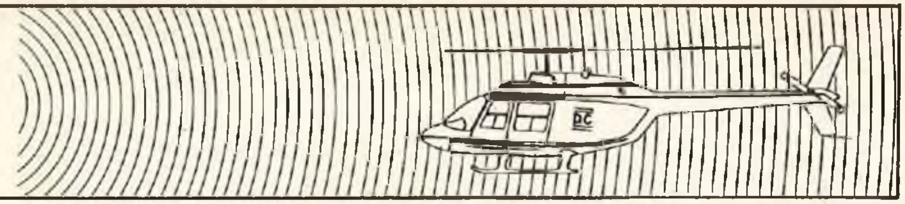

1/4" PLY LANDING GEAR MOUNT
1/8" PLY
NOTE: USE METAL STRAPS TO HOLD WIRE GEAR IN PLACE
WALKWAY - USE BLACK SANDPAPER & FUELPROOF
1/8" PLY CANOPY FRAME (2 REQ'D)
CUT L.E. FROM 1/4" MED BALSA
1/4" SQ BALSA HINGE BLOCKS
COVER STAB & ELEVATOR (TOP & BOTTOM) WITH 1/16" SHEETING (SOFT BALSA)
3/16" X 1/4" BALSA CROSS PIECES
1/4" BALSA CORE
AIR EXIT ALL AROUND
1/16" PLY INSIDE FIRST 3 BULKH'DS
WING FAIRING LINE MAKE FROM SOFT BALSA & GLUE TO FUSELAGE SIDE
NOTE: NOTCH 1/2" SQ ROD FOR STAB SPAR
1/8" X 1/4" SPRUCE SPAR
3/16" X 1/4" SPRUCE T.E.
3/8" LIGHTENING HOLES
3/32" WIRE JOINER
KRAFT MOUNT KM40R
RECEIVER LOCATION
CUT 1/2" SQ OUT AFTER ASSY.
3/32" BALSA BOTTOM-INLAY BTWN STRINGERS
SERVO AREA 3 ACROSS
1/16" PLY PILOT SHELF WITH 1/16" X 1/8" SPRUCE STIFFNER ACROSS FRONT
1/2" SQ. BALSA ROD
1/8" X 1/4" TOP STRINGER
1/2" △ STOCK WITH 3/16" BALSA FILL BELOW
3/32" I.D. TUBING
C5 ASSY
SOFT BALSA BLOCKS IN 2 PIECES (EACH SIDE OF FIN BASE
1/8" BALSA T.E. FOR RUDDER
EPOXY C5 TO FIREWALL
ROUND TOOTHPICKS FOR HATCH DOWELS
1/8" X 1/4" SIDE STRINGERS RELIEVE 3/32" AT F4 FOR SHEETING
CUT FIN L.E. FROM 1/4" SHEET BALSA
1/8" MED BALSA RIBS
3/32" SOFT ALUM. TUBING
LOOP ANTENNA & CANOPY LATCH
ALL STRINGERS 1/8" X 1/4" HARD BUT GOOD BENDING BALSA
CUT FROM RED TRIM SHEET 1/16" X 1/4"
RUDDER CHECKS
1/8" X 1/4" SPRUCE
WIRE
1/16" BALSA (2 LAYERS)
5/16" X 3/16" SPRUCE
1/4" SQ BALSA HINGE BLOCKS
1/4" SQ. BALSA FIN BASE
1/2" SQ. BALSA ROD
OS 40
8 OZ TANK KRAFT OR EQUIV.
3/32" BALSA TO FIREWALL
1/16" BALSA FILL
1/2" SQ. BALSA
RIGHT SIDE
SERVO LOCATION
3/32" BALSA FILL
HARD MAPLE BLOCK
WING FAIRING LINE
BATTERY LOCATION
1/2" △ STOCK
3/16" BALSA
1/4" SQ. BALSA ON BOTTOM CORNORS
GOLDBERG BRACKET OR EQUIV.
CUT FROM 1/2" BALSA SHEET
1/8" PLY
1/4" BALSA (2)
BALSA BLOCK
1/4" NYLON BOLT
1/4" BALSA
1/8" PLY BACK RING
THIS C3 LOCATED TO CLEAR EXHAUST EXTENSION
F1 & F2
NOTE: MAIN FIN SPAR (F1) 3/16" SPRUCE MAIN RUDDER SPAR (F2) HARD BALSA
C4 4 REQ'D
1/16" PLY
5/16" X 3/4" BASSWOOD STRUTS
1/2" BALSA (HARD) SPACER BLOCK
FRONT COWL RING ASSY
C3 7 REQ'D
1/16" PLY SPACERS
7/8" X 3/4" HARD BALSA
5/32" PIANO WIRE
1/8" PIANO WIRE
1/8" PLY
3-48 BLIND NUT-8 REQ'D FOR SPLIT COWL-3-48 SCREWS
COWL SKID MOUNTING ASSY MAKE 1 RIGHT & 1 LEFT
(△) DENOTES OUTLINE OF 1/16" PLY PIECES INSIDE FUSELAGE
2-3/4" DU-BRO WHEELS
TOP HALF SHOWN
C2 - 1/8" PLY REAR COWL RING-2 REQ'D
C4 LOCATION
DART
DESIGNED & DRAWN BY TOM MOUNTJOY
INKED BY DICK KIDD
SHEET 1 OF 2
PLAN NO. 703

FULL SIZE PLANS AVAILABLE — SEE PAGE 189



HOVER

By Don Chapman



There is only one thing about helicopters that is just about as enjoyable as flying them — and that is sitting down with a bunch of guys from all over the country and chewing the fat about these electro mechanical wonders. Anything that is radio controlled is really fun, but helicopters are so unforgiving. You've got to be on top of them all the time, constantly checking every part and listening while it's running for some strange new noises. But, that's what makes them so much fun; the challenge of it all — the flying and taming of them — they're like a wild animal just waiting for you to turn your back on it so it

Kirk Krest from Texas landed a little on the rough side after a roll attempt.

Don Chapman's Alouette, Webra Speed .40.

Harold Moore's mod. to Hell-Baby tail. Copper pictured upside-down for clarification.

John Simone Jr., 1st Place Expert – Revolution II, K & B .60 –Futaba.

Hubert Bitner, 2nd Place Expert – Hughes 500, OS .60 –Futaba.

Ray Hostetler, 3rd Place Expert – Jet Ranger, Webra Speed, Proline.

Tom Knerr, 2nd Place Novice – Revolution, OS .40, S & O radio.

Dwyane Stephens, 3rd Place Novice – Jet Ranger, Webra Speed, Variant.

Dave George, 1st Place Inter. – Graupner 212, HP .61, Kraft.

Wendel Hostetler, 2nd Place Inter. – Jet Ranger, Webra Speed, Proline.

Line-up of the scratch-builts.

Jerry Smith & Don Chapman. Jerry does the How-To section in RCM – a very nice person.

can escape doing what it doesn't want to do - - - fly!

When it's at rest, between flights, you look at it, study it, trying to think of a better way, a more dependable way to keep it under control; or trying to make it a little more tame or, in other words, to make it do the things you want it to do not what it wants to do - - - crash! This is what everyone in RC talks about, I'm sure, when there is a gathering of people who all are interested in the same thing — that is — how to improve their flying.

The gathering is usually called a contest. Between rounds of after the day's games, you talk over your latest brainstrom or listen to someone elses. But, with helicopters, there is so much yet to learn about them; they're really rather new compared to the fixed wing fraternity. The first successful flights were just about seven years ago when new endurance records of 27 seconds were set.

About three years ago we did a TV thing on RC helicopters and I can remember saying, "They can do things with the real ones that we can't do yet with the models," — meaning loops, rolls, etc. My! how times have changed and so quickly too.

The look of the RC helicopter is now starting to mature and to look and fly like the real thing. Configurations that were

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Bill Curtis, NRCHA Nats C.D., with his Jet Ranger. Beautiful field of Cliff Bennett's back yard.

Bill Curtis with his Rossi powered, no flybar Jet Ranger.

Nick Nicholas from Honolulu with his Kalt .40 size Jet Ranger.

Don Miner of Westport, the man responsible for Variant radio.

Machines line up for Scale judging.

Dave Georges beautiful Graupner 212.

Ray Hostetler doing his nose in 360° hover.

Hal Beauchesne about to be tapped on shoulder ending his 15 second hover with the Revolution II.

Dave George flying with Dan Dougherty calling. Dan won 3rd in Inter.

Dan Chapman with his Alouette and Webra Speed .40.

Here's a close-up shot of Dan's Alouette with full interior.

Bill Youmans scratch-built with Kraft .60 engine.

Hubert Bitner's Hughes 500 with Kavan Jet Ranger mechanics.

By Grady Howard

2ND ANNUAL ATLANTA

Saturday dawned gray and rainy on April 23, in Atlanta, Georgia. Was this what so many R/C helicopter pilots had driven and flown so far for? No, they had come to have a helicopter contest and that's exactly what they had. In fact, it turned out to be one of the finest events in the country — 34 entries! The weather didn't dampen the spirits of these "never-say-die" helicopter pilots. By 9 A.M. there were many pilots with their birds on the runway trimming and setting engines.

After a pilot's meeting, with the C.D. Dan Dougherty explaining the rules, flying began. It was agreed by a vote of the expert flyers to leave all of the maneuvers in the pattern that was listed by AMA rules. This was voted on because some flyers have objections to the loop and roll with high "K" factors.

After it was agreed to halt the flying if the rains came, we began the contest. Only once did flying stop for rain, and then only for about 3 minutes. The rain clouds stayed for most of the morning and then cleared by afternoon into a beautiful day for flying.

The Cobb County R/C Club hosted this contest with 4 classes plus Scale.











ROW 1: (L) Dan Dougherty the C.D. conducts pilot's meeting. Dan did a fine job of keeping the flights moving. (C) Line up of some of the many helicopters there. (R) Lloyd Wheeler had this beautiful Hirroba Gazelle on display; has 6 blade tail rotor and unique pull start soon to be imported here. ROW 2: (L) Some of the winners and their prizes plus their helicopters. Some winners had to leave early and missed this picture. (C) Sign showing a list of some of the sponsors who donated prizes. (R) Expert Faye Peoples puts his home design through the maneuvers. ROW 3: (L) 2nd in Expert Bill Youmans flying his hybrid design. Incorporates several different mechanics plus some of his own design. ROW 3: (L) Hal Beauchesne Expert Class flies his Allouette II in foreground. (R) Expert Walt Schoonard, in this writer's opinion, had the best looking Jet Ranger at the contest. ROW 4: (L) Intermediate winner Jim Gasowski with his Jet Ranger. (C) Lloyd Wheeler from SC Modeler flies his Graupner 212 to a 2nd place in Intermediate Class. (R) Keith Kreth 3rd in Intermediate flying a Kavan Jet Ranger.

HELICOPTER CHAMPIONSHIPS

There was a Beginners Class where a beginner had five minutes to fly "his thing". This was scored by two judges on impression from 0 to 100 points. One lady beginner, Belinda Sodowski from Asheville, N.C., flew to be the first lady contestant in helicopters that we know of in the world. She did a fine job with her Rev-olution and had only been flying for about 6 months. The only problem that this writer saw with the Beginner Class was a definite "sandbagging" by some contestants. This holds true in the Novice Class as well. A beginner should *not* be able to take off and fly circles in the air 100 feet high and return to a hover with full control. This is more in the Intermediate Class of flying than Beginner and Novice. With this type of flying, then the rank beginner may not even bother to come to a contest when all he can do is hop around and hover for only 15 to 20 seconds at a time.

I'll do a little editorializing here about the classification system that is being used in helicopter contests. All one need do is state in what class they wish to fly. There is nothing in the AMA provisional rules preventing an Expert flyer from en-

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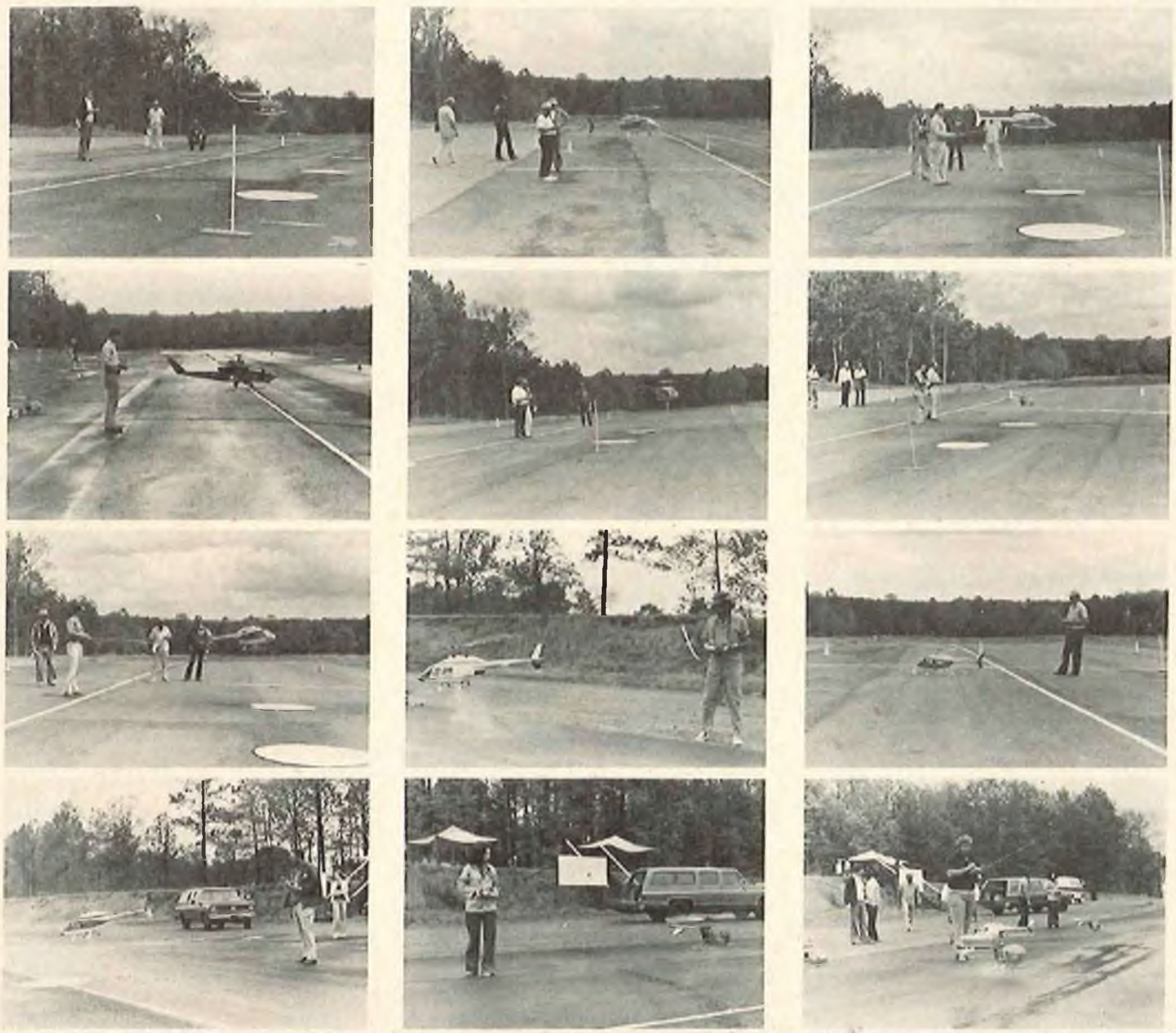
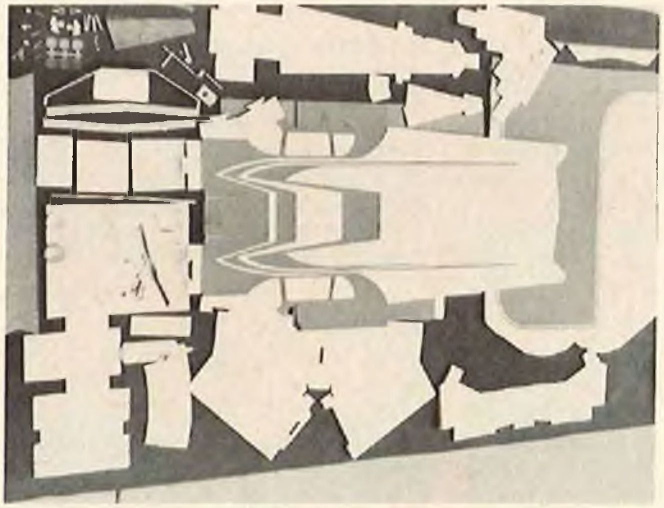


ROW 1: (L) Al Irwin flying his own design "Das Haban Box" in Intermediate Class. (C) John Clark 1st in Novice flew his Jet Ranger very smooth. (R) Robert Wilcox 2nd in Novice with his Jet Ranger. ROW 2: (L) Pat Harris 3rd in Novice has his Cobra in camouflage colors. (C) James Poe flying his Du-Bro Shark 60 in Novice Class. (R) Dave Chesney with a Heli-Baby flying in Novice. ROW 3: (L) Bill Runyan hails from Little Rock, Ark. and flies a Jet Ranger. (C) Larry Henry with his Jet Ranger and tray for radio. (R) Danny Floyd flying in Beginner Class. ROW 4: (L) Mickey Walker in Beginner Class had a few anxious moments when his Jet Ranger got away and he had the thing about 200 ft. high. But with several attempts, he finally got it back to earth without any damage. (C) Belinda Sadowski the only woman flyer of helicopters that we know of flew her Rev-Olution in Beginner Class. (R) John Church flew his Rev-Olution in Beginner Class.

RCM PRODUCT TEST

Phoenix Ind. Inc.
PAPER CUB



The Paper Cub is a .35-.46 powered, three channel, cardboard trainer designed by Avey Shaw, and produced by Phoenix Industries.

Being use to regular kit boxes, we were somewhat surprised when the Paper Cub arrived, since it was housed in a box that appeared to be more appropriate for a jig saw puzzle than an airplane. As you've probably surmised, the Paper Cub Kit is a whole raft of cardboard sheets that have been die-cut and scored to provide the necessary pieces for assembly of the airplane. Moreover, all of the pieces that form the exterior have been factory covered with a two color mylar film (blue and white) that is impervious to all fuels. In addition to all of the cardboard pieces, the kit contains color matched trim tape to seal the raw edges left after assembly, a four ounce bottle of Mung Super Glue, formed main landing gear, spring steel nose gear, control arm and bracket, molded plastic hinges, nylon control horns and snap links, and the screws required to secure the engine mount and landing gear to the fuselage. Finally, an extremely explicit, profusely illustrated set of instructions which, if followed precisely, makes for easy and quick assembly of the aircraft.

Before starting assembly of the Cub, we removed the mylar covering from those areas indicated in the instructions and went over the factory applied scoring/creases with a screen splining tool to assure that the cardboard would fold where it was supposed to. Assembly proved to be quite easy and essentially the same for the wing, fuselage and tail sections. For example, in assembling the wing, the two cardboard

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

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

SPECIFICATIONS

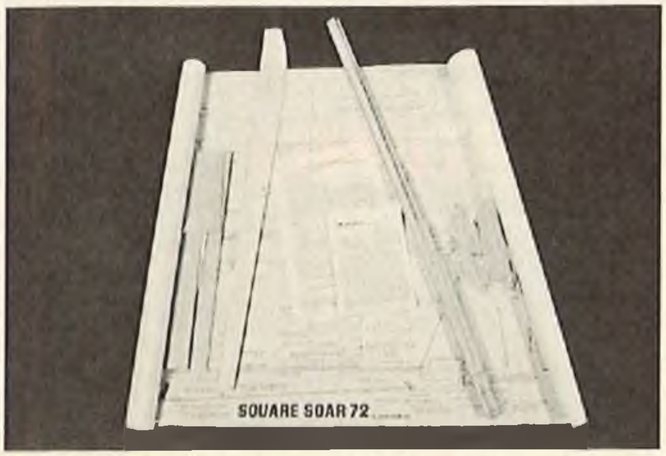
Name .... Paper Cub
Aircraft Type .... Basic Trainer
Manufactured By .... Phoenix Ind., Inc.
60 Engineers Drive
Hicksville, New York 11801
Mfg. Suggested Retail Price $29.95
(Introductory Price — $21.95)
Available From .... Direct From Mfg.
Mfg. Recommended Usage .... Powered Trainer
Wing Span .... 53 Inches
Wing Chord .... 9-2/3"
Total Wing Area .... 508¼ Square Inches
Fuselage Length .... 36 Inches
Radio Compartment Dimensions ...... (L) 11" x (W) 3-9/16" x (H) 5"
Wing Location .... High Wing
Airfoil .... Flat Bottom
Wing Planform .... Constant Chord
Dihedral .... 1½ Inches
Stabilizer Span .... 19½ Inches
Stabilizer Chord (incl. elev.) .... 6-11/36" (Avg.)
Total Stab Area .... 237-11/32 sq. ins.
Stab Airfoil Section .... Flat
Stabilizer Location .... Mid-Fuselage
Vertical Fin Height .... 6¾ Inches
Vertical Fin Width (incl. rud.) .... 5¼" (Avg.)
Mfg. Rec. Engine Range .... .35-.46
Recommended Fuel Tank Size .... 6 Oz.
Landing Gear .... Tricycle
Rec. Number of Channels 3
Recommended Control Functions .... Rud., Elev., & Throt.
Basic Materials Used In Construction:
Fuselage .... Cardboard
Wing .... Cardboard
Tail Surfaces .... Cardboard
Hardware Included In Kit .... See Text
Plan Size .... NA
Building Instructions on Plan Sheets .... NA
Instruction Manual .... Yes (8 pages)
Construction Photos .... Yes
Kit Includes .... Die-Cut Parts
Mfg. Rec. Flying Weight .... Not Given
Wing loading based on rec. flying wt. .... Not Given

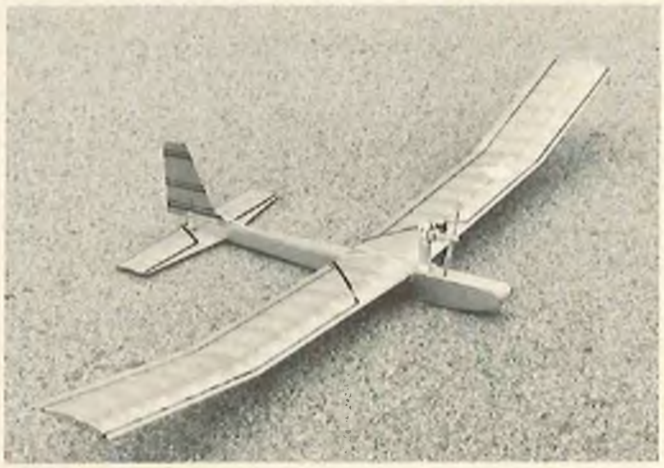
RCM PROTOTYPE

Weight, Ready To Fly .... 80 Ounces
Wing Loading .... 22.7 oz./sq. ft.
Covering & finishing materials used .... See Text
Engine Make & Disp. .... Enya .40
Muffler Used .... Sanders — Closed Front
Radio Used MRC-765
Tank Size Used .... 8 Ounce

RCM PRODUCT TEST

Cox Hobbies, Inc.
SQUARE SOAR





The Square Soar 72 is a 72" span Standard Class Sailplane designed by Lee Renaud and manufactured by Cox Hobbies, Inc.

Designed both as a basic trainer and as a sport sailplane, the Square Soar 72 has 504 square inches of wing area and can be built either with dihedral or polyhedral.

The fuselage has plywood sides and bottom front with the remainder of the fuselage being of conventional balsa construction. The wing has hardwood spars and leading edge with balsa center section, ribs and trailing edge. The rudder is sheet balsa while the stabilizer is of built-up balsa construction. Hardware included in the kit consists of rudder and elevator horns, clevises, hinges, pushrod and threaded pushrod attachments, tow-hook, and blind nuts. One unusual feature of the kit is that it can be built in different configurations. For example, you can choose either dihedral or polyhedral and select either conventional rudder and stabilizer or a V-tail. The polyhedral wing with conventional tail is recommended for the novice as the ideal trainer. In addition, an optional power pod can be installed for power assisted launches. A Cox .049 engine is recommended for this purpose.

We found the Square Soar 72 an easy building, sturdy glider designed to take the bumps. Follow the fuselage construction sequence outlined on the building instructions in order to minimize the chances of coming out with a "banana" shaped fuselage. Adding the washout in the wing tip panels can't be emphasized too strongly in order to produce a stable flying glider.

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

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

SPECIFICATIONS

Name	Square Soar 72
Aircraft Type	Glider
Manufactured By	Cox Hobbies, Inc. 1505 East Warner Ave. Santa Ana, California 92705
Mfg. Suggested Retail Price	$21.95
Available From	Retail Outlets
Mfg. Recommended Usage	Trainer/Sport
Wing Span	72 Inches
Wing Chord	7 Inches
Total Wing Area	504 Square Inches
Fuselage Length	31½ Inches
Radio Compartment Dimensions	(L) 7" x (W) 1⅞" x (H) 2"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord (Vee or Polyhedral)
Dihedral	2¾ Inches
Polyhedral	2⅞ Inches
Stabilizer Span	23 Inches
Stabilizer Chord (incl. elev.)	4½"
Total Stab Area	103.5 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Bottom Of Fuselage
Vertical Fin Height	7 Inches
Vertical Fin Width (incl. rud.)	4½"
Mfg. Rec. Engine Range	.049 — .051 (Opt. pod)
Recommended Fuel Tank Size	NA
Landing Gear	None
Recommended No. Of Channels	2
Rec. Control Functions	Elevator & Rudder
Basic Materials Used In Construction:	
Fuselage	See Text
Wing	See Text
Tail Surfaces	See Text
Hardware Included In Kit	See Text
Plan Size	43¾" x 32" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (27 pages)
Construction Photos	Yes
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	22 — 25 Ozs.
Wing loading based on rec. flying wt.	Not Given

RCM PROTOTYPE

Weight, Ready To Fly	25 Ounces
Wing Loading	7.14 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	See Text
Muffler Used	Cox
Radio Used	Cox-Sanwa
Tank Size Used	NA

ON THE CARE AND FEEDING

In General

A battery is a device that converts stored chemical energy into electric current when it is discharged. The quantity of electric energy made available is a function of the inherent potential and efficiency of the electrochemical reactions, as well as the amount of active material contained in the battery. Many combinations of chemicals have been tried, with varying degrees of success, as energy storage systems. One of the most successful combinations is that of nickel hydroxide and cadmium hydroxide, hence the name nickel-cadmium.

Primary vs. Secondary

The nicad battery is classed as a secondary battery. Whereas a primary battery such as the carbon-zinc dry cell and "alkaline" cell is discarded after use, the nickel-cadmium secondary cell may be recharged many hundreds of times due to the reverseability of its chemical reaction.

The "Sealed" Cell

The nickel-cadmium cells which make up the batteries commonly in use in R/C are the so-called "sealed" cell. Since they are sealed they are maintenance-free since no water need be added periodically such as in a lead-acid battery. As a matter of note, the "gel cell" is a sealed lead-acid battery. These 12V cells are coming into common use on the flying field. A receiver battery pack is made up of 4 cells wired in series. The individual cell is nominally rated at a voltage of 1.25 volts. This makes the nominal battery pack voltage 5.0 volts. The actual operating voltage will vary between 4.4 and 5.2 volts, depending on the state of charge and current drain on the pack. This means a cell voltage of 1.1 to 1.3 volts. When a cell reaches 1.1 volts it is considered discharged and must be recharged before further use. After charging, the cell voltage will be 1.3 volts for a pack voltage of 5.2 volts.

What A Relief!

Although they're referred to as sealed cells, most modern cells have a vent mechanism incorporated into their design as a safety measure. Any sealed cell, upon mis-application and abuse, could experience sufficient increase in internal pressure to cause permanent damage to the cell and a possible safety hazard. The safety vent is designed to open if such excessive pressures were to occur, release this pressure to the atmosphere, and then automatically close. For this reason it is called a resealable safety vent. The vent is there to protect the cell by opening to relieve damaging pressure, and resealing so that the cell does not remain open to the atmosphere, and permit the electrolyte to dry out. Some degradation of capacity will result if a cell vents.

What's A "C"?

Battery charge and discharge rates are expressed in multiples of the "C" rate. A General Electric cell discharging at the C rate will expend its nominal rated capacity in one hour since the G.E. cell (and most other makes) have been rated at the 1 hour rate. At the 0.25C rate, the rated capacity will be delivered in 4 hours; at the 4C rate in 1/4 hour, etc. The C rate of a 500 milliampere-hour AA cell, for example, is defined as 500 MA.

High Rate Charge Acceptance

A significant capability of the nickel-cadmium battery is its ability to accept very high charge rates. Although most rechargeable nickel-cadmium battery applications have used a "slow" charge rate of 0.1C, special fast charge batteries are supplied by several radio manufacturers. These batteries, in conjunction with special chargers at the 0.3C rate, thereby charge 3 times as fast. They may be overcharged without damage. Although they feel warm to the touch during overcharge, there is insufficient pressure built up internally to cause the cell to vent so no damage results.

How Fast?

Fast charge rates allow the user to recharge in very short periods of time, in

OF NICKEL CADMIUM BATTERIES

BY DOUG SPRENG

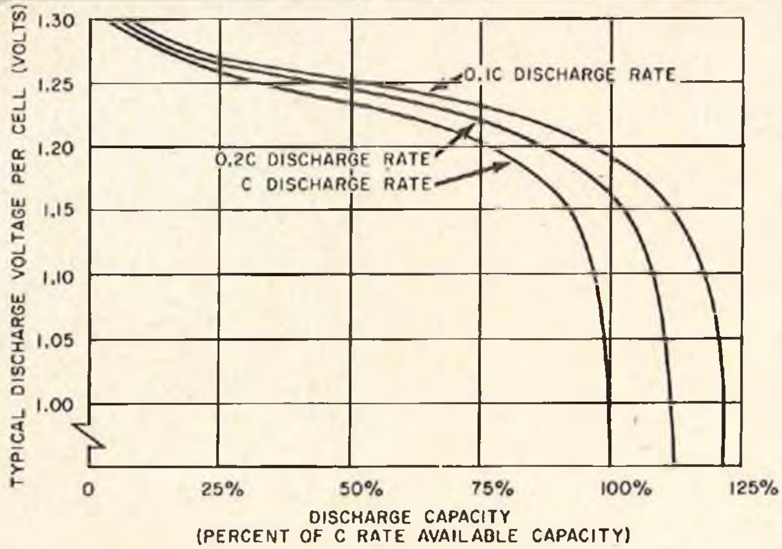


FIGURE 3-26
DISCHARGE VOLTAGE AS A FUNCTION OF DISCHARGED CAPACITY AT VARIOUS DRAIN RATES

some special cases in as little as 10 to 15 minutes. *But,* and it is a biggie, at these high charge rates (approaching 10C at times) great care must be exercised to *not* allow the battery to go into the overcharge condition. This statement applies to any charge rate above 0.3C! To do so will cause the battery to overheat and vent. It is possible for a nickle-cadmium battery to "run away". This is caused by the negative temperature coefficient of nickel-cadmium batteries. As battery temperature goes up, the battery voltage goes *down!* This causes the voltage difference between the battery voltage and the charging voltage to *increase.* As the voltage differential increases, the charging current increases also which causes the battery to get even hotter — and so the vicious circle begins. It can end in a damaged battery. There are several "quick charging" systems on the market for use at the field to charge your batteries from a car or motorcycle battery. Some require continuous monitoring to operate safely; another has a built-in mechanical timer that is set for 10 to 15 minutes and my favorite (RCM Battery Management System, Feb. '77 RCM), has an automatic voltage cut-off feature that terminates the charge when the battery voltage approaches the overcharge condition.

Discharge Capacity Rating

The capacity of the cell indicates the amount of energy that the cell can deliver to the load. This capacity is usually defined in terms of ampere-hours, but since the cells we use have a capacity of less than 1 ampere-hour, we use the milliampere-hour, or MAH, 1 ampere-hour being equal to 1000 MAH. The capacity rating of the cell assumes that the cell is fully charged at room temperature and that it is promptly discharged at room temperature to a specified voltage, usually 1.1 volts.

Figure 3-26 illustrates how the capacity of the cell is affected by the discharge rate. Note that 100% capacity is achieved at the C rate, whereas 120% capacity is achieved at the 0.1C rate. Also note the relative flatness of the curve at voltages above 1.15 volts (4.6 volts pack voltage). Below this voltage, the cells exhibit a very steep fall-off in voltage. If the 100% mark equated to 1 hour in time you can see that only a very few minutes of flying time would be left before the crash if the battery was at 4.6 volts in flight. This is why it is a good idea to invest in some form of field battery tester that plugs into the charge jack to test your batteries under load after every flight. If, under a .3 to 1.0C (150 to 500 MA for a 500 MAH pack), the voltage is approaching 4.7 volts, (pack voltage), it would be wise to recharge or quit flying.

Table 3-4 shows how the available capacity varies with the discharge rate. As you can see, the capacity is not affected much over our range of current drain (.1C to 1C or 50 MA to 1000 MA). The capacity will vary from about 100% to 120% depending on how many servos you had installed and the manner in which you fly.

How Many Flights?

The beginner and expert both wonder about this. I used to have a golden rule. If the thought occurred to me that maybe I should put in "one more flight", I would immediately put everything in the car.

The answer to the question of how many times can one fly on fully charged batteries depends on:

A) What size battery pack?
B) How many servos?
C) What type of model?

I can fly a full house multi aerobatic model with electric retracts 5 times (ten minute flights) reliably with a 500 MAH pack. This is normally all I wish to fly on any given day, but having a field charger, I could go on flying if I wished since the transmitter is good for about 3 hours and at this point I have used it for less than an hour. To carry it further, if I wished to save weight or space, I wouldn't hesitate to install a 100 MAH pack. Of course, I would recharge after every flight. The average receiver draws from 15 to 25 MA. Servos range from 5 to 20 MA. This means that the idle current drawn (no servos moving) with 4 servos, will range from 35 to over 100 MA. During flight the servo motors are running and the current drain goes up quite a bit. How much depends on how one flies. The obvious maximum here is helicopter flying. It seems the sticks never quit writhing. At the other end of the scale is the glider with 1 or 2 servos installed. In this case, a 500 MAH pack may last a couple of hours. Obviously if you have a 100 MAH on board you must divide the time by 5 since only 1/5th capacity is available. You may, however, take all the guess-work out of this by obtaining one of the Expanded Scale Voltmeters available that accurately read battery voltage under load. (See RCM Battery Management System", Feb. '77 RCM and "Updating the RCM Battery Management System", Aug. '77 RCM). The technique is to read the battery voltage after every flight and note how much it

DISCHARGE RATE C-MULTIPLE AMPERES	DISCHARGE TIME MINUTES	DISCHARGE TIME HOURS	AVAILABLE CAPACITY C-MULTIPLE AMPERE-HOUR
38	1	0.0167	0.63
1	60	1	1.0
0.12	600	10	1.2

TABLE 3-4
AVAILABLE CAPACITY VS DISCHARGE RATE

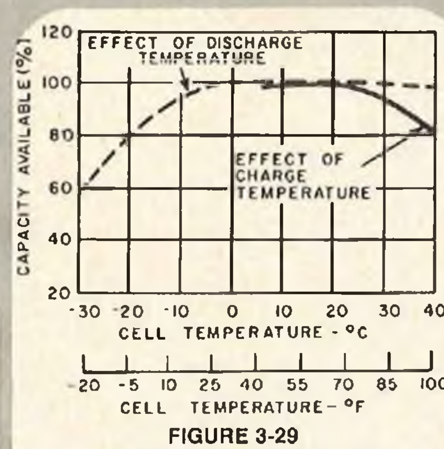


FIGURE 3-29
Temperature/Capacity Relationships — Sealed Cells At C Rate Discharge

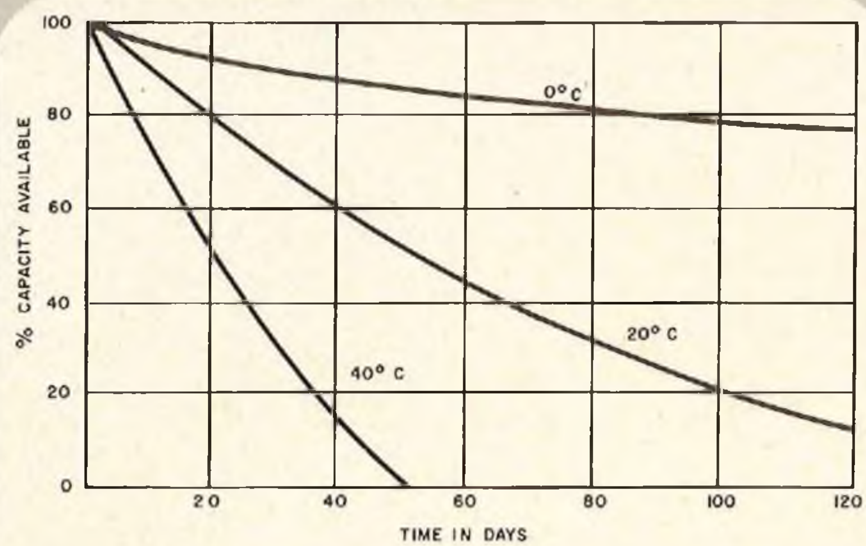


FIGURE 3-30
CHARGE RETENTION VS BATTERY TEMPERATURE
(SEALED CELL)

dropped during the flight. When the voltage approaches 4.7 volts under a 1C load, it is time to quit or recharge.

Temperature

Figure 3-29 shows the affect temperature has on the capacity (not voltage) of a pack. The dotted line indicates that if the pack was charged at room temperature and then heated or cooled, the capacity would remain essentially constant — your flying time would remain the same unless the pack got *very* cold. The important part of this illustration is the solid line. Notice that the Fahrenheit scale only goes to 100°F, where the capacity is down to 80%. This means that if you field charge on a hot day you may not be putting as much into the pack as you think, so field charge more often on hot days. The inside of a dark colored model on a hot sunny day, with the model in the sun on the ground, can approach 140°F!

Charge Retention

The ability of a battery to hold its charge under storage conditions when not in use is known as charge retention. This is sometimes referred to in terms of self-discharge. Figure 3-30 plots available capacity versus temperature and time. It is obvious by inspecting the curve that heat drastically affects this characteristic. Don't panic, though, notice the time in days to reach 80%. It would take a whole week at 100°F.

Storage

During the winter the battery may not be used for many moons. This is no problem; the pack may be stored an indefinite period of time with no detrimental effect. Just make sure all switches are off and cycle, that is charge and discharge the pack, a couple of times before your first spring flying session.

Memory

If you are in the habit of fully charging the pack and only flying one or two flights per session, then the pack can develop a temporary apparent loss of capacity. This effect is reversible by deep discharging the pack (down to 4.4 volts) and recharging. This effectively erases the "memory".

Mounting Considerations

The nickel-cadmium battery is an extremely rugged device. It would take more vibration than could ever be generated in a model plane or boat or car to damage it. I can't say as much for the wiring though. Excessive vibration can, and will, break wire, especially where it is soldered to the battery. Vibration has also been known to break the welds on the straps that interconnect the cells, so, above all, please wrap your pack in a layer of sponge before jamming it up under the fuel tank! Another good idea is to wrap the pack and sponge in a plastic bag. If fuel should get into the battery there is an excellent chance that in time it will wick up under the insulation of the wires and start corroding them. I have seen this happen and it doesn't take long for a wire to turn green and go to pieces.

Cleanliness Is Next To - - -

Radio systems draw large amount of current for short periods of time, such as when a servo motor starts running, or reverses suddenly. If the plug contacts are not clean and free of grease and goo, problems can develop due to contact resistance in the plugs. It is a good idea to wrap the joined plug with a layer of tape to seal out fuel residue. This also applies to switch contacts so be sure and mount the switch (and charge jack) on the clean side of the model away from exhaust spray.

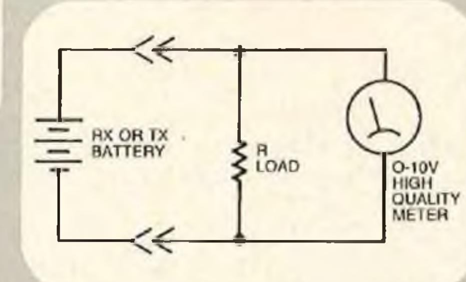
The Transmitter Has Batteries Also

I haven't said much about the transmitter until now because it is relatively easy on batteries. The current drain is constant and the environmental problems are not nearly as severe.

The transmitter battery is liable to develop a memory if not used much and charged often. A periodical deep discharge-charge cycle will prevent this from happening. Some transmitters have a voltmeter as well as an R.F. meter on the front — keep an eye on it. A periodical check of the battery capacity will detect failing cells early and possibly prevent a catastrophic failure.

Hello Test

If you do not possess one of the battery testers currently on the market here is how to check the capacity of your Rx and Tx batteries.



R load = 10Ω 10W for Rx } for 500 MAH pks only
= 20Ω 10W for Tx
= 20Ω 10W for 225 MAH Rx pks.
= 50Ω 10W for 100 MAH Rx pks.

Using the above circuit, apply the load and meter to the Tx or Rx batteries using the appropriate resistor. This will apply a 1C load to the batteries. Make sure the batteries have been fully charged according to the manufacturers instructions! Measure the time in hours, or fractions of hours, it takes for the battery to drop to 4.4 volts for the Rx or 8.8 volts for the Tx. The average current through the resistor will be about 500 MA. This multiplied by time in hours taken to reach 4.4 or 8.8 volts will yield the MAH capacity of the battery.

Current (MA) X time (hours) = MAH. When testing 225 MAH packs, use the 20Ω resistor and the current will be 250 MA. For 100 MAH packs, use the 50Ω resistor and 100 MA for current.

In Summation

I have attempted to explain in laymen's terms the workings and mysteries of nickel-cadmium batteries. I am sure I have left something unsaid and there will be questions. If there are, write to me: Doug Spreng, D & D Electronics Specialists, P.O. Box 2102, Lake Havasu City, Arizona 86403.

Since you will be hearing from me again in these pages, I will have an opportunity to answer any questions in future articles. □

Bibliography: The General Electric Nickel-Cadmium Battery Application Engineering Handbook, Second Edition. Figures 3-26, 3-24, 3-30, and Table 3-4 are reproduced from the above publication.

Model engines, as we know them today, are pretty much taken for granted by the majority of model builders and fliers, as something that has always been around. You walk into your friendly hobby dealer (or mail away to one of the discount houses), put out your cash and select the engine of your choice. However, this has not always been the case and few present day modelers and fliers know the history behind the development of our present day engines.

It all started back in the late 1920's and early 1930's when several men were working on home-built model aircraft engines. Some of the more notable early pioneers were Bill Brown, who was responsible for the Brown Jr. engines; Irwin Ohlsson, for the Ohlsson line of engine; Bill Atwood, designer of the Baby Cyclone and later Phantom Torpedos, Hi-Speeds, and Atwood engines; — sweeping the Nats. New rules were drafted immediately making a new class for gas powered models. This was the start of it all and the gas modeling fever was on its way.

One of these young men struck by the gas model fever was Irwin Ohlsson, a well-known west coast model builder and the subject of this article. Using a small South Bend lathe, Irwin turned out his very first gas engine in the garage of his mother's home. The year — 1934. Appearance-wise the engine was quite similar to the Brown Jr., however, size-wise it was considerably smaller. The Brown Jr. was a .60 displacement engine and Irwin's engine was a .011. Actually two of these engines were built and installed in converted rubber models. A friend of Irwin's was a photographer for Paramount movie studios at the time and took the early pictures we are presenting with this article. The date time.

After building his first two engines, Irwin went on to design a larger .56 displacement engine. A gentleman by the name of Harry Rice owned a small machine shop in San Gabriel, California, and Irwin contracted with Mr. Rice to manufacture parts for the engine. Irwin, in turn, assembled the engines which were first sold through a hobby shop in the Los Angeles area in 1936. The name of Irwin's company was Ohlsson Miniatures, so the name Ohlsson Miniature was attached to the engine by model builders. One of the features of these first Ohlsson engines was dural cooling fins. This was, in effect, an aluminum finned muff pressed over the steel cylinder. Because of this, these early Ohlsson engines are referred to by engine collectors as Ohlsson "dural fin miniatures". One of these first production engines in my own collection is pic-

IRWIN OHLSSON

A Tribute To A Pioneer Engine Manufacturer

By Clarence Lee

and Danner Bunch, designer of the Bunch Mighty Midget, Gwinn Aero, etc.

Of these early pioneers, Bill Brown would have to be credited with getting the first production model engine on the market followed shortly by the others. It was in 1932 that the first gas model airplane contest was held with four entries powered with a Brown Jr. engine. At the 1933 National meet, rules did not specify as to whether models were to be powered by rubber exclusively, and there was no separate class for "gas models". As a result a young man named Maxwell Bassett entered his Brown Jr. powered models in all the events in competition with the rubber powered models and won all categories on the pictures — 1935. The young lady pictured with Irwin was a movie starlet of the day. Shortly after the pictures were taken Irwin sold the two engines to a gentleman named Victor Savage and lost track of their whereabouts. This past year a gentleman named Erwin Schwartz contacted Irwin after trying to locate him for two years, and returned one of the engines. Mr. Schwartz had been given the engine by Mr. Savage ten or twelve years ago. Needless to say, Irwin Ohlsson was most happy to have his first baby, so to speak, back in his possession again. This engine could be considered the start of what was later to become one of the largest model engine manufacturing companies of all tured with this article. The engine actually came mounted on a wood stand complete with a gas tank, ignition coil, and condenser. I have never been able to locate an original wood mount, gas tank, and coil, to go along with the engine.

The aluminum muff on these first engines had a tendency to leak so the design was changed to a solid steel cylinder/fin combination. These engines are referred to as Ohlsson steel fin miniatures by collectors. There were actually two variations of the steel fin miniatures by collectors. There were actually two variations of the steel fin miniature. The first using two bolts to hold on the bypass

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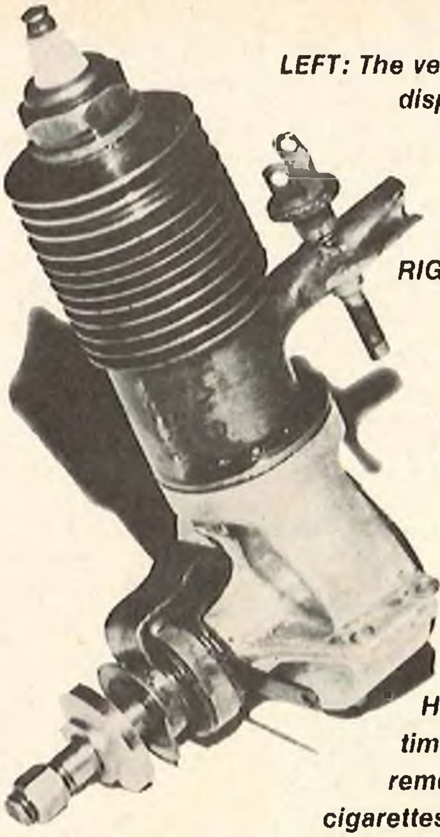

LEFT: The very 1st Ohlsson engine. .011 displacement. A bit shop worn after 43 years but still with excellent compression and capable of running.

RIGHT: Ohlsson engine on the right – Brown Jr. on the left. – 1935.

BELOW: Note: This is a different model than one with Irwin and movie starlet.

How many old timers out there remember Wings cigarettes? Year 1935.

Irwin Ohlsson at age 21 with Paramount movie starlet – year 1935.

1st production Ohlsson – "dural fin Miniature" Approx. 100 made – year 1936.

RCM PRODUCT TEST

MRC TAMIYA PORSCHE

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

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

SPECIFICATIONS

Name .... MRC/Tamiya
Type .... 1/12 Scale Turbo
(RSR Type 94 Porsche)
Manufactured By .... MRC
2500 Woodbridge Avenue
Edison, New Jersey 08817
Mfg. Suggested Retail Price $54.98
Available From .... Retail Outlets
DATA:
Power .... Electric motor powered by 4ea "C" cells
Length .... 14.5 Inches
Weight .... 2.6 Pounds
MATERIALS:
Body: .... ABS Plastic
Chassis: .... Duraluminum
Wheels: .... ABS Plastic with semi-pneumatic tires
Gear Assembly .... Stainless steel shafts, bronze bushings, Derlin gears

The MRC/Tamiya Porsche is a 1/12 Scale Turbo model. The data for this kit is as follows: Power: Electric motor powred by 4ea. "C" cells; Length: 14.5"; Weight: 2.6 lbs.; Materials: ABS plastic body; Duraluminum chassis; ABS plastic with semi-pneumatic tires for the wheels; and a gear assembly of stainless steel shafts, bronze bushings, and Derlin gears.

Special features include four possible gear ratios — 19.4, 15.5, 5.8, and 4.7:1; differential; two forward and two reverse speeds. Parts are organized in construction units and packaged in several plastic bags that are numbered and labeled with the parts they contain, in a blister pack, and two boxes. It also includes several sheets of plastic parts, the front and rear body sections, and a couple of sheets of adhesive-backed decals.

A glimpse at the completed car quickly suggests that this is not a two or three piece snap-together toy. You can't get here from there. It takes lots of pieces to end up with the scale, good performing R/C car like this one. And there are lots of pieces. We spent about 4 hours one evening assembling the chassis, motor, wheels, and gears. Then it took about another 5 hours the next day to build the body, install the radio, and add the decals. Sure, we work slow, but we enjoy the work. And this is enjoyable, not frustrating building.

This kit includes a detailed 16 page construction manual complete with a trouble shooting section. The construction part of the manual relies mainly on the use of exploded view diagrams of the several stages of construction. While it's easier to study a diagram than to read pages of a text, there were a few places in which we wished they had also used a couple more words. No real problems though.

The two forward and reverse speeds are controlled simply through the use of a printed circuit board with rotary wipers.

This unit comes fully assembled and wired. When installed, movement in one direction connects two batteries to the motor for slow speed. Further movement of the wiper in the same direction adds the other two batteries in the circuit. When the switch is rotated in the opposite direction, the same thing happens, but with reversed polarity. A simple, trouble-free set-up.

The only difficulty encountered with this unit was that, even with the longest arm on our throttle servo, we could get only enough throw to get one speed in reverse. While we could have added an extended arm, however, we are quite satisfied with using only the slower speed for reverse.

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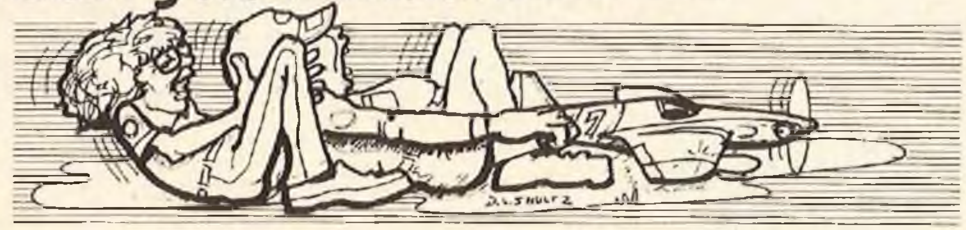
Racing At Random

FRED REESE



Mounting the engine is probably the most important part of building a racing airplane because rpm and engine power is dependent on a solid front end. Engine vibration must be dampened by the airframe in order for the engine to reach maximum rpm. The key to a stronger mount is the second mount bulkhead in front of the metal motor mount. The following mounting sequence applies to .15's and .40's.

First, determine the distance from the firewall to the back of the spinner from the plans. Clamp the engine in the mount with a clamp or vise grips and adjust until the spacing is right. Mark the engine mount holes on the mount. I use a 1/8" drill through the mount holes in the engine to mark the centers of the holes and to start the tap size drill bit. The 1/8" drill is used only to mark the hole location. For 6-32 screws, use a #38 drill which is recommended for .40's. 4-40's or 6-32's can be used for .15's.

Drill and tap the four engine mount holes. (Photo #1.) Also drill and tap a hole into the end of each mount beam for the forward mount bulkhead. One screw can be seen sticking out of the end of the right beam in the photo. Most racers use hardened socket head screws to mount their engines as they are stronger and much easier to install and remove than standard slot head screws. These screws are available from Goldberg or Sig. Also, Du-Bro has a set of two ball end, long reach hex wrenches for standard 4-40 and 6-32 socket head screws which makes changing an engine a snap compared to other types of screwdrivers. (Photo #2.)

Cut out the opening in the fiberglass fuselage for the engine clearance. Slip the engine and mount through the opening and install the screws as shown. (Photo #3.)

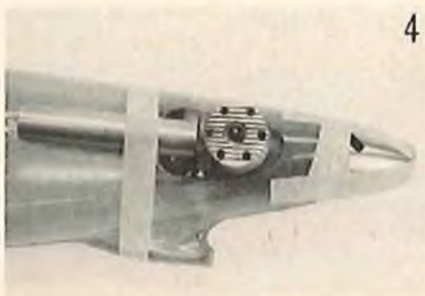
Cut a spacer ring from 1/32" plywood the size of the spinner (2" in most cases for Formula I and 1½" for QM) with a hole for the engine shaft. (Photo #4.) Install the engine spinner with the spacer behind the backplate and slip the pipe on the engine in the slot in the fuselage side. On most kits, the engine alignment is determined by the spinner backplate and the front of the fuselage. The spinner is tightly taped to the fuselage with masking tape and centered to the fuselage which should result in a 1/32" gap behind the spinner when the installation is completed. Shim the pipe to the fuselage, so as not to disturb the alignment, and also tape into place. This should align the engine to the cowl. Slip the firewall in place behind the mount. If the mount and firewall can be easily removed as a unit through the wing saddle opening, use 5-minute epoxy to glue the firewall to the metal motor mount, if not, use Hot Stuff so that they can be popped apart after the holes are drilled through the firewall. (Photo #5.)

Mark the location of the needle valve hole so that it can be cut out while the engine is removed during the next step. Remove the engine, spinner and pipe, leaving the motor mount glued to the firewall still loose in the fuselage. If the mount and firewall can be removed together, do so as the next steps will be easier. In the installation shown, the two would not come out together so the holes had to be drilled while they were still in the fuselage. I use a 12" x 1/8" drill available from Semco (or your hardware store) by Hanson Drills. Once the holes are drilled through the firewall, the critical part of the engine alignment is over. (Photo #6.)

1

2

3



4

If necessary, as was the case in this installation, pop the mount and firewall apart and remove from the fuselage and install blind nuts in the back of the firewall. 8-32 Tee-Nuts and socket head screws from the hardware store were used to attach the mount to the firewall. The ends of the screws should be cut off flush with the blind nuts after tightening using a Dremel tool and cut off discs. (Photo #7.)

Reinstall the firewall, mount, engine, spacer, and spinner, in the fuselage and again tape the spinner to the front end tightly. Using 5-minute epoxy, or Hot Stuff, tack the firewall into the fuselage in several places and allow to set thoroughly. Remove the engine and spinner and the firewall and mount are now permanently positioned. (Photo #8.)

Chop up some glass cloth into 1/4" x 1/2" fibers as shown. Mix a batch of slow setting epoxy (Hobbypoxy Formula Two was used here) and, with the glass fibers, pack and fill all gaps between the fuselage and the firewall and then continue by making a fillet of glass fibers and epoxy on each side of the firewall. This step took several batches of epoxy and about an hour to complete. (Note: Polyester resin would be used in place of epoxy if the glass fuselage was made from polyester resin.) (Photo #9.)

Cut two strips of glass cloth about 2" x 6" and epoxy them in a cross behind the firewall adding further reinforcement to the firewall and fuselage sides behind the firewall. (Photo #10.)

Make a paper template to fit the inside of the fuselage forward of the motor mount. Transfer the outline to 1/4" plywood and trim to fit even with the top and inside of the beams and cut away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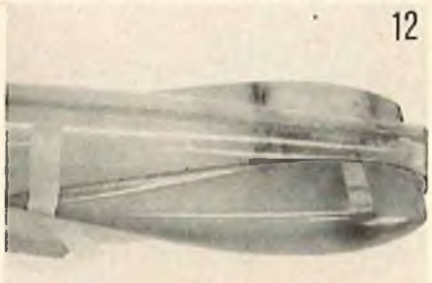
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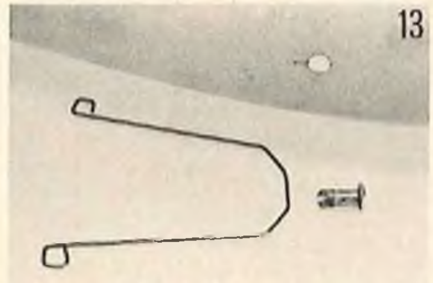
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18A


18B


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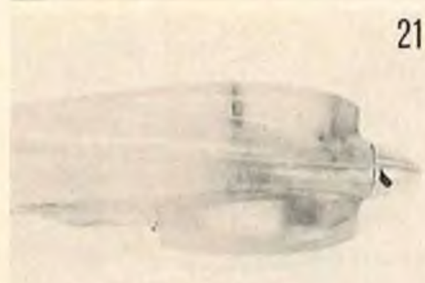
21

enough material for the engine to clear. Drill a 5/32" hole in each ear of bulkhead for the mount screws and trial fit into the fuselage (Photo #11.) Fill the holes with epoxy and install the mount screws. There should be no chance of these loosening up. Again mix epoxy and glass fibers and pack and fillet the forward mount into the fuselage. The engine mount is now complete.

The next process is mounting the cowl, baffles, and pipe. (Photo #12.) Center the cowl over the cylinder head by taping, or rubber banding, a piece of

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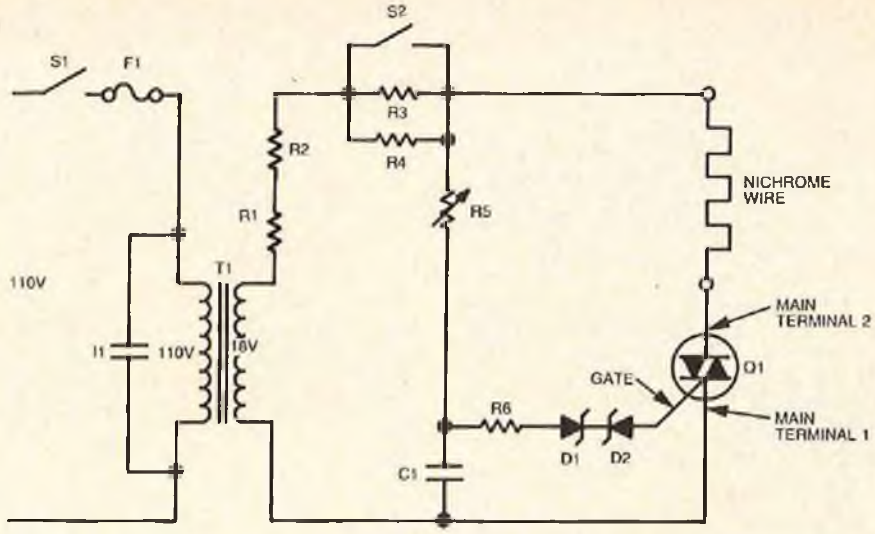
SAFE SUPER SIMPLE SOLID STATE STYROFOAM SLICER

By Rodney A. Kreuter



C1 — 0.47μf Radio Shack 272-1071
D1, D2 — 6.2 volt Zener diode. R.S. 276-561
F1 — 1 amp fuse. R.S. 270-1273
Fuse holder. R.S. 270-739
I1 — Pilot light (optional). R.S. 272-338
I2 — 12 volt bulb for testing. R.S. 272-1116
Q1 — Triac, 100 volt, 6 amp. R.S. 276-1002
R1, R2 — 1 ohm 10 watt resistor. R.S. 271-131
R3, R4 — 10 ohm, 10 watt resistor. R.S. 271-132
R5 — 10K linear taper potentiometer. R.S. 271-1715
R6 — Either 330, 470, or 560 ohms. R.S. 271-000 series
(See text about exact value)
S1 — On-off switch. R.S. 275-602
S2 — High-low resistance switch. R.S. 275-602
T1 — 18 volt, 4 amp transformer. R.S. 273-1514
Misc. — Heat sink, mounting hardware, line
cord, cabinent, etc.

FIGURE 1

I'm sure that many people already have a styrofoam cutter that uses either a train transformer, 110 volt line, or a 'doorbell' type transformer. Although these systems will work, they leave much to be desired in the areas of safety, flexibility, and cost. The circuit used here has been designed with these three objectives in mind and I think you'll find it hard to beat.

Almost everyone who attempts to build something from 'scratch' today faces at least two major problems: 1) lack of sources of materials and 2) lack of information. I have attempted to solve these problems by specifying readily available components and by explaining enough about the circuit so that you may substitute, if necessary.

The power supply used here is absolutely safe. It uses a commonly available 18 volt, 4 amp transformer. Total cost of the project should be about $20.00 using all new parts. If you have a couple of switches, some scrap aluminum, and a fuse holder, you can get this down to about $14.00.

The foam cutter will work with almost any gauge nichrome wire as long as the total resistance is between about 1/2 ohm and 20 ohms. If it is below about 4 ohms, you can switch in the extra ballast resistors to protect the transformer from overload. Below is a table of the approximate resistance of some common nichrome.

Gauge	Approx dia. (mils)	Ohms per foot
#20	32	0.64
#22	25	1.01
#24	20	1.61
#26	16	2.56
#28	13	4.06

Circuit Operation

The schematic and parts list appears in Figure 1. Please refer to this diagram to identify components.

Fuse F1 protects the circuit from damage caused by a short or an overload. You may use a fuse smaller than 1 amp but no larger. A smaller fuse will limit the temperature of your wire but in a pinch (blown fuse on Sunday night) it will work. Be sure to use a standard blow fuse *not* the slow blow type.

Transformer T1 steps the 110 volt line voltage down to 18 volts and isolates the nichrome wire from the AC line.

The heart of the circuit is the triac Q1. The triac is a type of electrical switch which can be switched on during any part of the electrical cycle. Resistors R5 and R6, in combination with capacitor C1, determine at what time during the electrical cycle Q1 turns on. By controlling this, the current through the heating element can be varied.

The two Zener diodes D1 and D2 are used to establish a trigger point. The circuit will work without them but you will have to experiment with the values of R6 a great deal to get the results that you want.

Resistors R1-R4 are used as ballast resistors and current surge protection. Switch S2 is used to short out R3 and R4 if the total resistance of the nichrome is above about 4 ohms.

Construction

Since the triac normally runs warm, it must be mounted on a suitable heat sink. Use either a Radio Shack 276-1361 or a piece of sheet aluminum about 8" square. Mount the triac in the center of the heat sink and carefully bend the leads upward at about a 45 degree angle. The metal will be connected to the 18 volt source because the terminal connected to the nichrome wire is also connected internally to the triac's metal tab. All that this means is that the metal heat sink must be mounted on some type of electrical insulator. Wood will be fine. Don't let any other component come in contact with the metal.

A terminal strip may also be mounted on the heat sink but remember not to use the terminal that is used for mechanical mounting for an electrical connection.

Mount the power resistors at least a few inches away from the heat sink since they have heat of their own to get rid of and will not help the situation at all.

Other than those few rules, construction is pretty much left up to you. Some type of box or case would be nice, however.

Testing

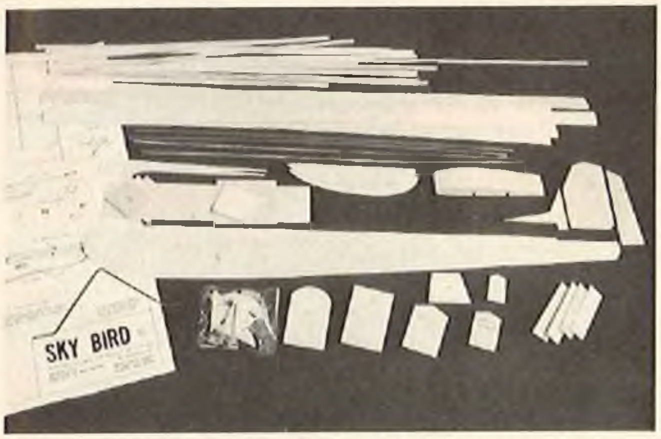
Probably the easiest way to test the circuit is to substitute an ordinary 12 volt light bulb for the nichrome heater. A 12 volt 'high intensity' or automobile bulb will work fine. The principle of this circuit is the same as modern lamp dimmers anyway.

Connect the light bulb into the circuit and turn the power on. Rotate the control R5 from maximum to minimum. The brightness of the bulb should vary from off to very bright. If the lamp will not go completely off, use the next higher value for R6. In order to keep cost and complexity down, it might be necessary to juggle the value of R6 because of the differences in triac characteristics. It is not really necessary that the bulb be able to go completely off since this position will not provide any current for the wire anyway.

If you have been careful, you should have no problems with this circuit. Be sure you have connected the triac correctly! I hope that this device will make your next project a little easier, but be careful. Some fumes are dangerous and that wire gets very hot. □

RCM PRODUCT TEST

Sandy's Hobby Corner
SKY BIRD I



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

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

SPECIFICATIONS

Name	Sky Bird I
Aircraft Type	Trainer
Manufactured By	Sandy's Hobby Corner 312 Tower Hill Road Houghton Lake, Michigan 48629
Mfg. Suggested Retail Price	$24.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Basic Trainer
Wing Span	48 Inches
Wing Chord	8¼ Inches
Total Wing Area	396 Square Inches
Fuselage Length	33 Inches
Radio Compartment Dimensions	(L) 6" x (W) 2¼" x (H) 3"
Wing Location	Parasol
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	2 Inches
Stabilizer Span	18 Inches
Stabilizer Chord (incl. elev.)	4¼" (Avg.)
Total Stab Area	76½ sq. Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	4½ Inches
Vertical Fin Width (incl. rud.)	5 Inches
Mfg. Rec. Engine Range	.049-.15 cu. in.
Recommended Fuel Tank Size	2 Ounce
Landing Gear	Conventional
Recommended No. Of Channels	2
Recommended Control Functions	Rudder & Elevator
Basic Materials Used In Construction:	
Fuselage	Balsa, Spruce & Ply
Wing	Spruce & Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	24" x 36" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (3 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	32 ozs.
Wing loading based on rec. flying wt.	11.6 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	30 Ounces
Wing Loading	10.9 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Cox .09
Muffler Used	No
Radio Used	Cox/Sanwa
Tank Size Used	2 Ounce

The Sky Bird I is a .049 to .15 cubic inch displacement basic power trainer and general sport flying aircraft manufactured by Sandy's Hobby Corner.

This parasol winged aircraft can be built as a Sky Bird I or Sky Bird II - - - the latter having a polyhedral wing while the Sky Bird I utilizes conventional dihedral. It is designed for two channel operation with .049 engine or three channels using .10 or .15 cubic inch displacement engine.

The kit is of conventional balsa, spruce, and plywood construction and the hardware kit includes a pre-bent landing gear wire, pushrods, clevises, control horns, hinges, and pre-bent tail skid wire.

We chose to build the Sky Bird I configuration with standard dihedral. The weight of our prototype was 30 ounces for a wing loading of 10.9 ounces per square foot. A Cox Medallion .09 engine is used along with two channels of a Cox Sanwa four channel radio. With regard to any recommended modifications, we added a 3/16" square piece of balsa at the rear end of the top fuselage stringer which allows the top fuselage covering to have an attachment point. It was then possible to cover the stab separately from the fuselage. We would also suggest that you cover the fuselage top in two pieces since we had a difficult time trying to do it with one piece of material. Also, the wing support structure was something of a concern when we first built the kit, however, many flights with less-than-perfect landings revealed no weakness in this area whatsoever. The kit builds quite rapidly and took only a portion of three evenings to complete the construction. In fact, finishing the aircraft takes longer than the actual construction. Carl Goldberg's Jet cyanoacrylate adhesive was used throughout. Our prototype was finished with Top Flite MonoKote, DJ Trim Tape, and K & B Butyrate Dope.

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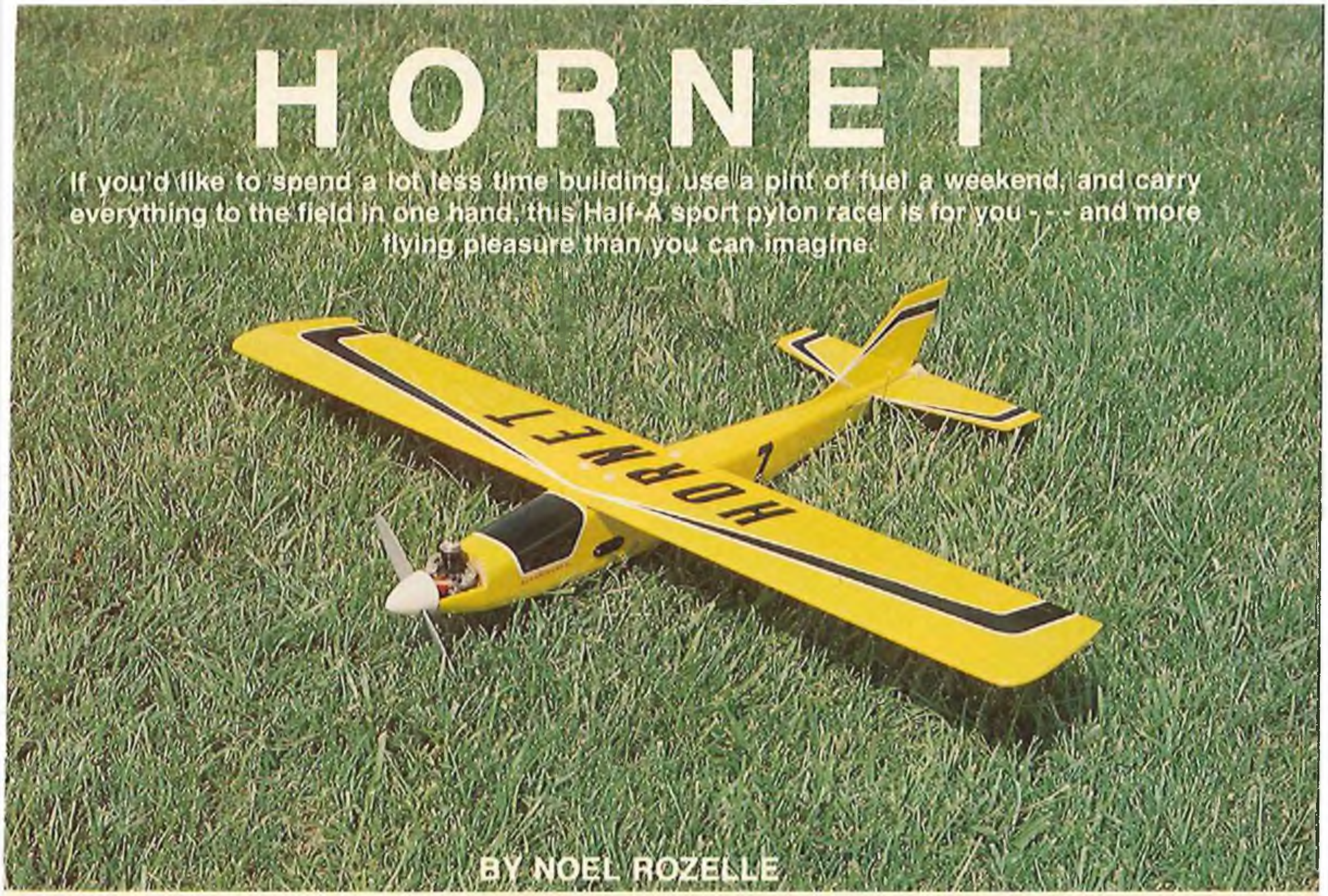
HORNET
Designed By: Noel Roselle

TYPE AIRCRAFT
1/2A Sport/Pylon
WINGSPAN
37 Inches
WING CHORD
6 Inches
TOTAL WING AREA
219 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
0" — 3/4"
O.A. FUSELAGE LENGTH
28½ Inches
RADIO COMPARTMENT AREA
(L) 7½" X (W) 2" X (H) 2½"
STABILIZER SPAN
12 Inches
STABILIZER CHORD (incl. elev.)
3¼" (Avg.)
STABILIZER AREA
39 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
3½ Inches
VERTICAL FIN WIDTH (incl. rudder)
4½" (Avg.)
REC. ENGINE SIZE
.049 — .051 cu. in.
FUEL TANK SIZE
1 — 2 Ounce
LANDING GEAR
None
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Aileron & Elevator
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage .... Balsa & Ply
Wing .... Balsa, Ply & Basswood
Empennage .... Balsa
Weight Ready-To-Fly .... 20 — 23 Oz.
Wing Loading ...... 13.1 — 15.1 Oz./Sq. Ft.

Cindy Mitchell – a newcomer to R/C.

HORNET

If you'd like to spend a lot less time building, use a pint of fuel a weekend, and carry everything to the field in one hand, this Half-A sport pylon racer is for you - - - and more flying pleasure than you can imagine.



BY NOEL ROZELLE

How would you like to spend a lot less time building? How would you like to use a pint of fuel on a weekend instead of a gallon? How would you like to go to your flying site and carry everything you need for a day of flying in one hand, unless you carry a six pack in the other, strictly for balance, of course? How would you like to enjoy R/C once again because you're not going to worry about how much it costs you to pursue this hobby, or have the constant threat of an expensive crash hanging over your head?

If you answered yes to the above questions, you're ready for a Hornet.

1/2A flying is really coming into its own lately and there are a lot of reasons why. The reasons above are some, but there are many more. It's really a switch to be able to have a brand new airplane with motor ready to fly for less than thirty bucks and one that finally costs you less in gas than most .60's need for priming and, how about this - - - a small airplane that actually *performs,* not just stays in the sky and struggles around. Let's go one step further — there are a lot of hot .049 planes around for racing and even some for pattern and most of these do a great job. But what about us knock-around fun-fliers who haven't got the interest in those events? What about the guy who just wants to go out and have a ball with as little fuss and expense as possible, the guy who wants a good flying, stable plane he can give his kid some stick time on without having to build the trainer that he'll probably never get around to anyway?

If you fall into one of the above categories, you're ready for a Hornet. It's a new 1/2A just for the fun of it and no special reason. It has very simple, fast and strong construction. It looks good and it's not cramped for radio space. The wing design gives it a glide you won't believe for setting up those dead stick landings everyone is so scared of on 1/2A's because a lot of small planes have a habit of just falling out of the sky when the fan quits - - - but not the Hornet.

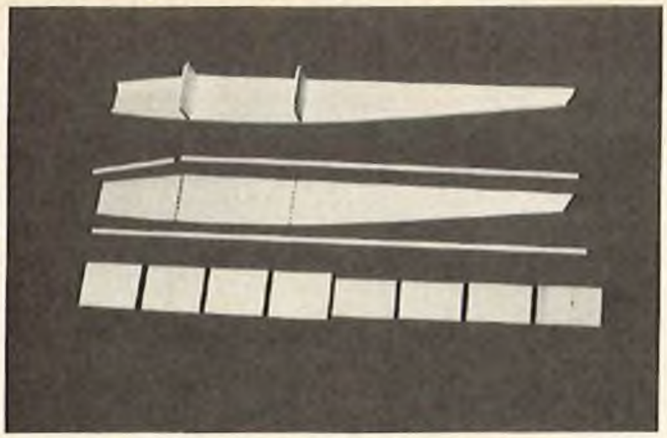
It might sound like I'm going overboard a little on this, but the Hornet has been a lot of fun for everyone who has tried one. One of my friends goes out on the dirt roads near his home after work and flies till dark several days a week. Every time three or four of us get together at a local school soccer field, we end up drifting into a very familiar left hand circle around the goal posts until we run out of gas and argue for hours about who cut the most pylons. I could go on for a long time about the Hornet, but it all boils down to one thing, the Hornet is fun and if you don't believe it, just build one.

Fuselage Construction

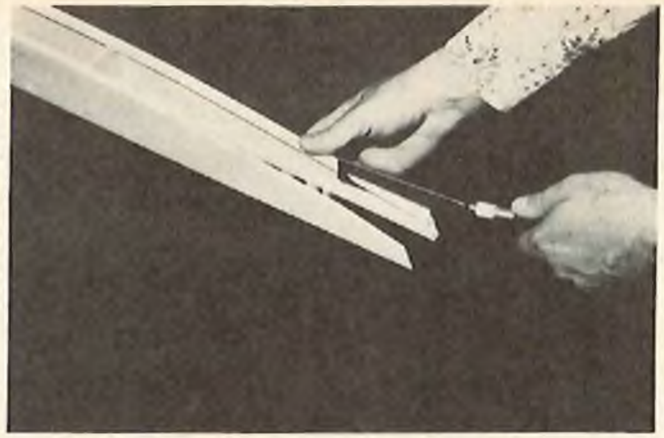
Cut the fuselage sides from 1/8" x 3" x 36" balsa sheet, saving the excess for bottom sheeting. Next mark the position of the bulkheads on the inside of the fuselage halves and drill the 3/16" wing dowel holes. From 3/16" stock, cut all longerons and glue them along the top and bottom of the fuselage halves. From a third sheet of 1/8" x 3" x 36", cut out the two bulkheads and save the left-over for empennage parts. Glue the bulkheads in place on one side of the fuselage, using a small modeling square to insure alignment. When dry, place the other fuselage side in place and cement, using a flat surface to align.

Cut the bottom sheeting from the 1/8" x 3" left over from the fuselage sides. Glue the first two or three cross-grain sheets in place. These will hold the alignment of the fuselage while the tail ends are fitted and glued together.

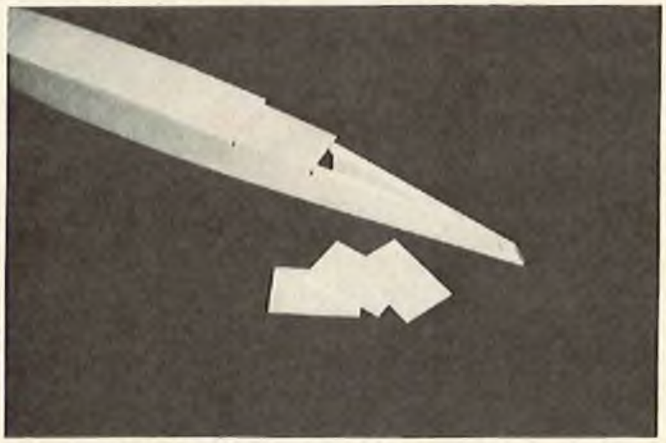
After gluing the fuselage together at the rear, finish sheeting the bottom and trim the excess. Next, from 3/32" x 3" sheet, cut out the top sheet but, before gluing in place, install the Nyrod outer housing between the bulkhead and the exit position on the fuselage side, keeping in mind the elevator servo position of your radio installation. Once glued in place, trim the excess from the top



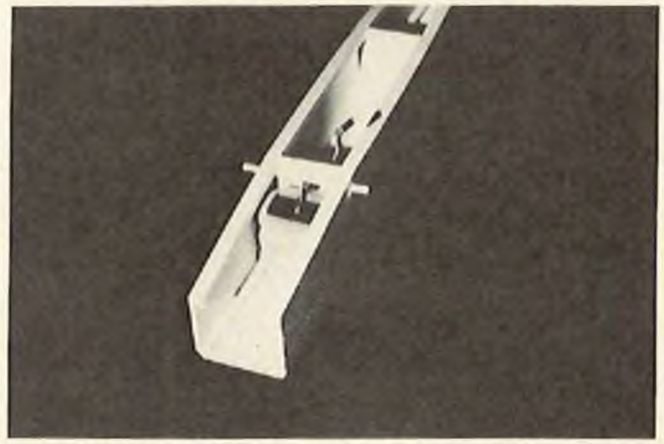
The fuselage parts for the Hornet.



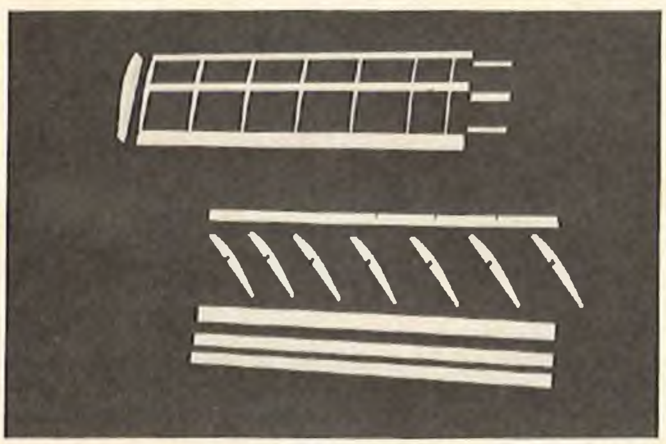
Cutting off the stringers prior to joining the tail.



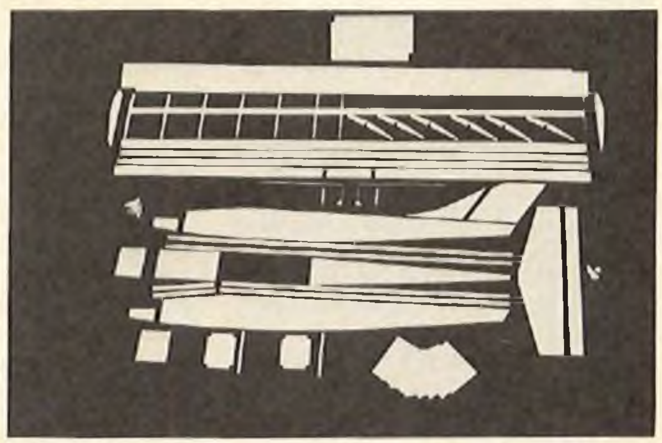
Planking the bottom of the fuselage.



The battery pack mounted in place.



Can you imagine a simpler wing to build?



A view of all of the Hornet parts.

sheet.

Cut the top nose block from a piece of 1/4" x 3" and glue in place. A large hole can be cut in the forward bulkhead for access to the tank and battery compartment. After this is done, square up the front end with a sanding block to accept the firewall.

Cut the firewall from 1/8" ply and install blind nuts for the motor mount and then epoxy in place. After the epoxy has set, cut the nose cowl pieces from 1/4" sheet and glue in place.

Temporarily install the motor mount and engine with the spinner in place. Trace around the spinner to locate the position of the 1/16" ply nose ring. Remove the mount and motor and cut out the 1/16" ply nose ring and glue it in place. This finishes the fuselage construction with the exception of the 3/16" wing dowels which should be added after the fuselage has been sanded and covered.

Wing Construction

The wood needed for the wing is mostly stock size and little cutting will be necessary. The leading edge sheeting is 1/16" x 2" x 36". The leading edge is 1/4" sq. x 36", the center spar is 1/4" x 1/2" x 36", the trailing edge is laminated from one 3/16" x 3/4" piece of trailing edge tapered stock and two 1/16" x 1/2" x 36", while all the ribs and center planking are cut from 1/16" sheet balsa.

The capstrips are 1/16" x 1/4", the wing tips are made from 1/2" x 3/4" block stock, and the ailerons and aileron

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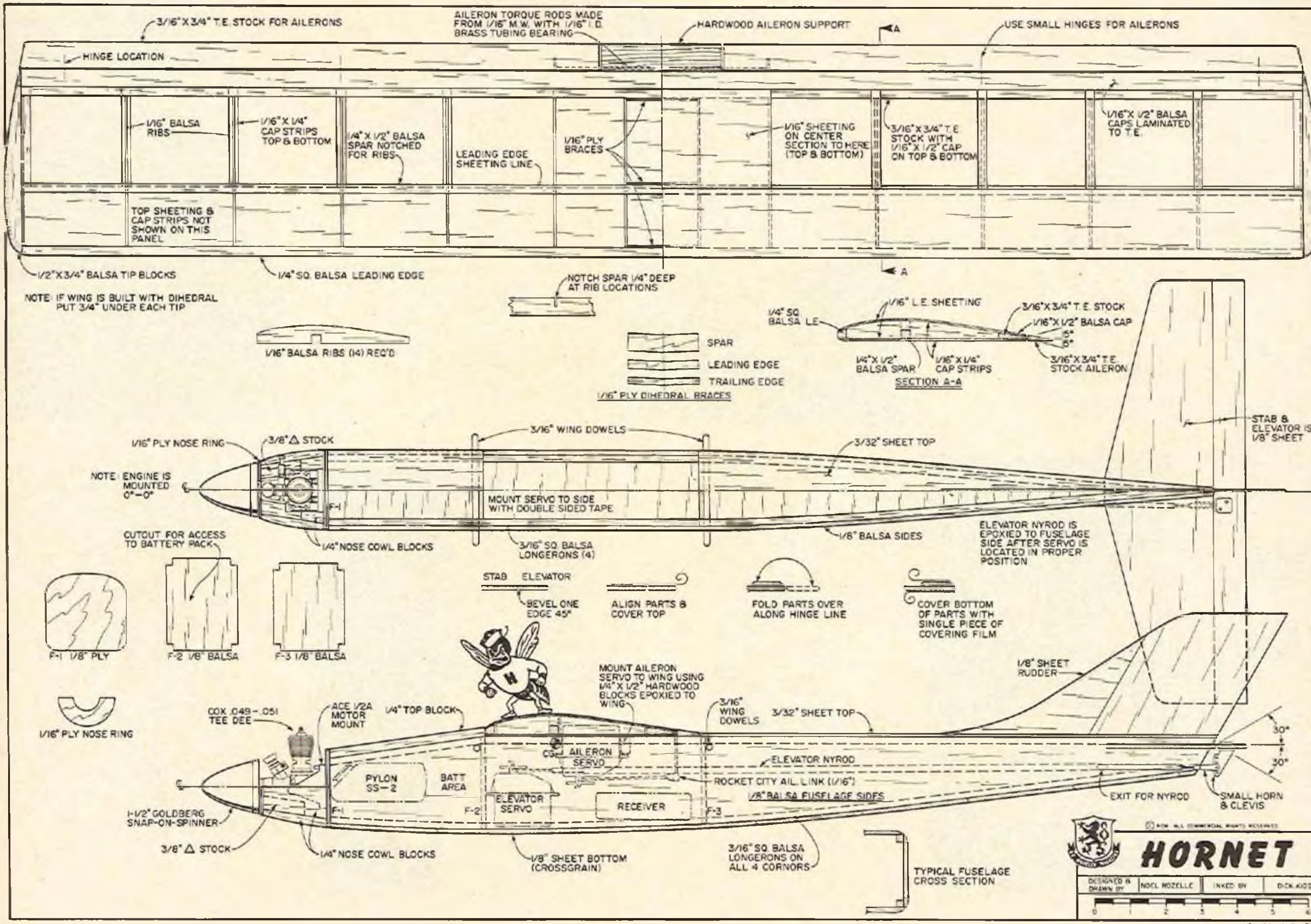
FULL SIZE PLANS AVAILABLE — SEE PAGE 189



PLAN NO. 705

HALF-A

BY MACK MOFFAT

The purpose of this column is to present information which will help modelers who use 1/2A and smaller engines. The column will deal with three major areas of 1/2A radio control. These will be: (1) Pylon Racing, (2) Stand-Off Scale and, (3) Sport Flying.

If the column is to be a success and a benefit to anybody, I'll need your support. Drop me a line, with photos if available, and let me know what you are doing in your area - - - what airplanes are being flown, if it is 1/2A pylon, what rules, winners, etc.

Now allow me to introduce myself. I have been building models most of my life, starting with free flight, and control-line. About 9 years ago, I entered radio control. My main interests are Scale/Stand-Off Scale and racing. I sincerely believe that 1/2A size airplanes are an enjoyable part of R/C and, with the new lighter/smaller radios, will become a common sight at the flying fields. The most important fact is that 1/2A size airplanes cost less, are easier to store, transport and handle. There are many kits available for 1/2A pylon racing, Stand-Off Scale, and Pattern. Accessories such as retracts are becoming available. For those who fly 1/2A or are thinking about it, hang on, 1/2A is going to grow in one big leap for the next few years! Maybe even another .049 to compete with the T.D.'s?

Enough of the introductions - - - let's move on to what has been happening in the Southern California area. When I get letters from other areas, I will report their activities.

1/2A Pylon Racing: The only race I have to report is the Valencia Valley Headwinds affair held June 5, 1977. The Valencia Valley Headwinds are one of the few clubs that do not use RCM's rules for the airplanes. Their rule is .051 cu. in. engine max. and that's it - - - no wing, weight, or size rules. The idea being, no rules, no hassle trying to enforce the rules, and it has been very successful for the past three years. You see some very interesting airplanes at these races. Twenty-two entries signed up and 5 rounds, 6 heats each, were flown. As can be seen by the results, the GLH team (Bob Nickle, George Kurrick and Bob Novac, all flying GLH's) took their usual top positions. These guys are hard to beat in the Southern California area — they are good flyers with well designed airplanes and hot motors, even though Bob Nickle remarked to me he hasn't had a good motor for some time. I wish I could get one of his bad ones!

Trophies to fifth place were awarded

Valencia Valley Headwinds
June 5, 1977 Race Results

1. Bob Novac	GLH-II
2. George Kurrick	GLH-II
3. Bob Nickle	GLH-II
4. Ron Clem	Tigercat
5. Tim Kurrick	Quickie 200
6. Len Curiel	Tigercat
7. John Szary	GLH-II
8. Bob Edelberg	Quickie 200
9. Ken Tinker	Quicksilver
10. Don Schauer	—
11. Dale Lopez	Mulligan
12. George Lacour	Little Gasser
13. Jay Ross	—
14. Steve McCann	Cricket
15. Tony Naccarato	Miss Hap II
16. Greg Rubin	Streaker
17. Marv Whiteman	Miss Norway
18. Chris Hoyer	Tigercat
19. Jay Replogle	Tigercat
20. Paul Gilbert	—
21. Gordon Davis	—
22. Bob Janiger	Cricket

Mack Moffat with his A-1 Skyraider.

Robert Boucher with his Partenavia Victor.

Fred Reese with his FW-190, Pietenpol & Chipmunk.

ABOVE: Tim & Ken Holden's P-39 & Westland Whirlwind. BELOW: Their P-51.

and Gordon Davis won a 1/2A Streaker, donated by Allied Hobbies, for the best crash. Marv Whiteman and Bob Janiger received Allied Hobbies gift certificates, and Paul Gilbert was presented the Turkey Trophy. (The Turkey Trophy is not a trophy to try to win!) Simi Valley, July 24, will be the next 1/2A pylon report.

1/2A Stand-Off Scale: The first 1/2A Stand-Off Scale contest was held June 12, at Mile Square Park, Fountain Valley. Orange County's Scale Squadron officiated and did an excellent job. The turnout was very disappointing with only 5 people entering. The contest had three events: *Class 1:* Two function control, not including throttle or engine cut-off; *Class 2:* Three or more functions, and *Class 3:* Static Scale (no flight requirement). The contest was run according to the rules published in the February 1977 issue of RCM and they worked very well. After going through a contest, a few problem areas will show up. In the future, we will discuss these areas and what, if any, changes can be made.

Highlights of the contest — everybody received a trophy, first place winners received a trophy and a House of Balsa 1/2A kit. My A-1 Skyraider and Ken Holden's Westland Whirlwind were the only scratch-built models. Robert Boucher flew his Partenavia Victor with electric motors which were very impressive and quiet. Fred Reese's Pietenpol had a

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RCM PRODUCT TEST

Steve Muck's
LIL LIGHTNING

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

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

The Lil Lighting is a tunnel hull hydro designed by George Campbell and manufactured by Steve Muck. This is a sport racing hydroplane with a 30" length, and a 12" beam. It is designed for the K & B 3.5cc outboard engine and two channels of radio control.

The all plywood and hardwood construction of the hull requires that a 30" by 6½" by 3/4" assembly jig has to be made prior to starting construction. A blueprint of patterns is supplied to help with shaping the components and to locate notches in the pre-shaped parts supplied in the kit. The all plywood and hardwood construction calls for higher-than-average modeling skills required to build most model airplane kits. The compound curves of the nose make this fitting operation extremely difficult with the 1/32" plywood supplied. Instead, we substituted 1/64" plywood coated liberally inside with epoxy for strength and for ease of assembly. In addition 1/4" x 5/16" hardwood rails were added inside the lower edge of the rear fan to prevent the ply sheeting from curling outward.

Our prototype was finished with two coats of K & B resin and one coat of K & B primer with each coat being finely sanded. Two coats of burgundy and green metalflake Plasticote were applied and sanded, then two more coats were applied. This was followed by two coats of K & B clear Super Poxy which completed the finishing process. The building time for the kit including building, filleting and fine sanding ready for finishing, entails 68 hours. An additional 53 hours was required for the custom finish job and another 5 hours for building, staining, resining, and felting the cradle, for a total of 126 hours.

Although not recommended for the beginner due to the complexity of construction, when completed this is one gorgeous boat. In addition, its performance with the K & B 3.5cc outboard engine leaves absolutely nothing to be desired. □

SPECIFICATIONS

Name	Lil Lightning
Boat Type	Tunnel Hull Hydro
Manufactured By	Steve Muck 3422 Greenwood Avenue Los Angeles, California 90066
Mfg. Suggested Retail Price	$48.95
Available From	Both Mfg. & Retail
Mfg. Recommended Usage	Sport/Racing Hydroplane
Length	30 Inches
Beam	12 Inches
Radio Compartment Dimensions	(L) 6½" x (W) 3¼" x (H) 1¾"
Mfg. Rec. Engine Range	K & B 3.5cc Outboard
Mfg. Rec. Fuel Tank Size	8 Ounces
Recommended No. Of Channels	2
Rec. Control Functions	Steering & Throttle
Basic Materials Used In Construction:	
Hull	Ply & Hardwood
Hardware Included In Kit	Plexiglass radio compartment cover, screws, steel turn-fin
Plan Size	None
Building Instructions on Plan Sheets	NA
Instruction Manual	Yes (12 pages)
Construction Photos	Yes
Kit Includes	Printed Paper Patterns & Shaped Parts

RCM PROTOTYPE

Covering & finishing materials used	See Text
Engine Make & Disp.	K & B 3.5cc
Muffler Used	NA
Radio Used	Not Given
Tank Size Used	Not Given

MINT JULEP

Again this year the Kentucky State Parks Commission, in cooperation with the local clubs in Kentucky and Indiana, put together one of the Nation's finest pattern and scale meets. These clubs enlisted the help this year of the Cincinnati club with Dave Brown as the Contest Director. Dave did a very fine job in organizing a meet with 6 flight lines and 105 contestants.

With 6 flight lines going all of the time, one would expect a few mid-air collisions but there were none. Each contestant was able to fly 6 flights in pattern and 3 in sport scale. The competition was fierce with only a few points separating first from third in most classes. Several places had to be determined by going to a third flight score.

Each class of pattern was shortened somewhat to speed up the flying and this allowed close to 700 flights for the 2 day event. As you can see, this required some fantastic planning. The judging was very consistent with fewer than the normal amounts of complaints. The few complaints, to put it like Dave Brown did, were ruled in favor of the judges!

The sport scale airplanes were fabulous to say the least. Gerard Davet, for the 2nd year in a row, won this event with his rocket firing P-51 Mustang.

The airplane that drew the most spectator interest was a B-29. This was a scratch-built foam and balsa model by Skip Mast from Royal Oak Michigan. It had 2 Enya .15's and 2 Super Tigre .15's, and was very impressive in the air or on the ground. Skip finished in 3rd place. Bob Underwood had a very unfortunate crash with his beautiful Russian Lavochkin LA5FN. With his static score and flying up to the crash time, he had enough points to finish a fine 2nd place.

There was some discussion about making the Sport Scale event a separate contest next year. This would allow for more contestants and more flying for everyone. Also there is talk of forming a national special interest group for scale modelers. Those interested in this action should contact Bob Underwood, 4109 Concord Oaks Drive, St. Louis Missouri 63128.

With the weather this year staying perfect, the Mint Julep was just as perfect. A feature that is always a crowd pleaser are the demonstrations at the noon break. Again this year the Du-Bro helicopter team was featured in this time slot. Not only were helicopters flown but also large cardboard airplanes. The airplanes are the products of the Du-Bro research people in the development of their new prop driver unit. These units allow a .60 size engine to swing 22" props and larger, and lift a 20 lb. plus airplane. The other flyers enjoyed seeing these 10 ft. span models fly as much as the spectators did.

Now that the flying is over, what now at the Mint Julep? Sitting around doing nothing, was not the order of the day. The Parks people had planned a fabulous Saturday night banquet at the Lodge with a pool party afterwards.

Well, if this has whetted your appetite for this kind of a fun weekend, then plan to attend next year's Mint Julep Meet when the Kentucky Parks people will treat you like royalty. □

By Grady Howard

OPPOSITE PAGE (Photo 1): Hawker Hunter by Bud Atkinson featured drop tanks and Rhom retracts. (Photo 2): P-51 Sharpe Shooter brought home a first place win for the 2nd year for Gerard Davet from Lexington, KY. (Photo 3): Pietenpol Air Camper by Bill Rohring from St. Joseph, Mich. Used Enya 29 and Heathkit radio. (Photo 4): B 29 by Skip Mast finished 3rd and is scratch-built of foam and balsa. Uses two Enya 15's and two ST 15's. (Photo 5): Zlin Akrobat by Leonard McCoy used W.E. radio, OS 60 engine.

TOP: Bob Godfrey's Citabria on unique rotating judging table. TOP RIGHT: Dave Hale of the Du-Bro Helicopter Team flies his Shark 60 in the noon demos. CENTER LEFT: Dave Gray from Du-Bro Products flew this 10 ft. cardboard model to demonstrate their new prop driver unit. CENTER RIGHT: Joe Nabor from St. Louis, Missouri, entered this beautiful P-51. Uses ST60 engine with Kraft radio and Rhom retracts. ABOVE LEFT: Bob Nutter had this unusual Phoenix 6 with Proline radio and Super Tigre with pump. ABOVE RIGHT: Roy Pinner from Waterford, Michigan, had this straight stabbed model of the X-Terminator.

European design flown by Don Seals in Master class. Curare influenced many of the aircraft flown.

Mark Corbit with his Atlas.

Ralph White of Fliteglas flew this Saturn in Masters class. Ralph produces this kit.

Gary Putman of Mich. with X-Terminator, Rossi & tuned pipe. Anhedral stab from Curare influence.

Dave Hale from Ohio with his own design he calls Pisces II. Proline radio with OS 60 FSR up front.

Dean Koger had the largest pattern airplane with 1050 sq. in.; 10 lbs. Uses Proline, Rossi & pipe.

Mr. Cool himself, Don Lowe with his Phoenix 6.

Spectator interest was held during lunch break by the Du-Bro helicopter team. Here is their line-up of copters.

Andrews Aeromaster fitted with a D & B Models 4 cylinder cycle engine. So quiet, engine was barely audible.

See what happens when a plane hits a landing light. James Poe owned this beautiful Nutcracker.

Scale winners are left to right: Bob Underwood 2nd place, Gerard Davet 1st place, Skip Mast Jr. 3rd place.

Novice winners left to right: Rod Barnes 2nd, Mark Boen 1st, Jimmy Lyons 3rd.

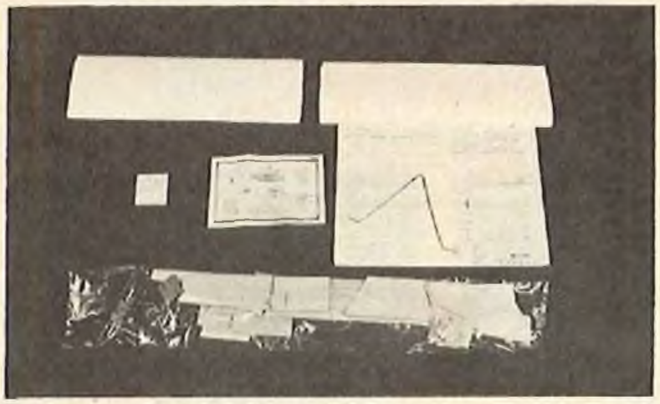
Advanced winners left to right: 3rd place Jim Marvin and 1st place David Boyte. 2nd place winner Dave Moerlein not pictured.

Expert winners left to right: Carl Allen 2nd place, Al Burson 1st place, Rich Willenbrink 3rd.

Masters winners left to right: Don Lowe 2nd place, Ivan Kristensen 1st place, Fred Kugel 3rd place.

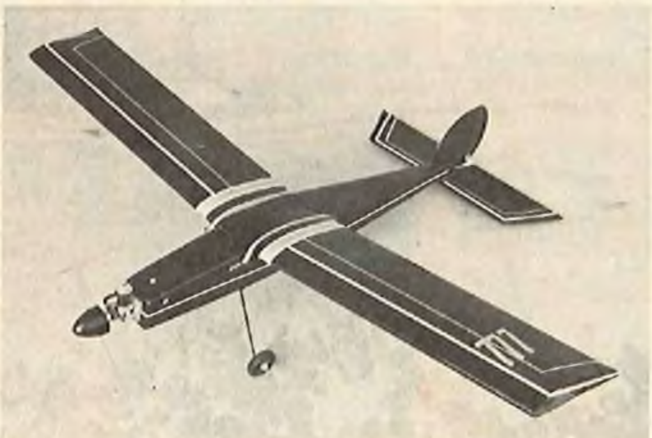
RCM PRODUCT TEST

GMC Models
HALF-A-STICK



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

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



The Half-A-Stick is a general sport aircraft designed for .049 to .051 cubic inch displacement engines and is manufactured by GMC Models.

Designed by Ted Bozanich and George Chabot the Half-A-Stick is designed to fly with rudder and elevator on two channels of control and is a conventional taildragger type aircraft.

Materials used in the fuselage and tail surfaces are conventional balsa and plywood while the wing is foam with balsa tips. The hardware included in the kit includes a Hillcrest engine mount, wire landing gear, control horns, J bolts and nuts. We found the molded foam wings to be very true and, as packaged in foam, free of any nicks and dings. Glass fiber reinforcing tape is used as a "main spar" to reinforce the one piece molded foam wing.

The fuselage is slab-sided balsa with no doublers which builds fast and is extremely light. The plans are 1/2 size, easy to follow, and the construction notes are simple but complete.

Our prototype used black and yellow Solarfilm for covering material with chrome Pro Stripe for trim. We recommend that the trailing edge of the wing should be protected by 1/64" aluminum or 1/16" piano wire so that the wing rubber bands will not cut into the foam.

This is an extremely easy to build aircraft that can be put together by an experienced builder in four hours and completely flyable in less than six hours. All pieces fit together well without any recutting or trimming.

With regards to the flight characteristics, the rudder is very effective and, in fact, extremely sensitive. The elevator control with 1/4" travel both ways provides ample maneuverability. After the test flights a Cox TD .049 engine with a Cox grey 6/3

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SPECIFICATIONS

Name	Half-A-Stick
Aircraft Type	Sport/Pylon
Manufactured By	GMC Models 7349 Rindge Ave. Playa Del Rey, California 90291
Mfg. Suggested Retail Price	$20.95
Available From	Both Mfg. & Retail
Mfg. Recommended Usage	General Sport
Wing Span	35 Inches
Wing Chord	5.5 Inches
Total Wing Area	192.5 Square Inches
Fuselage Length	26.5 Inches
Radio Compartment Dimensions	(L) 6.5" x (W) 2.2" x (H) 2.2"
Wing Location	High Wing
Airfoil	Semi-Symmetrical
Wing Planform	Constant Chord
Dihedral	2 Inches
Stabilizer Span	14 Inches
Stabilizer Chord (incl. elev.)	3.7 Inches
Total Stab Area	52 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Bottom Of Fuselage
Vertical Fin Height	3.7 Inches
Vertical Fin Width (incl. rud.)	3.7 Inches
Mfg. Rec. Engine Range	.049-.051
Mfg. Rec. Fuel Tank Size	2 Ounces
Landing Gear	Conventional
Recommended No. Of Channels	2
Recommended Control Functions	Rudder & Elevator
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Balsa Tips & Foam
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	11" x 14.7" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (2 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	20-24 Ounces
Wing loading based on rec. flying wt.	15.3 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	20 Ounces
Wing Loading	15.3 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Cox .049
Muffler Used	No
Radio Used	Cirrus
Tank Size Used	2 Ozs.

For Old Time's Sake

RANDY CARMAN

Welcome to Las Vegas and the Stardust Hotel, the headquarters for the 11th Annual SAM Champs!

The annual Bean Fest drew a crowd of 250 plus!

Bob Chambers, Al Hellman, & yours truly, gang up on Daddy Warbucks, A.K.A. John Pond!

Al Hellman delivered a rousing opening statement. What controversy was he talking about?

Gene Wallach, the F/F C.D., gives the modelers a few last minute pointers – "Don't chase on foot, use your car!"

Tom Bristol, R/C C.D., also added his two cents – "If you aren't scheduled to fly, please time!"

Irwin Ohlsson with one of the two original hand made prototypes of the Ohlsson .23.

Al looks like he really hated the task of introducing the 1976 and 1977 Miss SAM Champs, Pat Krapf and Tricia Webster. Many a man envied him.

The R/C C.D.'s tent was humming with activity even at 6:00 a.m. Most fliers were smart and got their "officials" over early in the day.

Tuesday morning and dawn over the desert! The dry lake bed that doubled as the flying site! Oh, those lucky fliers out West!

Hellmans Angels MC Club. It's the only way to fly!

Tricia was not only pretty, but willing to help with the flying chores!

Bob VonKonsky starts up his Powerhouse for the Antique event.

Jim Clark's MG made a pretty take-off.

Andy Anderson's Spitfire powered, silk covered Ehling Gas Champ – that's orange silk!

Danny Sheelds of Maryland did better with his Twin Pusher than with his GHQ.

Lee Webster (Tricia's Dad) tries to cool it. No, those aren't vultures waiting for him to drop from the heat!

Woody Woodman's McCoy powered Playboy helped him take third place in Class C Ignition.

Karl Tulp took first in Texaco with his O.S. .60 4 cycle on ignition powered Dallaire. That engine really purred.

Otto Bernhardt's conversion of Karl Tulp's O.S. .60 is a delight to the eye!

Ted Kafer, Editor of the SAM 21, took 3rd in .020 Replica w/Buzzard Bombshell.

Nick Nicholau's Super Buccaneer with a Merco .61 (on ignition) captured second in Antique.

ELEVENTH ANNUAL SAM CHAMPS A BLAST!!

Las Vegas will never be the same! The Society of Antique Modelers descended on the Stardust in droves — over 130 entrants, plus spouses, families, and spectators! It was some showing!

The Bean Fest on Monday, June 27th, was a fest and a half! The cocktail hour before the feed was perfect for getting acquainted. And the chow was something else — a buffet of burgers, beans, salads, and all the trimmings. The mood for the Champs was set - - - up all the way!

Al Hellman was master of ceremonies for the evening. He had the privilege of introducing Miss SAM Champs, Tricia Webster of Tennessee. Pat Kraph, last year's lady, passed on the banner of office to Tricia. The men went wild while the ladies turned green with envy.

Irwin Ohlsson was on hand with one of the original prototypes of the Ohlsson .23. It seems that a gentleman from Indiana came upon the prototype and returned it to Ohlsson. What a wonderful gesture! It's nice to know that there are good people in this world. Irwin intends to pass it on to his children. The evening was late when the fest finished — time to rest for the next day's activities.

Tuesday, with salt tablets in hand, we wended our way to the field, 25 miles southeast of Las Vegas. The flying site was a dry lake bed — not a tree for miles! A free flighter's dream! One would expect booming thermals rising from that parched earth, but they were few and far between until late in the afternoon. By that time, though, only the heartiest of souls, and the CD's were at the field.

Couldn't believe it, but at 6:00 A.M. the temperature was already in the 90's. Never felt such intense heat! Didn't stick around too long at the field! We decided after an hour and a half to head back to the air conditioned comfort of the casinos.

Wednesday was just as hot as the day before — the thermometer topped out at 114°! And that was in the city! We were told by one of the natives that the field was 20° hotter! Even in that sauna-like atmosphere there were plenty of contestants to fly. Most were shaded by tents, but even so, there were a number of cases of heat prostration!

Wednesday night was the annual SAM business meeting. Joe Beshar presided over a good turnout. He related that SAM is now over the 1600 member mark! Believe it or not, SAM ranks second only to the AMA in membership! That's just great!

Thursday was the final day of flying. Texaco was the main R/C event. Karl Tulp brought in a winning 16 minute, 57 second flight. His Dallaire with the O.S. Max .60 4 cycle on ignition beat out four Lanzo Record Breakers! Boy, that en-

Bob VonKonsky took fifth in Texaco with his Lanzo Record Breaker. Must have been the autograph from Chet Lanzo on the plane that did the trick!

Nick Sanford of Santa Rosa, California showed off his 1935 Ehling Record Setter with the 8½ foot wingspan!

Bruce McAvinew of Huntington Beach, California and Hobby Shack displayed his electric powered Ehling Gas Job.

Tom Laurie assisted Fernando Ramos of Villa Park, California with his .020 Powerhouse.

Al Schwankert of N.J. had a worthwhile trip. His Gas Bird with the K & B .40 brought home first place.

Otto Bernhardt not only converts engines, he flies too! That's a Lanzo Record Breaker with a Taipan .61 with VW points.

If Joe Beshar wasn't wearing overalls, no one would recognize him.

Jim Clark did well with his MG. He captured fourth place in Antique.

Bob Boucher won first place in the R/C Electric event with his Buccaneer with an Astro 10.

How's that for an engine! No fuss, no muss – just purr!

Don Bekins flew his Lanzo Record Breaker with the Anderson Spitfire to second place in Texaco.

Helen LeSuer and Pat Bristol were just tremendous as registrars! How they held up under the heat, we'll never know.

gine is a beauty! It just hums!

Thursday night was banquet night. The Stardust put on another huge spread for the 250 plus celebrants. Bruce and Leslie Norman, the Texas free flighters, walked off with the most hardware — 14 trophies between them! Heard they had to rent a trailer to haul the cache home! We always heard Texans do things in a big way! Lawrence Bekins, Don's son, was the youngest winner — and he didn't fool around either — First Place in R/C Class C! Really showed those old timers a thing or two! Danny Sheelds, much to his dismay, walked off with his own perpetual trophy for the best Twin Pusher flight!

It was some banquet. But the fun didn't end there! Tickets were made available to the group for the Stardust's famous Lido de Paris show. Only in Vegas could you see something like that - - - outstanding!

The entire week was outstanding! Al Hellman did a tremendous job! And the CD's, Gene Wallach and Tom Bristol, got thunderous applause for jobs well done! All of those who tolerated that inferno at the field to help out all day deserve many kudos.

It was a terrific SAM Champs. Next year's hosts have a lot to live up to!

Congratulations to all the winners!

The winners in the R/C events were:

CLASS A GLOW

1. Mark Patrolia, 891 points, Sailplane, Veco .19.
2. Al Schwankert — 858 pts., Sailplane, K & B .19.
3. Larry Fair — 814 pts., 75% Playboy, S.T. .19.
4. Joe Beshar — 727 pts., Playboy, S.T. .19.
5. Don Bekins — 672 pts., Zipper, Cox Conquest .15.

CLASS B GLOW

1. Art Peterse — 900 pts., Stratostreak, OPS .29.
2. Vince Bonnema — 899 pts., Comet Clipper, S.T. .29.
3. Joe Beshar — 898 pts., Fox-S.T. .29.
4. Al Schwankert — 857 pts., Zipper, K & B .21.
5. Ted Patrolia — 840 pts., Sailplane, OPS .29.

CLASS C GLOW

1. Lawrence Bekins — 827 pts., Playboy Sr., O.S. .35.
2. Art Peterse — 819 pts., Playboy, S.T. .35.
3. Jim Clark — 797 pts., MG, S.T. .40.
4. Al Schwankert — 784 points, Sailplane, K & B .40.
5. Lee Webster — 775 pts., Playboy, S.T. .35.

ANTIQUE

1. Al Schwankert — 898 pts., Gas Bird, K & B .40.
2. Nick Nicholau — 880 pts., Super Buccaneer, Merco .61 Ign.
3. Howard Carman — 872 pts., Powerhouse, Fox .45.
4. Jim Clark — 844 pts., MG, S.T. .40.
5. Lee Webster — 750 pts., Powerhouse, S.T. .40

TEXACO

1. Karl Tulp — 16:57 min., Dallaire, O.S. .60 4 cycle Ign.
2. Don Bekins — 15:41 min., Lanzo Rec. Break., Anderson Spitfire.
3. Otto Bernhardt — 11:54 min., Lanzo Rec. Break., Taipan .61 Ign.
4. John LeSuer — 11:43 min., Lanzo Rec. Break., Merco .61 Ign.
5. Bob Von Konsky — 10:55 min., Lanzo Rec. Break., Webra .61 Ign.

.020 REPLICA

1. Don Bekins — 636 pts., Playboy, Cox .020.
2. Art Peterse — 564 pts., Playboy Sr., Cox .020.
3. Ted Kafer — 487 pts., Bombshell, Cox .020.
4. Bill Squire — 450 pts., Playboy Sr., Cox .020.
5. John LeSuer — 395 points, Playboy Sr., Cox .020.

A-B IGNITION

1. Don Bekins — 705 pts., Playboy Sr., O.S. .30.
2. John LeSuer — 282 pts., Comet Clipper, O.S. .30.
3. Joe Beshar — 236 pts., Brooklyn Dodger, Forster .29.

C IGNITION

1. John LeSuer — 567 pts., Lanzo Record Breaker, Merco .61.
2. Don Bekins — 412 pts., Playboy Sr., O.S. .35.
3. Woody Woodman — 298 pts., Playboy, McCoy Redhead .60.
4. Nick Sanford — 248 pts., Scram, Anderson Spitfire .61.
5. Bob Von Konsky — 115 pts., Powerhouse, Anderson Spitfire .61.

ELECTRIC

1. Bob Boucher — 802 pts., Buccaneer, Astro 10.
2. Joe Beshar — 647 pts., Bombshell, Astro 020.
3. John Pond — 511 pts., Turner Special, Astro 25.
4. Bruce McAvinew — 425 pts., 1937 Ehling, Astro 10.

□

FAR LEFT: Bill Brenchley of Santa Cruz brought his beautifully built Cloud Cruiser with a K & B .40. LEFT: Woody Peterson showed up with one of the first R/C assisted models ever built, the Lanzo stick. BELOW LEFT: Tim Banaczak winds up his Korda Wakefield for the cabin rubber event. BELOW: Just love Tim's body english on take-off!

ABOVE: Bob Dittmer of Huntington Beach appeared with Miss Philadelphia. Wonder if his wife suspects anything? RIGHT: Larry Vance of the VAMPS with his patriotic Quaker. FAR RIGHT: How 'bout that hardware! It took a while, but it was all handed out.

HERE'S HOW

By Jerry Smith

Having built R/C models for a number of years, I have gathered an enormous pile of small hardware. No doubt you also have this same problem, lots of little parts laying around in jars, dishes and what have you. I have seen some work benches completely covered with no room to build unless time was spent clearing off a spot. Of course, my work bench is the essence of cleanliness as many of my friends will attest. However, most of us who wander down the broad highway of life, are not quite as organized as we

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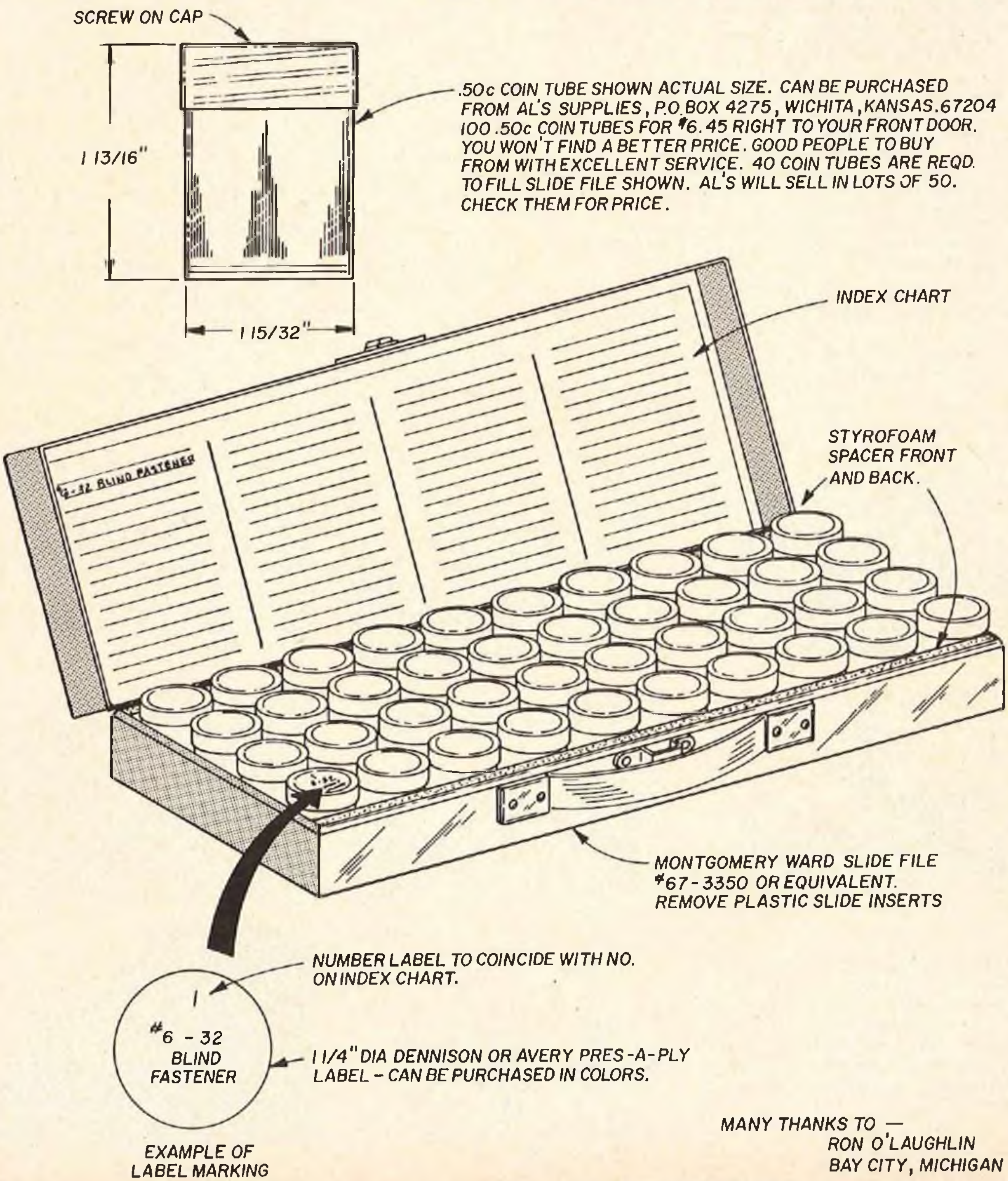


MANY THANKS TO —
RON O'LAUGHLIN
BAY CITY, MICHIGAN

DUCTED FAN DESIGN

By R.W. Kress

PART I

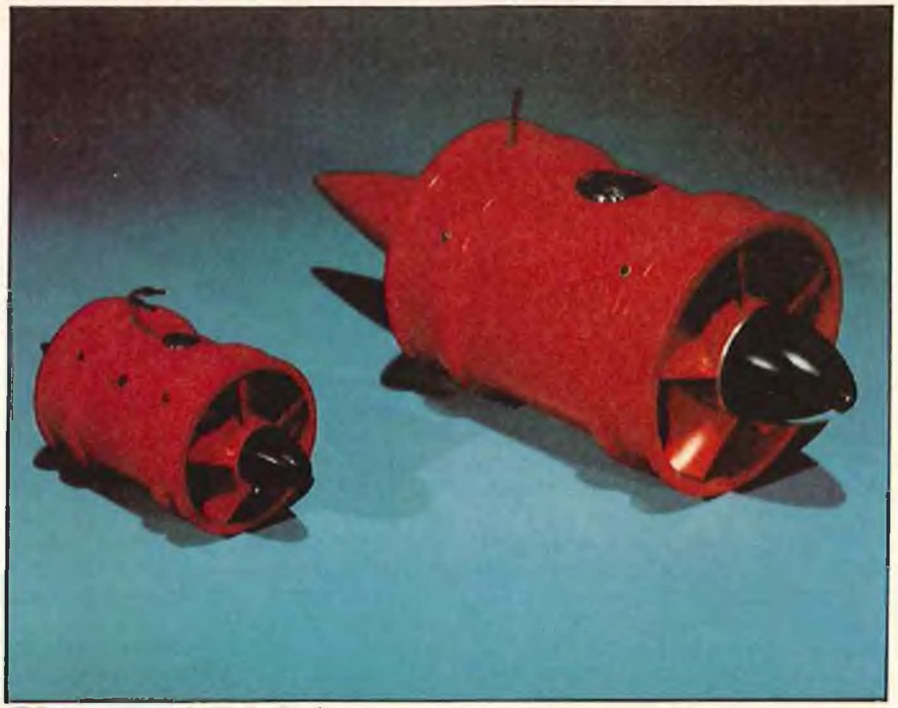


FIG. 1: .049 and .40 Axiflo fans.

FIG. 2: .049 Axiflo A4D.

FIG. 3: .60 Axiflo F-16.

FIG. 4: Grumman design 698 VTOL; two O.S. 40 FSR's in 7" ducts.

Background

How did I get into this mess? Well, ever since high school I have recognized the void in model aviation resulting from the lack of a good jet engine "simulator" or power plant. Having flown Dynajet models when they first came out in 1947 (when I worked for Bill Effinger of Berkeley Models as a prototype model builder. Bill, if you see this, please write), I realized *that* particular solution fell a bit short of popular acclaim!

After a lapse of some twenty odd years (some of which were quite odd), I returned to the quest for scale model jet propulsion, initially with no commercial intent. My first effort was to design an after-burning ducted fan under the assumption that the somewhat poor static thrust of the fan could be substantially augmented by heating the fan efflux to raise the exit velocity. I reasoned that I would get some gains in spite of the poor thermodynamics of the process and I really didn't care about fuel comsumption since it would only be used sparingly at full thrust.

After much fooling around with stainless tailpipes and injecting raw gas into the fan engine muffler chamber to heat and atomize it before sending it to the combustor, I did manage to get the thing to light off. Some milliseconds later I realized that the four foot flame would pose a few design problems. Also, the thoughts that ran through my mind when it was lit must have been quite similar to those of my wife the time she grabbed a raccoon by the tail as he disappeared into a hole in the barn floor — she quickly got an even better idea — let go!

I then moved on to seeing what could be done with just the fan itself, recognizing that the specific power output of stock model engines was rising quite rapidly. With the widespread advent of Schneurle ported engines, this approach has been proven quite feasible as this article will attempt to show.

A few years back, I showed one of my early fans to Joe Dale (of DE fame some 25 years ago), and he subsequently sent it over to Peter Chinn in England. Well, Peter showed a photo of it in his *Aeromodeller* column in 1975. That column impressed on me the keen interest existing in ducted fans - - - I answered letters coming from New Zealand to Upper Slobovia. One, from Lower Slobovia (Midwest Products), started the current events in motion. So, now that history has been properly served, on to ducted fans!

In the sections which follow, I will cover ducted fan basics, such as rough thrust prediction, tailpipe diameter effects, comparison with propellers, engine matching, engine cooling, muffling and installation of the fan in the model.

Under installation, I will cover inlets, duct friction losses and a simple method for assessing performance of a particular model.

Introduction

Ducted fans provide the key to realistic jet modeling, *if they are designed with the average modeler in mind, rather than those few with the patience and skill needed to cope with racing engines.*

It is the conviction of the author that the following features of a ducted fan are essential for widespread application in the model field (in order of importance):

(1) Good performance must be achievable with reasonably hot stock engines and moderate fuels, e.g., Cox TD .049 on 25% nitro and, at the other end of the spectrum, O.S. .60 FSR Schneurle on 5% nitro. You need a good engine, but not necessarily a screaming horror!

(2) A close second, low cost. By this I mean that you buy the fan to match your engine. You should not have to buy a new racing engine, or a fuel pumping system or a tuned pipe or other expensive accessories.

(3) The fan should be light, yet strong like the model itself.

(4) It should be efficient. By this I mean that it should be of good internal aerodynamic design to maximize its thrust.

(5) It should be throttleable without the use of special devices creating more cost and complexity.

(6) The fan should have an integral fuel tank to avoid the aggravation and complication of a separate fuel tank which always seems to be a problem with jet models.

Note that there is no magic involved, only putting together a log of important factors.

To me, the solution, after four years of engineering analysis, prototype construction and testing, took the form of ducted fan kits, marketed in a variety of sizes to match a spectrum of engines. The advantages are:

(1) Low cost to the modeler via the kit approach. The modeler's efforts involved only easy and enjoyable assembly of parts and painting, over a few evenings. The cost saving to the modeler is quite substantial.

(2) Weight can be kept to a minimum by using a maximum of plywood and thin plastic sheet versus thick injection molded parts or metal castings.

(3) Also, with spare parts readily available, repairs can easily be effected without buying whole new units.

Figure 1 shows two prototype Axiflo engines, the .049 and its bigger brother, the .40 as shown at the '77 WRAMS show in Toledo. The .20 and .60 models are not shown. The Axiflo will be marketed by Midwest Products during the fall of 1977 with a matching initial set of ducted fan model kits. First on the market will be the .40 followed by the .049.

The other part of the success equation is the model design itself. The requirements for a successful ducted fan model, once again, do not involve any magic but just plain good aircraft design. In order of importance:

(1) Keep the model light. Good model design with optimal structural arrangement and light construciton materials provide the keys.

(2) Again, a close second. Wrap the fuselage around the engine "skin-tight" so that the fuselage is of minimum size to keep the weight down. Let the wings be correspondingly small. Let the model be a *little* "hot" on landing or use flaps, if you wish. What I am saying is, keep the model as small as is reasonable for a given engine in the interest of saving weight.

(3) Exit the air from the fan through a smooth tailpipe of proper exit area, but, more importantly, *feed the air into the engine via a smooth, forward facing inlet of proper area with gentle inlet lip profiles.* Avoid secondary belly inlets, but if you *must* use them, do them right. More will be said on inlets in later sections.

(4) In summary, a "stand-offish" look about the model, i.e., big inlets and tailpipe and a "tight" fuselage with smaller wings will help the cause.

My partner in crime, Nick Ziroli, the old (young?) master of Stand-Off Scale, has provided the success formula regarding these new fans in three separate models, so far:

(1) The TD .049 fan-powered A4D of Figure 2. It weighs 24 ounces and flies beautifully.

(2) The lead sled F-16 of Figure 3. It weighed 13 lbs. due to overweight fiberglass and 1/2 lb. of ballast plus 1 lb. extra of external tanks and still managed to fly successfully with my OS .60 FSR fan.

(3) A new "X" fighter design of Grumman. This one also weighed 13 lbs. and flew surprisingly well, considering the weight, on the OS .60 FSR fan.

In later articles, Nick Ziroli will tell you how to build the Axiflo and will describe construction of the coming Midwest matching Axiflo jet aircraft models. By the way, the above models and fans do not represent the only joint ventures between Nick and me. We have previously worked together on the Grumman VTOL's; the Nutcracker (RCM, 1977, perish the name!) and Design 698 (viva!). The former had OS .60's running in 10" ducts for both the conventional flight and hover versions, while the latter used OS .60's in 10" ducts (13 lbs. thrust each!) for hover and OS .40's in 7" ducts for conventional flight (see Figure 4). But that is another story which, I'm sure, Nick will tell.

In summary, the use of good performing stock engines in well designed and installed ducted fans offers satisfactory performance in realistic jet models. Some weight and low speed thrust degradations compared to a prop are incurred, which are moderate for a carefully designed model.

PART I — DUCTED FAN BASICS

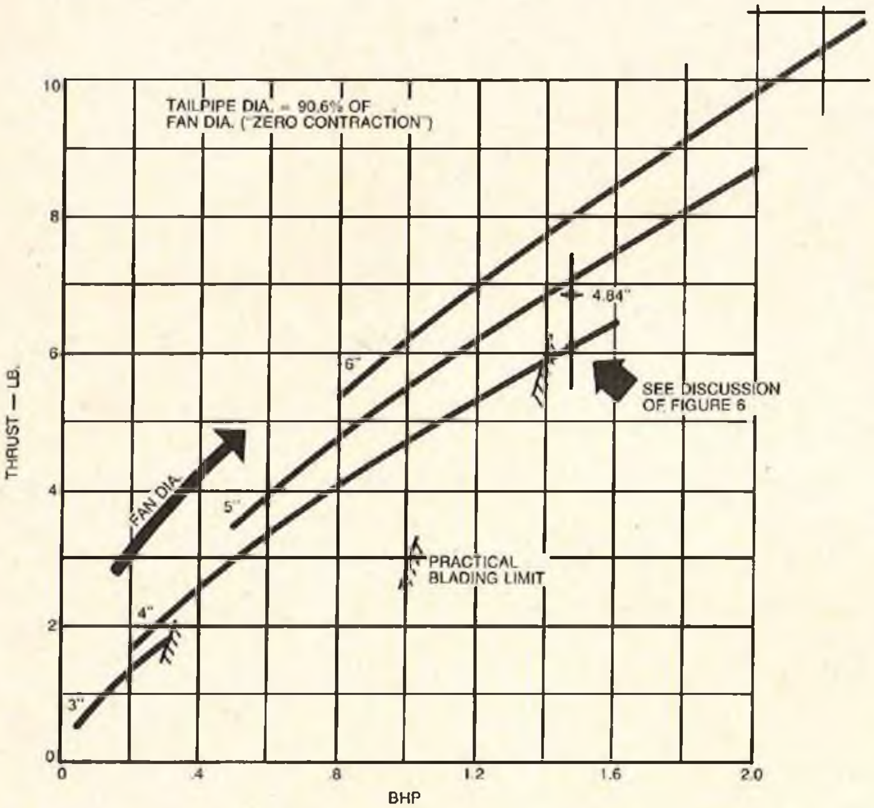
The information to follow is based upon several years of technical analysis, fan design and fabrication followed by thrust tests of the units for comparison with predictions. Prop analysis and thrust tests on the same engines were conducted for comparison.

One of the most important factors to become familiar with is the maximum static thrust which one can expect from a ducted fan unit. Calculation of the static thrust is quite simple (assuming you have a calculator) using the formula below:

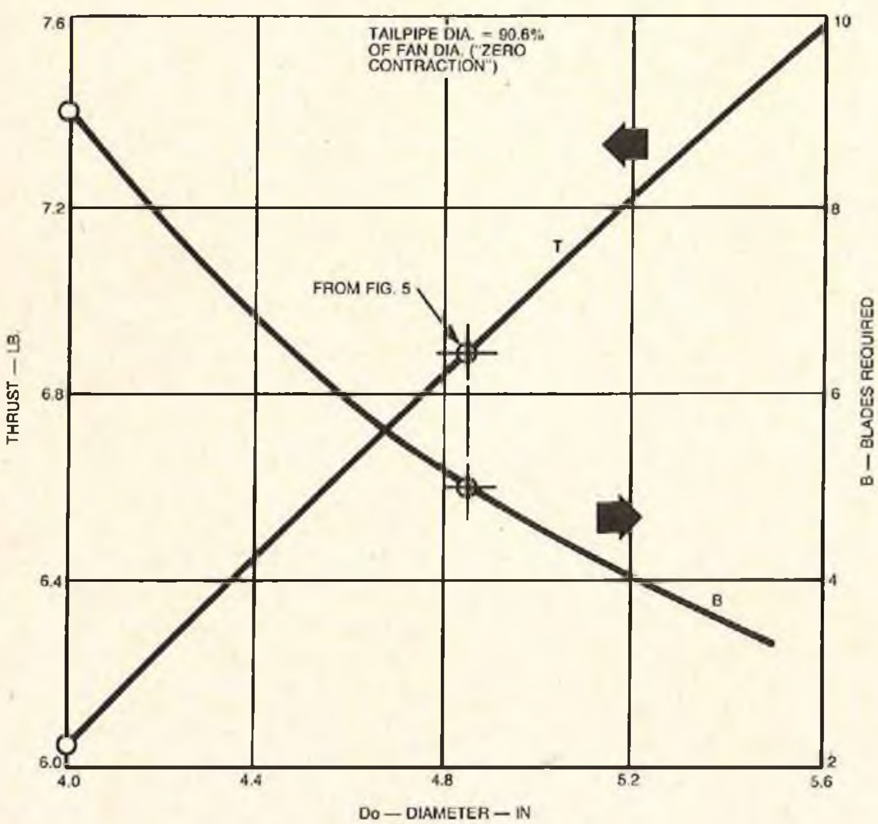
$$T = 13.13\left[\eta F \; BHP \; D_o \left(\frac{D_e}{D_o}\right)\right]^{2/3}$$

T = Thrust in lb.
ηF = Fan Efficiency
BHP = Brake Horsepower
D_o = Fan Diameter in Feet
D_e = Tailpipe Diameter in Feet

FAN DIA.	TAILPIPE DIA.
6"	5.44"
5"	4.53"
4"	3.62"
3"	2.72"



ACHIEVABLE STATIC THRUST FOR DUCTED FANS
FIGURE 5



FAN DIAMETER EFFECTS ON STATIC THRUST & BLADING; BHP = 1.48
FIGURE 6

This formula applies to a fan unit with a relatively short tailpipe and a short inlet with well-rounded lips.

My experience with ducted fans is that a fan efficiency of .70 (70%) is a representative upper limit value *now* achievable in a well designed unit taking into account cylinder head drag and blockage losses. The .70 value will be used in all of the following discussions. I feel that, eventually, efficiency values as high as .80 may be seen. In the thrust formula, the BHP value to be used is that at the peak of the BHP versus RPM curve for the engine of interest running on the desired fuel. Peter Chinn's fine engine articles are the major source of the engine data. For those readers not having a calculator, Figure 5 has been prepared which shows thrust achievable as a function of engine BHP and fan diameter. This chart has been developed for a basic fan unit having a short "zero-contraction" tailpipe. That is, the tailpipe exit area is equal to the fan annular area around the center body. The tailpipe diameter turns out to be 90.6% of the fan diameter for a typical center body diameter of 42% of the fan diameter. The cross-hatched limits on the plot will be explained later.

Note that use of the thrust formula and Figure 5 tell you nothing about what is going on *inside* the fan or how to design it. They merely tell you how much thrust it will put out if it is well designed (has a currently achievable .70 efficiency value). Don't assume, for instance, that you can stuff an OS .60 FSR in a 4" duct and absorb all that power! The required loading on each blade would be beyond stall for any reasonable number of blades (or solidity). The required fan design to absorb the power will all come out later. What the formula really does for you is allow you to check claims that "so much thrust can be developed with such and such engine in a given fan unit". Also, if (for the time being) you will only consider fan designs below the cross-hatched maximum fan BHP limits of Figure 5, the fan blading will be achievable, although with increasing difficulty near the limit. If you want to pack the power into the smaller diameter, it can be done but extreme design care becomes necessary, as will be shown shortly. You lose on thrust to boot!

One basic fact to note is that, given a fan with a particular diameter and tailpipe diameter, thrust increases with the 2/3 power of the horsepower. This means that, at best, (even if the blades don't stall), *if you double the horsepower you will only raise the thrust by a factor of 1.59!* So, therefore, some sort of finesse seems in order!

Taking a closer look at what happens when you try and pack a given engine horsepower into decreasing sized fans, Figure 6 has been prepared. Note that the Figure 6 information represents a "slice" at BHP = 1.48 through the Figure 5 chart as indicated. Figure 6 shows that, as the diameter is reduced from the Figure 5 value of 4.84", the thrust falls off from 6.88 lbs. to 6.05 lbs. at a diameter of 4.00". Furthermore, we have gone beyond the "practical blading limit" at the 4.00" diameter on Figure 5. On Figure 6 this translates into an excessive number of required blades; 9 at the 4.00" diameter for a solidity approaching 1.0 versus 5 at the 4.84" diameter. The message of all this is as follows:

For a given horsepower engine unit: (1) Diameter reductions improve compactness and weight of the fan unit, but (2) such reductions are accompanied by thrust losses and increasingly difficult blading problems.

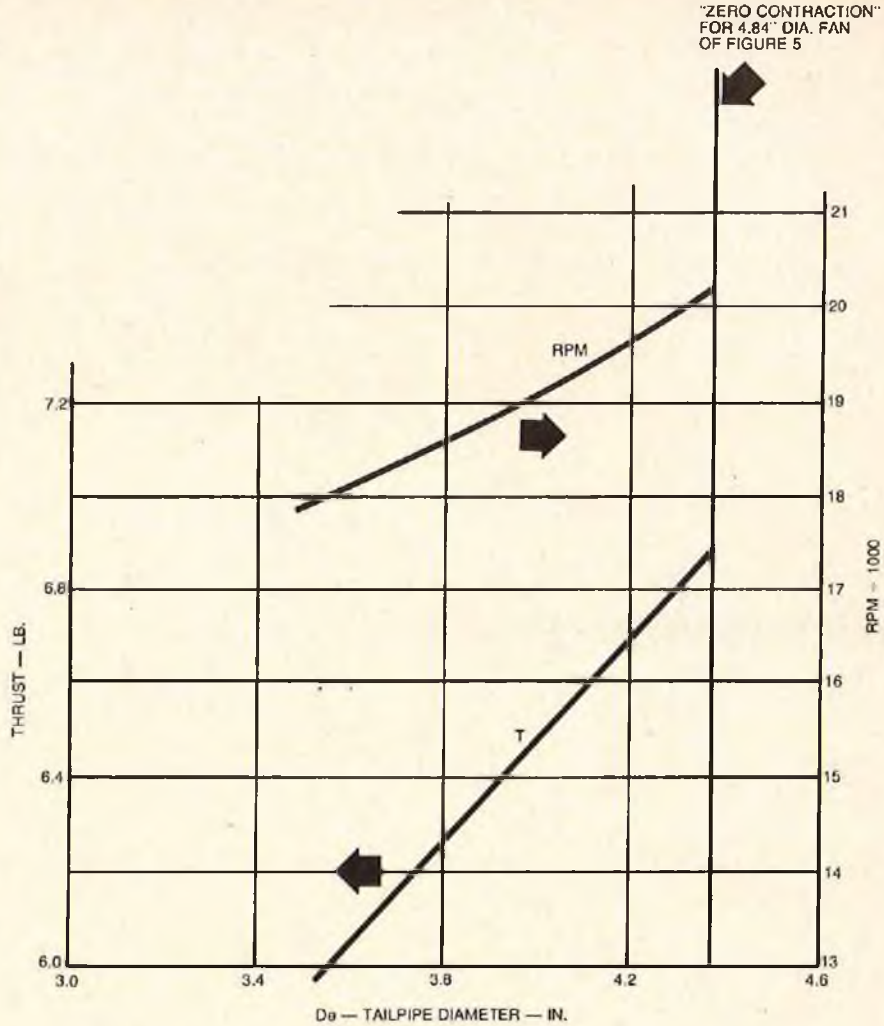
Up until now, I have been working with five bladed fans because I intuitively feel that decreased diameter engine thrust-to-weight trade-offs may be unfavorable. My present five bladed fan designs result in good thrust with workable diameters. They utilize rather conservative blade lift coefficients (CL ≤ .8) so that off-design performance remains relatively good. Someday I intend to pursue the smaller, denser fan to see what really happens to the power plant thrust-to-weight ratio which, after all, is what really counts from a propulsion viewpoint.

So far we have been examining fan diameter and BHP effects on fan thrust for a "zero-contraction" tailpipe with 90.6% of the fan diameter. This is the tailpipe diameter of most interest when it comes to comparing raw fan performance. However, close examination of the thrust equation shows that thrust depends *only* on tailpipe diameter, irrespective of the

$$D_o \left(\frac{D_e}{D_o}\right) = D_e!$$

This is, of course, assuming that the fan is designed to match the airflow allowed by the tailpipe diameter and therefore maintains the .70 efficiency value. Therefore, one can read Figure 5 in a different way. A fan diameter of 6" with a tailpipe diameter of 90.6% is equivalent to a tailpipe diameter of 5.44" as noted in the small inset table of Figure 5. If you desire a smaller tailpipe for a given BHP, you can read the thrust available as before by considering the fan diameter curves to really mean tailpipe diameter with the lower values as noted. You also have the option of using a larger fan diameter relative to the tailpipe such that impractical blading is avoided, if tailpipe diameter is the constraining feature of the model.

Figure 7 has been derived from the information of Figure 5 in the manner described for a BHP of 1.48. This shows thrust available versus tailpipe diameter as the tailpipe is reduced in size from the original 4.39" value which was 90.6% of the 4.84" fan diameter. The thrust versus tailpipe diameter curve is really based upon the assumption that, at each point, the fan design is changed to provide .70 efficiency and keep the engine running at its peak BHP and RPM. In actuality, if the fan is designed for the original "zero-contraction" tailpipe condition and the tailpipe merely closed up with no change in design, the original thrust versus tailpipe diameter curve *is still pretty accurate,* except that RPM will vary.

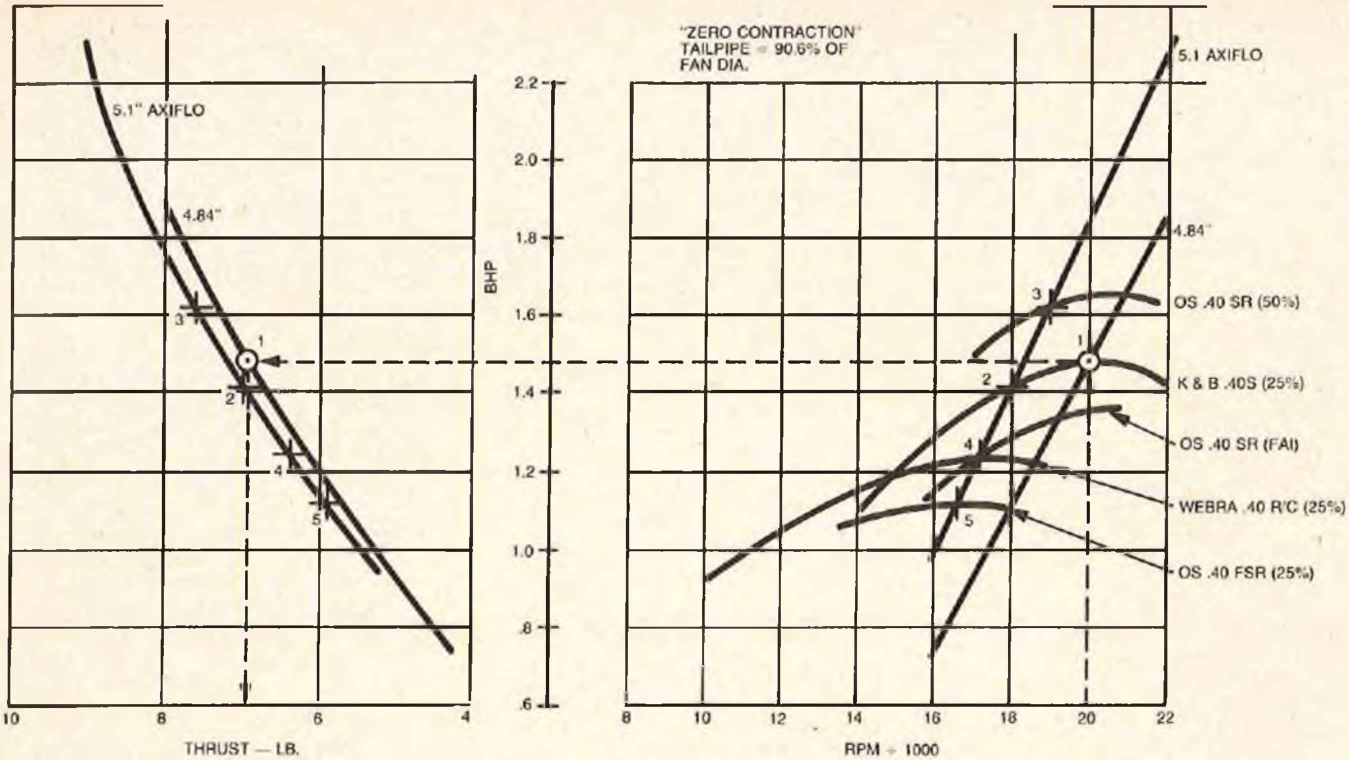


TAILPIPE DIAMETER EFFECTS ON STATIC THRUST & RPM; BHP = 1.48
FIGURE 7

The RPM versus tailpipe diameter curve of Figure 7 illustrates what happens when you "choke" up on the tailpipe in the manner described instead of redesigning at each point. As you "choke" the tailpipe, the engine slows down. Remembering, however, that the fan at the "zero-contraction" tailpipe diameter was designed to run at the peak of the BHP versus RPM curve, the roughly 2,000 RPM drop will not result in much of a drop in input BHP (less than 5%) because of the "flatness" of the curve near the peak. Likewise, fan efficiency is running at a relatively flat peak which does not change substantially for a 2,000 RPM change. So the only factor which reduced thrust, was the tailpipe diameter reduction itself.

Designing with a *somewhat* "choked" tailpipe in the manner shown in the static case is not bad under certain circumstances. If you happen to have an engine/fan combo which runs at the peak of the BHP versus RPM curve, or beyond, statically, it will have problems in flight. As the fan gets into up and away flight it will tend to "unload" just like a prop and overspeed. With the somewhat "choked" tailpipe, it will tend to run *up* onto its peak BHP versus RPM point. In the case of an "unchoked" tailpipe running at, or beyond, peak BHP and RPM statically, the engine will tend to *fall off* in BHP as the fan unloads and increases RPM past the peak of the curve.

But the obvious message of Figure 7 is *don't choke the tailpipe any more than you absolutely have to* — either for the reason above or for scale considerations! The *best* solution for a given engine is to design the fan diameter such that, with a zero contraction, unchoked tailpipe, the engine is running near, *but below,* the BHP peak and moves up in



DUCTED FAN BHP VS. RPM AND THRUST
FIGURE 8

RPM onto the peak in flight. This has been my practice and it has worked well.

You will also notice that a fan will run at a slightly higher RPM uninstalled, than it will installed in the model, even with a zero-contraction tailpipe. This is good since it further prevents fan overspeed in flight.

Now let's address Figure 8, which is a very fundamental graph showing the characteristics of a particular ducted fan/engine combination. It's a bit messy, but if you stick with it, you'll be in good shape.

To the right of Figure 8 is plotted the BHP needed to drive a particular ducted fan at a given RPM. Two fan diameters, each of my design, are shown, 5.10" and 4.84" (these are duct inside diameters). It is readily apparent that one can overlay the BHP versus RPM curve of a particular engine (best source is Peter Chinn's engine power curves) on this plot and find the RPM to which the engine will drive the fan on the given fuel. For instance, the K & B .40S on 25% nitro will drive the 4.84" fan to 20,000 RPM (Point 1) while putting out 1.48 BHP. Reading the *left* side of the plot now, you will see that the 1.48 BHP input, at that RPM, will produce 6.88 lbs. of thrust for the 4.84" diameter fan. If that seems familiar to you, it should, because this was the basic engine/fan combination illustrated in Figures 5, 6, and 7!

The obvious utility of Figure 8 is that, given a fan, you can tell exactly what RPM it will run at statically and what thrust it will produce with a given engine (using Peter Chinn's power curves). It is my intent to pack such a curve in the box with each Axiflo so that you will be able to determine everything you need to know about the thrust output of the fan. I will also *tabulate* expected RPM and thrust for a number of popular engines and fuels to make it easier. By the way, note that if you want to read RPM with an optical tach on my fans, you have to put a *pair* of reflective MonoKote (or other material) strips on the spinner to give you correct readings. If you use the blades themselves, you'll get RPM's that will blow your mind (and maybe your tach!).

So now let's dissect Figure 8 a bit since you now are (very) familiar with it. (Hang in there, it won't hurt too much!).

First of all, you will notice that the K & B .40S was running at the peak of the BHP versus RPM curve (Point 1) in the 4.84" duct. As I mentioned before, it will tend to unload excessively and "go over the top" of the curve at flight speeds. The better solution is to run it in a 5.1" duct (Point 2) so that it "unloads" up onto the BHP peak in flight. You will also note that its static thrust is 7.00 lbs. versus 6.88 lbs. due to the larger diameter.

But my original intent was not to address racing engines. True, with the OS .40 SR, for instance, on 50% nitro, you can get 7.65 lbs. of thrust (Point 3) instead of 6.4 lbs. on FAI fuel (Point 4), but was the thrust increase worth all that bother? Probably not, if you *carefully* made your model correspondingly lighter to compensate.

Note that the Webra Speed .40 R/C (also Point 4 by coincidence) and OS .40 FSR (Point 5) on 25% nitro do very credible thrust-producing jobs of 6.4 lbs. and 5.9 lbs., respectively.

What we see then with the 5.1" diameter fan is a unit that will accommodate a wide spectrum of engines from the "animals" at 50% nitro to the "pussycats" with a thrust variation from 7.65 lbs. to approximately 6 lbs. Was the extra 1.65 lb. worth it? I think not. Yes, I

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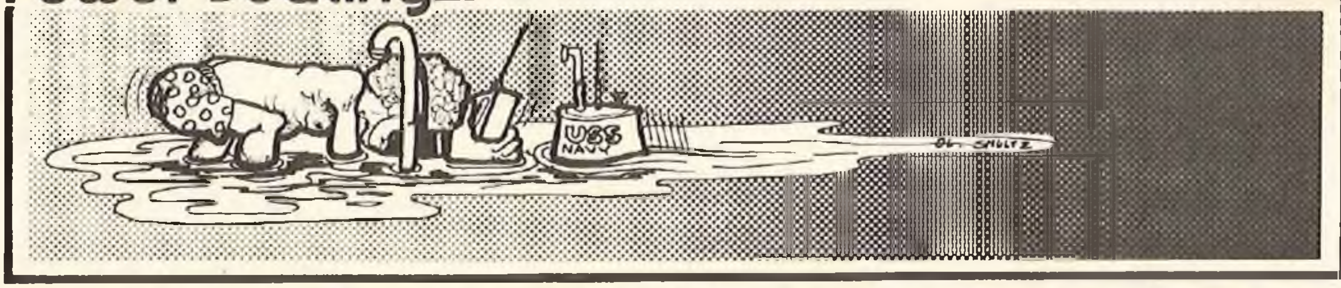
AXIFLO 5.1 Inch Diameter .40 Class Fan

Engine	Fuel (% Nitro)	BHP	RPM	Static Thrust Lbs.
K & B .40S	50%	1.64	19,000	7.31
K & B .40S	25%	1.42	18,000	6.65
OS .40SR	50%	1.62	19,000	7.27
OS .40SR	FAI	1.24	17,200	6.10
Webra Spd. .40RC	25%	1.24	17,200	6.10
K & B .40 RC	25%	.94	15,800	5.00
OS .40 FSR	25%	1.12	16,600	5.60
HP .40 RPR	FAI	1.02	16,300	5.53
Webra Spd. .40 Pylon	?(Mfg'g Data)	1.81	19,800	7.75

Power Boating

DAVID THOMAS



Stand up, you who said that the writer of Power Boating is going out of his mind!" He isn't. But, as the photo shows, it is true that he is busy building himself an R/C yacht. And why not? Okay, so this is a column about power boats, but I like to think that the emphasis is on boats, rather than power, and anyway, it's wind-power, isn't it?

I sailed one of these boats in Johannesburg last year, and was so taken with it, especially the handling, that the maker just sent me one, so now I shall have to get down and build it. The model is an Impi, built by Model Marine Products, P.O. Box 64006, Highlands North, Johannesburg, South Africa. The hull is in one piece, molded in glass-fibre, all the accessories including the mast are in gold-anodized dural, and the keel weight is cast-iron. The kit comes complete, including sails, rigging wire and, if you want it, a winch. I'll talk more about this one as and when I build it — not that it matters much which yacht I build, but I do think it's about time we had a look at other aspects of boat modeling, give everyone a chance.

The complete yacht kit, including winch.

The Impi hull molded in glass fibre.

The finished Impi sailing in a lake near Johannesburg.

★

Okay, back to power. George Feiger of Palo Alto, California, writes to ask how he should charge a single two-volt cell that he has cut out of an old automobile 53 a/h battery, to use as a starter battery for glow engines. Well, George, while it would be better to use a 2-volt charger, you don't need to worry too much about it. Just use an ordinary 6-volt charger, at about two amps. In fact, when I cut up an old battery, I always cut out two cells, and link them in series when charging. The reason is not that I need two batteries, but some other guy always turns up at the lake with a flat battery, and I get fed-up with having to go and get mine back from him every time I want to start a boat! Now I take two, and get some peace.

★

A little while back I was talking about water-cooling hi-power electric motors, and I mentioned the use of nickel cadmium cells. Now let's get one thing straight — there is absolutely no reason at all why lead/acid cells shouldn't be used as a source of power, but there is a snag; in fact, there are several. The first is that old bogey, weight. If you want a fast electric boat, then you are just going to have to use nicads — at least until something better comes along, and with the current fuel crisis the way it is, I have a feeling that there are some pretty clever guys working on things which, though destined for other uses, are going to be pretty useful to us boaters. Things like a fuel cell, and when that happens, yours truly is going to throw away all those messy, smelly, noisy I/C engines, and build some clean boats for a change! Seriously, though, if you build a fast — and that means planing — hull, and you fill it up with heavy lead/acid batteries, that poor thing is just never going to get up out of the water and go. No way! If, on the other hand, you have a slow displacement hull, a scale model of a trawler or something of that kind, then it is probably better to use lead/acids, because it will be cheaper.

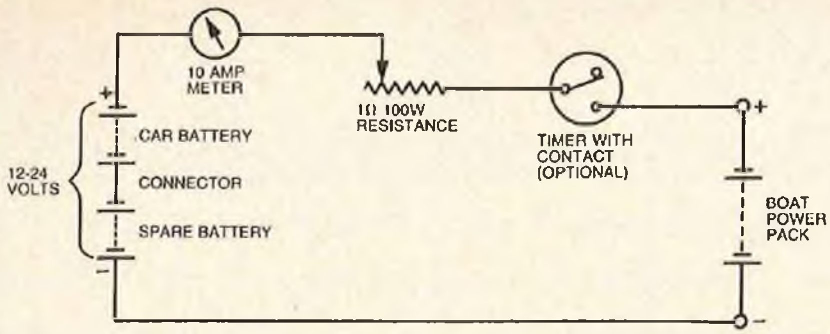
This shot clearly shows the spare 12v car battery, with self-tapping screws in the link-bars.

The complete charging system, linked up to the boat, under the hood of the car. Power for nothing!

Adjusting the variable resistance to keep the current at a constant 6 amps.

Another snag with them is that unless you buy the more expensive gel-cells, at some time or other, you are going to get acid on your clothes, and boy, will you be in trouble. Years ago I used them, and my wardrobe (and my marriage!) was only saved by the advent of the nicad.

The last real snag is charging. A lead/acid has to be charged very slowly, or it will be damaged. This means that when the battery is flat, that's the end of boating until the next day, because it



needs an overnight charge. Nicads, on the other hand, can be charged very fast — as fast as 6 minutes, which means that you have your run, take the boat out of the water, connect up to the car battery, charge, and back on the water for another go. This facility alone makes the nicad the only boat battery I would use, but it is not the end of the story. Over the years, it has been discovered that not only does this fast charging do no harm to the cells, it actually improves their capacity. I have seen figures, from an authoritative source, quote an improvement in capacity of 1.2 a/h cells of as much as 25%, which is pretty good. Furthermore, rapid charging doesn't have any effect on the life expectancy of the cells, which is generally accepted as being in the region of 800-1,000 cycles. A quick calculation shows that if you go boating fifty weekends a year (which is unlikely), and if you have four runs each time, then those cells will last between four and five years. And considering that you pay nothing to charge them, that's pretty cheap running costs.

Anyway, let's take a look at the charging problems. First of all, how do we charge them? A pure D.C. source is best, so don't bother with things like car chargers because, although they usually have a full-wave redresser, the output is not pure D.C., and nicads don't like it. The best bet is the car battery, but 12 volts won't allow rapid charging. Personally, I go and see my garage dealer, and ask him to put aside the first reasonable battery he comes across when someone comes in for an exchange. As I have said before, when a car battery goes, it is nearly always because just one of the six cells have gone hi-impedance. Now, all things are relative, and what is high impedance to a current like 40-50 amps, necessary to start a car engine, is not the same where 5-10 amps are concerned, and you will often find that an old battery, especially if it is treated with a commercial regenerating product, will serve you for a good year as a charging battery, giving up to 10 amps maximum. What's more, if your local garage man is a nice guy, it won't cost you anything, either!

Now, you have to be careful how you treat that battery, because if there is one thing lead/acids don't like, it is being left uncharged. Keep it well charged up, but at the same time, check the level of the electrolyte regularly, and top it up with distilled water. Okay, now you have 24 volts, but that is no good either, so you need a way of taking intermediate voltages out of the system, and that is really very simple. All you do is to take some big self-tapping screws, and screw them into the separator plates of the spare battery, which are made of lead, so it's not even a hard job. You can now have 14, 16, 18, 20 and 22 volts, according to the number of nicad cells you want to charge.

The next thing to consider is how much juice to pour into those nicads, because while rapid charging is okay, over-charging is *not!* In fact, if you over-charge at high rates, you'll have troubles like nasty big bangs, when the cells blow-up on you, and apart from the fact that it makes you jump, it also makes a nasty mess under the hood of that nice new car!

Normally, charging should be carried out when the total voltage of your power-pack drops to the equivalent of 1 volt per cell. In other words, with an eight cell pack, which has a nominal max. voltage of 9.6 volts, when the voltage drops to, or just below, eight volts. You really do need a small voltmeter to be sure, but these are cheap, and useful. If after a run, the cells are not down to this voltage, then connect a bulb from the car headlight to them, and meter the voltage until it drops to the right level. When it does so, we can consider that the cells in the pack are 90% discharged. A quick calculation shows the following state of affairs:

1.2 a/h = 1.2 x 60 = 72 amp/mins.

$$90\% = \frac{72 \times 90}{100} = 64.8 \text{ amp/mins.}$$

In other words, we now have to replace about 65 amp/minutes in the pack to bring it back up to full charge. This would mean charging at the following rates:

1 amp = 65 mins.
2 amps = 32.5 mins.
5 amps = 13 mins.
6 amps = 10.8 mins.
10 amps = 6.4 mins.

Personally, I usually charge at 6 amps for 10 minutes because if the cells were slightly more than 10% full, then no damage will be done. Remember, an extra 30 seconds at 10 amps could damage the cells.

This is all very well, but we now have to consider how to actually charge. Well, take a look at the diagram, and all will be revealed. You need a 10 amp meter, a 1 ohm 100 watt variable resistance, some heavy-duty automobile electric wire, and some crocodile clips. The meter should be easily available, but you may have to look around for the 1 ohm resistance — the one I found was made in Japan (as are so many things these days). I used some old plywood to make a convenient box (which I hate to admit I haven't finished, or even painted, yet — but, as I have already explained, trying out so many things doesn't leave much time for prettying them up). It is advisable to buy red and black wiring, and to try to find crocodile clips with red and black plastic ends, to avoid any confusion over polarity.

But before actually getting down to charging, we need to know one more thing; how many volts are needed to charge a given number of nicads. Well, it will depend a lot on the state of the lead/acid batteries, but the following table gives minimum rates:

No. of nicads	Voltage of lead/acid req.
8	7
10	9
12	10
14	12
16	14

It must be remembered that these are minimum values, and in order to charge at high rates, more will be needed, because the excess voltage is required, to drive the current into the cells.

Okay, having built your charger, put the spare lead/acid close to the car battery, and connect + on the car to − on the spare, using a heavy-duty cable. Next, connect the car to the − charger jack, and the + charger jack to the appropriate self-tapping screw on the spare battery.

Now connect the − charging lead to the − on the nicad pack, and similarly + to +. As soon as this last connection is made, the current will flow, and will be registered on the meter. If the meter needle kicks backwards, off the scale, disconnect the power pack, quickly, because there is a wrong connection somewhere. If it moves over the scale to a certain figure, fine, now you can adjust the variable resistance to the desired charge rate, but as you do so, check the time very carefully. If you can't get the desired reading, move the crocodile on the spare battery to include another cell, and then re-adjust the resistance.

As the charge progresses, you will notice that the charging current has a tendency to drop slightly, so from time to

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Pit Stop GENE HUSTING

Butch Kroells, the 1st World R/C Car Champion with 6', 2" trophy presented by OCRCAR Club.

70 of the 117 entries in the World R/C Car Championship race at Thorp Raceway, Pomona, Calif., July 2, 3 & 4, 1977.

That "T" shirt is a little misleading. The man wearing it is Michal Wickens from England who had nothing but problems and received the Foreign Hard Luck Trophy. With him is Phil Greeno, also from England, who had the fastest motors from the foreign entries.

Franco Sabattini, twice European Champion, with Bill Jianas, USA Champion.

Thorp's track has super traction, very smooth and everyone said they were going around corners faster than ever before. The large round "Plow Discs" in corners discourage corner cutting, without hurting cars.

Among the fastest foreign entries, as a team, were the English with their new P.B. cars. Phil Booth – winner of the "B" Main, Ted Longshaw – President of EFRA, Dave Preston and daughter Debbie Preston, who certainly must be the best woman driver in the world.

Mike Reedy, with the help of Bill Watson and Antonio Delazoppa, and Bob Stevens timing equipment, ran a very smooth race with no major difficulties.

It had to happen. It was just a matter of time. But most people didn't really believe we were ready for such a huge event as this was, at this time. It all actually started 2 years ago, when Ted Longshaw, from England, told me he thought he could get at least a dozen drivers to come to a World R/C Car Championship Race in the U.S., if we could stage such an event. I told him I thought we could and immediately received the cooperation of the Orange County Club in Southern California to stage this event. But the Orange County track was not good enough for a Championship Event such as this. After checking several other locations, John Thorp offered his track in Pomona, California, to hold the race. This is really a fabulous track with super traction and very smooth. Plans went ahead and entries started pouring in. We had 45 Foreign entries and 67 U.S. entries! The U.S. entries were limited to Expert and top Amateur Class drivers only. We wanted to hold the entries down so there would be enough practice time for everyone.

The race was scheduled for July 2, 3, and 4. About June 10, the first foreign drivers arrived. Bob Reid and Johan Pretorius came all the way from South Africa. They said they wanted to be ready. Eight days before the race, on a Friday, myself and a few of our team members went to the track and the 9 member Italian Team had arrived. By Sunday, most of the drivers had arrived for a full weeks practice. All of the U.S. drivers were wondering, "How fast are the Europeans?" and they in turn were wondering, "How fast are the Americans?" It was hard to compare performances ahead of time, because the European entries had to run a quieter muffler, but they were also allowed to run smaller tires and larger fuel tanks and wings.

My first impressions of the Italian team, was that their cars were too flexible. They seemed to have a lot of bounce. I asked Ted Longshaw about this, and he said "Don't worry, by race

Timing stand is on the R.H. side with one lap counter for each car. Each individual lap time was recorded. Many comments were made to the effect, "I wish we had a track like this back home."

Al Chuck's beautiful Concours winning Porsche 30 KL Sports Car.

Roger Curtis, from Southern Calif., won the "C" Main by 10 laps.

Phil Booth, from England, won the "B" Main.

Phil Booth's P.B. car. Notice the rear tires are smaller than the fronts. Large round unit behind K & B 3.5 is a very quiet muffler.

The first World R/C Car Champion – Butch Kroells.

Butch's Associated RC 100 car uses K & B 3.5 power with Futaba radio. The K & B 3.5 was used by virtually everyone except the Italian team, who used the Super Tigre. Futaba was also the most popular radio.

National Champion, Bill Jianas, was Top Qualifier and placed 2nd in the "A" Main.

Gene Husting hangs in there to take 3rd in the "A" Main.

Team Italy (not in order), Masse Mares, Alberto Cantoni, Sergio Agostino, Walter Collina, Franco Sabattini, Umberto Bisi, Guerrino Stanzini & Leonardo Garofali (Mr. Super Tigre – not shown).

Team England – Doug Blair, Dave Preston, girl (sorry), Ted Longshaw, Keith Plested, Phil Greeno, Phil Booth, and Debbie Preston.

Team Switzerland – Antonio Delazoppa, Stig Anderson, Udo Franke, Jean-Pierre Weber.

day they'll have them working. It's always this way." The Italian Team with the S.G. car was European Champion in 1974-75 with Franco Sabattini driving, and also in 1976, with Ronnie Ton driving. They were both here and they are both gifted Champion drivers.

The team that really made me think we were in a lot of trouble was the English Team with their new P.B. International car. They seemed to be about ready to race as soon as they arrived. They have excellent drivers, the cars handle very good, and on top of this, they're running 50% nitro, so their cars were exceptionally fast on the straightaway, easily as fast as anyone else's car on the straightaway.

On Monday, Rich Lee, with his Associated RC100 car, was turning laps consistently one second faster than anyone else there.

On Tuesday, Ted Longshaw, Phil Booth and Dave Preston were at the Associated factory gluing tires "The same as Rich Lee's" on their wheels.

On Wednesday, Ken Campbell and

Team Sweden (not in order), Roy Persson, Kjell Krusberg, Rune Sahlberg, Bo Japlin, Hans Crispin.

Team France – Jean Pierre Lemaitre and Patrick Rigot.

Team Japan – Yoshi Yokobori, Shoichi Mochizuki and Yuji Taki.

Team So. Africa – Johan Pretorius and Bob Reid.

"A" MAIN

Place	Name	Laps	Qual. Time	Country	Car
1	Butch Kroells	120	576.1	USA-CA.	Associated
2	Bill Jianas	118	542.6	USA-CA.	Associated
3	Gene Husting	117	569.0	USA-CA.	Associated
4	Mike Rowland	117	575.5	USA-CA.	Associated
5	Rich Lee	116	561.8	USA-CA.	Associated
6	Matt Azzara	116	561.8	USA-CA.	Associated
7	Chuck Phelps	112	556.9	USA-AZ.	Associated
8	Jeff Rold	112	569.7	USA-CA.	Magnum
9	Gary Buriani	41	580.0	USA-CA.	Associated
10	Arturo Carbonell	34	571.8	USA-FL.	Delta

"B" MAIN

Place	Name	Laps	Qual. Time	Country	Car
1	Phil Booth	110	596.6	England	PB
2	Gary Grossenbacher	109	598.0	USA-AZ.	Associated
3	Debbie Preston	106	590.9	England	PB
4	Bill Campbell	103	589.4	USA-MO.	Delta
5	Dave Dawson	101	592.8	USA-IN.	Delta
6	Reiner Dosch	92	592.0	Germany	PB
7	Bill Coalson	90	592.0	USA-MO.	Delta
8	Franco Sabattini	60	601.0	Italy	SG
9	Rick Davis	55	590.5	USA-MI.	Scratch-built
10	John Thorp	40	593.0	USA-CA.	Thorp

"C" MAIN

Place	Name	Laps	Qual. Time	Country	Car
1	Roger Curtis	100	605.5	USA-CA.	Associated
2	Bob Titterington	89	606.9	USA-CA.	Titan
3	Ted Longshaw	87	605.2	England	PB
4	Mike Queller	85	601.3	USA-TX.	Delta
5	Bob Welch	80	603.7	USA-WA.	MRP
6	Johan Pretorius	73	603.5	South Africa	Associated
7	Chuck Hallum	51	604.6	USA-CA.	HRE
8	Jay Kimbrough	41	603.5	USA-CA.	Associated
9	Don Stewart	8	602.2	USA-CA.	J-Car
10	Gary Kyes	DNS	601.1	USA-CA.	MRP

Top Qualifier Trophy .... Bill Jianas
Concourse Trophy .... Al Chuck
Hard Luck, Foreign .... Mike Wickens
Hard Luck, USA .... Neil Tilbor

A BIG THANKS to our trophy sponsors: OCRCAR, Dick McCoy, Associated, Delta Mfg., Racing Circuits, HRE, Ted Longshaw, Parma, RPM, JA-LEA, Delta Systems, Bill Watson, G.B. Models, and "J"-Car.

Arturo Carbonell were at the Associated factory gluing tires "The same as Rich Lee's" on their front wheels. The Associated rubber seemed to work equally well on everyone else's car who tried them. Although Thorp had a good supply of these tires, they were gone by Friday. I think that just about everything else that Thorp had in is store was also just about sold out by the end of the week.

With a whole weeks practice time, the racers had plenty of time to practice and still had a lot of time to get to know each other. I want to say that it was a great honor and thrill for me to meet and talk to Franco Sabattini and Ronnie Ton - European Champions, Phil Booth and Dave Preston - English Champions, Karlheinz Will, Reiner Dosch and Uwe Schildbach - German Champions, Udo Franke - Swiss Champion, Patrick Rigot - French Champion, Bob Reid - South African Champion, Yuji Taki and Shoichi Mochizuki - Japan Champions. I thoroughly enjoyed talking to all the drivers most of whom could speak English. The one exception was the Italian Team - only one of them spoke English and it seemed as though they didn't really care whether or not anyone talked to them, and they sure didn't go out of their way to talk to anyone else. They just continually worked on their cars from 10 o'clock in the morning till night, every day. They definitely were the hardest working group at the race. On Thursday night, a group of Americans took the 9 member Italian Team and the three German drivers to Shakey's Pizza Parlour and gave them all the pizza, fried chicken, wine and beer they could eat and drink. The Italian Team ended up on stage singing their National Anthem a couple of times. From there, they took them to a Malibu Grand Prix track, which has "U" Drive Formula I type cars in 3/4 scale. You get in the cars and drive around a road course which takes about one minute. The cars handle so fantastically well that you have the feeling of a true Formula I car, only at a safer speed. Each of your laps is electronically timed. It is so much fun driving one of these cars that you just don't want to get out. And that's exactly what happened. They got in the cars and didn't get out till closing time! The next day at Thorp's they were friends with everyone! The Americans were okay. It was a truly great feeling!

On Thursday, Thorp put the "Plow Disc" corner markers on the track, which discourages corner cutting. Bill Jianas and Chuck Phelps, with their Associated cars, were turning in the fastest practice laps.

Friday, Bill and Chuck were still the quickest in practice. Everyone else was also going quicker, notably Matt Azzara and Mike Rowland, both of whom were smoothly flying around the track. Mike is probably one of the most unselfish racers there is. He has helped everyone with their cars and it was good to see him running so well. Jeff Rold and Arturo Carbonnell were also looking *very* good — *as usual*. The foreign drivers were now starting to look much better and some that I thought would easily make one of the 3 "A", "B" or "C" 10 car Main Events were Franco Sabattini, with his Super Tigre powered S.G. car; Phil Booth, Dave Preston and Ted Longshaw driving P.B. cars; Phil Greeno's P.B. car who had the most horsepower of any Foreign car with K & B motor and super quiet muffler. The English cars were so quiet you actually had to be quiet and listen to hear them run. And would you believe there was a girl driver on the English team that looked as great as any man driver? Dave Preston's daughter, Debbie, is one fantasic driver. She's very calm, very smooth, and very fast. Bob Reid and Johan Pretorius from South Africa were as fast as any foreign entries with their Associated cars. Karlheinz Will — Associated and Reiner Dosch — P.B. from Germany, were running good lap times. Ronnie Ton from Holland with his S.G. was runing very fast laps.

The race schedule consisted of every racer receiving one 5 minute practice session on Saturday July 2 and one 30 lap qualifying race. The same schedule on Sunday with the single best qualifying race counting. On Monday there was practice in the morning and then the 3 main events. The 120 lap "A" Main for the 10 fastest cars, the 110 lap "B" Main for the next 10 fastest cars, and the 100 "C" Main for the next 10 cars.

On Saturday everyone was given a beautiful program which was prepared by Dean Brown and Chuck Hallum and was printed by Model Builder Magazine. Bob Steven's super accurate timing equipment was set up. Bob had volunteered to call the race but a serious illness with a close friend prevented him from being there, so Mike Reedy and Bill Watson joined forces and did a tremendous job in running the race. In spite of a language barrier, from 10 participation countries, the whole event went off very smoothly, especially with the help of Antonio Delazoppa from Switzerland, who did all the translating for us.

The super fast turn marshals from the Ventura Club were ready; Dave Shuck and the efficient lap counters were ready; and the Official Recorder, Cal Roe, and Joe Tentschert the Starter, were all ready to go.

The qualifying heats were set up using practice times from Thursday and Friday. The heats consisted of 6 cars each, basically with 3 USA drivers and 3 Foreign drivers in each heat. The fastest cars ran in the last heats, with a few variances due to frequency conflicts.

Everyone naturally wanted to make the "A" Main. A lot of drivers were pressing too hard costing them lost time. When we started getting down to the last heats, the times started dropping — as expected. The 30 lap times were counted in total seconds, and a couple were under 600 seconds until Rich Lee came along and turned a super fast 561.8! Rich had done a lot of experimenting during the week, and he finally went back to his early week set-up and was flying. Jeff Rold, with his Mike Reedy scratch-built car, turned 569.7, and Arturo Carbonell had 571.8.

In the next heat, Matt Azzara turned an effortless 561.8, I got through with 569.0 and Mike Rowland followed with 575.5. The last heat of the day, was the one everyone was waiting for. Everytime Bill Jianas got on the track, during practice, all the stopwatches came out. Now it was to be an official time. The heat started, but within a couple laps, Jianas was out with an engine that refused to idle! The fans weren't disappointed though, as Chuck Phelps turned in a record breaking 556.9.

Sunday's qualifying was a do-or-die effort for a lot of racers, including Bill Jianas. Bill was now running a motor built by Bill Newlin. He was placed in a slow heat, because of his no time from the day before. But this was meant to be Bill's day. Everyone was crowded around the track to witness a truly magnificent masterpiece of driving skill. Do to the slower cars in his heat, Bill had to continually pass cars, while trying to get a fast time. Everyone was totally amazed at his driving skill and at their stopwatches which read a record breaking performance of 542.6!! I think Chuck Hallum expresses prefectly what **Top Qualifier** means when he wrote in the program "Often the top qualifier does not go on to win the main race due to racing luck, but technically, the Top Qualifier has the fastest and best prepared car. The Top Qualifier trophy, sponsored by HRE, is to recognize the dedication, preparation and outstanding ability of the fastest driver in the world." Well said, Chuck.

Butch Kroells' qualifying heat was not exceptionally fast, but very important. Butch likes to *try* to drive with lock up brakes and total oversteer. An almost impossible combination. For the first 15 laps he was holding his own in his heat, but not going fast enough to make the "A" Main, then fuel was spilled on his brakes in the pit stop, which took away some of his brakes, and smoothed out his driving, allowing him to turn some fast consistent laps which gave him a time of 576.1. Gary Buriani turned a 580.0 to qualify.

The last qualifying heat, which had all the fast drivers in, turned out to be terrible. Half of them were trying too hard, banging into other cars, slowing down the times, so no one went faster than the day before. But they learned a lesson from it.

On Monday, July 4th, we were ready for the Mains. The 100 Lap "C" Main was up first. Roger Curtis got off in the lead and started to open it up. Jay Kimbrough got off to a bad start, but started passing cars, and by the 10th lap he was right behind Roger, but then he had a long pit stop. Bob Titterington took over second. Johan Pretorius was passing a lot of cars moving up, but then he lost a lot of time in the pits. Roger Curtis led the race from beginning to end with Bob Titterington, 11 laps back, finishing second, Ted Longshaw, running great for third, Mike Queller fourth and Bob Welch fifth. It was obvious that Roger should have been in a faster Main.

The 110 lap "B" Main was next. Gary Grossenbacher led the first part of the race, but he was being hard pressed by Rick Davis, who was really running great. A crash between Rick and Jon Thorp took both cars out. Gary continued to lead in a very close race. At 100 laps he was still ahead, but ran out of fuel, which dropped him to second and gave Phil Booth the lead. Phil went on to win, with Gary Grossenbacher second, Debbie Preston third, Bill Campbell fourth and Dave Dawson fifth.

The "A" Main was up next. This is the one everybody had been waiting for. The one which would decide the World Champion. The cars were flagged off to a perfect start with Butch Kroells taking the lead. I was right behind Butch and then there was a group of cars behind me. Butch started opening up his lead as I too started to put some distance on the other cars. About the 10th lap a red, white and blue car was coming up on me. It was Bill Jianas who passed me and took over second. About the 20th lap Bill caught Butch and took over the lead, but 2 laps later on his pit stop, the engine died and he lost 2 laps. Butch again had the lead and was stretching it out. Butch had realized after his qualifying heat yesterday, that the car was a lot easier to drive and go faster if he didn't use lock-up brakes. His car was perfect and he was doing a perfect driving job, not taking any unnecessary chances, just plain going fast and looking good.

I was still holding down second, but here came this red, white and blue car again. Bill passed me, and in what seemed like only 20 laps, he passed me again to take over 2nd. But then his engine died again in the pits costing him another 2 laps.

After about 60 laps, Butch had a one

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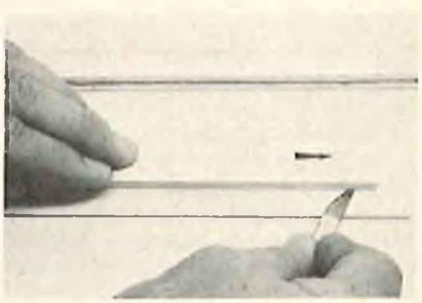
RCM WORKSHOP

By Fred Reese

FINISHING A WING WITH TORQUE ROD AILERONS

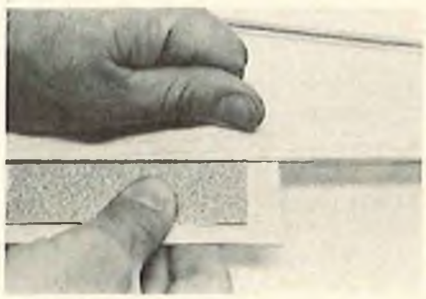
Torque rod ailerons are actually strip ailerons with a fixed inner section covering longer torque rod linkage to the movable outer ailerons. Outboard ailerons give your model a much more realistic appearance than strips and are just as efficient but with less drag. The inner portions of strip ailerons have little turning power but do cause drag when moved. Glassing the wing center section is also a proven method for joining two wing halves as it is used on most pylon racers and pattern ships.

(1) Make the right and left side torque rods in the desired length from 3/32" piano wire in 3/32" I.D. (1/8" O.D.) brass or aluminum tubing. Lightly glue or Hot Stuff the tubing to the back edge of the wing as shown. The torque rods should engage the ailerons by at least 1/2" and extend upwards into the fuselage about 1½".



(2) Cut the inboard fixed, tapered trailing edge stock to length. Begin notching the trailing edge for the torque rods by first making two cuts, 1/8" apart and 1/8" deep by sliding the edge against a stationary X-Acto blade shimmed up from the table 1/16"-3/32". The wood is being moved in the direction of the arrow along the edge of the shim piece.

(3) Remove the bulk of the wood in the slots with an X-Acto knife by making a couple of angle cuts the length of the slot and then pick out the strips.



(4) Finish enlarging the slot with a piece of 1/16" or 3/32" balsa with sandpaper wrapped around the edge.

(5) Finish fitting the inboard slotted trailing edges to the back of the wing and notch to clear the vertical rods, then epoxy in place. When dry, use a sanding block with #100 paper to smooth up the edges and fair the trailing edges into the wing.

(6) Glass the wing center section at this time if that is the method used to reinforce the wing center joint. Use a finishing resin such as K & B or Hobbypoxy and 6 oz. glass cloth about 4"-6" wide. The resin can be poured or brushed over the cloth and then the excess resin can be squeegeed off with a smooth piece of

balsa as shown. Do the bottom of the wing first and, when set, trim off the excess cloth and do the top side.

(7) Lightly sand the glass cloth to remove high spots and slightly feather the edges. Mix a paste of finishing resin, catalyst, and micro-balloons such as manufactured by K & B or Prather Products, and use this mixture to fill the dents and cloth weave and further fair the glass cloth into the wood. To facilitate sanding micro-balloons and resin, do the rough sanding or shaping shortly after the resin first sets and is still soft, then finish sanding about 20 minutes later.

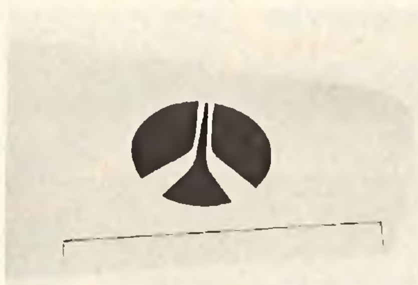
(8) Cut and fit the ailerons to the wing and then slot the wing and ailerons both for the hinges using an X-Acto knife or Goldberg's or Du-Bro hinge slotting tool for larger hinges.

(9) To make nice, close fitting control surfaces it is necessary to countersink the pin portion of the nylon

hinges into the ailerons. This is done with an X-Acto knife by making a notch over the hinge slot 1/8" wide, 1/8" deep and the width of the hinge. Also slot and drill the ailerons to receive the outer bend of the torque rods as shown.

(10) Slip all of the hinges into place but do not glue and attach the ailerons. The ailerons should fit tight against the wing with no gap at this time. Use the sanding block with #100 paper and sand the ailerons and wing so the edges all match. There should not be a bump when your fingers slide over the wing on to the ailerons.

(11) Remove the ailerons and hinges. Block sand the foreward edge of the ailerons to a "V" shape as shown. The ailerons will now be free to move as much as the amount of wood removed in this step.



(12) Paint or finish the wing as desired and epoxy the hinges first into the ailerons. If epoxy gets into the hinges, clean off with rubbing alcohol before it sets. Do not wiggle the hinges until the epoxy has set as it can work any epoxy further into the hinge. Now epoxy the hinges into the wing while, at the same time, applying some epoxy to the end of the torque rod as the ailerons are pushed into place. Before pushing the hinges in the last 1/8", check for excess epoxy in the hinge and wipe away with rubbing alcohol, then push the aileron hinges in all the way. Quickly check to see that the ailerons will be free to move as much as is needed before the epoxy sets.

(13) Install the aileron servo as shown by cutting a hole in the wing for the servo and epoxy plywood or hardwood servo rails onto the wing. Du-Bro #103 strip aileron connectors are shown on the torque rods. Adjustable Kwik Links with solder links on the other end are shown connecting the servo and the torque rods. □

MOTHER'S (RC Modeling) DAY IN JAPAN

By Larry W. Hoffman

The 8th of May dawned bright and sunny, portending a great day for outdoor sports. And a great day it was for the fourteen participants, and their assistants, in the 2nd Mother's Day Sailboat Contest, sponsored by the Tokyo-based *Sea & Sky* modeling magazine. Site of this event was the artificial lake at "Kodomo no Kuni," or "Kiddyland," an amusement park situated in the western suburbs of the city of Tokyo.

Since there were two distinct types of boats represented, slow and fast, they were separated into A and B Classes. Only mothers and children qualified as sailing captains and it was a ball listening to the husbands and sons giving instruction on tacking and keeping the prow away from the pool's rock wall!

The course consisted of two buoys about twenty meters apart with the furthest one about thirty meters from the starting line. The boats had to round the distant buoy from left to right, return to the nearest and circle it, also from left to right, to complete a round; each contestant sailed four times with the lowest time counting as the final score.

The majority of boats were from the Ishimasu Company Blue Sonic kits, with one US-made Santa Barbara yacht and a few original designs. The smaller boats used only rudder control making downwind sailing slow and difficult. The wind ranged from zero velocity to heavy gusts, changing direction frequently. The poor wind conditions, notwithstanding, everyone had a grand time. All contestants received prizes and the picnic lunches topped off a wonderful day of

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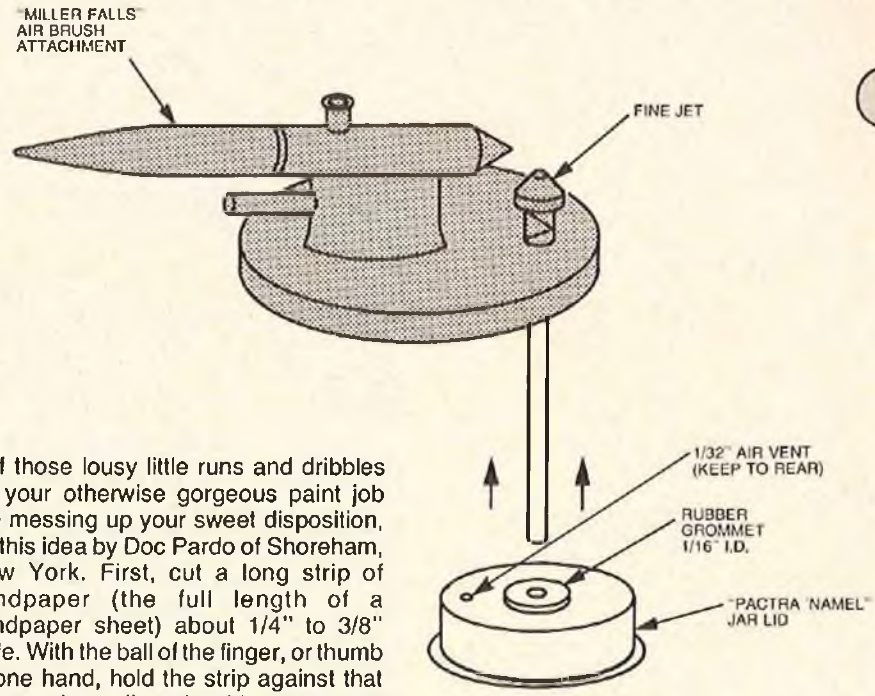
Mrs. Noguchi receiving a helping hand from son Satomu.

Start of heat.

FOR WHAT IT'S WORTH

John B. Tallman of Bowie, Maryland, suggested this modification to the Miller Falls air brush attachment to allow spraying Pactra Namel and other paints which are bottled in small quantities. It slips on and off easily and does not require any alteration of the air brush attachment. Any small jar may be used, although the Pactra jar is of an ideal size. Push the fine jet pick-up tube through the grommet as far as it will go, screw on a jar of paint and spray away.

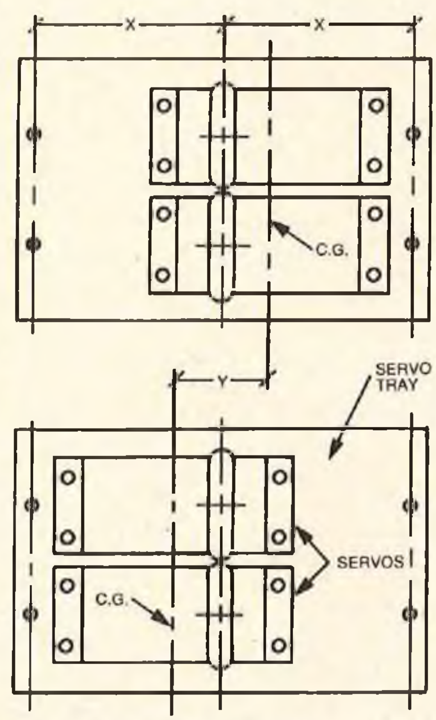


Chester Drew of Weathersfield, Connecticut, suggests that if you're interested in taking stills or movies from your aircraft, Estes Industries of Penrose, Colorado 81240 makes a Super-8 movie camera called Cineroc. The dimensions are 1-3/4" in diameter by 9.9" long. The price is $23.95 and weighs 3 ounces all up. A movie cartridge with film and batteries costs $4.95 and processing is $2.00. Estes also makes a camera called Camroc which takes one black and white picture. Its price is $8.95 for the camera, film holder, and one unexposed film disc. 400 film discs are $1.25 and developing is .50 cents per picture. Chester also mentions that the Cineroc uses color film, and at 31 frames per second, it produces a semi-slow picture. Shipping on both the Cineroc and Camroc is free unless other than UPS Service. These cameras are made for rockets and therefore come with parachutes, but can be strapped on, or inside, your airplane. Ten feet of film will last for about 40 seconds and any additional instructions you need come with the camera.

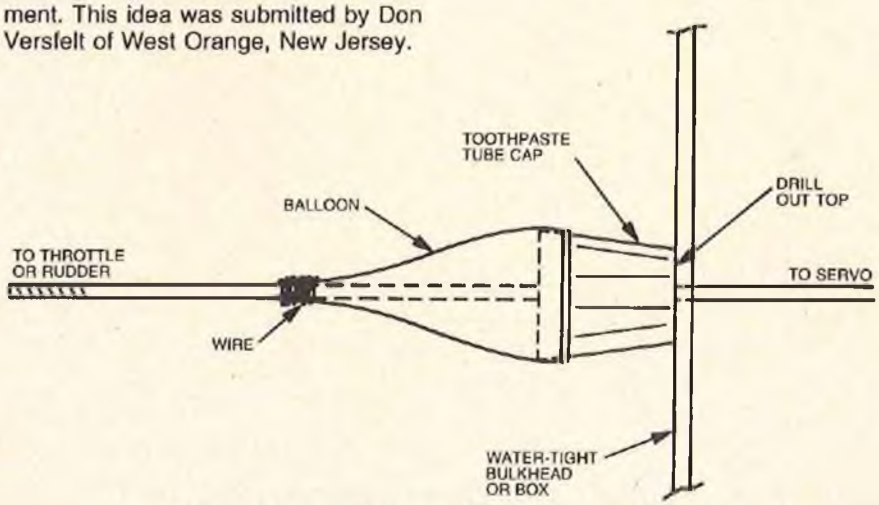
By epoxying a toothpaste tube cap to your watertight box, or bulkhead, with the pushrod through it and a balloon attached to the rod and cap as shown in the sketch, you end up with a watertight seal that stretches with the rod movement. This idea was submitted by Don Versfelt of West Orange, New Jersey.

If those lousy little runs and dribbles on your otherwise gorgeous paint job are messing up your sweet disposition, try this idea by Doc Pardo of Shoreham, New York. First, cut a long strip of sandpaper (the full length of a sandpaper sheet) about 1/4" to 3/8" wide. With the ball of the finger, or thumb of one hand, hold the strip against that "damned spot" and, with your other hand, pull the strip out through its entire length. Repeat the operation as many times as is necessary to flatten your drip out flush with the rest of the paint job. The method is quick, neat, and a whale of a lot more effective than that choice language you have for just such occasions. The technique might even save your marriage! Paint dribble grouches are not much fun to live with, you know.

The sketch from Ted Janor of Hamilton, Ohio, illustrates a simple way of changing the Center of Gravity on your sailplane by rotating the servo tray 180°. The mass pivots about the centerline of the servo arm, thereby shifting 3½ ounces (S-4 servos) 1". This idea could also be applied to ballast secured in an off-center condition.



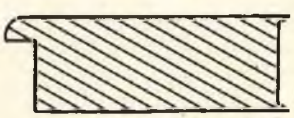
Y = C.G. DISPLACEMENT
SAILPLANE SETUP



Suppose you have to cut leading and trailing edge sheeting for the eleven foot sailplane you are building and all you have is a 36" straight edge. This was

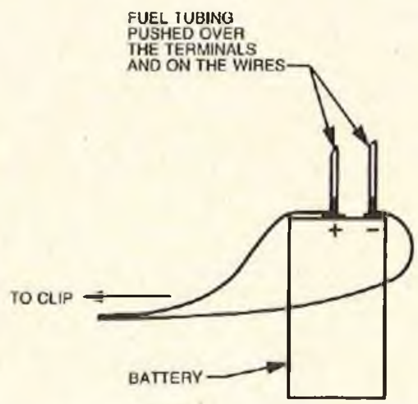
FOR WHAT IT'S WORTH

Jack Gershenson's, of West Chester, Pennsylvania, problem so he went out to buy a six foot straight-edge. When he found that the price was between $25.00 and $30.00, he decided to look for an alternative solution. The answer was to go to the nearest place that makes aluminum storm doors, and order a length of the aluminum extrusion that makes up the outer perimeter of the door. This comes in up to twelve foot lengths and is straight. Be sure to obtain the type that has a baked-on white finish. It measures 2¼" wide by 1" thick and has a profile that looks like the accompanying sketch. Jack has a seven foot length that cost him $4.00 because it was slightly scratched. You may have to pay more for a perfect piece. Use a thin X-Acto handle with a pointed blade. This allows you to get close to the straight-edge. The blade slides very easily along the enamel finish and the one inch thickness allows you to hold the knife firmly without getting your fingers in the way of the blade. You will find this item a welcome addition to your bench and will also find many other uses for it.



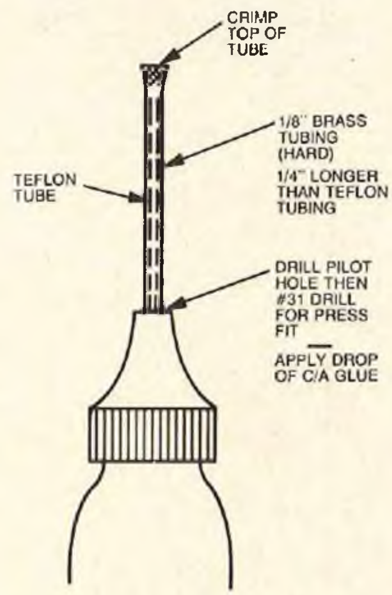
While working on his latest creation, Bill Hannah of Derby, Kansas, realized he was using tools that most modelers know nothing about yet they are fairly inexpensive and fill a place in anyone's workshop. Bill is referring to the pattern makers radiusing tool. With so many planes now starting out as a slab sider with triangular stock in the corners and a note "round off the corners to match plan view X-X," etc. This tool is almost indispensable. They come in a number of sizes, usually with a different size on each end of the tool. A few passes down the corner of the fuselage, a little fine sanding, and you have a perfect radius. Cutting should always be done with the grain, never against it. Also, for a large radius, it is better to make a smaller radius at first, followed by another cut rather than a large one all at once. In towns with foundries or a pattern shop, a local source for a pattern makers radiusing tools may be found. A well equipped hardware or woodworking supply store might also have them. Otherwise, they are usually listed in the woodworking or hard-to-find tools catalogue advertised in the various do-it-yourself magazines. There is a good one mentioned in the model press every now and then. As Bill points out, since the last twenty-five years or so he has been directly, or indirectly, involved in aircraft tooling, he has used a lot of ideas and tools in model building that he has learned in the full size business, and this is one of them. He has found it saves a lot of carving, sanding, and the modified (otherwise known as "oops, the knife slipped!") radius, and the big chips are easier to clean up than the dust.

If you lose the terminal screw-on caps to your starting battery, short lengths of fuel tubing will hold the wires in place as shown in the accompanying sketch from Jim Rosenkranz of Kendall Park, New Jersey.

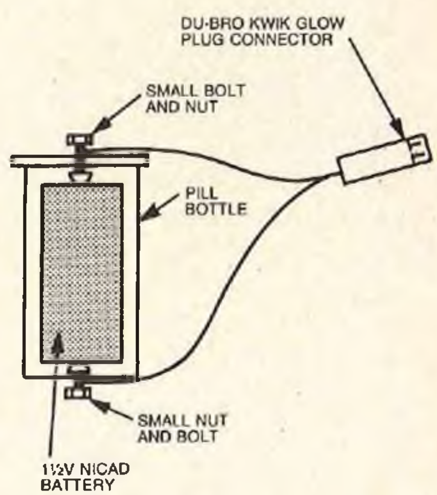


When covering the center section of a wing with fiberglass it is difficult to keep the glass in place while applying the resin. This is especially true if you are trying to cover both bottom and top with one piece of glass cloth. A solution to the problem, as suggested by Ed Gamils of Norman, Oklahoma, is to use Scotch Brand Spray Adhesive, sold in art supply and hardware stores. A light coat of adhesive to the fiberglass gives it a sticky backing. Then, simply place the fiberglass on the center section of the wing, smoothing out any bubbles. Once positioned as desired, the resin may be applied without bubbles or the glass moving around. An added feature is that, before the resin is applied, the glass can be repositioned as required. Ed has used this method in his shop on all types of aircraft without any problems.

This suggestion comes from Alfred J. Scott of Garden City, New York. Here is one more way to make the use of the cyanoacrylate adhesives more efficient and handy. Utilizing the Teflon tubing that comes with Zap type packaging allows for economical and accurate placing of the glue. However, it is a constant trial to remove, and then try to re-insert the tube back in the bottle after you remove it. In order to leave the tube in place and yet be able to close off the entire container for safety reasons, Al adapted the container by making a cover for the Teflon tube, which remains inserted and ready for immediate use. The sketch enclosed is self explanatory and has eliminated the problems of spillage, waste and sticking together of little fingers.



For a good, compact starting battery, take a 1½ volt nicad cell and find a pill bottle that it will fit into. Drill holes in the lid and bottom of the pill bottle and put a small bolt in the holes so they will touch and make contact with the battery. Then hook a Du-Bro Kwik-Glo glow plug connector to the bolts. You can also hook the battery charger to the bolts when recharging your 1½ volt nicad cell. This idea was suggested by Mike Blockard of Beaver, Oklahoma. □



MOTHER'S (RC Modeling) DAY IN JAPAN

from page 95

fun, games and the type of friendship that seems hard to come-by these days. Planning for the 3rd Mother's Day Contest has already been started!! □

PIT STOP

from page 93/90

lap lead. I was still in second, but Mike Rowland, Matt Azzara and Rich Lee were right behind with all of us on the same lap. You just couldn't afford to make a mistake with the competition that close. Here came that red, white and blue car to pass me again. With 110 laps down and only 10 to go, Butch now had a 2 lap lead. Jianas passed me to take over 2nd place. On the last lap, with only 3 corners to go, Mike Rowland passed me, but I repassed him in the next corner as Butch Kroells took the checkered flag with Bill Jianas 2 laps down in second, myself 3rd, Mike Rowland 4th and Rich Lee 5th.

Hail the first World Champion – Butch Kroells!

At the awards banquet that night, which was attended by 177 racers and wives, Chuck Hallum presented the 6 foot 2 inch tall trophy to Butch and Butch was given a standing ovation by everyone. He certainly deserved it.

I know everyone had enjoyed themselves with all the racing, but I think the greatest feeling that was in the hearts of everyone, was that we had thoroughly enjoyed each others company and that we had made a whole world of new friends, who we would certainly be looking forward to meeting again in 2 years at the next World R/C Car Championship in Europe. □

POWER BOATING

from page 87/86

time it will be necessary to correct it.

A word of warning: *don't* go off for a can of beer, or a chat with the other guys, leaving the power pack on charge. Chances are, you will forget it — but if you do, don't worry, the explosion will remind you! Having actually had this happen to me, I got chicken and incorporated a timing device in the charger. This is a clockwork timer with an electrical switch built into it. When everything is connected up, no current flows until the timer is set. Then, even if I go away and forget it, it will switch itself off at the right time. My timer runs for 20 minutes, which is about as much as you will ever need.

If you have got a very powerful electric motor in your boat, you will notice at the end of a fast run that the power pack is pretty warm. It is not advisable to charge at above 6 amps until it has cooled down. If you really must fast-charge, here's a tip: take the power pack out of the boat, put it in a very thin plastic bag, and dunk it in the lake for a minute or so. Those cells will cool down real fast. Incidentally, it is interesting to note that after a fast charge, the end voltage of the pack will be higher than if slow charging is used, but the cells will be quite warm, and it is not advisable to use them in this condition. So, repeat the same trick with the plastic bag, and you'll get an additional bonus because the end voltage will stay higher. This is mainly of interest to those people who make record attempts.

And there you are fellows, you know as much about charging nicads as I do, now. Incidentally, credit must be given for a lot of this research, to Dave Wooley and Rod Burman, who publish it in an English magazine. I will only add that I have checked all their findings, and can bear them out.

One of the results of all this playing around with electrics is that I am getting rather hooked on the subject, and have got to the point where I intend to build a really lightweight hull, and see just what sort of speed I can get out of it in a straight line. To make the hull really strong, as well as light, I am going to use carbon fibers. I have seen a glider fuselage reinforced with these, and the strength of the thing was just out of this world. Of course, I'm not looking for strength, so much as rigidity, but the two go together. When I have had a go at it, maybe I'll tell you how it went.

★

In the meantime, let's change the subject and talk about something quite different. Have you noticed how fast not only hulls, but also the material they are made of, is changing these days? There are of course still a lot of wooden hulls around, but glass-fibre is becoming more and more popular. The reason for this, in my mind, is that people now have more cash available to spend on a pastime such as boating, but they want to get right out there and start driving, rather than waste time having to build the hull themselves and, of course, a glass-fibre hull does mean of a lot of construction time saved.

Anyway, what started this train of thought was the fact that I have just started building a Graupner Taifun, which is a ski-boat kit; the hull of which is made of ABS plastic. This sounds okay until we get to the engine, which is up to 5cc. I have always understood that it is not a good idea to put an I/C engine in an ABS hull, because the vibrations make the plastic become very brittle over a period of time, and eventually, it will break up. In fact, I have actually seen boats where this has happened. Now, here is the biggest producer in Europe, and certainly one of the biggest in the world, advocating the use of a glow motor in an ABS hull. Graupner is certainly not known for making stupid mistakes, and I can't see them risking their very high reputation without having tried the thing out first, so I guess that it will probably be alright.

The 'Taifun' with engine and stern-tube fixed in place. Notice expanded foam, used to prevent sinking (I'm an optimist!).

The Graupner 'Taifun' hull in ABS, with some of the reinforcing parts built in.

The reason for my building this model is that my own ski boat, which I built while I was in the Army in Berlin, 'round about 1966, has just fallen to pieces. It was made of plywood, well fuel-proofed, but over the years the oil crept into the wood, until it was only luck and a lot of heavy praying that kept it together. I need to replace it because I have nothing else suitable for towing my skiers, which I use quite a lot, and I thought that the Taifun would make a good replacement, especially since it looks like a real ski boat.

But now I have a problem — every single glue, with the exception of one, that I have tried on the ABS, has refused to stick properly. And you can believe me when I say that I have tried just about everything. It may be that this is a new type of ABS — in fact it is quite probable — but the fact remains that only one glue will even look at it. Guess what? The good, old-fashioned balsa cement! The reason is most probably that balsa ce-

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POWER BOATING

from page 102/86

ment has a cellulose base, and the cellulose partially melts the plastic.

Okay, someone is no doubt saying out there, so he's found a glue that works, so why is he still crying in his beer? Because, have you ever tried gluing an engine mount for a 40 size glow motor into a boat hull with balsa cement? Well, don't bother, because the chances are the engine will jump out the first time that you try to start it. In fact, I have come up with a solution, but since I haven't yet finished the boat, I don't know if it will really work.

What I did was to smear a large area of the hull floor where the mount is due to go with balsa cement, lots of it. This partially melted the plastic, and has become an integral part of it. Then I laid down a double layer of glass-fibre over this area, and used resin to fix the mount to this reinforced area. I must say that I have fixed the engine in place, and then tried very hard to push, twist, jerk and otherwise yank it off, but it is still there. Mind you, it remains to be seen just what effect the vibrations from the motor will have, once it is running, but I am hopeful that it will stay in place.

The reason I brought up the subject is that there are quite a few of these vacuum-formed ABS hull kits around now, and since I am not the only person in the world who builds model boats, I thought that maybe someone, somewhere, may have already come across this problem, and know a 100% sure answer to it. If anyone does, please do write in and let us know about it, so we can keep all the other modelers up to date.

★

Well, I guess that's it for this month — the sun is shining, and I am now off to the lake, see if I can't beat my 10 year-old daughter at Balloon combat, just for a change! □

JULY PUZZLE WINNERS

The following names are additional winners of the July Puzzle Contest.

Murle Morgan
Christopher Pilla
Anne Redwine
Jerry Werner
Gene Neely
Elias Quintos
The Robertsons

HOVER

from page 49/48

thought to be impossible a couple of years ago are now commonplace and accepted as normal progress.

One element in the near future which will become common will be the scale-type head with no fly bars. I've been flying about 4 months, as of this writing, without a flybar in the Alouette and the Jet Ranger. It was very difficult at first but, as knowledge and experience are gathered, I sure it will become common with all RC helicopters.

Bill Curtis of NRCHA C.D. fame, from Greenville, Pennsylvania, has been doing much of the flight testing for me. Almost all my flying is limited to my small backyard (his backyard is about 50 acres) and Bill has been doing true controlled pattern ship loops, rolls, and Split S's — with much success. When normally attempting loops, the rate of crashes is 1 out of 5 attempts with maybe 1 fair loop in 25 tries. The other day Bill did 12 good loops, 6 rolls, and 3 splits, all on one 16 oz. tank, and no crashes. Now that's not a bad average at all for a helicopter. The quality of the loops at a typical contest usually get graded between 6 and 9 — probably more for sheer guts rather than the quality of the loops. But Bill's loops should be graded around 15-16, 9 to 10 for quality and 6 to 7 for guts.

But this head isn't just for aerobatics, it's also for the sport flyer because it's actually easier to fly than any standard or expert head. As I work out the set-up procedure to be more simple, it will be easily done to any machine. In a later column we'll go over the modifications to be done so you, too, can fly without that ugly *old* flybar.

•

The latest contest we attended was the AMA Helicopter Nationals held at the Tri-Valley Field in South Bend, Indiana, with Walt Schoonard as Contest Director. Actually the field is Cliff Bennett's backyard. What I wouldn't give to have a backyard like his. Picture a beautiful mowed grass lawn two football fields long and just as wide, with more open area beyond in all directions except toward the back porch.

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The contest wasn't the biggest in the world, but it was a good one. There were 23 entries, 9 Expert, 5 Intermediate, and 9 Novice.

The contestants came from all over the country. Sates represented were Alabama, California, Florida, Ohio, Texas, Massachusetts, Georgia, Michigan, Pennsylvania, Vermont, Illinois, Missouri, and Honolulu. The contest moved at a nice pace, not rushed or hurried, Seven rounds were flown with the best two counting. This is the way things finished:

Expert: 1. John Simone, Jr., California, Revolution II, K & B .60, and Futaba radio; 2. Hubert Bitner, Texas, Hughes 500, Jet Ranger mechanics, O.S. .60 FSR, Futaba radio; 3. Ray Hostetler, Ohio, Jet Ranger, Webra Speed, Proline radio.

Intermediate: 1. Dave George, Michigan, Graupner 212, HP .61, Kraft radio; 2. Wendel Hostetler, Ohio, Jet Ranger, Webra Speed, Proline radio; 3. Dan Dougherty, Georgia, Jet Ranger, Webra Speed, Proline radio.

Novice: 1. Charlie Jobeck, Vermont, Jet Ranger, Webra Speed, Kraft radio; 2. Tom Knerr, Penn., Revolution, O.S. .40 FSR, S & O radio; 3. Dwyane Stephens, Ohio, Jet Ranger, Webra Speed, Variant radio.

The bull sessions in the evenings were truly enjoyable. I got to spend some time with John Burkam and we hashed over new design ideas and theories. Also, had some good rap sessions with Bob Hellman and Don Miner from Westport International, Inc. — the people responsible for the Variant radio. They flew in from Connecticut just to observe the helicopter activity and to see what might be needed in the future to help us handle these machines in a better way.

I, personally, have been flying with the Variant in the Jet Ranger and can honestly say it's the best radio I've seen yet for use in helicopters. It's absolutely noise-free with a very tight, clean feeling when flying. Most radio manufacturers, I think, would rather never hear the word helicopter, but these people have met the challenge head-on and are more than interested in our problems. I think as more people try these radios, more will see just how good they really are.

•

If you have never attended the NRCHA Nationals at Greenville, Pennsylvania, you're really missing the biggest helicopter get together of the year. Now, talk about bull sessions. Try to picture Bill Curtis's backyard — not the 50 acre one but the one he pushes the mower around on — and picture 10

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HOVER

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to 15 choppers in the air all at once. Even after dark with the car lights on for visibility. Now this isn't the contest, this is in the evening after the day's activities, and with several groups of bull sessions in the basement, etc., — what fun! It's August 20-21 - - - try to make it if at all possible.

This year the contest will be different from previous years. Before Bill has gone all out to put together the best all-around contest possible containing the three phases of helicopter flying. What we feel are the three phases are: #1 — Simple school maneuvers like procedure turn, Figure Eight, fly around, approach, and landing. Not timed, just judged for smoothness and perfection. #2 — Free Style where you do your choice of aerobatic type maneuvers being judged on the degree of difficulty and the quality. #3 — The precise on the ground work doing something very exacting.

The past years have been very demanding of the machine and the pilot and, with so many entries, 60 to 70, it's been a very tight weekend — I should also say a very up-tight one, too. Contests above all should be fun. That's what it's all about, isn't it. Another thing

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HOVER

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that showed up were three flight lines going at the same time — the Novices who were flying indoors didn't get the chance to observe the Experts in action and the other way around, too. My son, Dan, was flying in Novice last year and I really didn't get the chance to watch him do his thing because I had to keep my eye on my own competition. You see what I mean? Plus, there should be more communication between the experienced and the inexperienced. But at the contest things are pretty up-tight in the heat of battle and with everyone trying so hard there ae bound to be crashes. That means you're tied up getting things repaired and there isn't time for talking.

There is one more problem, as there always is at contests, with judges. One judge will give you an 8 or 9 while another judge will give you a 3 or 4, both on the same maneuver. If you've ever competed at any type of contest you'll know what I mean.

At the Toledo show this year we had a good meeting with a lot of the prominent helicopter pilots and we've tried to put together a contest that eliminates judges; is lots of fun; but still demanding. It boils down to this: There will be tasks to do rather than maneuvers. Each task will be broken down into, for example, 5 parts, each part becoming more difficult. You go as far as you can through the task and that determines your score, not the judges.

All of the tasks will be into the wind at no more than 6 feet altitude. So, if you do happen to crash, it will be minor. The proposed tasks are as follows: #1: The graduated gates starting at 10 feet wide with the first one down to 3" per tip on the rotor. #2: Four pop bottles set up in a 25 foot square with the pilot positioned 5 feet behind the 25 foot square line. From that position you will proceed to knock over the bottles. #3: Balloons set in line away from the pilot. The pilot positioned behind the line will then proceed to burst the balloons one at a time with his pin equipped skid. #4: Double Limbo. #5: The tough one — lowering a weighted string tied onto the skid into 4" high circles starting at 3 foot diameter down to 3" diameter.

There will be a qualifying round in which the top 30 will be divided into Sportsman and Masters. Everyone gets to fly; everyone gets to watch; and, most of all, it should be fun. The NRCHA is built on tasks and this is the NRCHA Nationals so we're going to see how well this type of contest works out. It should be interesting with a lot less pressure during the contest and I'm sure there will be more time for talk between the people at the contest. •

While on the subject of communications, Harold Moore of Canal Fulton, Ohio, showed me his modification to the Heli Baby and its really super. The Heli Baby tail rotor pitch change operation is really simple with the angled slot in the aluminum plate at the rear. The only problem I've seen with it is to get it to move nice and free from end to end, then to keep the slot from wearing and becoming sloppy. You've all seen the nylon pushrod exits for the fuselage side of the airplane. Well, Harold has taken a 1" sized one, filed the aluminum plate out so it's just wide enough to accept the pushrod guide, cut off the ends of the nylon guide to the correct length, then hot-stuffed it on. Now you have a very smooth operating slop-free, wear-proof guide plate. This should also work on all Schluter machines that use this method for pitch control on the tail. Thanks, Harold.

•

Speaking of modifications, let's talk about the Kavan Alouette for a minute. This is a fine .40 sized helicopter but, like any kit, could use a couple of minor changes. When Grady Howard tested the Alouette for RCM, he commented that the controls were more for an expert. Well, with a couple of quick changes, you can tone it right down and still have plenty of control for all types of flying.

The Alouette uses two types of controls in the head — Bell system and Hiller system. Let me explain. Almost all model helicopters use the Hiller system for cyclic. The Hiller system works this way: when the swashplate tilts, it puts control into the flybar tubes or paddles. As the tubes, or paddles, change angle of attack as they rotate, they dive and climb as they go around. This causes the flybar to tilt left, right, forward, or backward, which, in turn, makes one blade have more pitch than the other. This is how your cyclic control works. With the Bell system, the swashplate puts the control into the blades directly instead of through the flybar first. The Jet Ranger and the Alouette use both. Remember this one thing — the Bell system is quick, but weak. The Hiller is slow, but strong.

The problem with the Alouette is the Bell system is too sensitive and fast and the Hiller system is too slow and weak. To identify the two systems on the Alouette, you have two pushrods running from the swashplate out to the head. One goes to a plastic bellcrank affair. This is the Bell system. The other pushrod goes to the control arm on the flybar. This is the Hiller system.

To make the cyclic more linear and a lot smoother and give a more balanced feel to the whole system, you can make the following changes. The swashplate has two extensions on the inner face. Remove the one that goes to the plastic bellcrank and replace it with a brass ball, bolt, and nut. This will cut the Bell system

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NRCHA

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Sponsored by R/C Modeler Magazine, the National R/C Helicopter Association has been established to promote and encourage active participation in sport and competition R/C helicopter flying. It is a vehicle whereby the R/C helicopter builder and flier will have a forum from which to discuss various ideas, helicopter competition rules, and provide a communications media with which to assist the Academy of Model Aeronautics in future programs in conjunction with helicopter contests. The primary purpose of the NRCHA is to encourage the dissemination of information between R/C helicopter pilots as well as to establish and create a self-improvement and achievement program similar to that utilized by the League of Silent Flight. A five step Grade Level Proficiency Program has been established with gold proficiency pins awarded for each grade level you complete successfully.

The Association is a non-profit organization whose administrative and clerical details are handled by the R/C Modeler Magazine staff on a gratis contributory basis.

As a member, you will receive a membership card in the NRCHA and will be assigned a registration number which you can use on your helicopter which will consist of the letter N followed by a number issued on a first come, first serve basis followed by a letter designating the district in which you reside. The annual dues have been established at $4.00 per year to cover postage, printing, etc. All additional costs will be absorbed by R/C Modeler Magazine.

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down and it won't be so sensitive and jerky around center. The plastic bell-crank at the head has two holes in it. Use the outer hole. If you want it a little more sensitive, use the inside hole. You can also use the same Bell system pushrod to track your blades. As you lengthen or shorten that pushrod, you're putting pitch in one blade while taking it out of the other blade. It's a very simple way to adjust the blades for tracking.

Now, if you wish to beef up the Hiller system, here's how: Shorten the flybar to 15" and replace the paddles with tubes that are 1½" long, 1¼" in diameter, and weigh between 14 to 17 grams. These changes make the head a lot smoother in cyclic control and a lot less jerky, plus it's a lot easier to fly. The cyclic is now linear. I have the tubes and flybars available for $10.00 ready to bolt on. The only other change to the Alouette is to change the tail rotor blades to Jet Ranger tail blades cut to 3¾" from hole to tip. With these tail rotor blades, the tail is much more positive and linear to stick movement.

Now don't throw away those Alouette tail rotor blades because they work just super on a Revolution or Heli Baby. I'll tell you why. With the high tail rotor speeds of the Revolution or Heli Baby, the Clark Y airfoil on the stock blade run with very little pitch and when they get close to zero, or go to negative, there is a flat spot in the controls to the tail right when they go through this area. The Alouette tail rotor blades are symmetrical and it doesn't matter whether they run negative or positive pitch, they work equally well in each direction. Just cut them off to approximately 2¾" to 3" from bolt hole to tip. Another added benefit is that they are a lot tougher than the wooden ones.

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Well, that's about it for this month. I'll try to keep you informed as best I can in the months to come. Hope to see you at Greenville. Until then, keep the stick forward. ☐

DUCTED FAN DESIGN

from page 85/81

know you can get 2 + BHP out of a tuned pipe — but do you need it? And how many modelers can cope with it? Better to design a good fan for reasonably "hot" stock engines and then keep the *models* light to arrive at the same airborne (T/W) which, after all, is what really counts.

Since there is probably a great deal of reader interest in knowing what thrust can be produced with various engines in a particular fan, I have prepared the table which follows for my 5.1" .40 class fan. The thrust numbers are based upon prototype fan experimental performance

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DUCTED FAN DESIGN

from page 116/81

which means that the thrust values shown are roughly 95% of the values shown in the previous equation and graphs due to the poorer manufacture of the prototype units. Engine data are from Peter Chinn's curves. □

HERE'S HOW

from page 80

could be. Just a little extra effort to pull things together can save time, money and gobs of frustration.

Ron O'Laughlin of Bay City, Michigan, has come to our rescue with a super small parts organizer. Ron's organizer has some real time saving features that will allow you to find that small part with ease and hopefully keep you from buying hardware you already have. Look at it this way, if you keep all of one part in one place, and can find it, then it is easy to determine when you are out of that part. It is also easy to locate that part as well, if it is located in *one* place.

Basically, Ron's super organizer is composed of a metal individual slide file purchased from Montgomery Ward. This slide file makes an ideal carrying case. It has a lock, convenient carrying handle and is smart looking with a jet-black enamel finish. Aside from all these features, it has a complete index chart on the inside of the cover that will prove extra handy for listing container numbers. For actual use, it is necessary to remove the plastic slide inserts from the file.

Next, Ron placed as many coin tubes as possible in the file. These coin tubes (50¢ size) are round, made of plastic and have a screw top that provides virtually air-tight protection from dust, moisture and atmospheric polution. You can store most all of your small hardware parts in them. The coin tubes can be found at any coin collector store priced at 10-15¢ apiece. However, they are available at bulk prices for about 7¢ apiece. One such source is Al's Supplies, P.O. Box 4275, Wichita, Kansas 67204. You can purchase 100 of one size (1¢ to 50¢) for $6.45 postpaid within the continental U.S.A. APO and FPO add for PAC. All others add 10%. The coin tubes fit in the slide file as if they were designed for it. When the cover is closed, there is very little movement of the tubes.

Now that we have all the coin tubes in the file, it is necessary to label and identify each container of parts. For this purpose, Ron used Dennison "Pres-A-Ply" labels 1¼" diameter. These labels sell for $2.80 per 1000. Some stores will sell them by the sheet which will allow you to buy just a little more than required for your organizer.

to page 120

HERE'S HOW

from page 118/80

Another good suggestion you might try with your organizer: Place as many 50¢ coin tubes in as possible but leave room for a wooden divider about I" wide to place small tools in. With this set-up, your organizer can be useful at the flying field. In case a part is needed, a short trip back to the car (instead of home) will take care of your needs. There is nothing worse than to drive 15 miles to fly and have your flying session pre-empted for the need of a small part. It has happened to all of us a time or two, remember?

In the workshop or at the flying field, you'll find Ron's small parts organizer a real treasure. The only trouble you might encounter at the field is becoming the spare parts man for those who are unprepared. But, when they see your organizer, and how easy it is to use, it won't be long before a few more will appear and you will be off the hook.

As a final comment, don't try to organize all your small parts in one evening. As you come across each part, drop it into its assigned container or establish a new one. In this way your organizer will develop at an unhurried pace allowing you more time to plan. Why not get started on yours right now. I am sure you will be more than delighted. □

HALF-A

from page 70

Baby Bee with a Davis Diesel conversion, providing very realistic flights.

Mile Square Park
Fountain Valley, June 12, 1977
Race Results

Class I

1. Mack Moffat, A-1 Skyraider
2. Tim Holden, P-39 Airacobra
3. Fred Reese, Pietenpol

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HALF-A

from page 120/70

Class II

1. Robert Boucher, Partenavia Victor
2. Fred Reese, FW-190
3. Ken Holden, Westland Whirlwind

Static

1. Tim Holden, P-51
2. Fred Reese, Chipmunk

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Helpful hint to 1/2A builders. If you are painting your model, use an airbrush; by doing so you get just enough paint to cover the model, not 3 layers too many. (I'm only talking 200 to 250 sq. in., not 600+)!

•

Sport Flying: Not too much to report the first time. If anybody is having, or participated in, a 1/2A Pattern contest, please drop me a note and let me know. We would like to make this column of interest to all 1/2A enthusiasts. ☐

HALF-A-STICK

from page 75

..... prop was installed and the Half-A-Stick did everything expected from a Half-A sport racer. The rudder rolls were quick but were not true axial rolls, due to the lack of ailerons, but more resembled a fast "corkscrew." A high speed elevator spin is not a true flat spin, just an extremely fast spin that will recover by itself without giving opposite command.

In pylon racing the Half-A-Stick is good and does not fall off on tight turns. There is just enough dihedral to make it groove in on the straight-away The Half-A-Stick has a very good glide after the engine quits and there is plenty of time to float before landing.

The Half-A-Stick has everything going for it for a fast Half-A sport racer that is not recommended for the novice R/C'er, but is definitely recommended as a first aircraft for learning racing style. ☐

MEMORIAL FUN FLY

Jim Thrift, long time RC'er and one of the founders of RC/NC and W-S/RC in North Carolina passed away in July of 1977. Jim worked for years with Winston-Salem Boys' Clubs' aeromodeling projects and RC club activities such as the renowned W-S/RC Annual Fun Fly.

This year's Fun Fly will be on October 1-2 in Winston-Salem, North Carolina in memory of Jim Thrift with RC/NC holding its anniversary meet in conjunction with the Jim Thrift Memorial Fun Fly. Friends of Jim and of RC/NC should plan to attend. Details from C. Douglas Holland, Box 12083, Raleigh, North Carolina 27605.

HORNET

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torque rod support are made from a good hard piece of 3/16" x 3/4" trailing edge stock.

After cutting all the ribs out and compiling the rest of the sizes you will need for the wing, locate the 1/4" x 1/2" center spar and mark the location of all the ribs. This spar must be notched, so set up a stop on your Dremel saw behind the blade that will only allow you to cut the notches 1/4" deep. You may have to make a couple of cuts on each notch to

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make them 1/16" wide, depending on the size of your blade. This same notching job can be done very nicely with your hand saw by simply standing the spar up between two pieces of 1/4" spruce, or some other hardwood stock, and sawing down to the hardwood.

After notching the spar, position all ribs and glue in place on a flat building surface. Now is the time to decide if you want dihedral or not. I have no preference and the prototypes that have been built in Albuquerque are about half and half, so the choice is yours. The only advantage that I can see is the flat wing is faster to construct.

If you decide on a wing with dihedral, all the building will be the same except the wing will be built in two halves and connected with 1/16" plywood braces prior to putting on the top leading edge sheeting and top center planking.

While still on the flat surface, glue the 1/4" square leading edge to the ribs and the 3/16" x 3/4" trailing edge. When these dry, remove the wing carefully from the building board and place the 1/16" x 2" bottom leading edge sheet and the 1/16" x 1/2" trailing edge cap on the building surface and place the wing structure on top of these, carefully positioning before gluing and pinning. With a sanding block, or modeling plane, shape the leading edge to follow the contour of the ribs and then glue and pin the 1/16" x 2" top leading edge sheet and the 1/16" x 1/2" trailing edge cap in place. After these are dry, the wing may be removed from the building board and the 1/16" x 1/4" capstrips and wing tips may be glued on.

At this time, if you have built the wing in 2 halves for more stability, sand the two halves until you have a good fit. Epoxy the 1/16" ply braces in place on one half, making sure you allow for clearance when the halves are joined and elevated to the desired dihedral. (Approx. 1½" total is recommended.) After joining the two halves, finish the center planking and install the 3/16" x 3/4" tapered aileron support with the torque rods and tubes glued inside. Make sure the aileron torque rods move freely and trim where necessary to assure full movement.

Glue the center planking in place and, when dry, shape the leading edge and wing tips. Fit the 3/16" x 3/4" tapered ailerons and sand the entire wing frame to desired smoothness before covering.

Empennage

Look around on your bench and you should have enough 1/8" balsa from the sheet you cut the bulkheads out of to cut out the entire tail assembly. Make sure

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HORNET

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when you cut out the dorsal and vertical stab, the grain is running in the direction shown on the plans. This will help in strengthening the vertical stab and help prevent warping when covered. After the parts are cut out, sand them to the desired smoothness and fit them to their location on the fuselage.

Mark the area on the fuselage where the vertical stab will be glued and strip away the covering to assure a solid bond. The vertical stab may then be covered and glued in place, paying close attention to alignment.

Next, mark the location of the horizontal stab where it intersects the fuselage when aligned and cover the entire stab with the exception of this area, top and bottom, to assure a good bond when glued in place. Hinges may be of the thin plastic type, sewn with nylon carpet thread, or made from the film covering as shown on the plans. If you decide on the film hinges, make sure they are ironed down good and not just kind of shrunk on with a heat gun. For successful covering with films, the adhesive backing must be carefully and smoothly pressed into the balsa.

Radio Installation

The size of your equipment will determine how much planning and fitting you will have to do so everything will clear. There is plenty of room if everything is pre-planned. I use a full size Futaba radio with a 450 MAH battery pack in mine because the smaller 225 MAH battery packs will only give me about four or five safe flights before I start worrying about them. Every weekend that I take mine out, I pass it around to so many people and put so many flights on it myself, that four or five flights is simply not enough.

Flying

Before flying, there are always several things to check on any plane.

(1) Check the balance point.

(2) Make sure all connections are tight and your batteries are charged.

(3) Check your control surfaces for freedom, proper direction and centering.

(4) Make sure your frequency is clear.

(5) Use common sense in choosing your flying site, keeping safety of persons and property foremost in your mind.

The Hornet is an extremely stable and groovy flying aircraft. It makes an excellent aileron trainer for the novice who has mastered his first rudder, elevator trainer and will prepare a pilot for more advanced 1/2A racing, but most of all it is a great knock-around grass field type, good times, machine that truly puts the fun back into flying because it gives you so much for such a small investment. □

SKY BIRD I

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With regard to the flight performance, it appears that the Center of Gravity position on the plans are labeled backwards. The more nose heavy position is more stable for the pilot, with only a few hours stick time, and then should be moved rearward for advanced flying. We mentioned this to the manufacturer and he found that there had been an error at the printers which has subsequently been corrected. The plane is responsive and agile but has no bad habits of any kind. ROG's are not difficult after some practice and the landings are very smooth. □

RACING AT RANDOM

from page 61/60

1/16" balsa on each side of the cylinder and tape the cowl into position as shown. Mark a spot directly over the glow plug and a spot directly over the back center of the motor mount for the cowl fastener. Remove the cowl and drill a 1/4" hole over the glow plug and a hole to match the fastener size. (Photo #13.) The fastener and hold-down wire are available from Prather Products. It usually takes me three wires to get one that fits and looks like this. The motor mount bolts hold the cowl wire in place. (Photo #14.) Slip the pipe in place and install the cowl. Mark a cut-out for the pipe outlet as shown. (Photo #15.) Cut out the section marked for the pipe outlet. Flip the piece over and epoxy back into the cowl while the cowl is on the fuselage to make sure everything will fit back into place. When set, trim and fill the edges to a smooth contour. (Photo #16.)

Cut out the air intake opening in the cowl and make 1/16" plywood baffles which are epoxied into the cowl as shown. The baffles direct most of the incoming air to the engine head which needs the most cooling. Direct about 2/3rds to the head and 1/3rd through the cylinder fins. (Photo #17.) Epoxy a wedge of 1/16" ply into the rear of the cowl for the aft locating pin. (Photo #18.) Drill a 5/32" hole through the rear of the cowl and fuselage (the surface hole on the cowl can be filled later). Drill another 5/32" hole through the bottom front baffle and the fuselage. Short pins made from nails or screws are then epoxied into the fuselage (Photo #19) with a little patch of glass cloth to reinforce the pins. The pins should protrude just enough to engage the holes in the plywood in the

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RACING AT RANDOM

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cowl. The cowl now will not slip around or move during flight. (Photo #20.)

The pipe is held down by a short spring attached to a "U" shaped wire clip passing through the fuselage. The ends of the wire are then bent over to make a little hook on each side of the pipe notch. Again, epoxy the hook with a cloth patch over it, inside the fuselage to prevent wearing through due to vibration. After the aircraft is painted, a blob of clear silicone is placed under the pipe to prevent wear and absorb vibration and heat from the pipe. The pipe should not actually touch the fiberglass fuselage, only the engine, spring, and silicone pad. The cowl should be trimmed around the pipe end so that the cowl can be easily removed and reinstalled. (Photo #21.)

The finished engine installation and cowl is shown in this photo. Depending on the aircraft, additional cut-outs may be necessary to vent hot engine air behind the cylinder, but forward of the pipe exit. In the case of the Big Art's Formula I LR-1A shown in this series, the area around the pipe outlet may be large enough to vent the hot engine air. If additional cooling is necessary, I will cut in another slot on the bottom side of the cowl later. □

MRC/TAMIYA

from page 59

We built the entire kit with a cyanoacrylate adhesive except for those places where a hot screwdriver is used! We didn't plan to paint the model because it is just about the same color as a Porsche we used to have. To overcome the plastic mold look and get rid of the adhesive finger prints and drips, we rubbed out the body with a finish grade of rubbing compound. To add a little gleam, we wiped the job down with Armour All. Looks great. If you would want to paint the car, we'd recommend changing the construction sequence somewhat so you'll get the entire body assembled but without the windows, door handles, lights, and so on in place. Once they're glued down you can't unglue them. And they'd be impossible to mask.

While there seems to be some slop in the steering linkage — enough to make more experienced R/C people break out in a cold sweat, the slop is not apparent at all in the handling of the car — so why worry? I guess I just like to worry about those kinds of things.

In operation we've used the car mainly on the street in front of our house, complete with a chalk drawn track. (Damn kids in the neighborhood who beat my time!) We've also chased the cats around the house and the secretaries at the office. As a side benefit we found that with a flat piece of corrogated cardboard taped to the roof, it is a quick way to get a cup of coffee. Don't make any sharp turns at the high speed though unless you're using double stick tape under the coffee cup. The car does turn sharp and tracks very well.

Because the handling of the car is so positive, it probably won't take long before you wish you could speed it up a bit. It only takes a minute to change the pinion gear to change the gear ratio. Even at the highest speed, the design of the car and materials used are such that it's hard to see how even a head-on run into the curb could cause much damage — though we couldn't bring ourselves to check out our car that way. It looks so great and runs so well that we couldn't deliberately try anything that might even scratch it!

The MRC/Tamiya 1/12 scale Porsche is not only something to admire sitting on your desk or mantle, it's a great fun toy. We also imagine that it could also serve as a trainer for folks new to R/C not only to familiarize themselves with radio installation and operation, but also to help learn those right and lefts coming and going. "Drivers, man (person) your transmitters" □

IRWIN OHLSSON

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cover plate the same as the dural fin miniature pictured. When leakage problems occurred, two more bolts were added to the top of the cover. Rather than change the existing die for two more screw bosses, two small notches were cut in the casting and the edge of the screw head hooked the notch — the two extra screws being tapped into the back side of the exhaust manifold. Not really the best way to go about it, but an easy solution to the problem. Although I do have both a two bolt and four bolt steel fin miniature in my personal collection, they are not pictured since this article is intended to be more of a general history of the Ohlsson Company rather than a listing and break down of all the various engines and variations of these engines.

In 1937, Irwin won the California State Championships and was awarded the Gold Seal of California for maximum points and design excellence. Following this win the name of the Ohlsson Miniature was changed to Ohlsson Goldseal --- a name with which many old time

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IRWIN OHLSSON

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model builders are familiar. The Ohlsson Goldseal went on to become one of the big three model engines of the era — the other two being the Brown Jr., and Baby Cyclone.

It was also in 1937 that Irwin designed a new small bore engine for production. Prior to releasing the engine, a contest was run to select a name for the new engine. A $50.00 first place prize was offered. The winner was a gentleman from Chicago, Hugo Geissler, who suggested using the engine displacement, and the "Ohlsson 23" was born. The engine appeared in the hobby shops during the summer of 1938 and was an instant success going on to become one of the most popular engines of all time. It was one of the few engines of its time to live up to advertising claims — easy starting, smooth running, long life, great power, etc. More modelers probably had an Ohlsson .23 as their first "gas engine" than any other engine. A year later the .23 was followed by a .19 displacement engine which was basically the same engine with a shorter stroke. Although a good engine, the .19 never sold in the quantities that the .23 did. It was also at this time that the .56 displacement Ohlsson Goldseal was increased in displacement to .60, given considerable design changes, and now

called the Ohlsson Custom.

Up until this time the name of the company had been Ohlsson Miniatures. In 1939 the name of the company was changed to Ohlsson and Rice with Irwin Ohlsson and Harry Rice now joint partners.

In 1942, the company had to stop model engine production due to the war and devoted its manufacturing facilities to the war-time effort. One of the many items manufactured was a twin cylinder target drone engine.

In 1945, war-time restrictions were lifted and O & R went back into model engine manufacturing. The reputation built prior to the war for easy starting engines, reliability, and unlimited life, was remembered by returning G.I.'s. The orders started pouring in faster than they could be filled. Many materials still difficult to obtain did not help the situation but, as things eased, more and more engines were turned out. The U-control boom was under way and model engine manufacturers had a hard time filling the demands of the modelers. It was during this time that many new model engine companies were formed to cash in on the new modeling market. Some with a good product and others with plain junk. O & R, having their reputation established, continued to expand and eventually hitting a peak operation of almost 1000 engines a day in late 1947.

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IRWIN OHLSSON

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In 1949, sales began to slump — partially due to some problems encountered with the introduction of the glow plug, causing rods to break, etc., and due to the fact that O & R, although having made many design improvements, were still producing out-dated designs. The McCoys, Doolings, Orwicks, etc., had taken over in many U-Control speed and pattern events. The partners had a disagreement over which direction the company should go and the partnership was dissolved. Harry Rice continued to manufacture the O & R engine for a few years, including some 1/2A engines. Irwin Ohlsson went into the fuel and glow plug manufacturing business.

Today, Harry Rice is still operating under the O & R name, manufacturing the O & R Compact engines with which most of you are familiar. Irwin Ohlsson is still in the glow plug business assembling glow plugs for many of your major marketers of glow plugs — K & B, Aldrich, etc. I say assembling rather than manufacturing because Irwin does not produce the plug 100% at his facilities. The company wishing to have a glow plug produced, purchases the materials and has the bodies machined by their own, or outside, screw machine companies. The parts are than shipped to the Ohlsson facilities where the elements are wound and the various glow plug components assembled. Several of these operations covered by patents held by Irwin Ohlsson.

Irwin is still active in R/C modeling today and has turned the operation of his company over to his son so that he may have more time to enjoy the love of his life — modeling. Irwin's most recent R/C model is a Gruman Widgeon powered by two Kraft .60's which he flies at Lake Elsinor here in Southern California, with the assistance, or hinderance, whichever the case may be, of Joe Bridi. □

SQUARE SOAR 72

from page 53

Our prototype weighed 25 ounces for a wing loading of 7.14 ounces per square foot. It was covered wth MonoKote and trimmed with Bridi striping tape. The optional power pod shown in the photograph was coated with resin and painted with dope to match the MonoKote. Two channels of a Cox-Sanwa radio was used for control.

The Square Soar 72 is a good, stable flying glider with or without the optional power pod. It is ideal for flying out of school grounds or on the local hill in a light breeze. □

PAPER CUB

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..... sheets which make up the wing skins are connected by means of a cardboard joiner, wing ribs are glued to the cardboard box spar for each wing half, the dihedral braces are inserted and glued into each spar, the spar with ribs is glued to the bottom inside surface of each wing half, and the top wing outer skins are then wrapped around and glued to the ribs and spars and joined with the bottom sheeting at the wing trailing edge. After the glue sets, tape all exposed edges with the appropriate color tape, and "presto" a completed wing that is as strong or stronger than a built-up or sheeted foam wing. Assembly of all components is just that simple due to the very clean die-cutting and precise scoring of the cardboard by the manufacturer. However, upon examining the wing after its completion we noted a rather severe twist or warp in the left half. To correct this, we removed the trim tape, opened up the wing half and realigned and re-glued everything within reach and then applied weight to assure that the twist would not re-occur as the glue set. At any rate, after some four or five hours of folding, wrapping, gluing and taping, our Cub was ready for installation of the radio, engine, landing gear and those other items that would make her ready to take to the air.

Although assembly of our Paper Cub went off with only a minor hitch and resulted in a not unhandsome aircraft, one big question remained. How would she fly? Well fly she does, and quite well. However, our first couple of flights were plagued with a severe left turn tendency which could not be trimmed out with the transmitter trim or without an inordinate number of turns on the rudder snap link. In desperation, we finally used the left wing trailing edge as a fixed trim tab; we bent down the trailing edge and then glued several strips of 1/16 ply on top of the wing sheeting to assure that the trailing edge would remain in the desired position. That's what was needed — now our Paper Cub flies like a trainer should. Crank up the engine, head into the wind, pour on the coal and when she begins to skip across the turf, apply a little up elevator and she's airborne. Climb-out is straight and true, and she's up at altitude before you know it. Slow flight is quite good - - - at approximately 1/3 throttle she'll fly straight, as well as do gentle turns, without losing altitude. At full throttle she moves out crisply and does tight loops, barrel rolls and Immelmans with ease. Final approach is nice and slow as you come across the fence, ease in a little back pressure on the elevator stick and she settles in on the main gear as gentle as you please. Not only does the Cub fly well, but she's rugged too. On our next to last flight, prior to writing this review, we misjudged the fuel consumption and were forced to bring her in dead stick. Well, we undershot the field and put her nose-first into a hedge which has overgrown a chain link fence. The Cub sustained nary a scratch only a bruise or two, and within a few minutes was airborne again.

Our conclusions: We feel that the Paper Cub is a sound investment for the beginner. It flies quite well and it goes together quickly and easily. However, we would recommend a .40 or larger size engine after having observed the flight performance of our Cub versus one powered with a .35 engine. □

ATLANTA HELICOPTER CHAMPIONSHIPS

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tering a Novice Class. This needs to be changed by the AMA Helicopter Advisory Committee. Helicopters are growing and so are the contests. This means that a tighter control should be put on contests for classification of flyers. The system could be patterned after the airplane flyers with points accumulated for places won and advancement automatic when a certain number has been reached. A contestant may enter any class at his or her first contest but, once entered, cannot go to a lower class but only go up as the points accumulate. If the helicopter pilots want this sandbagging to quit, then write your suggestions down and send them to Walt Schoonard, AMA Helicopter Advisory Comm., 2080 Sharon Rd., Winter Park, FL 32789.

Now back to the job at hand, reporting on a finely run helicopter contest. The judges were pattern airplane judges so they knew what a maneuver was sup-

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ATLANTA HELICOPTER CHAMPIONSHIPS

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posed to look like. Be it done with a helicopte or an airplane, a stall turn is still a stall turn. Judging was consistent and only small discrepancies could be noted. The flying kept moving with four ready boxes being full at all times. Four flights were flown with the two best being added together for your official score.

Only two disasterous crashes occurred. This goes to show just how far helicopters and their pilots have come in just a few short years. More and more flyers are being seen at contests because of more reliable equipment with this year's entries more than tripled over last year's registration. With the quality of the contest, you can look for this one to be even bigger next year.

The winners received some very nice and expensive prizes along with nice engraved plaques. Prizes included, to name only a few, a Kraft radio, a Revolution II Helicopter kit, and an Allouette II kit and an assortment of Du-Bro accessories including one of Du-Bro's Kwik-Fill Fuel pumps. The winners were as follows:

EXPERT

1st, Grady Howard — Du-Bro Shark 60
2nd, Bill Youmans — Home-built
3rd, John Simone, Jr. — Rev-olution

INTERMEDIATE

1st, Jim Gasowski — Jet Ranger, Kavan
2nd, Lloyd Wheeler — Graupner 212
3rd, Keith Kreth — Kavan Jet Ranger

NOVICE

1st, John Clark — Kavan Jet Ranger
2nd, Robert Wilcox — Kavan Jet Ranger
3rd, Pat Harris — Hegi Cobra

BEGINNER

1st, Gerald Culpepper — Rev-olution
2nd, Mickey Walker — Kavan Jet Ranger
3rd, John Stavros — Rev-olution

SCALE

1st, Bill Youmans — Kavan Jet Ranger
2nd, John Clark — Kavan Jet Ranger
3rd, Ron Barber, Graupner Bell 212

CULVER DART

from page 45/41

movable and there is room for your hand, thanks to side by side seating.

My plane weighed in at exactly 6 pounds ready for contact. The C.G. was right on the noodle, or just a shade ahead of one third of the chord from the leading edge.

You have read the instructions — it's time to start. It won't be long before you'll know why airmen of note have been heard to quote, "It's smart to fly a Dart."

Editor's Note: The following is the actual press release sent to the aero publications in early 1938 concerning the Dart 'Model G' 90 H.P. Monoplane:

With purchase of the design of the two-place, low-wing cabin *Monosport* Model G from the Monocoupe Corp., the newly-formed Dart Manufacturing Corp. of Columbus, Ohio, plans a production program on this plane in the near future. Although the aircraft now bears a Group 2 approval from the Department of Commerce, Dart officials will seek a full approved type certificate under which manufacturer will be conducted. *(Granted April, 1938).*

Structure of the fabric-covered cantilever wing consists of two laminated wood spars, rigidly braced in torsion with deep wood box drag struts and double internal tie rods. The basic airfoil section is the NACA 2315 type combined with a semi-elliptical planform. Dihedral is 5½°. Ailerons are of the full Friese type having a wood structure, fabric covering, and incorporating differential operation. Aileron travel is 30° up, and 25° down.

Welded tubing is utilized to fabricate the fuselage frame, covering consisting of metal forward and fabric aft. Seats are arranged side-by-side on a one-piece base facing dual stick controls and dual rudder pedals with a bungee control placed between pilot and passenger. Deep cushions add comfort for the occupants of the cockpit which features ample width, length and head room. Forward visibility is enhanced by the use of a sloping windshield.

Full cantilever tail surfaces are of metal tubing, fabric covered. Elevator travel is ±30°, and rudder travel is 30° right and left. Landing gear is of the fixed tripod type with one of the legs provided with an oleo strut. Equipment consists of 6.50 x 10 Ebbert Hatch wheels with mechanical brakes and, when desired, streamlined pants. Standard equipment includes a leaf-spring tail skid, although optional equipment provides for a tail wheel with 160° travel.

The 90 hp (2375 rpm) Lambert R-266 engine is enclosed in a full-cowled nacelle and mounted on the fuselage through rubber pads to reduce vibration. Exhaust duct is at the bottom of the nacelle and pressure baffles are provided for adequate cooling. The 2.5 gal. oil tank is

placed in an adequately ventilated accessory compartment, and 25 gals. of fuel are contained in two wing tanks, being metered to the carburetor by an engine-driven pump supplemented by a hand pump on the instrument panel. A stainless steel firewall separates the engine from the cockpit. Standard equipment includes a fixed wood propeller, although a metal propeller may be installed at additional cost.

Specifications and estimated performance figures of the 90 hp Lambert R-266 powered Dart Model G follow:

Wing span	29', 7"
Overall length	18', 7"
Overall height	6'
Wing area	145.72 sq. ft.
Empty weight	967 lbs.
Useful load	583 lbs.
Payload	244 lbs.
Gross weight	1550 lbs.
Max. speed	130 mph
Crusing speed (66% power)	110 mph
Landing speed	40 mph
Rate of climb	800 ft./min.
Service ceiling	15,000 ft.
Cruising range	580 miles

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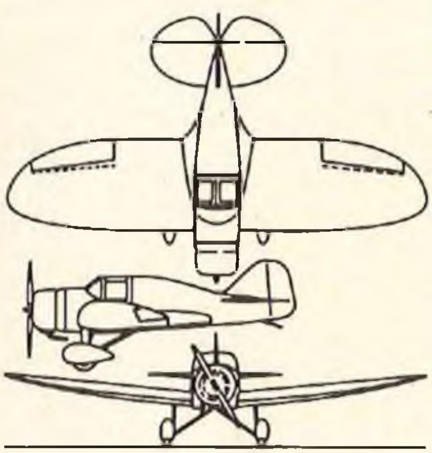

HOT DOG FLYING

from page 39/38

routine. Make a low altitude high speed pass and, when your plane is in front of you, pull straight up and hit snap roll controls. That should get the attention of the crowd for the maneuvers to follow. Next, try a Circus 8 from the Las Vegas pattern. Pull up to a 45° climb and do a 1½ snap roll ending up inverted. Now pull through like a Split-S and do the same thing again. Beats the old reverse Cuban 8, doesn't it? Finally, try a loop with one snap roll at the top. One snap roll is hard. It seems like you are releasing the controls before the plane moves. Practice and you'll get it.

Your second maneuver is the inverted spin. Climb up to a high spin altitude and roll inverted. Throttle back and put in inverted spin controls. Photo 3 shows controls for a left inverted spin and Photo 4 shows the right one. Notice that the

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rudder is backwards. Try the control positioned with your plane upside-down in a cradle to prove to yourself that they are correct. If your plane spirals instead of spins you need to take corrective action similar to what you used to make the plane snap roll. On planes that have the stab higher than the wing (low wing planes) you will need more down elevator than up. You obtain this by angling the elevator horn forward for planes with the horn on the bottom or by turning the pot in your elevator servo to angle the servo arm toward the tail. See Photos 5 & 6. A couple of my planes needed stall strips to spin inverted even though they would snap roll without them. When you have it spinning inverted, turn the controls loose and it will recover.

The third hot dog maneuver is the inverted snap roll. The control stick positions are shown in Photo 7. If you do a loop with an inverted snap at the top you have the Las Vegas pattern avalanche. You can also use the inverted snap to enter a high speed inverted spin. Recover by releasing the controls.

The fourth crowd pleaser is the flat spin. Use a lot of altitude for your first try on this one. Enter a normal upright spin using the controls shown in Photo 8. Once the spin is established, add three quarters to full throttle, but hold everything else. Controls are shown in Photo 9. Now add opposite aileron. See Photo 10. Your plane should now be spinning flat or nearly flat. Experiment with different power settings and aileron positions to get the kind of flat spin you want. The recovery from a flat spin can be a little different. This is the reason for the high entry altitude. Try releasing the controls and see what happens. Usually the power coupled with the relaxation of the rudder will stop the spin. If it doesn't, put in a lot of down elevator and keep the power up. This has worked for all my planes. As a last resort, if these two methods fail, go back to normal spin controls. The nose should drop and the plane should revert to an upright normal spin. Now you can release the controls for a normal recovery.

The last and ultimate hot dog crowd pleaser and peer impresser is the Lomcevak. Always say "Lomcevak" with a deep voice, it gives a much better effect. The basic Lomcevak goes like this: you start from a shallow climb, do a snap roll to kill off a little speed then reverse the controls to inverted snap position. The plane does and end-over-end tumble, then falls off into an inverted spin. Now

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HOT DOG FLYING

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let's get to the particulars. Throttle back to half power or a little less. Pull up into a 30° climb. Now put in snap roll controls as shown in Photo 11. When the plane does one roll and returns to right side up, rapidly put in opposite elevator and aileron. Leave the rudder and throttle the same. See Photo 12. Hopefully your plane should stop the snap roll and tumble end-over-end and then drop off into an inverted spin. The trick is to bleed off the airspeed at the same time your plane becomes right side up. This is easier said than done and requires a lot of experimentation. Try hitting snap roll controls then reversing as soon as you touch the corner. If your plane snaps very fast and does not slow down you may have to start from a knife edge climb or even an inverted climb and do one and a quarter or one and a half snaps before reversing. I usually start upright and do two full snaps first. Also try different entry speeds and climb angles. It takes a while to get the Lomcevak down, but it is well worth the time and effort used in practice. To recover from the inverted spin just release the controls.

Occasionally one of my planes will not enter an inverted spin after the Lomcevak, but will enter an upright flat spin. This is unusual since I'm holding full down elevator. The plane does not like to recover from this spin and releasing the controls only slows the spin down a little. This causes some apprehension since you tend to do the Lomcevak at a lower altitude than a flat spin. My recovery technique for this spin is both sticks forward and hope the engine doesn't quit. That is, release the rudder and aileron and add power and down elevator. The prop blast kicks the tail up and the plane falls out of the flat spin gaining flying speed.

Once you get these maneuvers down you should have no trouble keeping the attention of the spectators. Set your plane up carefully, practice regularly, and the next time you have an air show or a group of spectators at the field give them a real performance. One final comment, always put safety first. Don't perform any maneuvers over spectators or parked cars and always make sure your plane and equipment are in good condition before you fly. □

CADET UT-1

from page 35/33

Sanding:

Sanding is intended to smooth the surfaces of the wood so that the finished model will look better. Any defect will not be hidden by the final finish, but will show up more visibly. The care and patience spent now will reward you with pride when you show your model to your friends and provide you with the self-satisfaction of doing an outstanding job. The difference between a good looking or poor model is usually sandpaper and there are no substitutes. One hour with a sanding block now will provide satisfaction for the life of the model.

We suggest that the following tools and materials will make this work easier and provide better results: A small block plane such as Sears No. 37057 is great for shaping the leading edges and hardwood parts; in addition, a razor plane is excellent for shaping balsa; several different sanding blocks, covered with different grades of paper, will give true flat surfaces, emery boards are also helpful for tight corners or stubborn spots.

Use the better grades of sandpaper such as Aluminum Oxide or Silicon Carbide open coat. Garnet paper is also satisfactory, but the more common grades of flint paper wear out so quickly that their low cost is offset by the inconvenience and wasted time. Check the shelves of your local hardware store or automotive supply outlet if you can't find these materials elsewhere. We recommend that you use #120 for rough sanding, switching to #220 then to #320 or #400 for final sanding. One sheet of each grade is more than enough to complete this model. Use long strokes and blend the surfaces smoothly. A little water or saliva on dents may raise the wood fibers enough to eliminate the need for filler in most cases. Bad dents or cracks should be filled and sanded smooth.

Re-sand all surfaces with worn #320 or #400 paper by hand and you are ready to cover and finish your model.

Covering And Finishing:

Every modeler usually develops his favorite methods of covering and finishing models. Many times, however, a great deal of weight is added to the model trying to get a super finish. This is bad for any model. For a small airplane, disasterous! Whichever method you choose, keep it light!

We strongly recommend that the entire model be covered in Super MonoKote or Solarfilm. We know of no other way to get a slick, good looking surface with minimum weight build-up. You can use silkspan and dope if you prefer, but be careful to avoid warps.

The wing is covered in four separate pieces, and the stabilizer with two pieces. Follow the instructions provided by the supplier if you use Super MonoKote or similar material. Be careful when shrinking the material to avoid warping or distorting the structure. Be sure to adhere the covering to the ribs on both the top and bottom surfaces for greater strength.

We suggest that you cover the vertical and horizontal tail surfaces separately, and then remove the material locally to assemble. We also find it easier to cover the tail surfaces before installing the hinges.

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CADET UT-1

from page 163/33

IMPORTANT NOTE:

For better turn response and stability both wing panels must be washed-out slightly at the tips. This is easily accomplished by twisting the wing so that the trailing edge is higher than the leading edge and using your iron to re-shrink the MonoKote or by holding the panel in your hands and passing the tip through steam if tissue and dope covering was used. The proper amount of wash-out is shown on the plans and be sure that both tips are the same.

Final Assembly:

Make up the tail skid assembly, remove the covering where it mounts on the fuselage and epoxy the skid in place. Laminate the main skid from two pieces of 1/16" x 1/4" spruce, tapering the nose section as shown on the plans. Remove the covering under the nose of the fuselage where the skid mounts and make up the foam tape shock mounts and stick these on the skid. Glue the skid and mounts in place with Hot Stuff or similar glue. A couple of coats of polyurethane varnish or clear epoxy will add durability.

Remove the covering from the lower surface of the stabilizer and epoxy the stab to the fuselage, checking alignment carefully. Install the elevator and rudder, checking that the surfaces move freely without binding. Mount the control horns and make up the pushrods and install the servos. Check the radio operation to be certain that both surfaces move in the correct direction. Mount the wing on the fuselage and check the balance point. Add weight to the nose until the complete model balances on the wing spar. Install the struts using a small rubber band through the tubes in the fuselage to secure the inboard ends. Make a hook from a small paper clip or music wire to help pull the bands through the tubes.

For extra realism, make a cockpit floor from 1/8" sheet balsa that fits between the fuselage stringers. Use small triangular pieces glued to the fuselage sides to support the floor. A Williams Brothers 1½" scale sport pilot is the right size and worth the effort to paint and install. Add a simple instrument panel, outline the ailerons with striping tape, and you have finished the scale detailing.

Flying:

The Cadet can be easily launched with a standard or heavy duty hi-start, or can be winched if you pulse carefully. Balanced as shown, with the wash-out in the tips, and with neutral control surfaces, the model should thermal with only minor trim adjustment. Turn response is very good and the Cadet will hold a tight thermal turn with ease. We hope that you enjoy flying your Cadet as much as we did our prototype. □

ARMCHAIR ACE

from page 30

hopes of successful competition with an advanced trainer/sport type aircraft were dashed. They said I'd be flying against the latest hardware — retracts and all — and no amount of practice would likely put me above last place, flying even the most maneuverable of sport-type aircraft. If I want to score at all in competition, I must go with the same type of aircraft and hardware the "biggies" use in international competition.

So times have changed, but not much. If you're going to fly the competition route, you need the time and bucks to acquire the aircraft, power plants, and practice — just like the big boys — to ensure any degree of success. Even 500 racing means several custom-tuned engines at no small expense. It would be fun to get back in competition. I remember the cameraderie of meeting the same guys and the sharing of help and parts between competitors — and learning the "tricks" from "pros" like Harold Coleson when we used to call for each other, such as saying an enthusiastic "wow!" as if we'd done a good tail-slide when we did a bad one. It would be nice to compete again.

Maybe if I could interest a wealthy sponsor. . . □

SUNDAY FLIER

from page 22/20

make perfect circles around a center that is travelling with the wind, without gain or loss of altitude either upwind, downwind, or crosswind. If you increase the bank, without adding power, there will be a loss of lift due to the lift vector slanting more, and if you decrease the bank, lift will increase due to the lift vector approaching upright. So, as I said before, whether an airplane loses altitude on a downwind turn depends on the the pilot - - - just like "ballooning" when you turn into the wind (and usually decrease the bank angle).

Two — the so called torque effect is, in reality, a combination of four forces - - - torque, asymmetric thrust, gyroscopic action, and slipstream vortex. And the one that is most critical depends on whether you are changing direction (either vertically or horizontally) at the time, or flying at a high angle of attack, or whether the slipstream vortex is aligned with the top, center or lower portion of the aft portion of the fuselage and the vertical fin and rudder side areas combined. And that's a matter of design parameters.

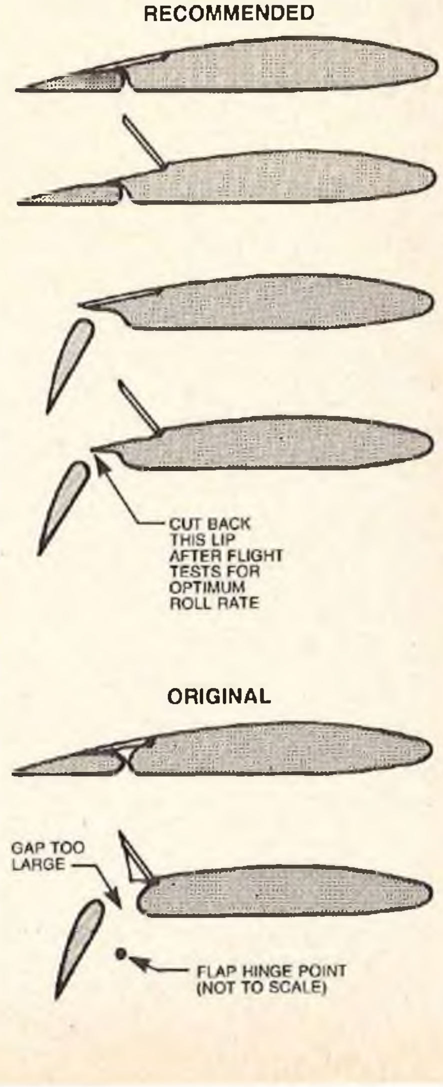
So, let's get on to other things. Back in March I published a letter from a reader on use of spoilers instead of ailerons for an aerobatic ship. I advised against it, but maybe I was wrong. Read this letter from Dennis Brown, of Wichita, Kansas:

Dear Ken,

I read your latest RCM column and can contribute some to the spoiler discussion. My first attempt (1969) at an R/C project was just such a configuration – and it works.

I built a wing to fit a .60 size pattern airplane designed and built by Art Morgan, Lexington, Kentucky, called the Half-Adder. My wing was of the exact same area as Art's original wing – so that we could get "comparative" figures on roll rates of the spoiler system versus the conventional wing with barn door style ailerons. The Half-Adder has the same proportions as most of today's style competition planes to give you an idea of aircraft configuration. We changed nothing, not even the pitch trim setting, on the fuselage/tail assembly.

The new wing was built as a scale model for a home-built I was working on – a Turner T-40. The wing was NACA 66-215, rectangular in planform, true Hoerner tips (not the drooped kind), 0° dihedral, 25% chord full span single slotted flaps, 10% chord spoilers located at 70% chord. The flaps were hinged below the wing surface so that optimum lift(∓2% slot gap) occurred at



40° flap. The spoilers formed the slot lip for the gap and were of about 25% of the wing span. These sizes made the spoiler less than half the size of a normal aileron.

Before we risked "life and limb" on the new wing, we pinned fixed spoilers (one wing only) to Art's plane – how's that for guts – take a friend's plane and purposely try to make it roll, permanently. However we didn't go to that extreme immediately – we started with 1" x 2" x 5° deflection and worked up to where it took 1/2 aileron just to fly level – not bad technique, since we could get roll rate info by just letting go of the aileron and feeding elevator at appropriate intervals to keep the roll going level. Now I had the answer to the "inverted" question, but I'll not mention it yet.

What I had anticipated in terms of response was that the spoilers would have good roll control with the flaps deployed – since the slot in front of the flap would be increased enormously when the spoiler was raised resulting in loss of lift. I also anticipated that there might be a tendency for the spoilers to deflect upwards of their own accord due to the slot so an elaborate cam arrangement was made so that the spoilers were not movable either up or down, except by the servo's action, and then up only.

The first take-off was with about 20° flaps – enough to get some flow through the slot, but not enough to cause pitch trim problems. It was just right, the roll response was about the same as the much larger ailerons. Now came the surprises.

The roll rate with the flaps up (high speed) was very low. The roll rate with the flaps down (low speed) was super high. Obviously what was anticipated as far as roll control was correct – but I missed the magnitude of the slot's effect by bunches. It was unbelievable the roll rate with full flaps – you didn't dare move the stick more than the slightest amount – and the airplane flying super slow (those are big flaps at full deflection). It was strictly a case of too much roll, over-control was so easy that only on 2 or 3 occasions did we attempt a landing with full flaps. The best setting was the one we started with on the first take-off.

So now that we found that it would fly we tried several other favorite arguing points, such as, will it work upside down? Why do low wing models pitch up with flaps and full size planes pitch down? These questions are good for lots of magazine articles – just like torque and downwind turns. Sorry to eliminate at least one of these subjects, but I can assure you, spoilers will work in the same manner as ailerons when inverted. Plug style spoilers not included. I have photos showing low inverted fly-bys if you don't believe it – better yet – do what I did to Art Morgan's *plane, strap a spoiler on one wing and try it. Get your own A. Morgan though. There was no detectable adverse or proverse yaw in any flight regime with the spoilers so shoot another argument down. We had lots of fun doing this experiment. We found out info regarding tip shapes (through tuft testing), flaps/pitch effects, and spoiler effects. I still have the wing in the basement, it's never seen a crash. The Half-Adder is still alive also, but Art hasn't flown it for a couple of years.*

In summary I would say:

(1) For fun flying by all means try spoiler/flaps, you'll have a ball. Just don't try to get by without lots of mechanical and structural complications.

(2) Make the spoilers larger than mine – say 50% of the wing span with a maximum deflection about 50°.

(3) Do not arrange the spoilers so that they increase the slot gap drastically with deflection. Start with a given slot gap (spoilers not making any change) and work up to optimum through flight testing.

One additional caution – there have been far too many articles implying that model testing is a complete method for trying out ideas for full scale aircraft. This is going to get somebody hurt. It is true that model testing can help but it would be foolhardy to think that a very inaccurate model (models must be to thousandth's tolerances), with non-accurate moments of inertia, is going to give you all the assurance of a complete engineering program. Proper use of R/C models as engineering tools takes $$$. Models are worth the effort, but don't bet your life on the results.

Sincerely,
Dennis H. Brown

Now here's the interesting difference. Dennis has his "spoilers at the 70% chord point - - - and I usually think of spoilers as being at the point of maximum curvature of the wing's upper surface - - - around the 30% chord point. So let me ask you readers a question. Does Dennis really have spoilers? Or does he have ailerons of "infinite differential," 40-50 degrees of up aileron on one wing, with zero degrees of down on the opposite wing? You have to admit that it is an intriguing thought. In any event, I can readily see why there is no "reverse action" when inverted, if the "spoilers" are back near the trailing edge. Hey, you want to experiment? Put spoilers on your plane at the 30% point, and try inverted flight. Betcha they'll reverse in action. Now, keep relocating them further aft - - - say ten percent of the chord at a time, and find out at which setting they stop giving reverse action and start acting like ailerons. I'll make a guess - - - right around the 65% point. What do you think?

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SUNDAY FLIER

from page 170/20

That wraps it up for this month, except for a couple of "announcements." First, I'm getting quite a bit of mail, nearly all of it asking for a reply. But no self addressed, stamped envelope is included, and frankly, fellows, the postage bite gets too big when the mail runs as high as it does. So, if you want a personal reply, please enclose a stamped envelope. As always, those that are of broad interest to the R/C fraternity will be answered in the column.

Second. Yes, I have cleared, unclassified movies of flight tests of the RPV's that I have flown, and I have given talks, like the recent one in Memphis. But I can't let the movies go without me going with them - - - part of my arrangement. I'll be glad to show them to you, and spend an evening with your club. No charge - - - but I will have to have expenses reimbursed. Now that I'm "retired", the budget doesn't stretch quite as far as it used to. If you want to see the movies, write me at RCM well in advance, since I have to get approval from Lockheed for each presentation.

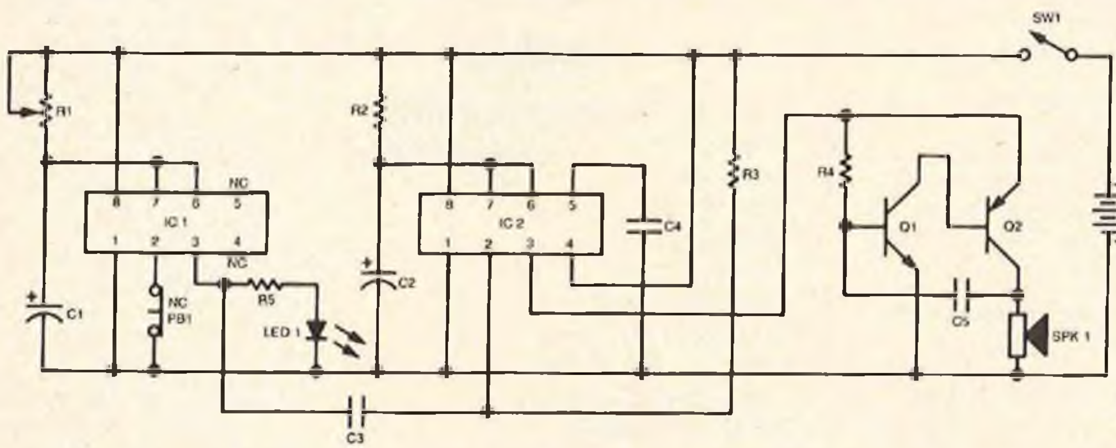
Hope we can get together. Meanwhile keep "test flying." And keep writing. We gotta' keep in touch. □

RADIO SPECTRUM

from page 18/15

Dear Jim:

I have been running R/C boats for awhile now and I have discovered the inconvenience of running out of gas. While this doesn't sound very serious it does create a problem for other boaters who are trying to race. Besides that, it's hard on the nerves seeing other boats using your boat for a bouy! I have never flown R/C aircraft other than sailplanes, but I can imagine what its like



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RADIO SPECTRUM

from page 173/15

trying to make a dead stick landing from 400' up. So, to remedy the problem, I have designed a circuit which I call "Fuel Life" that might be of interest to some of your readers.

The circuit is an adjustable timer which produces an audible tone when power is first applied and, upon completion of the timing cycle.

Circuit Diagram: Using components shown, timer is adjustable from approximately 0-16 minutes. Cost should be about $10.00 if you lean heavily on your junk box.

PARTS LIST

R1 – 3 Meg pot.
R2 – 10,000 Ohm
R3 – 10,000 Ohm
R4 – 56,000 Ohm
All resistors 1/2 watt
R5 – 680 Ohm
C1 – 100uf 10 volt
C2 – 100uf 10 volt
C3 – .001uf 50 volt
C4 – .01uf 50 volt
C5 – .04uf 50 volt
IC1 – NE-555 Radio Shack #276-1723
IC2 – NE-555
Q1 – 2N1302 NPN Gen. Purpose
Q2 – 2N404 PNP Gen. Purpose
LED1 – Radio Shack #276-041
PB1 – Normally closed pushbutton
SW1 – SPST switch
SPKI – any small 8 Ohm speaker
B1 – 4AA batteries & holder

Circuit Description:

IC1 – is used as a timer with R1, C1 being the time constants. PB1 starts the timing cycle and further triggering will not affect the cycle until it is finished. The LED is used as a monitor to show timing cycle is in progress. IC2 – is a re-triggerable monostable multivibrator that receives the output pulse from pin 3 of IC1 at the duration of timing cycle. Pin 3 on IC2 then supplies power to the simple oscillator made up of Q1 and Q2. Q2 then drives the speaker to give an audible tone, for approximately 3 seconds then IC2 resets itself.

Circuit components are not critical, junk box parts will work for Q1, Q2. Current draw at 6vdc is approximately 14ma. Timing cycle will always remain constant until voltage drops below 5.0vdc. Max. voltage is 15vdc.

Circuit Adjustment and Operation:

Adjust R1 for time cycle you want.

In operation you turn on timer when you turn on your transmitter; at this time a "Beep" will be heard. When you launch, you depress PB1; to start cycle LED1 should come on also. At the end of the cycle another "Beep" will be heard and timer will reset itself.

I built my Fuel Life in a small mini-box and clip it on my belt to keep it out of the way.

N.B. if accidentally triggered before you are ready, simply turn SW1 off then back on again and it will reset itself.

Looking forward to more of your columns.

Yours sincerely,
Mel Patrick
Surrey, B.C., Canada

★ ★

Well, I think I'll call it quits for this month and start working on next month's column. If I work fast I may make the deadline. □

from page 12/10

erate well without either a muffler or exhaust baffle — one or the other must be used. This, in itself, might be the cause of your trouble. You say the engine is running hot, but the fact that the engine will idle and accelerate with the battery connected, indicates the fuel or glow plug is too cold. There should be no difference when you remove the battery clip. Install either a muffler or exhaust baffle and use the recommended glow plug and fuel and I am sure you will end your trouble.

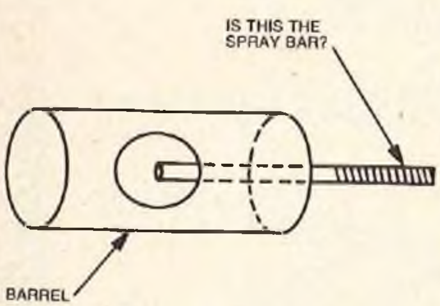
Dear Clarence;

I am a beginner as you will see. I have an old Perry carb and I've been reading about the necessity and importance of keeping the hole in the spray bar straight down or slightly forward a hair, in relation to the venturi. Do you mean the slot on the bottom of the spray bar or the hole in the end of it? I've tried to move the spray bar, or the part I think is the spray bar, in my old set up. This part does not move.

My other question is this: If our fuel is composed of alcohol, nitro, and castor oil or Klotz, what is meant by methanol and nitro-methane?

Just one more question: I've got a new K & B .61 with muffler for use on a Senior Telemaster. What should I use for a prop for breaking-in?

Thank you,
Al Marcantonio Jr.
Glens Falls, New York



Al, the tube that sticks into the air intake is the spray bar. Some engines have a spray bar that only extends half-way ala the Perry, Webra, etc., and others extend all the way through. In the case of the Perry, this tube is pressed in and should never be changed. To do so would change the relationship of the slots in the idle mixture disc end that

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from page 175/10

regulates the fuel. Some engines have removable spray bars and these can, many times, be positioned incorrectly.

There are many kinds of alcohol — Ethyl, Iso-propol, etc. Methanol is the kind used for model fuel. Nitro is just short for nitro-methane, the power ingredient in the fuel.

The 11/7½ Rev-Up will work fine with your K & B .61 Senior Telemaster. Use the same prop for break-in as you will for normal flying.

Dear Mr. Lee;

I enjoy your column very much and look forward to each issue. My reason for writing is not because I'm having trouble with anything (reading and following instructions usually takes care of that), but because I'd like to pose some questions that I think would interest the inter-mountain fliers (those who live at elevations of 4 to 6 thousand feet or higher).

Your thoughts and comments please on the following: A time honored general rule of thumb, when running model engines at altitudes considerably above sea level, is to use a somewhat smaller prop than would be used at low elevations. Given that the density of air at higher altitudes is less, it stands to reason that engines are going to draw a lower mass of air for combustion and, hence, produce less power as the elevation increases. At the same time, because of this lowering of density, the prop will be moving a smaller mass of air with each revolution.

Now, why does the "smaller prop rule" hold? Does the efficiency of the engine fall off faster than the lessening of the air load on the prop so that one has to go to a smaller prop to maintain the same rpm's?

Is there a rule of thumb guide that can be used to estimate the loss of power with altitude?

If an engine has a given power output at sea level with say 5% nitro fuel, can the altitude loss be compensated for, either partially or entirely, by going to a somewhat higher nitro content fuel?

Thank you very much for your time.

Respectfully yours,
Larry D. Kubicek
Idaho Falls, Idaho

Engines develop their max horsepower at a given rpm. You will always want to run the engine as close to its horsepower peak as possible. At higher elevations, with less air density, the engine is developing less power, but you still want to run it close to its horsepower peak. This means running a smaller propeller. Generally, it is better to drop down a little in pitch rather than reduce the diameter as, again, due to the thin-

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ENGINE CLINIC

from page 180/10

ner air, you need all the bite you can get. There is no rule of thumb to use as a guide, as there are too many variables involved — type of aircraft, power of the engine, fuel, etc. At higher elevations, more nitro can be used — up to 25%. Even at sea level 15% is not excessive and many pattern flyers are using 20%-25%. A raise in compression ratio is the most beneficial thing you can do to an engine for better performance at high elevation.

Dear Clarence,

I have an old McCoy .60 Redhead engine. This is a Series 20 engine produced in the early Sixties. It has never been run, but has a broken piston ring. The cylinder bore is .940 and the ring thickness is .046.

I have tried Testors Corp. and they have no more parts. Other brands of rings are a smaller thickness. The rings cannot be allowed to slop vertically on the piston.

Can you help me?

Gratefully yours,
Edward Jones Jr.
Norwich, Connecticut

There seems to be an awful lot of guys

out there with old McCoy .60's they want to put back in operation since I have answered this same question four or five times in the past. I get about a letter a month from someone looking for rings for the McCoy .60. The K & B/Veco .61 has the same identical dimension and is interchangeable. Wall tension and end gap is a little different but, if anything, will only improve the performance of the engine. □

CUNNINGHAM ON RC

from page 7

but also the follow-up to see that everything is just as it should be.

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And, now for a letter . . . from Ed Chargo writing from Willmar, Minnesota, and if you think that this subject matter is a logical follow-up for the above, it really is:

. . .However, the most discouraging part of this hobby, second only to crash, is the repair. I don't recall seeing any articles dealing with this subject exclusively and I, personally, feel some guidance could be welcome. During the past year I've suffered a number of crashes, which is not unusual. With the patient help of our club instructors, Hugh Krause, Dave Wickland, and

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Chuck Ring, last night, I cut the umbilical cord and soloed (at least that's what Hugh called it) with my basic trainer. The hand launched take-off was, I thought, quite nice, however, my landing helped encourage this letter. It would be great if, after picking up the pieces, I knew I could go home and start following a general procedure, such as how badly damaged a piece should be to warrant replacement, or merely repair, what glues to use, where to reinforce, etc., etc,. or at what point do you say "to hell with it" and start a new one. Perhaps a record of Gordon MacRae singing "Oh what a beautiful morning" would help. I hope you feel this subject important enough for you to editorialize upon. Other 'old' modelers may feel the same way.

Sincerely,
Ed Chargo

So Ed, for you, and for others who may have washed out their favorite birds with a bit of pilot error, let's think about the problem and see best how to attack it.

First, I don't think that I can give you any really hard and fast rule to follow as to when to repair, and when to pitch into the trash can, because this really depends not only upon the crash, but also upon your nature, and the strength of your pocket book. I have seen some well-heeled modelers pitch an aircraft into the trash can, that many others would have salvaged and re-built. So, let's go back to the beginning and assume that your beautiful bird just gobbled up a chunk of ground and you're standing there with a surprised look on your face. The first thing to do is not to smash your transmitter into the ground as well! Turn off the switch, and hand it to a friend to take care of, and then you and, hopefully someone else, can go over to the crash site and start picking up the pieces. Don't be in a hurry. You can be in a hurry to get to the scene of the mess, but once there, take your time, and be careful. Search out the battery pack and turn off the switch if it is still connected. A year or so ago, I went with a friend to his crash site, and by the time we got there, the battery pack had shorted out and started a fire in the dry grass. Battery packs have a way of leaving the scene of the accident, and you may have to look around for it a bit.

Next, dump the fuel out of the fuel tank so that you're not slopping fuel on everything. If your engine is buried in the ground, take a screwdriver or other tool and dig around it to loosen it. Be sure *not* to turn it over, it probably is okay, but full of dirt, and if you try and turn the crankshaft, you may ruin the inside of the engine with grit and sand.

Now, be sure that you have all of the radio parts. Make sure that you have the same number of servos that the aircraft started with, and that the receiver is also

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CUNNINGHAM ON RC

from page 184/7

located. Give all of these items to your friend to carry, and then start picking up the pieces of the airplane. It often helps if a car trunk is handy in which to put all of the pieces. If not, use all of your pockets. Don't even try to make the decision of repairing now, you're too upset. Just pick up all of the pieces and take them home with you. Pick up all of the pieces that you can find. Keep them for a couple of days, and then look at it again. Now is the time to decide if you're going to want to repair, re-build, or start over. Many times a wing and tail will survive, and the fuselage is just too smashed up to re-do. So, build a new fuselage. Or, if the wing is damaged, check for how much structural damage was actually done. You will probably need to remove some of the covering to get at the spars but, even if you do, so what? It's easier to recover than it is to re-build. Check the dihedral brace and the main spars and, if cracked or broken, repair with liberal amounts of epoxy. With the new super glues, crash repairs are much easier because you can tack all of the pieces together and then go back with epoxy and make final repairs. If, for example, the ribs are cracked, a dose of super glue will splice them together. But, if a spar is broken, you may need to slob on the epoxy and then glue in an extra piece of spar material to reinforce the joint.

Probably the most important thought is to go all over the airframe, testing it and flexing it to see if the structure under the covering is broken. Let's face it, a first airplane should not be a thing of beauty and joy forever, it should be a working partner in your search toward your pilots wings. If you're flying an aircraft that is all patched up, so what, at least you're flying, and the patches will be much easier on your wallet than will a new aircraft each time that old Mother Earth reaches up to grab your plane!

A really good example in repairing is my Antique Powerhouse. After about twenty five flights, it suddently had a bit of radio malfunction (sure, Chuck - - - Editor) and spun into the ground. The wings and tail were in good shape, but the fuselage was broken just behind the wing. I picked up all the parts, small pieces of balsa and all, and took the whole thing home with me. The next day I took all of the parts out to the patio, along with a bottle of super glue. I cut the MonoKote from around the broken area, and then held the front part of the fuselage with my feet with the engine resting on the concrete. I placed the tail section in the correct location, or as nearly correct as I could get it, and then tacked all of the parts together with super glue. Naturally, everything was shaky, but I mixed up a batch of five minute epoxy, and glued all of the diagonal pieces and cross pieces back together, then added extra pieces of very hard balsa to each longeron splice. When it was done, I had my favorite airplane back together again. With a few pieces of orange MonoKote to cover the stripped off places, it's hard to tell, from five feet away, that it had ever been crashed. And yet, when I picked up the pieces just after the crash, I could only think how much I hated to lose it, and how long it would take me to make an entire fuselage over again. By waiting until the next day, and by salvaging all of the pieces, I had the aircraft ready to fly again in less than an hour and a half.

So, be careful on your test flights, and if something does happen that necessitates a repair job, don't be in too much haste.

Take your time, and fix it. □

FROM THE SHOP

from page 2

The following letter was received from Leslie W. Griffin, MD, Medical Director for Detroit Diesel Allison Division of General Motors Corporation. We feel it is important that you read it in the interest of workshop safety.

Dear Mr. Dewey:

Mr. Claude's reference to recommendation to use carbon tetrachloride for dissolving foam from hinges is BAD advice.

In the first place, carbon tetrachloride fumes are extremely hazardous and can cause liver and kidney damage and death. In the second place, it cannot be bought at every drug store, primarily because carbon tetrachloride as such was taken off the market several years ago after many deaths had been confirmed as being caused by carbon tetrachloride fumes after using it for cleaning purposes. After reading Mr. Claude's article I inquired at a drug store about the purchase of some, and it was confirmed to me that carbon tetrachloride had been taken off the market.

There is a substitute available called Safety Solvent; however, that labeling carries the same warning as did carbon tetrachloride. So if anyone uses either of these products for the purpose advocated by Mr. Claude the solvent(s) should be used in a well ventilated area – exhausted area if in an enclosure (such as a room in the home). The user should also be forwarned of the hazards involved.

Yours for a safer hobby,
Leslie W. Griffin, M.D.
Medical Director

□