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VOLUME 15 1978 NUMBER 2

R/C MODELER

FEATURES

THIS MONTH'S COVER features an original design by Johnny Johnson of Palm Desert, California, and built by Allen Johnson. Johnny also designed the P.D. Parasol which was featured in RCM in 1969. The young lady is Miss Carol Kobza. Ektachrome transparency by Johnny Johnson.

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FEBRUARY

From The SHOP

DON DEWEY

The following is an interesting account of a crossing over the Swiss Alps by a team flying a radio controlled model airplane. It was sent to us by H.R. Schlapfer of Switzerland. The original story was written by Gallus Ullmann and translated for RCM by Mr. Schlapfer.

Read on . . .

OPERATION ST. GOTTHARD

The Modellfluggruppe Einsiedein, which is associated with the Modellflight Region 5 of the Aero Club of Switzerland is located on the northern boundary of the Alps.

A few members of this very active model flight club had the spooky idea in mind for more than 6 years and that was to cross the Swiss Alps with a radio controlled model airplane.

On September 1, 1977, they were able to realize the north/south crossing of the St. Gotthard from Andermatt to Airolo. The RC model airplane was a well-known "Big Lift" equipped with a 15ccm "Hoernlein" engine. The model was controlled with a Varioprop FM radio system and flown by two pilots in an alternating sequence.

The seven man team consisted of Karl Kalin (Chairman of the Modellflight Club) and Rolf Schneebeli acting as Pilot; Madeleine Karpf and Walter Schneebeli, acting as drivers of the Citroen 2-CV car with an open roof; Emil Kalin and Billy Hax, radio communication officers; Gallus Gullman who was keeping the minutes; Willy Bomatter, Chairman of the Tourism Office of Andermatt, and Walter Bernet, Hotel Manager in Andermatt who acted as witnesses.

The schedule went as follows:

07.30 hrs: Departure of the whole team from Einsiedeln with destination Andermatt.

09.00 hrs.: Arrival at Andermatt. Last minute briefing of the team; recognizing the weather conditions; preparation of the model airplane, fueling and preflight tests were the duties of the crew for the next 1½ hours.

10.44 hrs.: Take-off near the downhill station of the Gemsstock cableway. The Big Lift, fueled with approximately 2 liters of fuel was soon airborne and climbed away in a few turns up to approximately 200m above ground level and cruised in the direction of Hospenthal.

10.53 hrs.: The first hand-over to the second pilot was in the region of Hospenthal, on the command of the radio operators. At this stage, the model gained more height while it circled for a few minutes. After a second hand-over to the other pilot, the model flew in the direction of St. Gotthard.

11.08 hrs.: Third hand-over of the controls. Suddenly the headwind sharply increased. The hand-over was abruptly delayed because of some difficulties crossing the first hill of St. Gotthard. Only after the third trial was it a success. By this time, the Big Lift was being controlled from the 2-CV car along the more or less straight street uphill towards St. Gotthard.

11.12 hrs.: Crossing of the St. Gotthard Pass. A great moment! The airplane gained height rapidly in the strong slope lift. The airplane cruising at approximately 600m a.G.L. is passed by two military jets which are crossing the St. Gotthard approximately 150m below the model. Not frightened by these two big birds, the model is circling quietly with reduced throttle.

11.24 hrs.: Fourth hand-over immediately at the edge of the gully of Tremola. The destination of this operation, Airolo, lies below and the weather conditions are looking just fine. The tension of the pilots is fading away. Everybody is relaxing, as the most difficult part is behind us. The visual range is reduced by a light misty air. For this reason, the model is lowered to approximately 100m a.G.L. in order to more easily judge the attitude of the model. Descent down to Airolo is initiated. Sudden strong turbulences and lee-rotors, pressing the model downwards. Consequently, the next hand-over of the controls had to be performed before the located place is within reach of the second pilot.

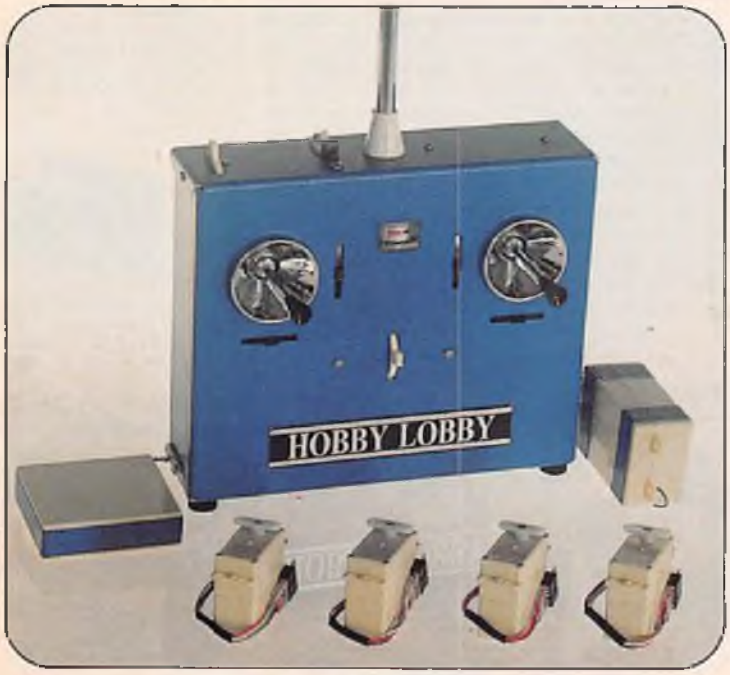
11.34 hrs.: A dramatic take-over of the spinning model by the 2-CV crew. The spinning model can be recovered, but due to the strong lee-rotors, there is no hope of restoring a safe climb.

11.36 hrs.: To reach the goal of this operation, the model has to be landed at a distance of approximately 500m in front of the piloting crew on the St. Gotthard street. The landing was very hard and, in its last sequence, out of sight of the pilot.

11.50 hrs.: Recovery of the landed model. The plane was slightly damaged, while touching a retaining wall of the street during the landing. A lorry driver stopped his car in front of the

to page 185

You'll see many good radios in this magazine. Here are the BEST ones.



When we say these are the BEST radios you can buy we'd better have good reasons for saying it. We do:

MOST RELIABLE

1. Hobby Lobby Radios are the radios best designed to prevent vibration-caused failures. Ours are the ONLY radios you can buy that have the servo amplifiers inside the more shock-protected receiver case rather than inside the servos.

2. You get more SAFE FLYING TIME from a Hobby Lobby Radio. Our servo amplifiers use very little current. With a HL radio you can fly confidently right through your last flight of the day while owners of other radios are worrying about discharged batteries.

3. You are never the test flyer for any Hobby Lobby Radio system. The electronic design of HL radios is a well-proven design. It has not ever required redesign. The tradition with less reliable radios is to redesign annually. And each annual change makes the RCer the guinea pig for field testing.

4. Owners of other radios have to worry about the security of their often-disconnected aileron servo connector (which can't be tightened like Hobby Lobby's). The owner of a HL radio can tighten the connectors on his set and then forget about them. Flying a high performance RC plane can be nerve-racking enough without having to worry about connectors coming apart.

5. We don't recommend this, but many owners of HL radios tell us that they can fly their HL radio with the transmitter antenna partially collapsed. You can fly your RC plane much more confidently knowing that there is tremendous extra flying range built into your HL radio system.

6. Hobby Lobby Radios use electronic circuitry that gives you one-cell-out flight capability. In the rare event that one of the four cells in the airborne battery pack loses its charge or shorts out your HL Radio continues to fly safely.

MOST USABLE

1. One transmitter is capable of flying many RC planes. But, with most RC outfits it costs you almost the price of a complete new radio system just to buy four new servos to put into a second airplane. When you own a Hobby Lobby Radio you only pay for the expensive servo amplifiers once—they're inside the receiver case (except for the two auxiliary channels on the HL6). So, extra servos for our radios only cost you $14 each. There's no other radio made that lets you equip a second 4 channel plane with 4 servos for only $56.

2. "Usable" means your being able to change the direction of rotation of our servos in less than a minute. It's so simple to do this that you can do it right at the flying field. If you own any other radio than a HL radio you have to send the servo back to the factory for this change. Or, worse yet, you have to buy another servo.

3. The HL6 and HL3 both have adjustable centering tension on the control sticks. You can adjust yours real tight if you're a beginner and need tight sticks to keep yourself oriented during nervous first flights. When you become an expert you can loosen our control sticks so there's nothing between you and the "feel" of your high performance aircraft.

4. You get an Owner's Manual with the HL6 that tells you how to do routine maintenance, how to install the radio in a plane, how to reverse servo rotation, how to adjust servo neutral—one more example of how we make our radios more USABLE.

5. A "usable" radio is one that'll fit into today's smaller RC planes. The four-servo version of the HL6 weighs only 11½ ounces. The two-servo version of the HL3 will only add 7 ounces to a small .049 plane (with our optional small battery). And these light airborne weights are for radios that give you enough servo power to fly planes as big as a 25 pound, 12 foot span Curtis Robin that we've flown.

These are the reasons that we can say that Hobby Lobby Radios are BEST. Call us and order one today.

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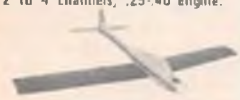
SPITFIRE MK I $26.56
List price $34.95

Brand new injection molded all foam kit. Clear canopy and molded radiators. Decal sheet. 50" span, 450 sq. in. wing area. For 2 to 4 channels, .29-.40 engine.



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Hobby Lobby/S.L.E.C. MULTI-PROP Introductory Price **$9.99**
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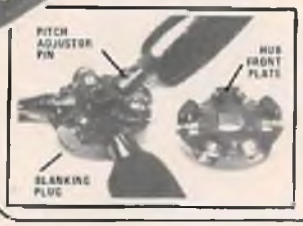
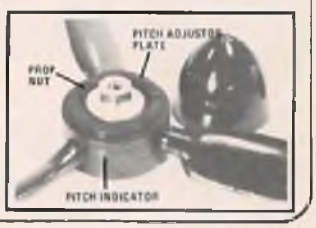
This is the most **revolutionary model airplane prop** we've ever seen. It is 10 inch diameter and comes with 3 blades. Extra or replacement blades are available from open stock for 99 cents each. You can set it up as a **2, 3, or 6 blade prop. It is scale in appearance**—both the blade shape and the hub. The 3 blade version runs **noticeably quieter** than a conventional model airplane propeller. It's made of glass fiber filled black nylon. It **will run on engines from .29 to .60** displacement because it can be **adjusted to any pitch you want!** With 3 blades the prop looks like a Hamilton Standard with the hydraulic pitch control type of hub. With 2 blades it looks like most private plane props. With 6 blades it looks unearthly! Since the pitch can be minutely adjusted through a range of about 4 to 10 pitch it is **capable of getting the absolute maximum** out of any engine you put it on. You can't imagine what happens to engine performance when you can adjust prop pitch to any value you select.

HERE'S HOW IT WORKS:





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- 2-channel powered glider—great trainer slope soarer and sport plane!

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(Prices in effect until February 28, 1978)

We have complete accessory packs available for all these kits. Call us!

(Accessory packs contain everything you need to complete each kit except for radio and engine!)

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(Until Feb. 28, '78, you can buy a DuBro Prop Drive Reduction Unit for only $59 with the purchase of a Bud Nosen kit!)

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Citabria $78.00
J-3 Cub $93.00
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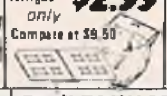

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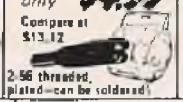

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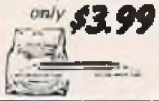

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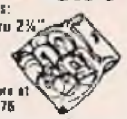

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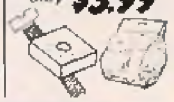

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25 Clevises only **$3.99**
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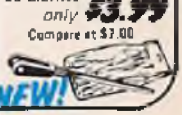

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Tiger's sleek line are reminiscent of the NATO fighter. The 52" span foam wing comes ready-sheeted with obechi veneer, and the rest of the plane is very simple balsa construction. For .35 to .40 engine, 4 channels. Flying characteristics: fast, unusually aerobatic, holds knife edge attitude, lands at very slow airspeeds.

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1/2 oz.
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D 2 rolls/Hobby Lobby SUPERKOTE

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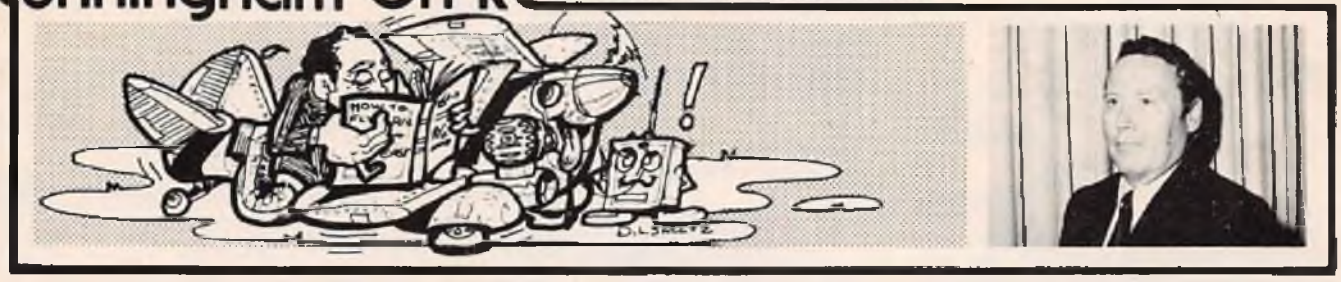
Cunningham On RC

CHUCK CUNNINGHAM



As you may have gathered from the trend of my writing for the past year or so, I am hooked on the larger RC models. I have been enjoying flying the big aircraft and feel that this is the way that the hobby is moving. Seems kinda' strange that the cars are getting smaller while the models are getting larger. But, we in this country are really taking a back seat to some of the thinking going on in England.

My wife, Jan, and I spent a very joyful 2½ weeks weeks wandering about the British Isles and the beautiful city of Paris this past October, and one of the things that I did at every chance was to go into stores selling magazines to look at the RC magazines. Perhaps one of the biggest thrills that I got was to go into a newsstand in the very heart of Paris, on the Rue De La Paix, and to find three copies of RCM waiting to be snatched up by some English-reading modeler. Naturally, I snatched up a French magazine called *Modele Magazine*, which featured the American Nationals. Since I can't read French, I had to kind of guess what all of the articles were about, but enjoyed nevertheless. In England, I purchased several different copies of *Radio Control Models and Electronics*, and *Radio Modeller*. In one of these were pictures taken at a large British scale meet. They really are going in for fantastic sized models. There were several pictures of a WW II Lancaster bomber being flown on two 55cc motors driving three bladed 20/14 props. The wing span of this little toy is only 22'! Another giant plane was a 2/7th scale ME 109 weighing a cool 40 lbs. And, yet another slightly large model, a 1/2 — that's right — a 1/2 scale of a Cassutt racer. This, again, was powered by the Rowena motor driving a 20/18 prop. All of these aircraft flew at this meet. Let me quote one brief passage from *Radio Modeller* in a column written by Roy Yates. "It is a requirement of law that such aircraft need to have a certificate of exemption, issued by the Civil Aviation Authority, before they can be operated. Quite stringent limitations should, and indeed do need to be met, both on the ground and in the air. These limitations are enough to dictate that a bona-fide airfield is virtually a must".

A number of other aircraft at the meet were of the more (?) conventional size of 1/4 scale. Wow, I wish that I could show you the pictures that were in this magazine. I really wish that I could have seen the models for myself. Do any one of you readers know anything about the Rowena 55cc engine? Keep in mind that a .60 is 10cc. Looks like you could climb into one of these models with just a bit of urging.

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Engine Clinic

CLARENCE LEE

This month, I have another old time engine to tell you about which will be the 8th engine in this series on old timers. The engine is the Invader .45 and one of those engines I have mentioned in past columns that I have in my collection about which I know little or nothing about.

Supposedly, the engine was designed by an old time model race car man named Bert "Speed" Hannigan. Prior to WWII in the late 30's, model race cars were a very popular hobby. In the San Fernando Valley area, there was a model race car track situated on an old chicken ranch. Several old time race car men I have spoken to remember Hannigan as running his model race cars here and that he was always trying something different. Beyond this, I have never been able to obtain any further information, other than those who have seen the Invader say "Yeah, that was one of 'Speed's' engines."

The Invader .45 that I have came from a good friend who came across it, and parts for several others, in a box at a swap meet in the San Fernando Valley. Included were several experimental piston/sleeve assemblies for Super Cyclones and Hornets using an ingenious method of porting also used in the Invader engine. This method of porting is different than any engine I have ever seen. Some engines have been similar but none the same as the Invader.

You will note in the accompanying photograph that the head of the piston has a "volcano" shaped opening. The actual top of the piston being the floor of the volcano shape. You will note four port windows around the head of the piston. These match up with the four corresponding port windows in the liner which are, in turn, fed fuel from the crankcase by four channels or bypass passages in the crankcase. Under operation, during the bypass cycle, fuel mixture enters the cylinder through the ports in the liner and head of the piston and is directed up through the large hole in the top of the piston. Combustion takes place and the spent exhaust gases exit down the outside slope of the "volcano" head and out four large exhaust ports. The combustion chamber shape of the head matches that of the piston with the spark plug actually extending into the hole in the head of the piston. By doing this, the spark plug ignites only 100% fresh fuel mixture not mixed partially with left over exhaust gases. How well this system would perform under actual operation I do not know as I have never run the engine. I had always intended to borrow one of the piston/sleeve assemblies intended to be used in either a Hornet or Super Cyclone and give it a try. This way, I would have a test engine which could be run with the conventional designed porting and the Hannigan porting. However, this is one of those things that I just never seem to get around to doing — other things always taking precedence.

One other feature of the engine that is a bit different from the conventional is the use of two piston rings in the same groove. This is an old race car trick used by many fellows in the past. Normally, you would take two piston rings and reduce them to half their original thickness. These two rings then fit the groove where one full width ring had been previously used. If the engine had previously used two full width rings, it would now actually have four. These were known as "split rings", the advantage being the elimination of combustion pressure leakage past the end gap in the ring. With the ring end gaps 180° apart, the leakage was reduced. I personally

used "split rings" in many of my old time racing engines, and the first Veco .61 prototypes flown by Cliff Wierick, Phil Kraft and Doug Spreng had the split rings. Production-wise, the thin rings are harder to install, break more easily, and do not seem to offer any real advantage when it comes to engine performance. Hannigan dealt with the split rings a bit differently by using two full width rings in the same groove.

Other than the method of porting, the engine was of conventional rear rotor intake design with a long, upswept venturi. This, along with the rearward swept dual exhaust stacks, gave the engine a very unusual appearance. The engine was extremely well made with the crankshaft using a large ball bearing at the rear and needle bearing at the front.

Although Bert Hannigan was noted for his race car activity, I have a feeling that the Invader .45 was intended for aircraft use. As can be seen in the photograph of the engine, it sports an extremely long one-piece extension shaft that utilizes a 5/16" threaded section for retaining the propeller and then drops down to a 1/4" threaded section for use of a spinner. You can just imagine the "racy" looks a speed job with this engine would have had.

Obviously, this was never a production engine. How many were actually built I do not know. I personally know of five engines in existence — one of these with a serial number of 013. So, I think it is safe to assume that at least this many

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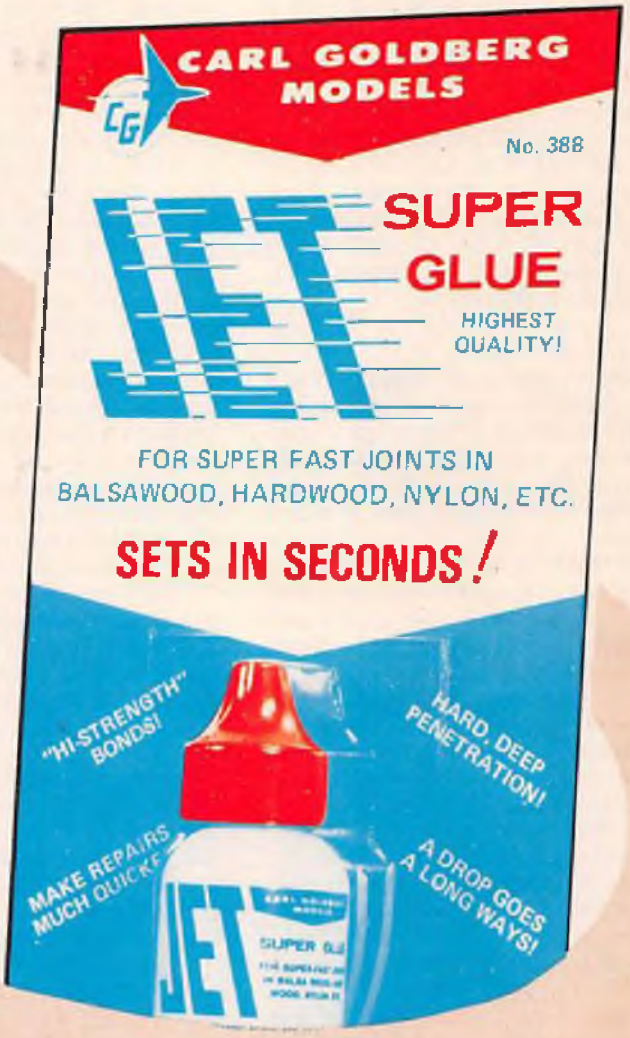

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ALL ITEMS AVAILABLE IN CANADA

from page 10

engines were made. Because of the overall quality of the castings and workmanship, I would guess that Hannigan, or whoever made the engines, had production ideas in mind. I have no idea what year the engines were made but guess them to be post-WWII, when U-control speed was really taking hold. The long extension shaft used on the engine was an item manufactured by Austincraft shortly after WWII (still in business today).

That about wraps up what I know of the Invader .45 — another old time engine that was a bit different from the others. If anyone out there can shed any light or has any additional information on the Invader .45 or Bert "Speed" Hannigan, it would be greatly appreciated. Let's get to a few letters.

Dear Clarence,

I recently purchased a Scozzi ducted fan unit and have ordered one of Bob Violett's A-4D's in which to use it. The instruction sheet that accompanies the Scozzi unit says to use the K & B 6.4 SRII front rotor engine. There is also a picture of the K & B 6.5 with a Perry pump. When I went to purchase the engine at the local hobby shop, they said they did not know of such an engine and the K & B 6.5 could not be had with the Perry pump.

I have also heard that fellows are installing .60 size Perry pumps on the 6.5. Comparing a .60 size pump with the back of a K & B 6.5 front rotor, I do not see how this can be done.

One final question. I understand that a "tuned pipe" should be used for the additional power. The K & B 6.5 front rotor engine that the local hobby shop has in stock is a #9000 with Perry carburetor and a muffler. Can a tuned pipe be used with this engine?

Thanking you in advance for any information you can give to clear up the confusion.

Sincerely,
Bob Jacobson
St. Charles, Missouri

Bob, I haven't seen the latest Scozzi instructions to which you refer, but several other fellows have written me in the past few weeks with letters similar to yours. I do have a Scozzi unit, but mine was an earlier model evidently with different instructions.

First off, the SRII designation is in error. The K & B 6.5 SRII engine was the rear rotor racing engine intended for Formula I racing. The later model of the same engine is now called the 6.5 RSIII. The front rotor 6.5's are an off-shoot of the rear rotor engines, but do not carry an RSII or SRIII designation. There are two versions of the 6.5 front rotor available. The 6.5 (.40) R/C front rotor, catalog #9000, comes with a Perry carburetor and muffler. This engine is intended for sport flying and the Formula 500 events. The second version is the 6.5 (.40) free-flight or pylon racing engine, catalog #9020. This engine comes with a venturi insert (no carburetor) and a short mini-pipe, the same as a 6.5 rear rotor racing engine. The sleeve timing in this engine is different than the #9000 engine to allow for the use of the mini-pipe supplied, or a tuned pipe, if you wish to use one. This is the engine you would want to use with the Scozzi unit.

Perry does not make a pump for the K & B 6.5. Although the Perry pump for the K & B front rotor .40 R/C will fit on the engine, it is not deep enough, i.e., the back plate of the engine extends deeper into the crankcase than the .40 pump. To use the .40 size Perry pump, it would be necessary to machine .180" off of the back of the case. Without doing this, the pump cannot be used. Evidently, when Scozzi printed the picture for their instructions, they thought Perry would be marketing a pump for the engine.

As for using a .60 pump, there is no difference in the pump units themselves. The .40 size and .60 size pump are identical. Only the housings for the various engines that they screw into are different. So there would be no advantage to using a .60 pump over a .40.

To get maximum power from the 6.5, it is necessary to use the large bore pump carburetor. This will not fit the Scozzi mount without being raised approximately 11/32", so something in the way of an adapter has to be made. The final item you will need is the tuned pipe. These are available from both Rossi and OPS. They will connect directly to the short K & B exhaust stub with a piece of silicone hose. I understand Bob Violett, who is the country's #1 authority on the Scozzi ducted fan unit, is using a .60 size Rossi pipe in his A-4D.

Several fellows have written in who have already purchased the K & B 6.5 front rotor R/C with Perry carburetor and they wanted to know if this engine could be used with a tuned pipe in the Scozzi unit. The answer is yes, but with modification. The exhaust port in the sleeve has to be raised .040". This will make it the same as the "pipe" sleeve in the front rotor pylon racing engine, both sleeves using the same transfer and boost port timing. Although the engine comes with a Perry carburetor, it is the non-pump carburetor with a .275 venturi, actually the same carburetor as used on the non-pump K & B .61. The carburetor needed is the .61 pump carburetor that has a .375" venturi, the same as the venturi insert used on the racing engines. The muffler adapter will also have to be replaced with the pipe adapter. So, although the 6.5 front rotor R/C engine can be converted to use with the Scozzi unit, it is a bit easier and cheaper to start with the 6.5 front rotor racing engine.

This seems like a good time to mention that I do have available "Lee Custom" versions of the K & B 6.5 with the Perry pump and pump carburetor for use with the Scozzi ducted fan unit. These sell for $135.00. The engine has the carburetor raised 11/32" to clear the Scozzi mount and comes with the short K & B mini-pipe. If you already have an engine that you wish to send in, the charge to install a Perry pump and pump carburetor, including my normal customizing/blue print procedure, is $57.00 for the 6.5 racing engine (#9020) and $60.00 for the 6.5 R/C engine (#9000). This includes the price of the pump, pump carburetor, and adapter to raise the carburetor in the case of the #9020 engine and the same, plus modification, of the exhaust timing for pipe use, and installation of, a short pipe adapter for the #9000 engine. If you already have an engine, pump, and pump carburetor, the charge is $28.50 for the #9020 engine and $32.50 for the #9000. Postage is $1.50 additional. These prices pertain to new engines only. If the engine has been used and parts are required, there will be additional cost. If someone should wish to have a Perry pump installed on a K & B 6.5 for use other than with the Scozzi ducted fan unit, write for prices and let me know what you have in mind.

Dear Mr. Lee,

I read your column every month and enjoy it very much.

I have two problems that I wonder if you would give some consideration.

First, I have a Veco .61 Series 72 that is giving me a problem and I do not understand the reason. While running at full throttle in the air with the mixture rich enough to see the smoke, it will suddenly kick the prop completely (I've lost 3) and continue to run wild until I realize what has happened and shut it down.

This problem started after a crash that required a maximum repair. I think K & B salvaged the head and prop washer. The fuel had been fresh and I was not having any problems in other engines (10% nitro and castor lube).

The second problem is with the Perry carbs. So far, my experience has been with three of them; two with the Veco .61, the last of these is less than two years old; the third is on a K & B .40, purchased in June 1977. All three had the same defect. The needle does not stay put when the engine is running (as they come from the factory). Most every modeler who I have talked to swears by them and I also see the ads, but, at the same time they tell me how good they are, they also say you have to stretch the spring or crush the female threaded part or mutilate the threads a little on the needle. If this is what's happening all

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To: Satellite City
Arleta, California

Gentlemen:

I am enclosing a print of my PBY-2 "CATALINA" built from RCM plans. The plane was begun in January '77, when my workshop temp. averaged 40 degrees. Without HOT STUFF and baking soda as per your suggestion, I don't think I could have built the model, as the entire hull is planked with 1/64" plywood and at 40 degrees, conventional adhesives would have been nearly inoperative. Your idea about piercing a hole every 1/2" or so in the plywood and dropping HOT STUFF through the hole is analogous to "BLIND RIVETING" in full scale aircraft and worked very well. In some sections of the hull, this was the only method that could have been used. Upon completion in June, (the winters are long up here) the plane and I won the first stand-off scale contest we ever entered. (Northwest Seaplane Championships) So, I want to thank you for a great product in HOT STUFF which I feel was a prime factor.

Very truly yours,

Robert A. Kreuzinger

Bob,
We're pleased that HOT STUFF was a part of this fine piece of craftsmanship! Congratulations-
Bill & Bob Hunter
S/C

ENGINE CLINIC

from page 12/10

over, I wonder why the factory doesn't make a change. I am looking forward to hearing from you.

Sincerely,
Joffre F. Dillon

Nine out of ten times, when an engine throws a prop in the air, it has been caused by flooding the engine on the ground when starting. The engine kicks back several times, loosening the prop which, in turn, later comes off in the air. Also, be sure you are tightening the prop with a good prop wrench — not a pair of pliers. Judging by the mangled prop nuts on engines that I get in for repair, an awful lot of guys do use pliers.

You do not say what you are using for a propeller. Some of the Top Flite regulars are pretty soft and keep compressing. Use the Maples.

Using a glow plug that is too hot and causing pre-ignition can loosen the prop, especially if the engine is being run a little on the lean side. Seeing a smoke trail is not a true indication of whether the engine is running rich enough or not. On a nice, clear day, you will see a smoke trail even with a lean engine. Always go by the sound of the engine, not the smoke trail. I know some guys do not have the "ear" for this, but it is something that is developed with experience. Be sure to use an idle bar glow plug such as the K & B or Fox. There are some discount house glow plugs around that have far too high of a heat range and you can hear the engine frying when using them. If you peak an engine out and detect a slight frying egg sound, the plug is too hot. If, on the other hand, when you remove the starting battery and the engine slows considerably, the plug is too cold.

Possibly, ganging of tolerances when the engine was rebuilt has caused the compression ratio to be a little on the high side. A .015" head gasket would solve this problem. The 1970 and earlier Veco .61's did use a .015" gasket. If you

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Sunday Flier

KEN WILLARD

The Saga of Jenny

March 4, 1886: A son was born to Alonzo and Huldah Ann. He was their first born. They named him Chester. Inevitably, he became known to his friends as "Chet", but not to his mother; to his mother, he was always "Chester". As time went on, he was blessed with two sisters, Susie and Mary, and a brother, Eldon.

Alonzo was a hard working man. He worked as a Teamster at the Hayes Ionia plant. He owned a small house out on Lincoln Avenue in Ionia, on a one-acre lot. He had a large truck garden in the back which he turned by hand with a spade; he could not afford a plow and a horse.

Chester was a good boy, as boys go. His first job was for a comparatively well-to-do neighbor who had cows in a nearby pasture. For 25¢ a week, Chester went out in that pasture and led the cows back to the barn for their evening milking. It was a big pasture, and it took him over an hour each night, seven nights a week, for which he was paid the 25¢. Chester grew, went to grammar school, and on to high school. In high school, he played football - - - not very well, but very enthusiastically. When he was about 18 years old, he met Mildred. She was a stunner from Saranac, Michigan — 10 miles away from Ionia. Her father, Charles Scheidt, was a blacksmith, and they moved from Saranac to Ionia where he set up shop as a blacksmith.

Chet married Mildred. It was a happy marriage, but it was a struggling marriage. They had four children: Keith, Kester, Kenneth, and Genevieve. This was in the era from 1908 to 1913. Chet worked hard and became a postal clerk. He made somewhere around $17 to $18 a week, and he supported his family.

Soon, in Europe, war was raging. As much as Chet loved his family, he loved his country more and, early in 1918, with his brother-in-law Pat, he enlisted in the United States Army Air Corps and was assigned to the Air Service Mechanics School (ASMS) at Kelly Field, Texas. He studied hard and became a rigging instructor and, while he was there, his wife, Mildred, played the piano in the Ionia Theatre. With her meager income as a piano player, and with his allotment which he sent home, they kept the four kids in clothes. Kester and Kenneth got the hand-me-downs from Keith. Genevieve, the sister, got what she could with what was left of the meager income after the bills were paid.

"Chet" Willard with Jenny 2800 during a dual training session.

Chester was a good student in the Air Service Mechanics School, and he was given the opportunity to take flight training to get a rating as a flight instructor. He passed ground school with flying colors. It wasn't like when he was in high school, because here he was really interested in what he was doing. Then he began his dual flight training in the ASMS Curtiss JN-4D2 training aircraft. They had about 12 of them at Kelly Field,

"Chet" Willard (in white leggings) with Jenny 2805 prepares for his third solo flight.

ABOVE AND BELOW: The end of the last flight of Jenny 2805 (with "Chet" Willard flying his third solo flight).

running from Serial No. 2800 up to 2812.

Chet did very well in his dual instruction and soloed. He was not as young as some of the others. This was in 1919 — he was 32 years old and would soon be 33. On his 33rd birthday, he soloed (March 4, 1919). His first solo was a great success. He received congratulations from his classmates. That afternoon, he went up for more solo flights. The second one was successful. On the third, it is not clear what happened but, for some reason, the Jenny crashed nose down and was virtually demolished.

Chet survived, with serious internal injuries — he also lost an eye, and was given a medical discharge from the U.S. Army Air Corps and went back to Ionia, Michigan, to his old job as a postal clerk. He had had a fling at insurance, but he wasn't cut out to be an insurance salesman. He was dissatisfied. His wife, Mildred, continued to help support the four children by playing the piano. With her great love for her husband and her equally great love for her children, she had told them that their father was a flight instructor and had crashed while teaching a student to fly, and the student had frozen on the controls and the resultant crash had injured their father. The children believed this. The facts were that he actually crashed on his third solo flight, but she couldn't bring herself to tell her children that.

Chet went from Ionia, Michigan, to Evanston, Illinois, determined to become better educated. He only had a high school education, plus his training as a mechanic at ASMS. He wanted to

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American R/C Helicopters' NEW .60 JET-RANGER!

SPECIFICATIONS AND FEATURES: RADIO - 4 Channel; ENGINE SIZE - .61; Main Rotor Span - 48"; Flying Weight - 9.75 lbs.; Overall Length - 48.5"; Titanium Main Rotor Shaft; All Shielded Ball Bearings; Heavy Duty Fail Safe Clutch; Fuel Tank Included; Six to Eight Hr. Assembly (Excluding Painting of Fuselage).

$389.00
With K & B .61 and Muffler

$329.00
Without Engine or Muffler

$99.95
FUSELAGE KIT ONLY
Without Mechanics, Engine or Muffler

FINALLY...

A Jet-Ranger Helicopter Kit You Can Afford to Buy and Afford to Fly! (Spare Parts Priced Well Below the Other Jet-Ranger Kit)

RUGGED CONSTRUCTION
TITANIUM Main Rotor Shaft, Fuselage of EPOXY GLASS, Windows and Tail Cone of Rugged, Durable LEXAN.

EASY TO ASSEMBLE
Requires Only 6-8 Hours to Assemble (Excluding Painting of Fuselage)

EASY TO FLY
No Tedious Adjustments Required - High Speed Rotor System For Outstanding Inherent Stability.

At Your Dealer's or Direct • Dealer Inquiries Invited • Prices Subject to Change.

American R/C Helicopters, Inc.
23811 Via Fabricante · Suite 102 · Mission Viejo, California 92675
Telephone (714) 837-2676

from page 16/15

go by himself, but his wife said, "No, we will all go," and they did. For awhile, in Evanston, Illinois, this family of six people (father, mother and four children) lived in a two-room flat on Chicago Avenue. The kids didn't know they were poor, and they weren't. Materially, yes; spiritually, they were rich.

Chet got his degree at Northwestern University. He then became an instructor in the School of Commerce, as it was then called, and gradually worked his way up from an instructor to an Assistant Professor, Associate Professor, full Professor, and finally, became Dean of the Veterans School after World War II. Because the academic profession did not pay well, he also worked at Lord's Department Store in Evanston, beginning as a floor walker. He wound up as a member of the Board of Directors.

All through this time, with internal injuries still plaguing him and with only one eye, he lived a full life. At the age of 72, he died. And from his humble beginnings at 25¢ a week, bringing cows in to be milked from the field, he left his wife an estate of almost a quarter of a million dollars, which he had carefully accrued through judicious investment in the stock market as a result of his knowledge gleaned through his associations with business men in his position in the School of Business at Northwestern University.

He was not the greatest man ever to live, but he was the greatest man I ever knew.

He was my father.

A number of years later, a company in Philadelphia, Sterling Models, headed-up by a great modeler named Ed Manulkin, put out a series of model airplane kits. One of the kits was a 3/4" = 1 ft. scale model of the Curtiss JN-4D2, the famous Curtiss Jenny. In presenting the kit to the public, they set the kit up with the markings of the Air Service Mechanics School, Kelly Field, Texas. The decals included the star on the blue background on the wings and the special roundel of the Air Service Mechanics School, to which they added the Air Service Mechanics School Serial Number 2805.

This kit has been sold by the thousands throughout the United States, and most of the modelers who built it used the decals that came in the kit, and marked their models with the Air Service Mechanics insignia, including the Number 2805. Unknown to them and unknown to me until I researched the archives was the fact that Air Service Mechanics School Curtiss Jenny No. 2805 was the self-same Jenny in which

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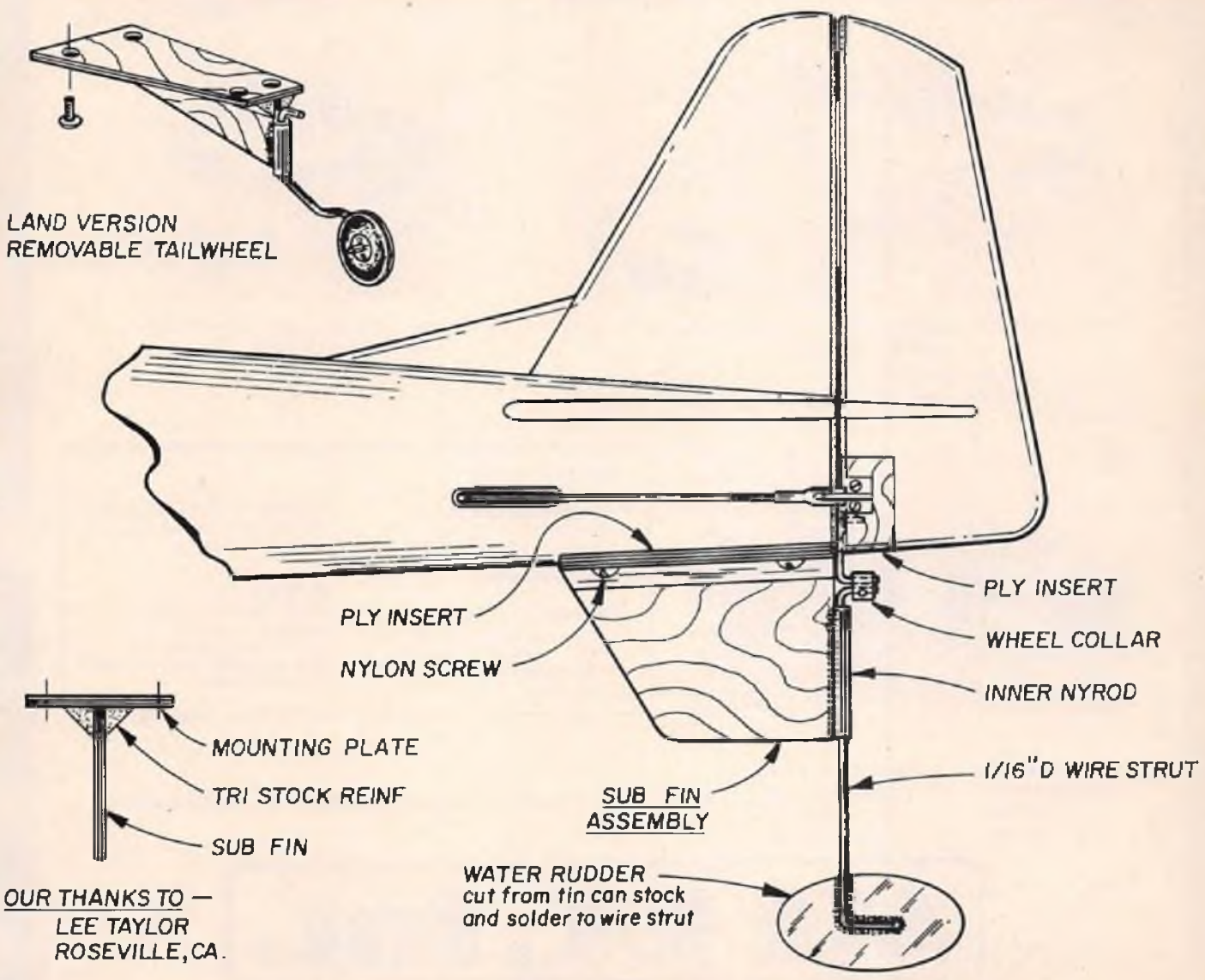
HERE'S HOW

BY JERRY SMITH

MANY MODELERS WOULD LIKE TO TRY THEIR HAND AT FLYING OFF WATER BUT, BALK AT CONVERTING ONE OF THEIR EVERYDAY PLANES COMPLETELY TO THAT CONFIGURATION. THE INSTALLATION OF FLOATS, GLUING ON A SUB FIN, RIGGING LINKAGE TO OPERATE THE WATER RUDDER, IS JUST TOO MUCH TROUBLE TO GO THROUGH FOR WHAT MIGHT BE A TWO OR THREE TIMES-A-YEAR USAGE. HOWEVER, BY USING THE METHOD SHOWN BELOW, CONVERTING ANY AIRPLANE TO A VERY EFFICIENT FLOAT PLANE, AND BACK AGAIN TO A LAND PLANE, IS A SIMPLE BOLT-ON JOB. NEITHER CONFIGURATION INTERFERES WITH THE OTHER. YOU LITERALLY GET TWO AIRPLANES, A SEAPLANE AND A LANDPLANE, FOR THE PRICE OF A LANDPLANE AND A SET OF FLOATS!

THE BIG HANGUP HAS ALWAYS BEEN THE SUB FIN, (NEEDED FOR INCREASED VERTICAL STAB AREA) AND THE WATER RUDDER LINKAGE. THESE HAVE ALWAYS BEEN RATHER PERMANENT INSTALLATIONS AND MESS UP THE USAGE AS A LANDPLANE. THE USE OF FOUR SMALL SCREWS AND A WHEEL COLLAR COMPLETELY INSTALLS OR REMOVES THE SUB FIN / WATER RUDDER CONFIGURATION IN SHORT ORDER.

THE SUB FIN SHOULD BE ABOUT 20 - 25% OF THE VERTICAL FIN AREA AND THE WATER RUDDER GENERALLY ABOUT 2" LONG BY 1" HIGH. 1/3rd OF THE WATER RUDDER AREA SHOULD BE AHEAD OF THE WIRE STRUT. THIS MAKES IT EASIER TO STEER AND HELPS ELIMINATE POSSIBLE RUDDER FLUTTER.



OUR THANKS TO —
LEE TAYLOR
ROSEVILLE, CA.

DIGITAL COMMANDER
THREE CHANNEL SYSTEM KIT

SINCE ITS INTRODUCTION LAST SUMMER, our Three Channel System Kit has gained tremendous popularity in the field. Its flawless performance, easy assembly, sensible mechanical layout, and low price all have combined to make a radio system kit that is one of the best bargains in the industry today.

Now we are adding another dimension to this concept: transmitter conversion kits so the Three Channel System can be upgraded to five or seven channel operation . . . the builder can start at an economical novice level with a Three Channel System and, as he gains competence, he can add functions at a minimum of expense; none of his equipment is obsoleted.

The conversion contains an additional stick assembly, a new case, and complete instructions for performing the conversion. All existing electronics and hardware are utilized.

Since the receiver has eight channel capability, all that needs to be added is more wires and connectors plus additional servos for each additional channel.

If you didn't buy a Three Channel before because you knew you would want to go to more channels later, you no longer have any excuse.

THREE CHANNEL SYSTEM KIT WITH STANDARD FLITE PACK
10G30 $119.95

NOTICE. . .This higher price will be in effect Jan. 1, 1978. If we receive your order postmarked before Jan. 1, we will still honor the introductory price of $109.95.

THREE CHANNEL SYSTEM KIT WITH MICRO FLITE PACK
10G30M $124.95

FIVE CHANNEL TRANSMITTER CONVERSION
11G35 $21.95

SEVEN CHANNEL TRANSMITTER CONVERSION
11G37 $26.95

TRANSMITTER
- Expandable to more than three channels.
- Open gimbal two axis stick.
- Quality throttle stick with trim.
- Battery condition meter.
- Uses 9V dry battery.

RECEIVER
- Double deck design for small aircraft.
- CMOS Decoder for low current drain
- Eight channel capability.
- Light weight

AIRBORNE BATTERIES
- GE 450 mah or 100 mah Ni-cds.
- Charger furnished.

SERVOS (TWO FURNISHED)
- Quality D & R Bantam or Dunham Micro mechanics.
- High performance Signetic 544 amp.
- One comes assembled.

AVAILABLE ON ALL AMERICAN R/C FREQUENCIES.

ACE R/C, Inc.

PLY FUSELAGE, FOAM WING TRAINER
FOR THE NOVICE AND SPORT FLYER

NEW! ALPHA

DESIGNED BY TOM RUNGE

50L212 ALPHA KIT $19.95

The Alpha offers what most novices and sport flyers are looking for--an attractive airplane that gives durability and flyability at an economical price.

Lite plywood fuselage construction and double sparred foam wing assure the strength necessary to hold up under rigorous flight conditions.

In addition to the strength, the high wing with a-flat bottom airfoil provides stable flight with good slow speed and glide characteristics.

Complete hardware included.

Alpha--the ideal small sized trainer/sport airplane from the small plane experts, Ace R/C.

THE ANATOMY OF A SERVO

When you look into a servo, what do you want to see . . . . .Power?--the Ace R/C Digital Commander Bantam servo is powerful enough for the .60's (about 5 lbs. of thrust from the inner hole). Speed?--Almost as quick as you can move the stick (about a half second for 90° rotation). Strength?--heavy duty gears that can stand the punishment. Resolution?--better than 1%. Size?--measures only 3/4" X 1 3/8" X 1 1/2" and weighs only 1.25 oz. Cost?--how about $23.95 for a kit and $29.50 for an assembled unit.

A state-of-the-art Signetics 544 amplifier with external drive transistors, top quality mechanics, motor, and pot all combine in the Ace Bantam Servo to give the performance you want when you look into a servo.

DIGITAL COMMANDER BANTAM SERVO
14G20 Bantam Servo, Kit $23.95
14G20C Bantam Servo, Assembled $29.50

Separate servos come less connectors. Will work with any positive pulse receiver (if you have a negative pulse receiver, a 14G18, Pulse Inverter, $2, is needed for each servo.)

We have other servo options available including the popular new Micro, plus flite packs and complete systems. See our catalog for complete details.

Please send me your complete catalog. Enclosed is $1.00 which is refunded on my first order. (Add $.50 for 1st class mail return; add $1.00 handling on all other orders.)

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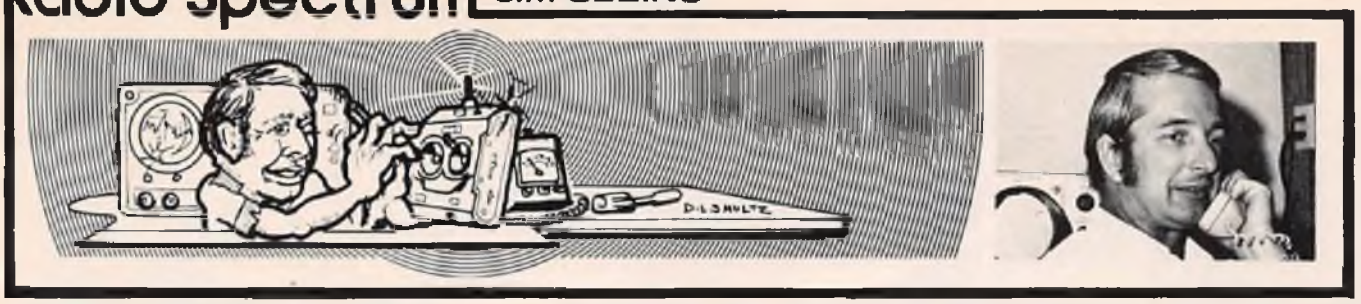
ACE R/C, Inc.

BOX 511B, HIGGINSVILLE, MO. 64037

Radio Spectrum

JIM ODDINO



In most parts of the Northern Hemisphere, it's that time of year when a young man's fancy (and some old guy's, too) turns to thoughts of the super plane he's going to campaign with in 1978. Yes, even in Southern California, we do stop flying for a weekend here and there and think about the next contest season. Should I build another Curare or should I try to come up with something that can beat a Curare? Should I stick with the Rossi or try a Super Tigre rear exhaust ABC? Eventually, we get around to the question, do I need a new radio control system? Unless you sit down and think about what you want in a system and what you need, it is kind of hard to answer that question. I decided to do just that. I started with the transmitter.

Transmitter:

(1) The transmitter must have good RF power output. I think a half watt is a minimum and I can't think of any reason not to have the full legal output with some of the high efficiencies that can be achieved and with fast charging available. The RF section should also be capable of operating with the antenna down or off without damaging the circuits.

(2) The RF section should be capable of being changed at the field in order to change frequencies or even bands. I watched a lot of guys overcome what could have been disastrous results at Dayton at the 1976 Nationals by simply changing modules. If you always fly at the same field, this may not be a problem, but it sure is a shame to waste time when there is only two or three of you at the field and you're all on the same frequency — and the other guys are fooling around with ground checks all day.

(3) If I were going to get a new transmitter, I'd want one of those new fangled encoders that can be programmed such as the Kraft Signature, Millcott Specialist or Royal Omega. The pots that you adjust to optimize your airplane ought to be easily changed so that if you switch airplanes, you don't need another transmitter. Just pop in another programming board. All the active circuits could stay in place. If you're going to compete, you probably want two transmitters but it would be nice to have them interchangeable with your two airplanes which are never exactly alike. Switchable programming boards are the answer.

(4) The encoder would incorporate exponential servo/stick response or dual rate capability. This allows you to have insensitive controls for smooth flying around neutral and sensitive controls when you need it for spins, snaps, vertical rolls, etc.

(5) Another feature that would be nice, and is easy to incorporate in encoders with operational amplifiers, is variable trim sensitivity. On a new plane, you can have plenty of trim available, and after you get it set up, you can cut this to a minimum. Then you don't have to worry about someone knocking your trim levers when your transmitter is in the impound.

(6) A built-in mixer might be nice to have and might even be a necessity if we change the pattern to a lot of maneuvers with square corners. It might take a control-line set up with coupled flaps and elevators to achieve the desired results.

(7) One of the most important things is precision gimbals that have no slop and return to exactly the same neutral every time. Almost everyone has gone to the so-called "open sticks" in order to eliminate the slop in the bales associated with closed gimbals. However, just because they're "open" doesn't mean they're precision. So be careful when you read the ads.

(8) The sticks should be adjustable in length or replaceable with sticks of various lengths. Variable tension would also be nice. The whole transmitter must be a comfortable size and it would be desirable to have it compatible with a tray.

(9) I don't have to mention that it must be extremely stable with varying voltage and temperature and have no interaction. It should have good low impedence batteries that can be fast charged reliably from a 12 volt auto or motorcycle battery. A seven cell 8.4 volt pack might insure this capability.

(10) It ought to have a built-in expanded scale voltmeter to tell you what the condition of the battery is.

(11) I left servo reversing until last because I'm really not sure I want it. If I had a transmitter with this capability, I'd want a means of making sure they couldn't get switched inadvertently.

Receiver:

(1) If we're going to have plug-in RF sections in the transmitter, we ought to have them in the receiver, too, although it isn't that much harder to switch complete receivers when you want to switch frequencies. It is more expensive, however. Another thing that makes plug-in modules attractive is the ease with which one could switch to new bands that might become available, such as the 30 to 40 MHz frequencies that have been suggested. The plug-in modules should not result in a large receiver. We still want minimum volume and weight here.

(2) If we have plug-in modules, we will probably need crystal or ceramic filters in the IF. If we go crystal, we might think about going to 10.7 MHz and eliminate image problems. Dual conversion is another solution to that problem.

(3) The receiver must have good sensitivity and still not be bothered by overloading or cross-modulation, which might occur when taxiing under someone else's antenna. It should have low noise and probably be narrow band. It is possible that we might have channels spaced closer together in the future. In Germany, they are now only 10 KHz apart compared to our present 80 KHz.

(4) The receiver should work on low voltage just in case we have a cell in our battery pack go out. We also would like to have a low current drain so our batteries last as long as possible. Fast charging minimizes the importance of this feature.

(5) The decoder should be capable of driving two or more servos and it should reset if no signal is received. This eliminates the chance of servos driving hard over if we turn our transmitter off first.

(6) I would like to see no cables on the receiver. The cables are the one thing that look bad and, for that matter, actually go bad, with time, on the receiver. A properly mounted receiver should last for ten years if we get rid of those cables.

(7) I haven't mentioned it because it isn't legal on 27 or 72 MHz, but it might be desirable to have this system on FM.

Servos:

(1) The servos must have good resolution resulting in precise return to neutral and some output for even the smallest input. They should be linear, meaning the output should be proportional to the input over the entire range, and the travel should be the same in both directions.

(2) The cases and gears should be physically strong to endure the vibration

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Lanier Ready-to-Fly* Models

...every one designed and flown by the experts!

*** ASSEMBLE IN 5-12 HRS.**

Four Easy Steps to R/C Flying

1. Glue pre-cut wing halves together.
2. Mount tail surfaces.
3. Attach control surfaces.
4. Install engine and equipment (not included).

NOTHING to cover or paint.

NEW FEATURES

- Faster assembly. We Pre-Hinge® ailerons and elevators on all models, rudders on most.
- Better value. Prices of Lanier models have gone up, but they haven't skyrocketed like balsa kits. Even if you don't count your labor, a Lanier kit costs less.

the straight story

- Lanier planes fly better because automatic machines mold every wing accurately and true. Wings and stabilizers are molded from styrofoam and pre-covered with special hard skin. Elevator, rudder, and ailerons are balsa covered with Air-O-Skin.
- Lanier planes fly better because every fuselage is vacuum formed from Air-O-Sheet & assembled with specially made tools to make sure it's straight. Air-O-Sheet is tough, pliable material that will not shatter like fiberglass and other plastics. Fuselages are complete with motor mounts, engine cutouts and dorsal fin and are available in several colors.
- Models have nose and main landing gears pre-formed and aileron linkage ready for installation.
- Models are fuel resistant.
- Interchangeable spare parts are available.
- All kits come with step-by-step instructions and Air-O-Cement & hardware.

LEARNING R/C?

We have found that leaving off the wheels on our Comet 35 & Transit (and others) is a big help for beginners.

A landing in short grass is easy where wheels can snag and cause a bad spill. Use a nylon prop & hand launch the model.

Len

IMMEDIATE DELIVERY FROM Our complete stock of kits and parts . . . thru your dealer or direct. Same day shipment—prepaid.

CANADA DISTRIBUTOR
Southwestern Hobby
5540 Wyandotte St. E,
Windsor N8SIMI, Ont.

CAPRICE $73.50

Flies with rudder, elevator, aileron and motor control

designed by George Hill KIT LA 116

63" PATTERN/SPORT

Span: 63 in.
Area: 630 sq. in.
Wt. Complete: 6¼ lbs.
For .50-.61 engines

HARD SKIN WING AND STAB

FLIES COMPLETE AMA & FAI PATTERNS

WAYNE VOYLES REBEL BIPE NEW $99.50

DELUXE KIT NOTHING TO BUILD. . .

LA 159

JUST ASSEMBLE & FLY!!

Span: 50"
Power: .60
Wt. with std. Radio 6#-0

PRE—CUT FUSELAGE TRIM & SUNBURST DESIGN FOR WINGS.

Transit

LA 108

$44.50

Span: 65 in.
Area: 520 sq. in.
For .35 or .45 engines

Flies with motor, rudder, elevator control. (No ailerons).

Wing, Stab & Fin covered with "Toughskin"

SCAMP $52.50

LA153

50" PATTERN/SPORT

Span: 50 in.
Area: 350 sq. in.
For .25 or .40 eng.
Wt. Complete: 3 lb. 10 oz. with standard 4 ch. radio

Flies with rudder elevator, aileron and motor control.

- Pre-Hinged Rudder and Elevator
- Complete Push Set included (not wheels)
- Bolt or Rubber Band wing hold down
- Steerable nosegear
- Ample fuselage room for 4 channel radio
- Plywood reinforced aft fuselage

Comet 35 Smaller Size Lanier Model

50" SPORT/TRAINER

LA 154

$52.50

Span: 50 in.
Area: 350 sq. in.
For .19-.35 engines

Flies with rudder, elevator, aileron and motor control.

- PRE-HINGED RUDDER & ELEVATOR
- COMPLETE PUSH SET INCLUDED (NOT WHEELS)
- BOLT OR RUBBER BAND WING HOLD DOWN
- STEERABLE NOSE GEAR
- AMPLE FUSELAGE ROOM FOR 4 CHANNEL RADIO
- PLYWOOD REINFORCED AFT FUSELAGE

Comet II

63" SPORT/TRAINER

LA 105

$58.50

Flies with rudder, elevator, aileron & motor control.

Span: 63 in.
Area: 830 sq. in.
For .50 or .61 engines
Wt. complete: 6 lb. 4 oz.

Features plywood aft fuselage reinforcing

Cessna LA 119

48" - 3 CHAN. TRAINER/SPORT

$46.50

Flies with motor, rudder, elevator control. (No ailerons).

Span: 48 in.
Area: 480 sq. in.
For .15 or .19 engines

$46.50 Pinto

48" - 3 CHAN. TRAINER/SPORT

LA 146

Flies with rudder, elevator and motor control.

Span: 48 in.
Area: 480 sq. in.
Wt. complete: 3 lb. 8 oz.
For .23 or .35 engines

RADIO SPECTRUM

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they are going to be subject to. We also need rugged cables and connectors that can survive our pulling and tugging.

(3) The output should offer a choice of rotary (wheel or arm) or linear (push-pull racks). Both have advantages in certain applications.

(4) After watching Bill Salkowski practicing snap rolls, I'm thinking we could use faster, more powerful servos to get those big rudders over right now. We still need good damping to eliminate overshoot and undershoot or creeping into position.

(5) I've said for years that I thought the decoupled feedback pot was a necessity to keep vibration out of the pot, although this will increase backlash in the servo. I'm not sure what the ball-bearing buys you on the output. Might be a sales gimmick.

System:

Throw in a good switch harness and airborne battery that lets you monitor and charge without taking the airplane apart and you ought to have a pretty nice system. It would also be nice to have a cable that allows you to operate the controls in the plane from the transmitter. Without transmitting RF, this is pretty easy to incorporate. Some of you might want buddy-box set-ups and it might also be nice to monitor the airborne battery on the transmitter expanded scale voltmeter. A timer to pace your flight is another "extra".

You can probably find most of these features offered someplace, but I don't think any one system on the market has all of them. Almost makes me want to go away and engineer a new system. However, I'm going to go back and dream about my new airplane and what color I'm going to paint it and let someone else do all the work. While I was at the Las Vegas Tournament of Champions, I pursued this question with some of the competitors. I was amazed that most of the guys were pretty satisfied with the equipment that they had. Of course, they would all like to have the systems fly forever, but the only way I know you would stand a chance is to trade it in every 1,000 flights or so. Even if you flew 100 flights in an old plane and then planned to fly 900 in your good planes before starting the process all over again, sooner or later, you would lose a good one. But that would be one way of keeping your "good" planes flying forever.

The other big concern of top pattern flyers is servos. They all want perfect neutrals with extremely smooth response. They all thought we were making progress in this area.

No one talked about it much, but you never saw such an assortment of buttons and switches on transmitters. We talked about ways of incorporating "snap" buttons after last year's Las Vegas contest and I'm sure there were some in use this year. This kind of brings up a subject that Bob Elliott of EK Products and I discussed at Las Vegas, namely computer programmed flight. Bob called it "un-radio control" because it takes control away from the pilot. This idea is not new and many people are concerned that someone might program the perfect flight. This is never going to happen because of a number of factors which are beyond our control. Don't get me wrong: I think we will see programmed maneuvers but they won't be perfect. I've been involved in guided missile programs where we tried to "program" a maneuver. Even with a well understood guidance system, the results were less than perfect. The way we approach perfection is to "close the loop": that is, to monitor the results and make the output equal to some standard by constantly making corrections. I don't know of any sensors available that can determine if a loop is perfectly round, so how are we going to feed back any info to our programmed input to make corrections for wind velocity and heading, as well as initial attitude variances. The answer is to put a pilot in the loop who can see the path of the plane and make the required corrections. Therefore, I can visualize a computer used to program a nominal maneuver with the pilot making small corrections around this nominal input. I'm sure the purists will scream but all is fair in competition and, if someone can figure out how to gain an edge, he'll do it.

We got an interesting letter from Switzerland on this subject that gives you the insight as to how a microprocessor might be used to program a maneuver. I hope RCM will share it with you.

★

Knowing that most of you made it through high school and are experts in all phases of flying, I thought I'd try one of my daughter, Sue's, high school algebra problems on you. I modified it slightly.

A pilot takes off from the local airport and flies directly into the wind for 10 miles at constant speed. At that point, he passes a balloon drifting downwind towards the airport. He continues to fly straight ahead for an hour then turns around and flies downwind back to the airport where he arrives at the same time as the balloon. What was the wind velocity? If you can figure that out, you ought to be able to figure out the speed of the airplane, right?

Send in your answers and we'll see if you guys are really reading all this stuff.

★

Last month, we started talking about the new generation of transmitter encoders, and we showed how operational amplifiers are used to perform a number of "signal conditioning" functions that

allow us great versatility. This month, we'll show you how we take the inputs from a number of channels and feed them into one op amp and then how the output of the op amp is transformed into a pulse width.

The device that allows us to share one op amp with all channels is called a multiplexer. We can think of a multiplexer as an eight position switch, as illustrated in Figure 1.

If we can picture the switch being stepped at the end of each timing interval, we can see that the output of the op amp will be successfully controlled by the voltages set on the control pots (and other functions that might be summed in). The output of the op amp might look like Figure 2.

Notice that the top trace looks like just the thing we need to modulate our RF section. If we can convert the voltage out of the op amp to this wave form, we'll be in business. Notice that we need a binary counter to interface with the multiplexer in order to make it switch at the right time.

A straightforward means of generating the familiar "concertina" wave form is by making an oscillator with a couple of comparators, a transistor switch and a timing capacitor, as shown in Figure 3.

The timing capacitor charges linearly until it reaches the voltage out of the op amp. At that point, Comparator No. 1 switches from high to low, Comparator No. 2 inverts this and turns on the transistor discharging the capacitor, at which time it starts charging again. At the same time, Comparator No. 1 switches, No. 3 also switches and produces the wave form desired to modulate the RF and clock the multiplexer. If you can't understand this explanation, just hesitate to write. I think within the next year, you'll see all of these functions in one chip and you won't need more than a handful of external components to do what the Kraft, Signature, or Royal Omega encoders do, and you won't care what is inside or how it works. Eventually, we'll go full circle and anyone who can solder will be able to build a complex system by interconnecting a few "black boxes" that are inside integrated circuits. We'll still need a few innovative guys to design the integrated circuits so I'm hoping to inspire a few of you who are in the integrated circuit business to think RC and build devices we can use.

★

We've kind of rambled this month, but I think we ought to answer at least one letter. Most of us take things like charging jacks for granted, but there apparently are some systems out there that don't have them.

Dear Jim:

Thank you for a wonderful column. Some of your stuff goes way over my head, but I'm trying to hang in there.

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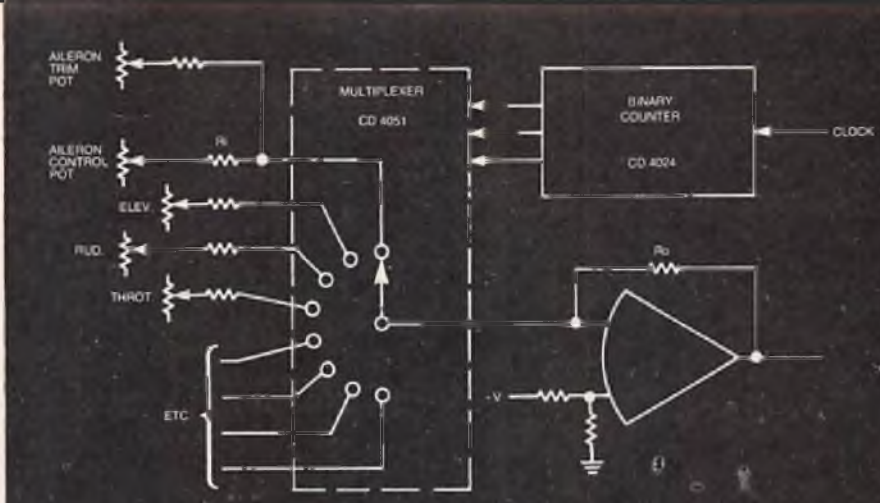


FIGURE 1

FIGURE 2

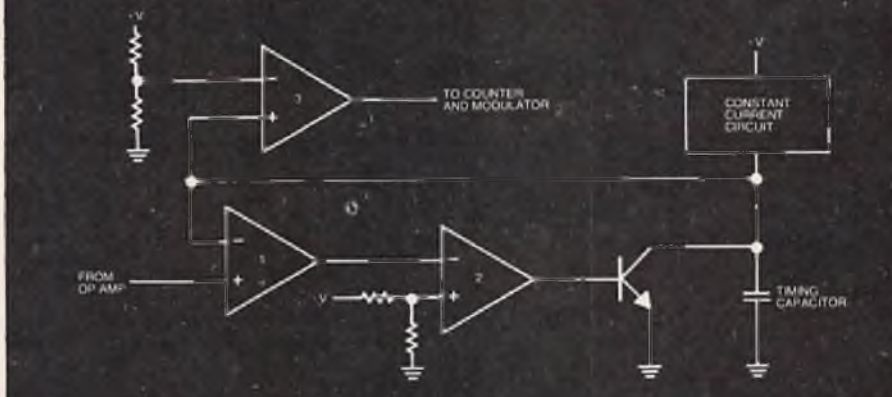


FIGURE 3

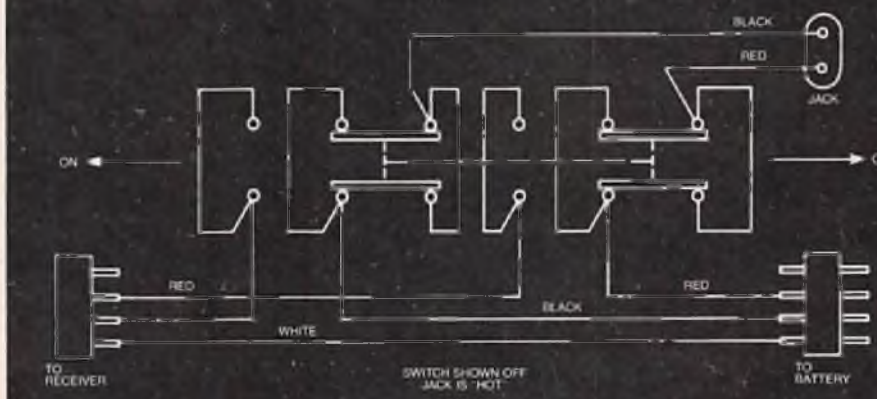
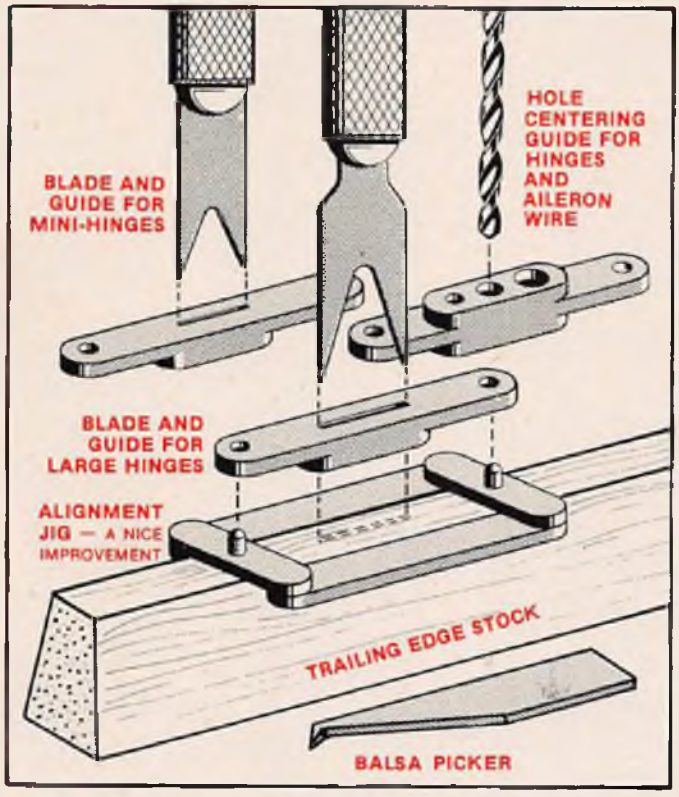


FIGURE 4

New! DU-BRO
KWIK-HINGE SLOTTER



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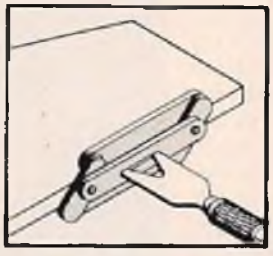

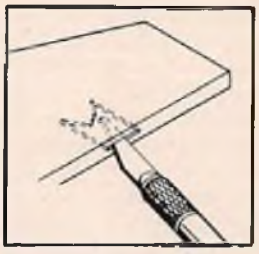

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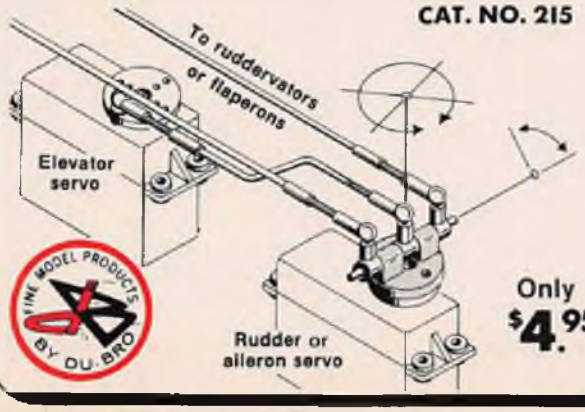

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RCM PRODUCT TEST

Tri R Models
N. AMERICAN YAT-28E

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			NA		
Quality of Fiberglass			NA			Fidelity to Scale	●				
Other Materials			●			Flight Performance		●			
Accessories			●			Overall Appeal		●			
Die-Cutting			NA								

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

The North American YAT-28E by Tri R Models, has a lot of potential for either the scale or sport scale enthusiast. The big, wide fuselage and roomy engine compartment are well suited for full cowling, scale exhaust (which is unique), and interior detail which could really impress the judges. Other noteworthy features include the fully built-up fin, rudder, stabilizer, and elevators. For the purist, there is also plenty of room (and materials provided) for enclosed aileron and elevator pushrods.

Some caution is in order however - - - this is not a model for the inexperienced builder. Most scale models on the market today are highly prefabricated in comparison with the YAT-28E, consisting of sheet stabs, rudder, pre-formed or slab fuselage construction, etc. By contrast, the YAT-28E utilizes a number of construction jigs which require careful alignment. The fuselage and **all** surfaces are built-up. Most of the fuselage is planked with 1/8" x 1/2" balsa strips and, while not difficult, does take time and care in fitting. The bonus, of course, is in the weight reduction. This is a **large** model - - - the fin measures 12" above the fuselage - - - yet our finished product weighs less than 8½ lbs. ready for take-off. Our prototype was done using K & B lightweight glasscloth with resin. All finishing materials were K & B Super Poxy.

Materials provided are of generally good quality, although the canopy is rather thin for its size and a little too flexible for our liking. Included in the kit were large decal sheet, landing gear wires, pushrods, bellcranks, blind nuts, screws, washers, wheel collars, elevator horn, and hinges. Also provided was a scale spinner and prop blades (for static display only). Our major criticisms were limited to the instruction manual and, to a

to page 171

SPECIFICATIONS

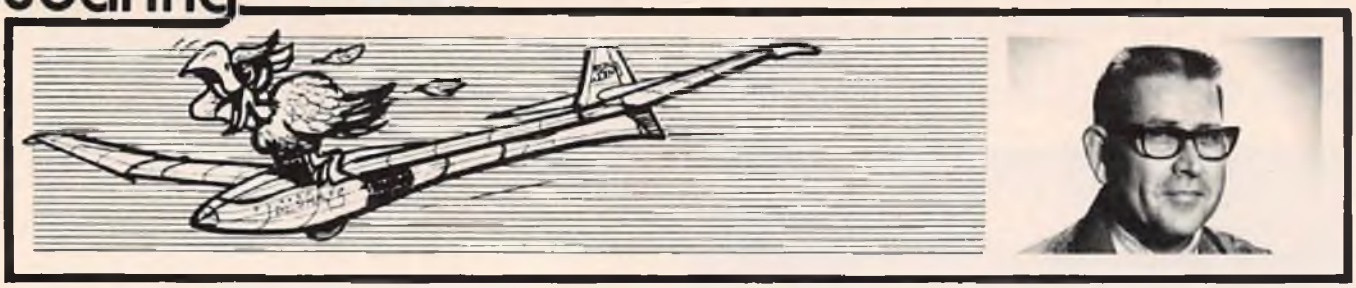
Name ..... North American YAT-28E
Aircraft Type ..... Scale or Sport Scale
Manufactured By ..... Tri R Models, Inc.
1747 Rush Rd.
Wickliffe, Ohio 44092
Mfg. Suggested Retail Price $129.95
Available From ..... Direct from Mfg.
Mfg. Recommended Usage ..... Sport or Stand-Off Scale
Wing Span ..... 66 Inches
Wing Chord ..... 11.5 Inches (Avg.)
Total Wing Area ..... 760 Square Inches
Fuselage Length ..... 55 Inches
Radio Compartment Dimensions ..... (L) 13" x (W) 7" x (H) 4.5"
Wing Location ..... Low Wing
Airfoil ..... Semi-Symmetrical
Wing Planform ..... Double Taper
Dihedral ..... 4-15/32 Inches
Stabilizer Span ..... 32 Inches
Stabilizer Chord (incl. elev.) ..... 6 Inches (Avg.)
Total Stab Area ..... 192 Sq. In.
Stab Airfoil Section ..... Symmetrical
Stabilizer Location ..... Top of Fuselage
Vertical Fin Height ..... 12 Inches
Vertical Fin Width (incl. rud.) ..... 7.5 Inches (Avg.)
Mfg. Rec. Engine Range ..... .60-.80
Recommended Fuel Tank Size ..... Not Recommended
Landing Gear ..... Tricycle
Rec. Number of Channels 4-6
Recommended Control Functions ..... Rud., Elev., Throt., & Ail.
Flaps, Retract Gear
Basic Materials Used In Construction:
Fuselage ..... Balsa
Wing ..... Balsa
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See Text
Plan Size ..... 30" x 42" (4 sheets)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... Yes (7 pages)
Construction Photos ..... No
Kit Includes ..... Shaped Parts
Mfg. Rec. Flying Weight ..... 120-136 ozs.
Wing loading based on rec. flying wt. ..... 22.7-25.8 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 121 Ounces
Wing Loading ..... 22.7 oz./sq. ft.
Covering & finishing materials used . K & B Glass Cloth & Super Poxy
Engine Make and Disp. ..... Webra 61
Muffler Used ..... Dubro
Radio Used ..... Kraft
Tank Size Used ..... 11 Ounces

Soaring

AL KINDRICK



This month, we salute Barbara Henon, Vice-President, League of Silent Flight. Barbara is a past L.S.F. winner, very active in the S.F.V.S.F., and an eager contestant in West Coast contests. She is also a member of W.I.N.G.S., a contributing editor for their fine newsletter. All in all, a very active gal. True to the expression, "If you want something done, give it to a busy person".

★

Barbara Henon, Vice President, LSF. Active West Coast flier, WINGS member and a director for SFVSF.

With the man-on-man, or pilot-on-pilot, concept ever increasing in popularity, the landing is becoming a very important part of the assigned task as a point getter. Look at the scores from a man-on-man contest - - - very few points will separate the top five to eight places.

A pilot who travels the contest circuit will find himself confronted with different types of landing conditions: grass, loose and hard dirt, asphalt, concrete, and sod. Landing skids used for one field may not be acceptable at another flying site. I have seen a hard rubber landing skid used for a grass field, and the landing sailplane slid 8' to 10' past the spot. This situation makes the landing skid a very important part of your sailplane. A

The right skid material used on your sailplane will add to your landing points as discussed in text.

skid that can be easily changed or removed would be "Utopia". I am going to present to you the closest that you could come to that perfect skid.

On the right side of the picture, you see a 2" wide, smooth face, no open cells exposed, adhesive backed neoprene rubber pipe insulation material. This skid excells on hard dirt or oiled landing surface. The adhesive back has good adhesion and will hold the skid on a contoured or rounded fuselage. Two layers really absorb severe landing shock.

The material on the left is automotive weather stripping. It comes in a variety of widths up to 3/4", and the adhesive back is the best I have seen. The neoprene is open cell — open cells exposed on the face — and not as dense a material as the pipe insulation. It will not absorb a severe landing shock, but sure grabs onto asphalt or a concrete surface.

Material in the center is the real "grass grabber". It is made by cutting a doormat into 1" strips. The construction of this mat is neoprene with 3/8" high conical points on 1/4" centers. Because it is a doormat, there is no adhesive backing, but it can still be easily attached with double sided tape, foam servo mounting tape, or by cutting away 3/4" of the conical points on both ends of the skid down to the base material. This leaves a step, or ledge, that can be easily taped to the fuselage bottom. More sophisticated flyers can make a rectangular plywood washer and wood screw it to the nose and fuselage bottom.

This skid excells on grass, wet grass or sod landing surface, and it absorbs a tremendous amount of shock.

Sections of cog or link belt, sections of "V" belts, strips of indoor/outdoor carpeting, strips of hard felt and plywood strips on edge will make a skid and will stop your sailplane, but will offer none or little shock protection to your sailplane and radio installation.

A landing skid is one item that the builder has to install and use according to his flying conditions. The kit manufacturer will suggest, or even include, a skid, but you, the pilot, must determine what is best for you.

There is not a contest director in the field of sailplaning who would knock off landing points for shedding or losing parts of the landing skid material.

The pipe insulation is available from plumbing or refrigeration supply houses. Obtain auto weather stripping from Sears, Wards, or auto supply stores. Doormat can be purchased at a local hardware or discount store.

★

Windspiel Models is introducing a new spoiler/flap unit that can be built into new construction or added to your existing wing with very minor alterations. It is a flush-mounted, fiberglass constructed unit that deploys by raising the center section.

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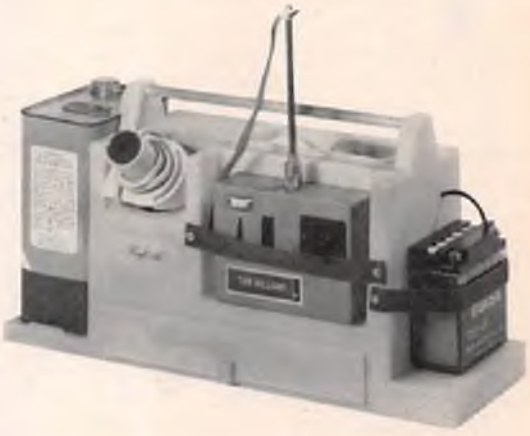

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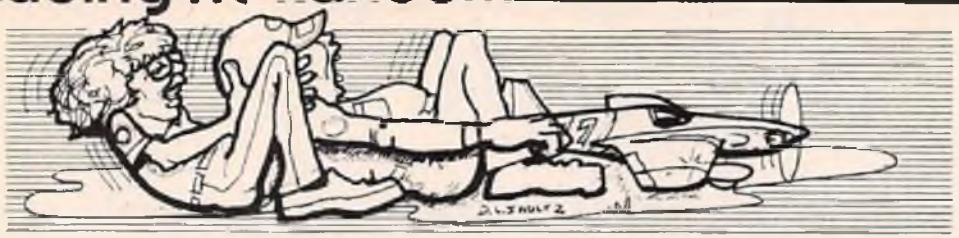
Racing At Random

FRED REESE

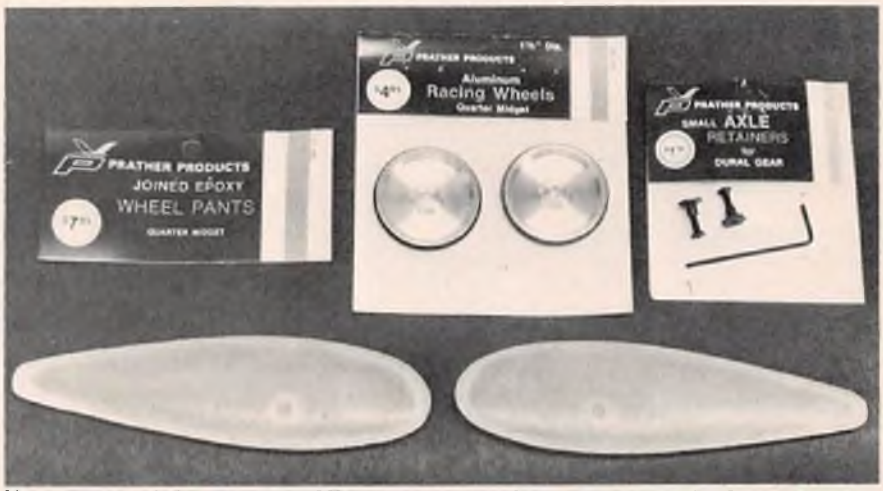


The following letter relates a problem that affects us all. I held off answering until I finished the glass and foam LR-1A Quarter Midget kit I was building to evaluate what I did, relative to this letter. The letter is from Harold Newby, Catano, Puerto Rico.

Dear Fred,

So far, I have built the House of Balsa "Shoestring", an LR-1A, "Rickey Rat", and P-51 Quarter Midgets, and I cannot get any of them to weigh less than 3 pounds. I have used the paint (spray) sparingly and installed the equipment with no trays, only on rails. I use only 225ma battery packs. All of the models have epoxy fuselages except the Shoestring. I use only small D & R servos and they all still weigh out between 3 and 3½ pounds. I want to turn left and go fast, but I also want to be in the front when I do it.

The answer is not simple, yet actually the solution is simple. To build light, we must do less; that is, we must build lighter structures, use less glue, less epoxy, less fillers, less paint, less primer. This also means that we must sand more, choose wood more carefully, and replace wood in a kit if it is too heavy, and hollow the blocks and the thick sheet parts if they can structurally stand lightening. We are fighting an escalating weight problem from the engines - - - each new engine that is more powerful is also heavier. The associated motor mount is also heavier and the engines now require exhaust extensions and larger fuel tanks which further increase the weight. At the same time, aircraft size has increased. Wingspans have increased from about 36" to over 40" now on most of the new kits. The new engines are more powerful and the larger airplanes fly better - - - but, keeping the weight down is more difficult. For example, my LR-1A that I finished for the Nationals weighed 2¾ pounds, which is 4 ounces overweight. While building, I did not feel I added excessive epoxy or fiberglass; yet, when I examined the wreckage after a splattering full bore crash on asphalt that destroyed the airplane, engine and split apart servos, I found the two major areas of additional reinforcement intact. The firewall was solid in the nose of the fuselage, yet the fuselage aft of the firewall was destroyed because I had added lots of extra epoxy and cloth and fibers around the firewall. An equally strong firewall mount could be achieved by more careful packing of glass fibers in the gaps between the wood and fuselage and reducing the total volume of epoxy used. The wing center joint is the other area of major reinforcement. After the crash, the wing had some cracks and splits, but the center joint was intact and the wing could even be repaired to fly again; yet, the impact broke the engine crankshaft and sheared all four hardened bolts in the engine mount. Surprisingly, most of the unreinforced fuselage aft of the wing survived the crash and, although the rudder and elevators were ripped off, the stab and fin joints were not cracked. Because we don't always know how strong is strong enough, we tend to over-reinforce by pouring in extra epoxy. I am sure I used at least an ounce of epoxy to secure the wing hold-down blocks and landing gear block in the foam wing. Actually, all three are really supported by the fuselage itself; the gear block is sandwiched between the metal landing gear and the fuselage by two large bolts, and then has glass cloth over the block.



New lightweight Quarter Midget accessories are available from Prather Products. These are all included in Terry's Nats winning Quarter Midget "Little Toni" kit. The pair of wheel pants weigh only 1/2 ounce! The Quarter Midget wheel pants are $7.95, the wheels are $4.95, and the axle retainers are $1.79. Not shown is the dural landing gear for QM's at $4.95. These top quality items are lightweight and sturdy, too.

The wings seem to cause the greatest increase in weight. My LR-1A Quarter Midget wing weighs 9½ ounces finished, but without servo or landing gear. The foam core wing is covered with 1/16" balsa with solid wing tips and ailerons. The center is wrapped with a single layer of 6-ounce glass cloth, 3¼" wide, and finished with one coat of resin followed by additional resin and micro-balloons to fill the weave. The finish is MonoKote and MonoKote trim. At 9½ ounces, the wing feels very light, yet the airplane was 4 ounces overweight. Next time, in order to build a lighter wing, I will hollow the wing tips, but lightening holes in the ailerons, and select lighter wood for the sheeting. Wing sheeting should be light, straight grained wood that is not too soft. The glass cloth around the center can be tapered, rather than a constant width strip, reducing the width to about 1" at the trailing edge. Rather than filling with micro-balloons and resin past the cloth, I will sand the glass more to feather it into the wood which will require less filling. Be sure to only sand very lightly over the actual center joint. I will finish the wing with MonoKote the same as before, giving the wood a coat of Balsarite first to make the MonoKote bond better to the wood. I expect to be able to reduce the wing weight by an ounce or even 1½ ozs., but this means I will have to make even tighter joints so as to use less glue, especially around the gear mount block. An 8-ounce wing is very light, but is something to strive for. I believe that a built-up wing could easily weigh less

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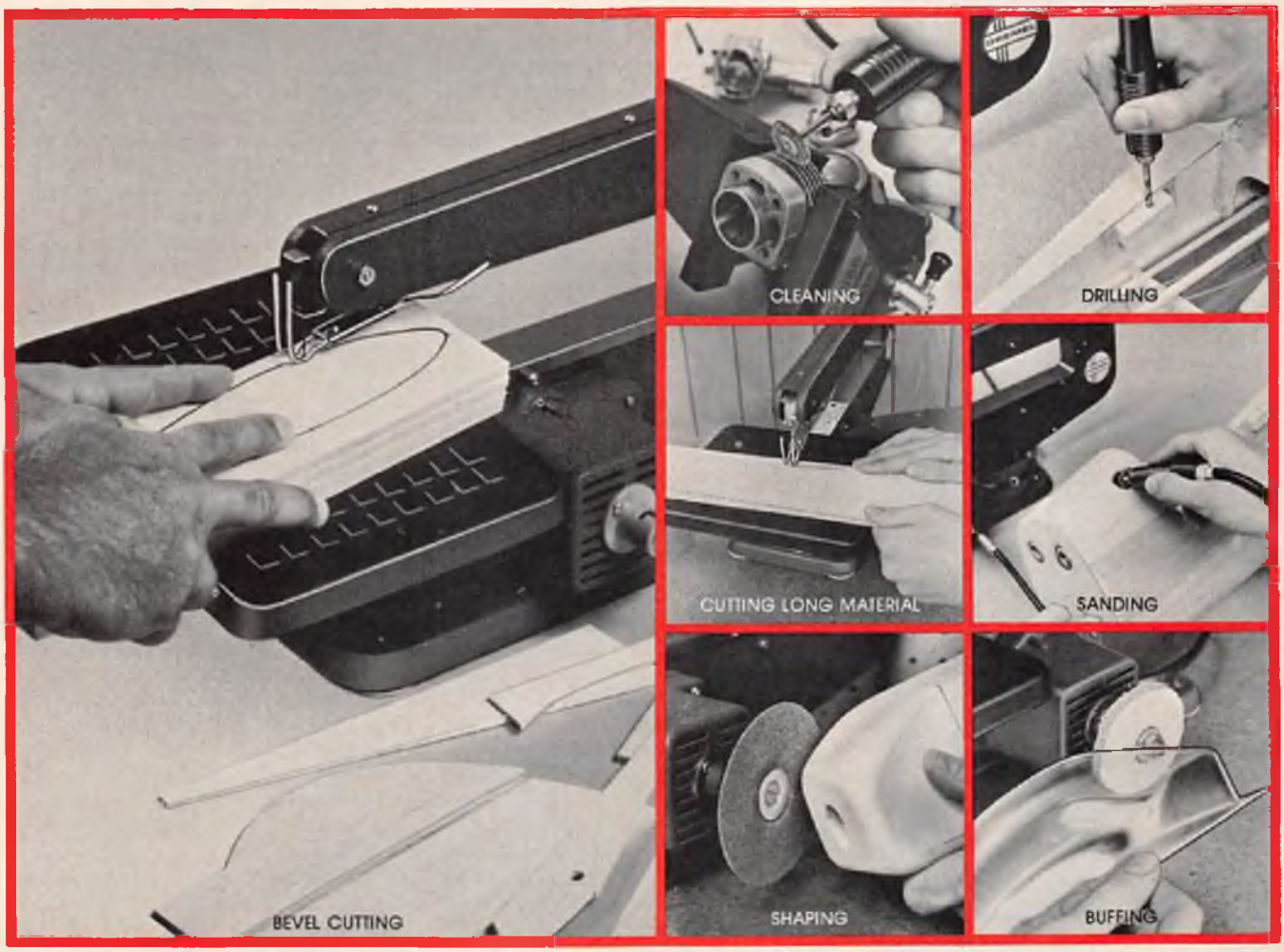

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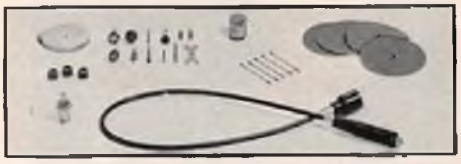

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BY AL CULVER

When I decided to expand my modeling into radio controlled model airplanes, I went into it operating on the premise that not all airplanes capable of being flown by a novice had to be ugly and non-scale. My choice was a home-built seaplane known as the Osprey. The Osprey has undergone a name change and design change to make it amphibious. I offer it to you in this configuration.

I chose a Super Tigre .19 for power and a Blue Max radio for control. Being rather traditional, I chose balsa as the medium in which to work. The design is a natural for foam application, but wood provides the lightweight, strong construction I desired. The airplane builds fast and easily so the wood isn't a detriment.

Flying brought some moments of glee to the family and the local club because the Air Skimmer didn't fly. I had, in spite of careful thought about high thrust lines, built the neatest winged car in captivity! I did get lots of taxi time, though. A high thrust line has a tendency to tuck the nose at power increases and pitch it up at power decreases. To compensate, I built a negatively lifting horizontal tailplane and, following the taxi tests, a slight thrust modification cured the "kiwi complex". The controls are very sensitive and small amounts of movement go a long way in the air.

The only deviation from common building practices might be the landing gear that is silver soldered. Silver soldering isn't difficult and construction might well begin with the metal work. For those who haven't used silver solder, a few words of introduction. A Benzomatic torch will do a good job. Your local welding supply can furnish you with flux and silver solder. It is expensive, but a little goes a long way.

Cleanliness is the real secret to success. Sand and file all joints until they are clean and the flux will keep them clean. I use lots of flux to keep the area around the joint clear of oxidation and discoloration. The flux, which is either a paste or a liquid, will, when heated, dry out and then liquify again. When it is liquid, the temperature is getting nearly right and the silver solder should be put to the joint. 1100° silver solder is probably the best suited for model work. When it melts, if the metal isn't hot enough, a little ball will form. As soon as the temperature is right, it flows. Silver solder moves easily to the heat so, by moving the torch flame along the joint, the silver solder just follows it. One caution - - - silver solder does not fill large holes so make your joints close fitting.

The landing gear is semi-scale and fully shock absorbing. It can be removed and filler bolted in place of the nose gear for operation off water. The main wire components are simple to bend from 1/8" music wire. The shock cord mount is 3/32" music wire with washers soldered on and then filed down as retainers of the shock cord. The pivot point is .032" brass side plate and 5/32" brass tubing.

The throttle cable (nylon housing with brass cable) can be secured to the pylon with a small nylon landing gear clip with one end cut off. Be sure that the cable works smooth and free.

The elevator horn is a standard Sig control horn with a nylon link for control hookup.

The only other metal I used is aluminum templates of the wing and horizontal ribs. With sandpaper glued to one side, you can cut ribs with hardly any need of sanding.

The wing is built in three sections and is super simple and strong. I found that building the basic wing first and then the ailerons was the easiest way to get a nice, straight wing. The tabs on the ribs provide a straight, steady working situation while you install spars and spar webs. When you have the 1/16" leading edge cap, the four spars, all the webbing and the ribs assembled, glue a piece of 1/8" balsa to the vertical side of the trailing edge tabs. This will hold the aileron ribs as a single piece when you cut them free from the rest of the wing. Glue the aileron leading edge and sand to shape on the top. On the wing, glue in the aileron cut-out trailing edge and shape it. Install the nylon aileron torque tube assembly and set the aileron back into position on the wing. Be sure and use nylon for the torque tubes as there may be a tendency for the wire to rust causing a bind if brass or aluminum is used. Install the hinges. The top surface of the hinge is flush with the top of the uncovered wing and aileron. At this point, I covered the tops of both outboard panels with 1/16" balsa sheeting. Then I assembled the three pieces of the wing, blocking up the tip panels 1" at each tip. These tip panels are butt glued and reinforced with glass cloth and resin when complete and ready for covering. Threading the aileron nylon torque tubes through a covered center section would be a problem. Install the wing bolt mounting plates and the landing gear mounts and then plank the rest of the wing.

Cut out the wing tip blocks per the plan view and glue on to the wing. Sand to the plan form shown. Shape the top first by straight edging along the top of the wing skin. After the top is in, straight edge from the bottom contour at the last rib up to the line made by the plan form and the top contour. When I planked the wing, I covered right over the aileron cutouts and didn't cut the ailerons loose until I had finished sanding the wing. This makes a nice looking aileron.

Cut out the engine pylon and install it carefully. Small amounts of thrust line changes make significant flying differences. I mounted the engine before installing the pylon because the wing makes drilling motor mount holes a bit awkward. The fairing on the pylon can be added as shown in Section B-B. The only caution is to epoxy the engine pylon in place extremely well.

Float construction is of hollow blocks of balsa. The shape of these floats is a bit unique in that they are square across the back. On the bottom, the float is slightly V'd in the front but flattens out about two-thirds of the way back. At the wing intersection, the float is streamlined. From this intersection down, it fairs into the square trailing edge of the float. I spot glued two pieces of balsa together and made the outer contour. Then I popped it into two halves and hollowed each half. The floats are epoxied to the bottom of the wing and a small fillet is run around each. I recommend fiberglassing the bottom of the floats to help protect them when the airplane is on wheels.

The horizontal stabilizer is built like the wing. Choose the wood carefully to get the optimum strength to weight ratio. Throughout construction of the horizontal tail, bear in mind that it is mounted on the vertical fin and every fraction of an ounce of weight increases the destructive force it can wield in a ground loop, sudden stop or crush. Don't cut the elevator loose until after the final sanding. It will be easier to sand and will acquire a nice, final contour. When mounting the horizontal stabilizer on the vertical fin, careful alignment is a must to prevent poor flying characteristics. On a T-tail, a misaligned horizontal stab can be seen for a mile and that judge is only 10 feet away! Note the high hinge line and that the horizontal stab appears to be upside down. If you were to turn it over, it would compound the problems of the high thrust line.

The fuselage is relatively simple but a few words are in order to start it on the right track. Build the formers by epoxying the pieces together to form a rectangle and then sand in the top contour. I have found that this gives a stronger, lighter former than any other type. When they are ready, glue in the three formers that are within the plywood doubler area. This box, made up of the doublers and the formers, can then have the rest of the airplane built around it. The temptation to glue the ply doublers to the sides first will produce a non-bending lamination that will probably break on the first landing. The rudder post is the rearmost former of the fuselage and care must be taken to get this one in straight as the alignment of the T-tail is at stake. Spruce may be substituted for this piece for strength. After the sides and the bulkheads are assembled, the bottom should be glued in place. The nosegear mount is made of hardwood block with a hole drilled for the wire and a slot cut for the key. The retaining block is also hardwood and is drilled for a 4-40 bolt with a blind nut. For use on water, with the nosegear removed, the holes can be covered with scotch tape. This is the simplest method. Use your own favorite method.

Before the top decking goes on the fuselage, I recommend a coat of fiberglass and cloth for the inside of the hull. Later, the outside needs the same treatment.

The top deck at the front is not drastically compound curved and can be installed as a single piece. The switch can be mounted on the cockpit floor right behind the windshield. It can be waterproofed with a piece of balloon, vinyl, etc. This material should be sandwiched between switch and plate. The rudder should be built and installed and the control system mounted. The rear decking can then be installed and the construction of the fin commence.

Rather than having control horns and pushrods all over the outside of my airplane, I put a step down lever and a horn similar to a large airplane's into the rudder system. I made the horn of nylon and the connector of a brass tube. The nylon horn is just another rudder rib with the horn part cutting through the right side of the rudder leading edge. Drill holes through the nylon and sandwich it between two 1/16" balsa ribs. Clear a little of the leading edge away so as not to bind the rod connector. The connector is a piece of 3/32" brass tubing split horizontally about 1/4" and drilled for a good sized pin. Drill the horn pin size and install it. Put a small bit of solder on to the pin to prevent it from coming out. I filed down a Kwik-Link rod to slip into the connector tube and soldered it in. Due to the angle between the rudder hinge line and the rod direction, the rod must be left to turn in the Kwik-Link so choose one with good threads and do not jam nut it as usual. The lever itself is half an aileron bellcrank. When building the verti-

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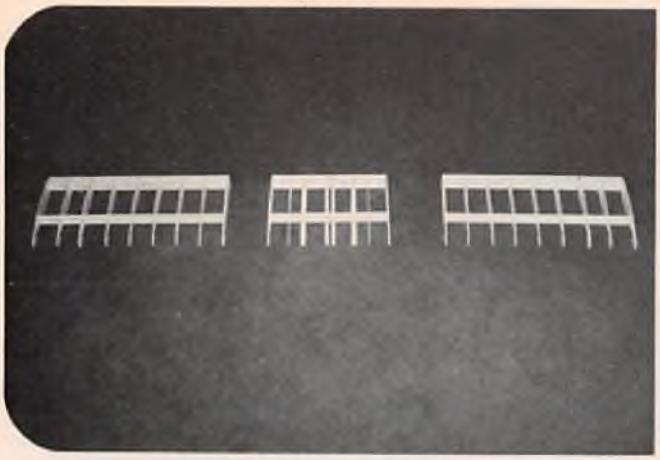
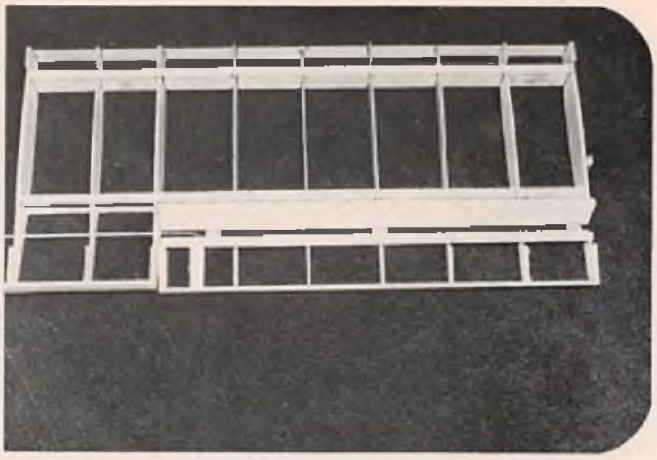
AIR SKIMMER

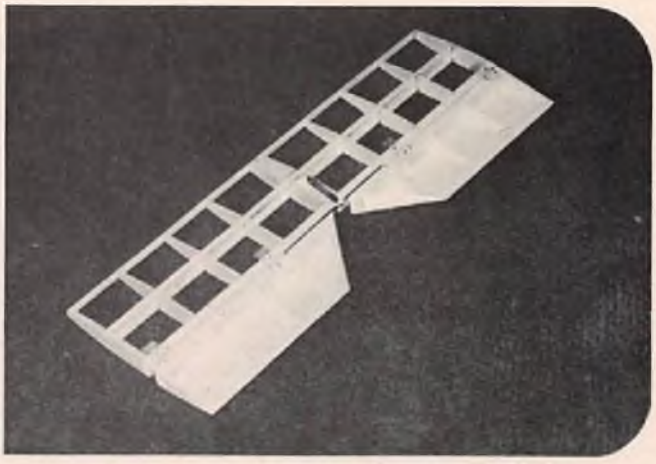
Designed By: Al Culver

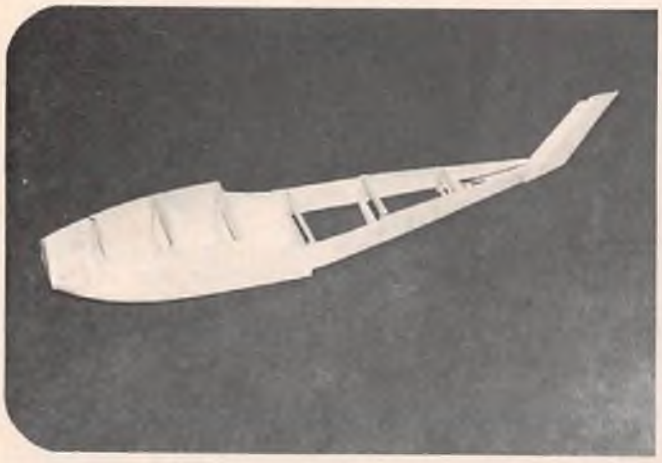
TYPE AIRCRAFT
Stand-Off Scale Amphibian
WINGSPAN
47½ Inches
WING CHORD
8 Inches
TOTAL WING AREA
372 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Semi-symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1"
O.A. FUSELAGE LENGTH
32 Inches
RADIO COMPARTMENT AREA
(L) 10½" X (W) 4" X (H) 2½"
STABILIZER SPAN
13½ Inches
STABILIZER CHORD (incl. elev.)
5"
STABILIZER AREA
64 Sq. In.
STAB AIRFOIL SECTION
Semi-symmetrical
STABILIZER LOCATION
T-tail
VERTICAL FIN HEIGHT
5 Inches
VERTICAL FIN WIDTH (incl. rudder)
5 Inches (Avg.)
REC. ENGINE SIZE
.19
FUEL TANK SIZE
4 Ounces
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., & Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready-To-Fly	47 Oz.
Wing Loading	18.2 Oz./Sq. Ft.

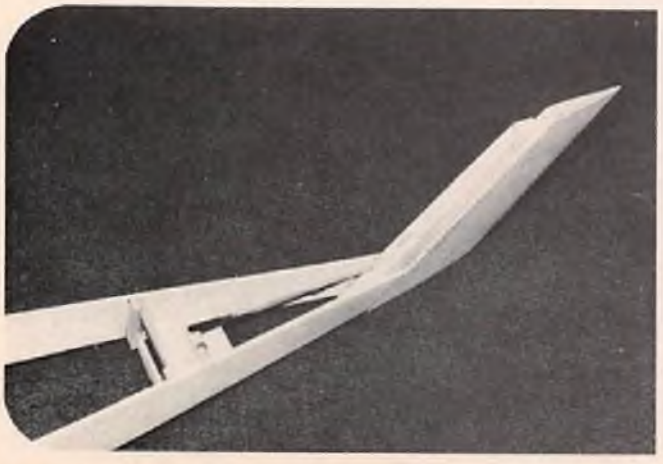




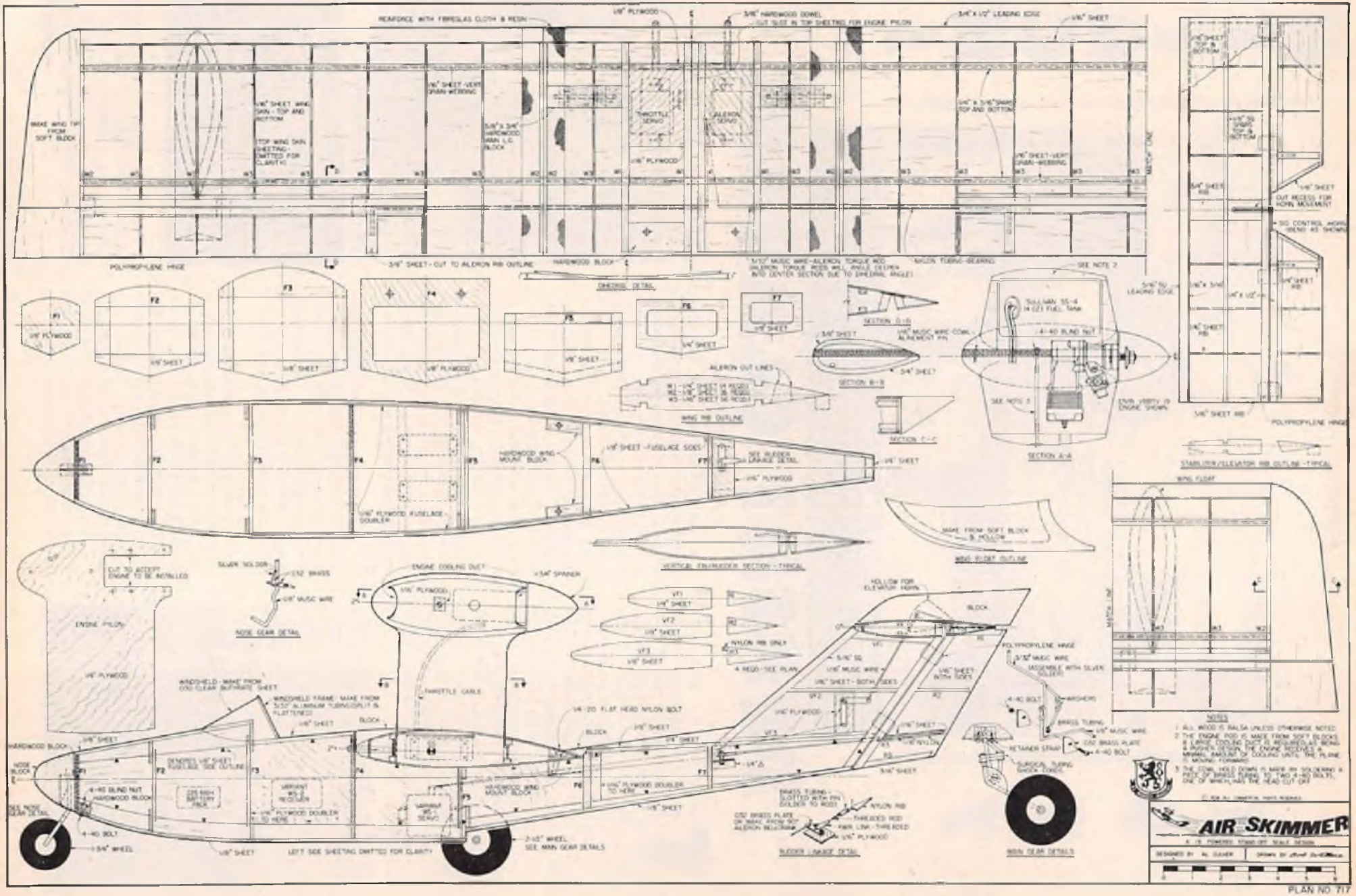




TOP, LEFT: Three basic wing panels. These sections are butt joined with epoxy and wrapped with lightweight glass cloth and resin. TOP, RIGHT: Bottom side of outer wing panel showing aileron and torque rod. ABOVE, LEFT: Center section of wing with engine pylon in place. Check for accurate thrust alignment of engine. ABOVE, RIGHT: Top side of horizontal stabilizer showing control horn. LEFT: Basic fuselage assembled with rudder and linkage in place. BELOW, LEFT: Close-up of rudder linkage in place. BELOW, RIGHT: View of landing gear. One shown on right is completely assembled and ready for installation.



FULL SIZE PLAN AVAILABLE — SEE PAGE 187



1977

HITACHI

California City, Calif. – Dick Russ (left) and Joe Hildreth proudly display the trophies and the more than $2,500 in merchandise donated by Hitachi Sales Corporation of America, sponsor for this year's event. The competition attracted over 85 entries and more than 5,000 spectators to this Mojave Desert town.

DESERT CLASSIC

By Dick Russ

The $22,000 1977 Hitachi Desert Classic attracted 158 contestants from all over the U.S. as well as Japan and Sweden. Unfortunately, only 93 were allowed to fly due to entry limitations of 20 in each class.

The festivities really began Friday night at the home of Dick Russ, the Contest Director. All contestants, workers and judges were invited to a nice buffet, courtesy of the two host clubs — The Antelope Valley Tailwinds, Inc. and Chaparral Aeromodelers. It was a get-acquainted party for everyone before the fierce competition began early Saturday morning. It must have been a success for the food and drinks were all consumed.

Five-year old Chip Hyde of Yuma, Arizona, one of the youngest R/C fliers in the country, put his flier through an amazing array of difficult patterns that astounded most of the competition's 88 contestants.

It was dark on the flight line when many of the contestants began assembling their planes by flashlight and people hurried to their places. They had been warned well in advance that the first flight would be at 7:00 a.m.

As the sun rose over the majestic mountains surrounding beautiful California City, the massive P.A. speakers came alive requesting everyone to direct their attention to the runway. At that very moment everyone knew this was no ordinary contest. The Boy Scouts of America, in full dress, paraded down the runway as The Star Spangled Banner was playing in the background. You could feel a sense of pride in the air as everyone pledged their allegiance to our flag.

The contest started right on schedule when the first plane broke ground at 7:03 a.m., followed very shortly by three others. Unfortunately, a few received zeros for their first round when they were not on the line when it was their time to fly.

One contestant was overheard stating he couldn't believe his contest packet. It contained a bottle of Hot Stuff, Wilhold Glue, Devcon 5-Minute Epoxy, WD 40, an OPS glow plug, a decal, patches, and tickets for free R/C Cola and Oly beer. In fact, he got more than his $20.00 entry fee back just in the contest packet.

Saturday's flying stopped sharply at 6:00 p.m. to enable everyone enough time to get ready for the banquet.

Bruno Giezendanner, World Champion R/C Pattern flier, inspects the plane he borrowed to compete in the 1977 Hitachi Desert Classic. Bruno's own plane never arrived in time for the meet, and he was forced to compete with borrowed controls and plane. As a result, he finished 5th in the Master's Division.

The banquet was a big hit with the ladies, as each lady was given a large bottle of cologne, courtesy of Avon. The only request made of them was, "Please don't everyone try it in the banquet hall".

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Masters, (L/R): Jim Oddino, 1st; Jim Kimbro, 4th; Curt Sidles, Hitachi; Bill Salkowski, 2nd; Phil Kraft, 3rd; Bruno Giezandanner, 5th.

Expert, (L/R): Ken Hirose, 1st; Rusty Van Baren, 4th; Curt Sidles, Hitachi; Bill Simpson, 2nd; Curt Oberg, 5th; Geoff Nelson, 3rd.

Sport Scale, (L/R): Don Lien, 1st; Ron Gilman, 2nd; Joan Lockwood, 3rd; Col. Robt. Thacker, 4th; Jim Bronowski, 5th.

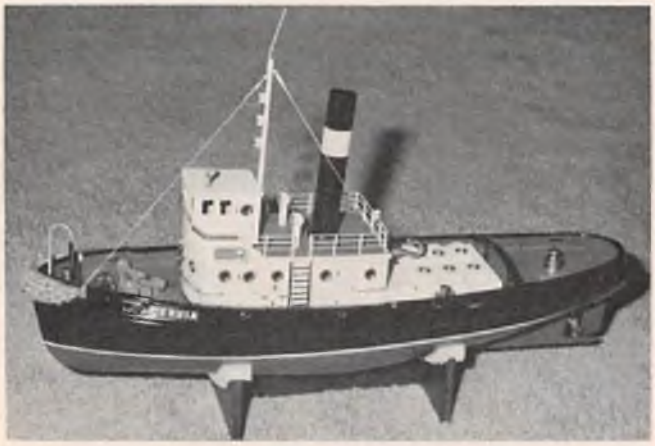
Novice, (L/R): Tom Purkiss, 1st; Jim Zahorik, 2nd; Curt Sidles, Hitachi; Dave Wilson, 3rd; Perky Perkins, 4th; Rick Anderson, 5th.

Advanced, (L/R): Marty Wittenberg, 1st; Curt Sidles, Hitachi Executive (National Service Manager); Frank Morris, 2nd; Joan Lockwood, 3rd; Tony Lopez, 4th; Dave Saadel, 5th.

Curt Oberg of Phoenix, Arizona, 5th Place Expert, with a $1,000.00 smile when presented with a new Kraft radio - one of many gifts presented to contestants.

RCM PRODUCT TEST

Hobby Shack Cervia



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

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

The Cervia is a fascinating live steam powered tugboat from Saito/Hobby Shack. While small by some standards for a live steam model (24" overall), the Cervia is powered by a one cylinder precision engine that receives its steam from an alcohol fired boiler. Anyone who enjoys the operation of fine machinery will go bananas watching this little jewel perform.

The white gel coated fiberglass hull is top quality, almost a shame to paint it. The die-cut plywood parts are clean and all fit nicely in their respective positions. Then there are the accessory fittings, many plastic bags with identifying numbers to match the plans and instruction booklet. The fittings are machined from aluminum, brass, and stainless steel. There are enough details on the boat to completely dress it out, but they are practically all finished for you so you do not have to spend months getting a sharp looking model finish.

The model assembles easily by following the sequence and steps in the instruction booklet. We found the instructions quite interesting; they are complete, but to the point, with no unnecessary words.

Following the manufacturer's recommendations for finishing, we used sanding sealer, lacquer primer, and colored lacquers. Using lacquers was an enjoyable change of pace and is easier to apply than most fuelproof finishes.

The installation and operation of the steam engine and boiler are very simple; merely follow the illustrated instructions. If there is any concern over safety hazards associated with this steam system, be assured that anyone would have to try very hard to create a problem with it.

For control, we used one servo of Hobby Shack's Aero Sport

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SPECIFICATIONS

Name ..... Harbor Tug "Cervia"
Boat Type ..... Steam Powered Tugboat
Imported By ..... Hobby Shack
18480 Bandilier Circle
Fountain Valley, California 92708
Mfg. Suggested Retail Price $79.99
(Boat kit and complete steam power unit)
Available From ..... Hobby Shack
Mfg. Recommended Usage ..... Single Channel R/C Boat
Hull Length ..... 23½"
Beam ..... 6⅜"
Overall Height ..... 13¾"
Radio Compartment Dimensions ..... More Than Ample
Recommended No. Of Channels 1
Recommended Control Functions ..... Rudder
Basic Materials Used In Construction:
Hull ..... Fiberglass with White Gel Coat
(All other structure is ply & hardwood)
Hardware Included In Kit ..... Complete set of Aluminum, Brass and Stainless Steel Details which include propeller, shaft, stuffing box, rudder, anchor, funnels, lamp, bollard, winch, hand rails, stanchions, ventilator, life buoy, towing hook, mast, etc.
Plan Size ..... 24" x 34" (1 sheet)
Building Instructions on Plan Sheets ..... No
Instruction Manual ..... Yes (8 pages)
Construction Photos ..... No
Kit Includes ..... Die-Cut Parts

RCM PROTOTYPE

Finishing materials used Sanding Sealer, Lacquer Primer, Colored Lacquer
Engine Make ..... Saito OE1 engine with OB1 boiler
Radio Used ..... Hobby Shack Aero Sport

RCM PRODUCT TEST

Mark's Models Sunny

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

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

The "Sunny" is a sport cabin-type biplane manufactured by Mark's Models, designed by Mark Smith, designer of the Windfree, Windward, and Wanderer sailplanes.

The kit consists of a box-type fuselage, built-up wings, and solid balsa tail surfaces. The hardware with the kit includes a dural main gear, 1/16" diameter wire for the steerable tail wheel, hardwood engine rails, wing tie-down dowels, pushrods, and all the necessary screws, nuts, blind nuts, and washers.

The kit design and manufacturing are excellent. All the parts fit with no adjustments being necessary. The plans, instruction manual, and construction photographs are very good. Anyone who has built one or two kits should experience no difficulty in building the Sunny.

The RCM prototype was built using Goldberg "Jet" cyanoacrylate, "Gluit" sandable aliphatic glue, and Devcon 5-Minute epoxy. HobbyPoxy 2 was used to fuelproof the engine and fuel tank compartments. K & B polyester resin was used in applying the fiberglass reinforcement to the wing center sections and to coat the inside of the radio compartment.

We used Super MonoKote to cover the entire airplane.

There are several features in the design which we feel are worthy of note. The 1/8" x 1/2" plywood servo rails fit into a groove machined into the side of the fuselage. This makes it very easy to adjust the servos fore and aft for balancing. The main landing gear is secured by two wood screws which pass through oversize holes in the 1/8" plywood mounting plate and are secured to a 1/16" plywood "nut plate"; in the event of a bad landing, the screws will pull out of the "nut plate" without

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SPECIFICATIONS

Name	Sunny
Aircraft Type	Sport Biplane
Manufactured By	Mark's Models P.O. Box 2134 Escondido, California 92025
Mfg. Suggested Retail Price	$32.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	General Sport Aircraft
Wing Span	Upper 40" — Lower 36"
Wing Chord	7½"
Total Wing Area	559 Square Inches
Fuselage Length	34½ Inches
Radio Compartment Dimensions	(L) 7" x (W) 2½" x (H) 4½"
Wing Location	Biplane
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	Upper 1⅝" — Lower 1-13/16"
Stabilizer Span	17½ Inches
Stabilizer Chord (incl. elev.)	4" (Avg.)
Total Stab Area	70 Sq. Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	6 Inches
Vertical Fin Width (incl. rud.)	5 Inches (Avg.)
Mfg. Rec. Engine Range	.15 cu. in.
Recommended Fuel Tank Size	4 Ounces
Landing Gear	Conventional
Recommended No. Of Channels	3
Recommended Control Functions	Rud., Elev., & Throt.
Basic Materials Used In Construction:	
Fuselage	Balsa & Plywood
Wing	Balsa & Spruce
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	44" x 36" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (14 pages)
Construction Photos	Yes
Kit Includes	Die-Cut & Shaped Parts
Mfg. Rec. Flying Weight	56 Ozs.
Wing loading based on rec. flying wt.	14.5 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	56 Ounces
Wing Loading	14.5 oz./sq. ft.
Covering & finishing materials used	MonoKote
Engine Make & Disp.	OS Max .15
Muffler Used	Yes
Radio Used	Cox 4 Channel
Tank Size Used	4 Ounces

DOUBLE

By Fred Reese

Our intrepid, prolific designer of things that occasionally fly, is back with an "easy to build," "easy to fly" .40 size sport biplane that will provide you with several seasons of flying pleasure.

Double Trouble is a sport biplane for Sunday flying that features high performance and simple construction for .40 sized engines.

Over the years, most of the biplanes that I built were light, low powered, gentle flying machines and, though, I still enjoy flying slowly, now I prefer a design with more capabilities. I rarely fly in pattern competition but during a Sunday flying session, if I feel like trying a four point roll or knife edge flight, it is more fun to be flying a model that is capable of these maneuvers. Double Trouble is a biplane that is capable of these maneuvers and of any others you might think of.

With ailerons on each wing, the rolls are truly axial and smooth like a single winged pattern airplane. The model flies smoothly and remains docile at low speed and is very easy to land. Think about it: This is a biplane without struts that has pattern performance, tricycle landing gear and really is easy to build.

The wing span may appear too short at first glance, but the combined wing area is 548 square inches, which results in a wing loading of only 16.8 ounces per square foot. Double Trouble only weighs four pounds ready to fly. This is the third .40 powered biplane I have built of this size and it seems to be just right since mufflers, fixed landing gear and frontal area drag take their toll of the available power. The result is an airplane that is not super fast, but has the power to pull up through "top hat-like" maneuvers, yet does not build up excessive speed coming downhill. I mentioned that I rarely fly in pattern contests, however, I did fly the Double Trouble at a local Sport Biplane Pattern Event hosted by the R/C BEES in Riverside, California, and placed Second simply because the airplane could do all of the maneuvers easily and I got points for every maneuver on each flight.

CONSTRUCTION

Fuselage: Make a pair of fuselage sides from 1/8" x 3" x 36" balsa sheets as one piece runs full length down the middle with a 2" section added to form the top of the cabin and upper wing saddle and a 1½" section is added to complete the bottom outline and lower wing saddle. Glue the 1/4" balsa nose doublers onto the fuselage sides. Use contact cement to bond the 1/32" plywood doublers to the fuselage sides aft of the nose doublers. Cut the plywood doublers from

TROUBLE

6" x 12" sheets. Also glue the two 1/8" x 1/2" rear fuselage stiffener strips onto the fuselage sides. Cut the firewall from 1/4" or 3/8" plywood and, before gluing in place, bolt the aluminum motor mount in place and install the blind mounting nuts in the firewall. Also mount the Goldberg steerable nosewheel unit and drill a hole through the firewall behind the outer hole in the control arm for the steering linkage. Place the engine on the mount and drill the firewall for the fuel lines and throttle linkage. Epoxy the firewall to one of the fuselage sides up against the 1/4" nose doubler using a square to align the firewall. Cut the #3 bulkhead from 1/8" x 3" balsa and cut a hole for the pushrods. Glue bulkhead #3 to the same fuselage side. Note that the bulkhead is glued on to the plywood doubler from top to bottom. Epoxy the other fuselage side to the firewall and bulkhead.

Glue the 1/2" triangle stock to the fuselage sides behind the firewall along the top & bottom edges. Cut a 3-5/16" x 4½" piece of 1/8" plywood and epoxy it in place behind the firewall to form the bottom of the fuselage. Glue the 1/8" x 3" x 3-5/16" balsa forward windshield in place above and behind the firewall. Pull the fuselage sides together at the tail and glue together. Add the top and bottom rear fuselage sheeting of 1/8" balsa with the grain running crosswise. Glue the lower chin block and 1/2" triangle in place and then sand off the excess wood flush with the front ends of the fuselage sides with a sanding block. Temporarily bolt the engine in place with a prop and spinner installed. Slip the #1 balsa nose block in place behind the spinner, if possible, and either add or shorten the fuselage sides until there is a 1/32"-1/16" gap behind the spinner. Glue the nose block in place and mark the outline of the spinner on the nose block as a guide while shaping the front end. Remove the engine and shape and sand the front of the fuselage. The cowl shape can be simply rounded off to give a Cessna look or a larger spinner could be used and the entire cowl streamlined into the spinner. Round all the edges of the fuselage except the wing and stabilizer saddles with a sanding block and sand the entire fuselage smooth with #220 sandpaper.

Cut the fin, rudder, and stabilizer from 3/16" x 3" balsa and the elevators from 3/16" x 2" balsa sheet. Join the two elevator halves with a 4" length of 1/4" dowel epoxied into the 1/4" notches in the elevators. Epoxy the fin and stabilizer to the top of the fuselage.

Wings: Make a 1/16" plywood master wing rib to match the #1 rib outline on the plan and cut out 30 ribs from 1/16" or 3/32" sheet balsa using a sharp X-Acto knife. From the 30 ribs, select eight and cut out notches for the landing gear block to make the #2 ribs. Cut out four 1/16" plywood half-ribs using the same rib template to make the #3 rib doublers.

The landing gear block is 3/8" x 3/4" x 12" with a 1/8" wide by 1/8" deep slot for the landing gear wires. Make the gear block from pine or hardwood or it can be laminated from 1/8" plywood. From 3/4" square pine or hardwood, cut four 5/8" spacer blocks for the lower wing and two 15/16" spacer blocks for the top wing. These spacer blocks are placed where the wing mounting bolts and landing gear pass through the wing and will be drilled through in a later sequence. The two wings are the same except for the two extra ribs in the center and the landing gear mount in the lower wing. I will describe the construction for the lower

wing with the additional structure only.

Lay some Saran Wrap or waxed paper over the plan and pin down a 36" length of 1/4" square in the spar location on the plan and a second piece of 1/4" square which will act as a building spacer, in the area marked for the 3/8" square along the back edge of the ribs. Glue the #3 plywood doublers to the #2 ribs. Glue all of the ribs in place on the 1/4" square spar with the landing gear notches up. Pin and glue the 3/8" square trailing edge to the ribs and pin down to the 1/4" square balsa spacer on the plan. Be sure to center the back edge of the ribs along the 3/8" square to leave a 1/16" edge top and bottom for the cap strips. Glue the top 1/4" square spar in place. Glue the 3/8" square leading edge onto the forward ends of the ribs, again leaving a 1/16" edge above and below the ends for the ribs for the wing sheeting. Glue down the 1/16" x 3" x 36" leading edge sheet using pins to hold things in place while the glue dries. It would also be helpful to fit some scrap blocks under the leading edge to give some added support to the wing structure while applying the sheeting and cap strips. Fit and glue in place the 6" center section sheeting aft of the spar. Glue 1/16" x 1/4" cap strips over the remainder of the ribs. When dry, remove all of the pins and remove the partially built wing from the plan. It is easier to make the cut-out for the landing gear block and install it now before the top sheeting is in place. With a pin or the point of an X-Acto knife, push through the sheeting to locate the landing gear notches in the ribs, then cut away the 3/4" x 12" strip of 1/16" sheeting over the notches. Epoxy the landing gear block into the wing flush with the sheeting. The notch is on the outside. Turn the wing over and pin down to the plan, shimming as before for support and to insure straight wings. Epoxy the four 3/4" square by 5/8" pine spacers in place on top of the gear block and up against the top spar and a rib or rib doubler, as shown on the plan. The top edge of these spacer blocks should be flush with the top of the spar as they should make contact with the top sheeting. Glue the top 1/16" x 3" x 36" leading edge sheeting in place. Add the 6" wide center sheeting and the cap strips on the top. When dry, remove from the plan and build the top wing using the same procedures but omit the rib doublers and gear mounting. In the top wing, use 3/4" square pine spacers 15/16" long between the sheeting and against the spars for the top wing mounting bolt supports. The wing tips are simply end caps of 3/16" or 1/4" sheet balsa glued onto the outboard ribs and then sanded to match the airfoil.

I chose to mount the aileron servo in the bottom wing although it could be in the top wing if desired. Make a pair of strip aileron linkages from two 5" lengths of 3/32" piano wire and two 2½" lengths of 3/32" I.D. brass or aluminum tubing. Bend 1½" arms 90° upward on each wire to connect to the servo, then slip the tubing over the long ends of the wires and make 90° bends 1/2" from the outboard ends to plug into the balsa ailerons. Be sure to make a right and left side. Cut a 6" length of tapered trailing edge stock from each of the two 36" lengths required. Cut a slot along the forward edge of the 6" length of trailing edge for the lower wing aileron linkage by first making two 45° angle cuts with an X-Acto blade, removing a wedge shaped strip of wood. The slot can now be easily enlarged with a piece of sandpaper wrapped around the edge of a piece of scrap 1/16" or 3/32" balsa sheet. The finished slot should be 1/8" wide and 1/8" deep to completely accept the 1/8" tubing around the aileron linkage. Cut two notches in the slot, 1" apart, on the top center for the servo connecting arms of the linkage, then epoxy the tubing of the linkage into the slot in the trailing edge. The ends of the tubing should be even with the end of the wood. Epoxy the 6" center sections onto the wings. Cut the remaining trailing edge stock into four 15" lengths and glue a scrap of 1/4" sheet onto one end of each aileron to match the wing tip blocks. Cut, fit, and round the leading edge, and put an identifying mark on the inboard end of each aileron so that, after covering, each aileron can be matched, hinged and installed where it was fitted. Shape the leading edges of the wings and finish sand the entire wings with #220 paper and a balsa sanding block to remove any bumps or ridges. The 3/8" square back edge of the wing must be tapered slightly to match the forward edge of the ailerons. Bend the main landing gear from 1/8" piano wire. Drill a 1/8" hole through the gear block and into the pine spacer blocks deep enough to take the ends of the gear wires on each side of the lower wing. The holes should be 2¾" from the ends of the landing gear block. Trial fit the gear wires into the slots and adjust if necessary. After covering, the gear wires are held in place with metal straps and screws such as Du-Bro GS-25.

The next step is to mount the wings. Adjust the wing saddles so that the wings seat completely against the sides of the fuselage by placing a strip of sandpaper between the wing and fuselage and sanding the sides while maintaining slight pressure with the wing. The saddles may also need slight adjusting side to side so that both wings and stab are all parallel when viewed from the front. Epoxy and screw the four 1/2" square maple wing mounting blocks into the fuselage. Make centerline marks on the top and bottom of the fuselage and at the leading and trailing edges of the wings for the wing alignment. Using rubber bands, masking tape, and pins, firmly mount the wings into position. Check the wing alignment visually and by measuring from the wing tips to the tail on each side. Also measure the distance between the wings at the tips. Make any necessary adjustments, then add enough pins to keep the wings from shifting while drilling for the mounting bolts. The mounting holes should be 2¾" from the leading edge and 2½" apart to align with the spacer blocks in the wings and the mounting blocks in the fuselage. Drill straight down through the wings and hardwood blocks in the fuselage with a 3/16" drill for each of the four mounting bolts. Remove the wings and enlarge the two holes in each wing with a 1/4" drill. Turn a 1/4"-20 tap down through the 3/16" holes in the hardwood blocks in the fuselage. Mount the wings using 1/4"-20 x 2" round head nylon bolts and re-check the wing alignment.

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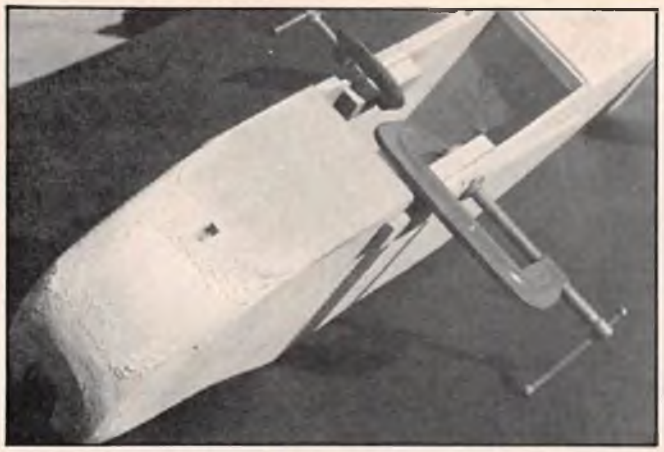
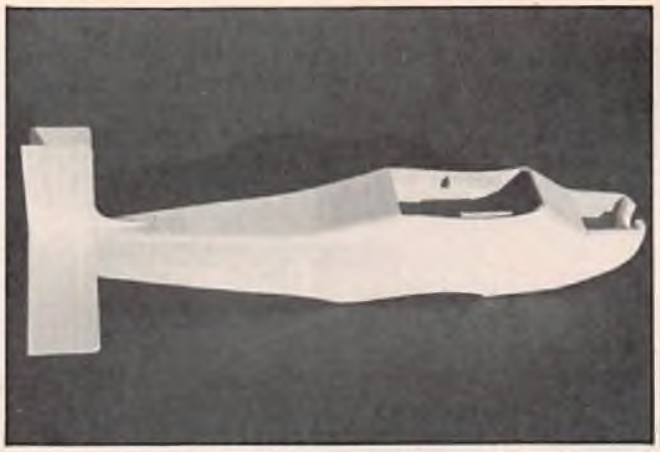
DOUBLE TROUBLE

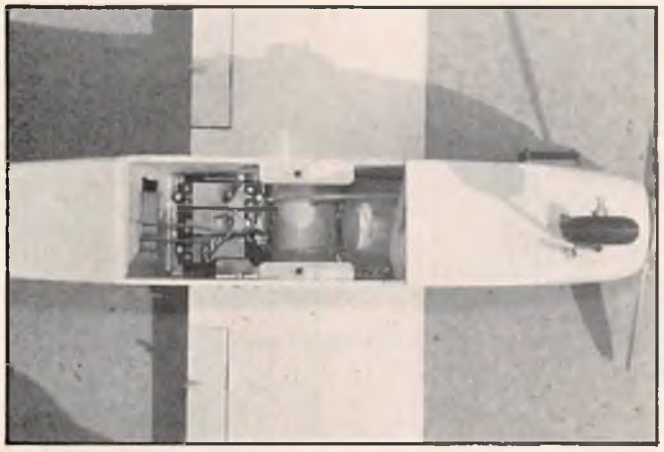
Designed By: Fred Reese

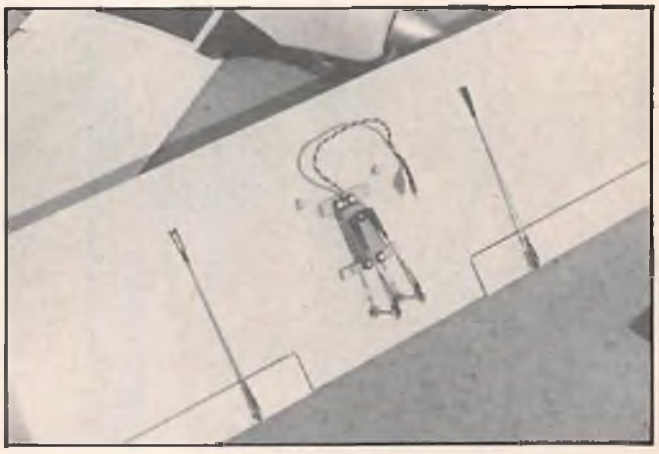
TYPE AIRCRAFT
Sport Biplane
WINGSPAN
36½ Inches
WING CHORD
7½ Inches
TOTAL WING AREA
548 Square Inches
WING LOCATION
Biplane
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
None
O.A. FUSELAGE LENGTH
36 Inches incl. Spinner
RADIO COMPARTMENT AREA
(L) 10" X (W) 3" X (H) 4"
STABILIZER SPAN
14 Inches
STABILIZER CHORD (incl. elev.)
5" (Avg.)
STABILIZER AREA
67 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
4½ Inches
VERTICAL FIN WIDTH (incl. rudder)
5¾ Inches
REC. ENGINE SIZE
.40
FUEL TANK SIZE
8 Ounce
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., & Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply, & Hardwood
Wing	Balsa & Hardwood
Empennage	Balsa
Wt. Ready-To-Fly	64 Oz.
Wing Loading	16.8 Oz/Sq. Ft.

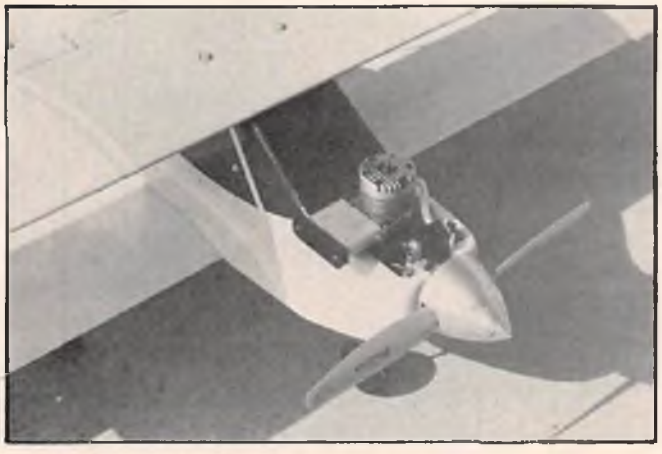




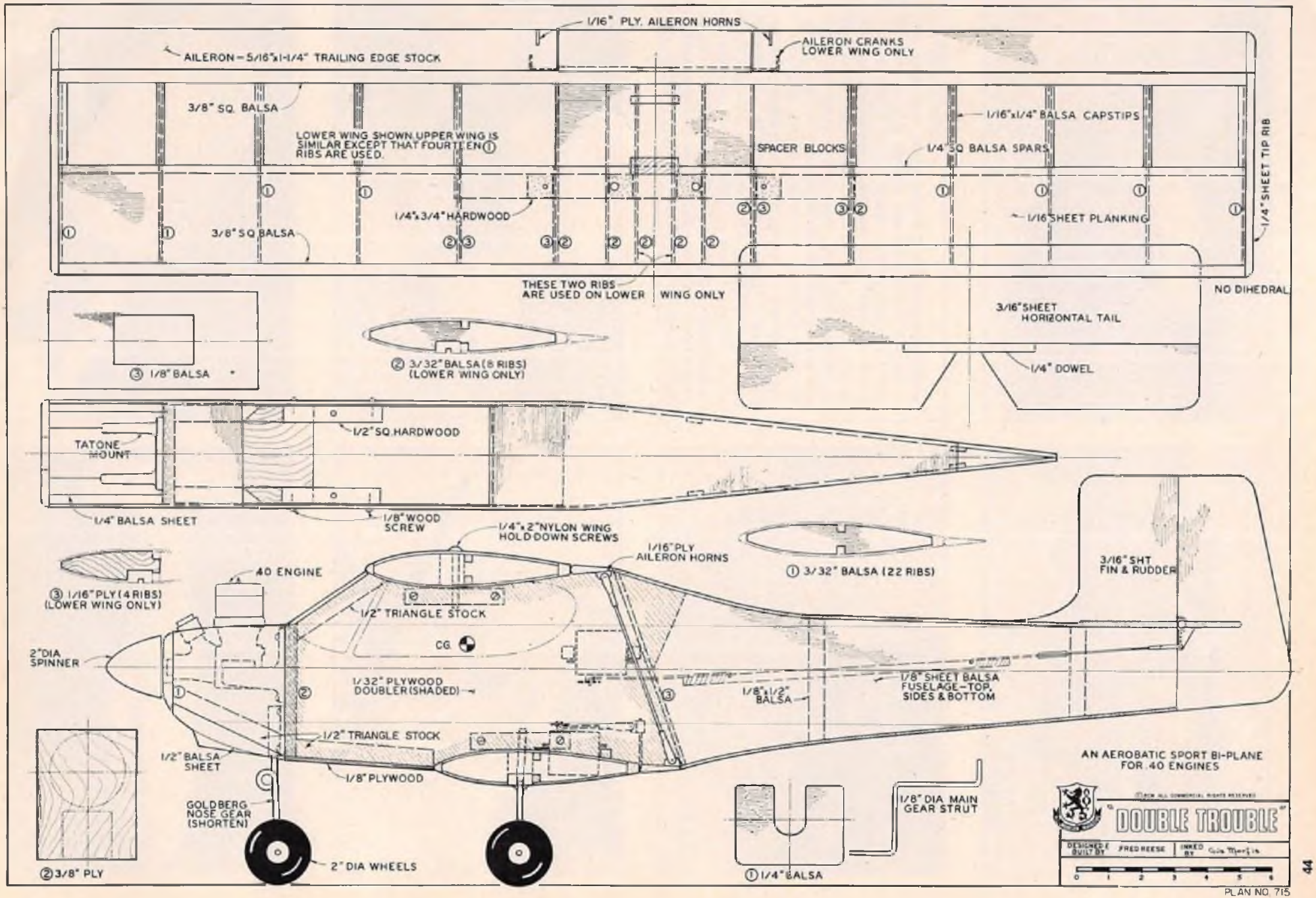




TOP ROW, LEFT: 1/2" sq. maple wing mounting blocks being glued into the fuselage. Clamps hold things together until epoxy sets. TOP ROW, RIGHT: Fuselage assembly ready to cover. ABOVE: Lower wing removed to show radio installation and rear portion of 8 oz. tank. ABOVE, LEFT: Aileron servo installed in the lower wing. Clevis on the ends of the connecting rods allows quick and easy hook-up. RIGHT: Aileron connecting rods attached to plywood horns epoxied to the ailerons. Four ailerons allow this bipe to roll like a pattern ship. BELOW, LEFT: K & B .40 with Du-Bro muffler installed gives good power but not excessive speed. Wings mount with two nylon screws. BELOW RIGHT: Double Trouble coming at you. Trike gear and absence of cabanes or struts is simple and practical.



FULL SIZE PLAN AVAILABLE — SEE PAGE 187



PLAN NO. 715

RCM PRODUCT TEST

MH Manufacturing ANSER

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

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

The Anser, from MH Manufacturing, is a 72" span sailplane which, as advertised, was designed for the novice builder and pilot in mind. The packaging of the kit is very professional and construction is simple. It requires no special building aids. Common pins and masking tape, along with a good resin glue and epoxy, will get the job done. We used Wilhold Aliphatic resin glue and Pacer's ZIP (5-Minute epoxy).

The balsa and hardwood parts are packaged in separate groups, either by rubber bands or plastic bags, for easy identification. Included were 2 Golden pushrods, 6 hinges, and 2 control horns. The pre-cut balsa leading and trailing parts are a big aid in the ease of construction. The simple hatch cover (sheet plywood with plywood clip) gave us quick and easy access to the non-mounted receiver power switch. Hinges were glued in place with 5-Minute epoxy. The servos were mounted with servo mounting tape with control arms set up for minimum throw. A simple music wire tow hook was bent and mounted 3/4" forward of the balance point. With the proper balance, this location proved to be satisfactory.

The flying surfaces (wing, stab and elevator) were covered with light blue Super Kwik Cote. No trim was used as we were in too much of a hurry to get to the flying field with our new project.

The only modification that we may try at some later date on the Anser would be to add some 1/8" sq. balsa or spruce spars along the top forward section of the wing. The Anser was very quick on the slope and able to move when speed is called for, however, we would like to try our idea to see if there would be any improvement in the speed performance. We are definitely

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SPECIFICATIONS

Name ..... The Anser
Aircraft Type ..... Sailplane
Manufactured By ..... MH Manufacturing
2623 Honolulu Ave.
Montrose, California 91020
Mfg. Suggested Retail Price $29.95
Available From ..... Both Mfg. & Retail
Mfg. Recommended Usage ..... Sport/Competition Sailplane
Class ..... 2 Meter
Wing Span ..... 72 Inches
Wing Chord ..... 7-3/16"
Total Wing Area ..... 495 Square Inches
Fuselage Length ..... 33½ Inches
Radio Compartment Dimensions ..... (L) 5" x (W) 2" x (H) 2½"
Wing Location ..... High Wing
Airfoil ..... Flat Bottom
Wing Planform ..... Constant Chord, Center Double Taper, Tips
Polyhedral ..... 1½" — 2nd Panel 2½"
Stabilizer Span ..... 19¼ Inches
Stabilizer Chord (incl. elev.) ..... 4" (Avg.)
Total Stab Area ..... 82 Sq. In. (Approx.)
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Top Of Fuselage
Vertical Fin Height ..... 7 Inches
Vertical Fin Width (incl. rud.) ..... 6¼" (Avg.)
Recommended No. Of Channels 2
Recommended Control Functions ..... Rudder & Elevator
Basic Materials Used In Construction:
Fuselage ..... Balsa & Ply
Wing ..... Balsa, Spruce, & Ply
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... Pushrods, Hinges, Control Horns
Plan Size ..... 42" x 30" (1 sheet)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... Yes (2 pages)
Construction Photos ..... No
Kit Includes ..... Die-Cut Parts
Mfg. Rec. Flying Weight ..... 21-23 ozs.
Wing loading based on rec. flying wt. ..... 6.4 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 25 Ounces
Wing Loading ..... 7 oz./sq. ft.
Covering & finishing materials used ..... Kwik Cote
Radio Used ..... Cirrus Sport IV

SAILPLANE "How-To"

By Brian Shaw

● Here are a few sailplane hints and kinks which I have found to be quite practical. The tailplane, or stabilizer, lock is suitable for all flying stabilizers which protrude in front of the fin leading edge such as used on the Aquila, Centurion I, Centurion II, etc., and provides an instant and positive lock to secure the two sections of the stabilizer in position (see Figure 1). To assemble the stabilizer, press the forward end of the retaining spring down to allow the wire peg to enter the tube, then release the lock.

The canopy hold-down is especially easy to apply to home-made canopies and those commercial ones that fit over the fuselage such as on Don Dewey's Centurion. The first step is to trim the canopy to oversize as shown, 1/8" on each end and 1/4" down the fuselage sides (see Figure 2, Step 1). The next step is to grip the canopy edges between 1/8" x 1/4" spruce strips, using numerous clothespins as clamps (see Step 2). Warm slightly in front of a heat source and ease the edges together ever so slightly. This gives the canopy more curvature for a snug fit and keeps the edges perfectly straight.

Now, with the canopy pulled tightly in place, drill holes and epoxy 1/32" wire pins (see Step 3) on both sides of the fuselage. The canopy will now be a snap fit over the pins which need only protrude just beyond the thickness of the canopy. In cases where the canopy need not be easily removed, the small sheet metal screws may be used to secure the canopy in place.

Fitting spliced joints is normally difficult, as for example in the case of wing spars, since the ends must be beveled so that a good joint is obtained. In order to do this as simply as possible, roughly saw the two parts to be spliced to the required angle (See Figure 3, Step 1). Next, pin both sections down to the building board, about 3" apart and parallel to each other with the ends just over the edge of the board (see Step 2). Using a flat sanding block with the sandpaper glued to it, sand the two surfaces of the bevel together until sharp points are achieved at the ends and the surfaces are flat. The 3" spacing helps prevent a

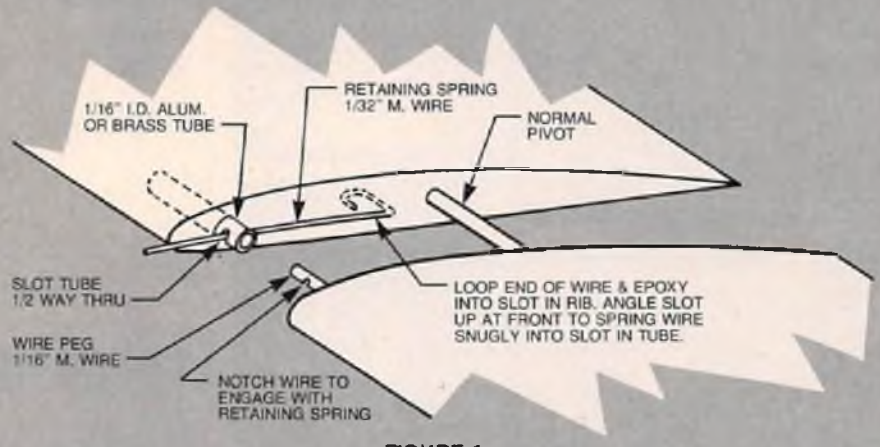


FIGURE 1
STAB LOCK

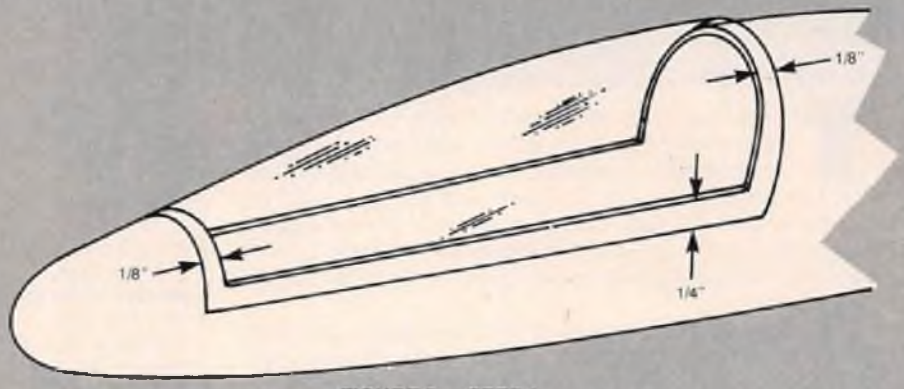
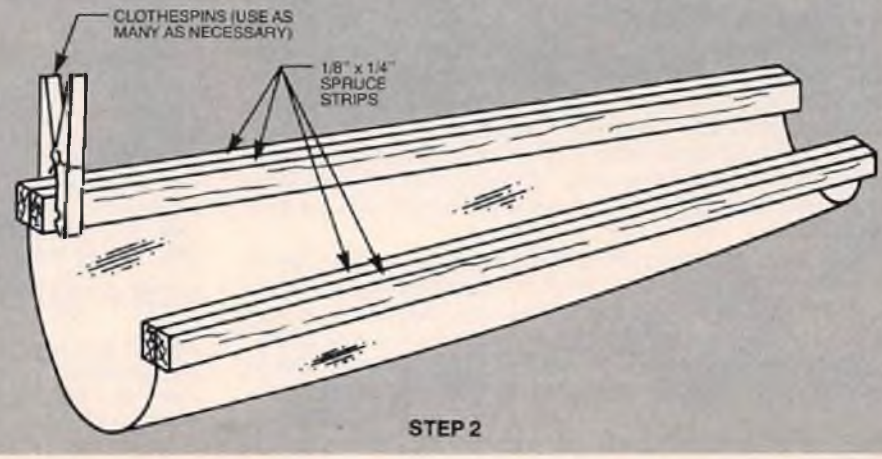


FIGURE 2 — STEP 1



STEP 2

STEP 3

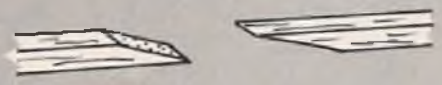
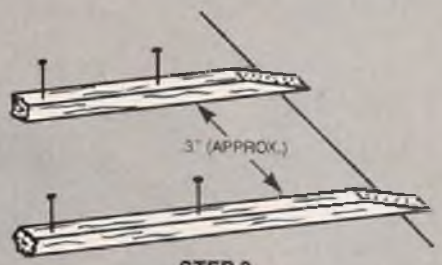


FIGURE 3 — STEP 1



STEP 2

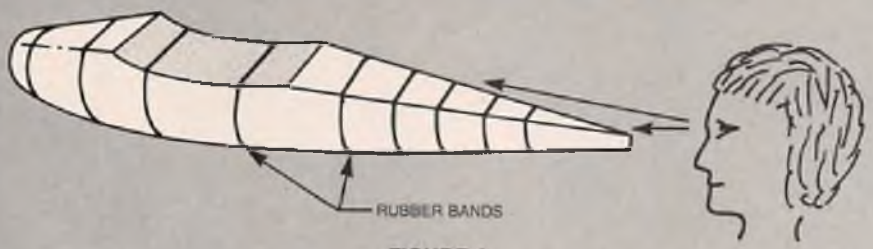


FIGURE 4

rocking action when sanding. Even if more material is taken off one part than the other, a perfect fit will still be achieved. Try this one - - - you'll be surprised!

Finally, rubber bands can be a tremendous aid when sanding a fuselage. The next time you have to sand your fuselage to shape, slip rubber bands around the fuselage at 2" intervals. Sighting down the fuselage, the contours are now easily seen and it is obvious where further sanding is necessary in order to obtain the desired contours.

These are a few of the tips that I have found extremely helpful in sailplane construction — I hope you'll give them a try. □

WAS THE SCANNER WORTH BUYING?

By Jerry F. Saner

Here behind the Redwood Curtain, hidden in the North Coast fogbelt in California, is the Eureka R/C Club, a small group of very dedicated fliers. Only the postman can boast of more dedication in getting out the mail than our group has when it comes to flying. The only time you can't find two or more fliers at the field is when there is a torrential downpour, or when there are hurricane force winds (then it's down to Table Bluff for some slope-soaring). And talk about the perfect flying field, you can't ask for one better than ours.

We fly from the Eureka Airport, (or Samoa Airport as the name on the old airport office roof reads) which is located across Humboldt Bay on the Samoa Peninsula. There is light full-size activity (5-6 landings in a month of Sunday flying), and only club members have keys to get through the gate. We are far enough away from any population centers so that there are no noise complaints and little chance for radio interference. Our club is AMA chartered because we needed the recognized organization with its insurance to satisfy the city fathers. We have few activities and fewer meetings, but after a few years of collecting dues, we did have money in the treasury. So why, with all that isolation, did we buy a World Engines scanner? Sharing our bit of Paradise is a sanctioned dragstrip with a large, paved area for the pits which also serves as a go-kart track. The east side of the airstrip is used by the local autocross club (not in the runway of course). And, besides this small possibility for radio interference, there are always spectators and this gives them something to ooh and aah about.

Well, Murphy's Law being what it is, the inevitable happened. If we had a club newsletter, that month's issue would have headlined "Scanner — Was It Worth Buying? — Ask Ken Kilburn". One Sunday afternoon, when the drag races were being held, Ken, local ace pilot, and a couple of other die-hards were still hanging around the field, chewing the fat. Deciding to take his pride and joy up for one more flight, Ken grabbed his frequency pin and fired up the engine, going to inverted flight within moments after take-off. Climbing to flight altitude, he went through the usual

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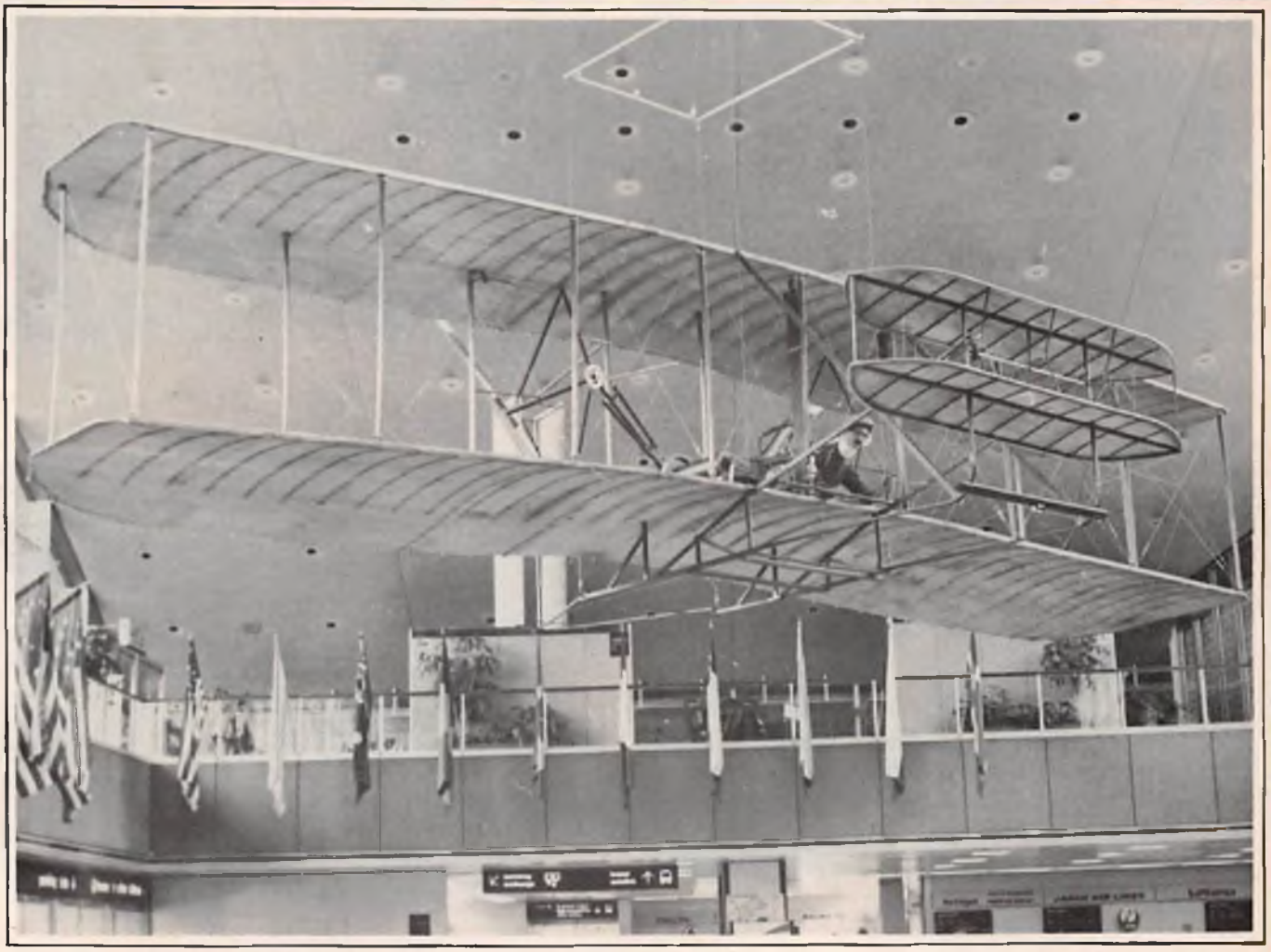
KITTY HAWK '76

BY VICTOR HERBERT



● Now that the excitement of the Bicentennial celebrations has subsided, the time has come to tell the story that led to the construction of the Wright Brothers' "Kitty Hawk" Flying Machine currently on exhibit at the International Arrivals Building at the John F. Kennedy International Airport. Literally thousands of people pass through the airport each day. Those fortunate enough to view the plane hung in the spot occupied previously by a Calder mobile, marvel at the workmanship apparent in this full-size, accurately detailed replica of the Wright Brothers' incredible flying machine. Almost as incredible is the process which led to the exhibition of the model.

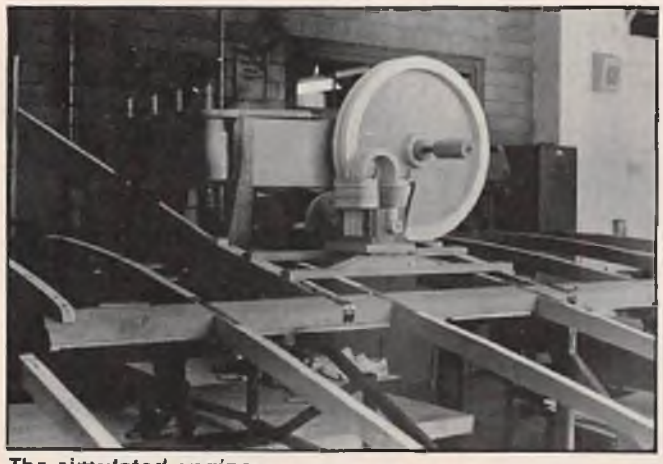
Just before Christmas of 1975, the Port Authority of New York and New Jersey gave Mr. Donald Burns, one of its top staff members, a task which appeared impossible: the reconstruction of an accurate replica of the Wright Brothers' Kitty Hawk airplane. At first, it seemed simple enough since plans, based on notes left by the Wright Brothers, were available in the Smithsonian Institute. When they were submitted for a cost estimate, materials and labor amounted to nearly sixty thousand dollars and completion was projected as requiring two years time. Stunned, but not stopped, Mr. Burns took the problem to Dr. Lawrence Costello, principal of August Martin High School in Queens, New York, which is a comprehensive high school, maintaining a magnet program built around aerospace. The key member of the August Martin staff for a project such as this, was Mr. Howard Kelem, Assistant Principal, Supervision Career Education. Howard Kelem is a former WW II pilot and has been associated with aviation and building airplanes almost all of his life. As a teacher, he was instrumental in introducing Aerospace to the N.Y.C. Board of Education where it is now being taught in many junior high schools as a regular subject of Industrial Arts. He has many designs, patents, and teaching aids to his credit and has participated in many seminars and demonstrations with his radio controlled planes in the aid of furthering aerospace education.

The question was put to Mr. Kelem, "Could you, with the help of other teachers and students, build a replica of the Wright Brothers' plane and have it ready in time for the Bicentennial in July, 1976?" This was a "once in a lifetime" opportunity, a real aviation enthusiasts dream come true. Where, or when, would anybody in the world ever get an opportunity again to build such a magnificent project? Even if it meant working night and day, around the clock, the answer was yes, without any hesitation, and Mr Kelem presented his plan.

If two teachers could be assigned to the project on a full time basis, and if a group of August Martin students could become involved in the construction as part of their normal school program, Mr. Kelem was confident that under his supervision, the project could be completed on time. Unfortunately, the Port Authority could only afford to pay for the replacement of one full time teacher. Once again, the project was on the brink of disaster until Mr. Kelem contacted

Mr. Isaac J. Dornfeld (left), General Manager of the Port Authority of New York and New Jersey, presenting a check to Dr. Costello, Principal of August Martin H.S., officially getting the 'Kitty Hawk' project off the ground.

Frame construction.



The simulated engine.

Larry Chanin on the rudders.

City College and arranged for two student teachers, Mr. Henry Chu and Mr. Larry Chanin to be assigned to August Martin High School for their internship and in their free time assist in building the Kitty Hawk.

It seemed that the last obstacle had been overcome, but it wasn't all that easy. There were tons of paper work and miles of red tape in order for the Board of Education to approve the project. A special thanks and appreciation must go to Dr. Jack Zach, a retired N.Y.C. High School Superintendent who worked so hard in getting it approved when time was of the essence. On February 4, 1976, the Board of Education approved the final papers and with the pledge of cost coverage from the Port Authority to Dr. Costello, the project "Kitty Hawk" was officially off the ground.

Initially, work progressed slowly. Teacher, Mr. Martin Muller, an expert former pattern maker, and the two student teachers from City College admitted that they had some doubts about the feasibility of the project with so much time consumed by the need to construct manually hundreds of small parts unavailable anywhere. Their confidence was restored when the props, the rudder and elevator sections began to take shape. Meticulously, Mr. Kelem set the goal, as far as humanly possible, the same materials, design and techniques would be used just as the Wright Brothers did in the original. That presented a serious problem when the need for wing fabric arose. Fortunately, Mr. Muller had a very helpful friend, a representative of the D.H.J. Fabric Manufacturing Company, who supplied the original fabric used by the Wright Brothers. He was able to obtain the same material hidden away in some obscure corner of a warehouse. The fabric is no longer manufactured by the company. Mr. Kelem and the construction team were amazed to find that very few wood joints in the entire airplane were glued together. It was all held together with metal straps, wire, screws, nuts and bolts. It seemed foolish at first, but it was later learned that the Wright Brothers design allowed for extreme flexibility. Each section, by itself, was a delicate, fragile construction. However, when joined together, each section supported the other, resulting in remarkable strength and resilience.

Only one modification had to be made in this full scale replica. Since the construction occurred in the wood working shop area of the high school, it had to be designed for easy disassembly so that each piece would pass through the doors of the International Arrivals Building at Kennedy Airport, seven feet by seven feet. Then, each piece would have to fit together again and be mounted by cables from the ceiling. A crucial concern was the ability of the wings to support themselves. Obviously, the Wright Brothers never intended their flying machine to hang suspended immobile from steel cables! Doubt was quickly quieted when the masterly craftsmanship of these pioneering geniuses again became apparent.

When the wings were completed by the August Martin team, they were attached to the body of the plane. They not only supported themselves perfectly well, they stretched out straight as arrows. Unfortunately, plans of the original plane from the Smithsonian Institute indicated that the wings had an obvious

Henry Chu on the elevators.

curve and were apparently designed to simulate that of a bird's wing. It was not weight, nor poor support, that accounted for this curve, it was part of the original design. The team had to cut all the wires and start the rigging supports all over again. This time they were braced to include the 10" negative dihedral. By this time, little doubt remained that this marvelous machine was much more sturdy and capable of self-support than it appeared to be.

Almost 14 weeks later, the magnificent flying machine was nearing completion. It was truly a work of art. A masterpiece in its own right, but yet something seemed wrong. Yes, it looked brand new. The idea was to build it to resemble the original now hanging in the Smithsonian Institute which is approximately seventy years old, where the once white fabric has faded to an almost brown color. The team experimented with many coloring agents in order to resemble the aged fabric and success was finally achieved using 42 cans of Walnut stain aerosol spray to cover the entire plane.

Visitors to the International Arrivals Building invariably ask the same question, "Can that *thing* fly?" The answer has to be a "yes" and a "no". The display plane contains an engine simulated from cardboard, wood, tin and a variety of bicycle parts. Many are the same pieces taken by Orville and Wilbur Wright from their own bicycle shop. Nevertheless, as it is constructed now, the replica would not fly. If an adequate power supply were added, it most certainly would fly since it follows the same tested theories of flight which led to the original flying machine and which have been improved but never entirely replaced by modern flying science.

Another question often asked by viewers of the hanging model is: "How did they get it up there?" The answer, trite,

perhaps but absolutely accurate, "Very carefully!" Passage through the doors was easier than expected even though it required twenty men moving with the precision of surgeons. Assembly took two hours, including a few lost minutes caused by a broken wing wire. The Port Authority proceeded to raise it to its resting place with obvious skill and concern

Mr. Kelem (Supervisor) illustrating scale model of project to be built.

for the venerable replica. When it was all over, everyone relaxed, looked up with awe and suddenly realized that something was missing; there was no Orville! Hours away from the dedication ceremony, no one had thought to place a reclining flying figure like the one in the Smithsonian. Resolution of that problem reflected the general ingenuity of the construction team.

Several quick phone calls for a figure reasonably resembling Orville Wright resulted in one female, quite bald mannequin, a local department store was willing to donate to the cause. Unfortunately, it was shaped to display the lines of feminine clothing and did not appear to resemble any kind of flyer. The team went to work. Armed with a borrowed hack saw, Mr. Kelem decapitated the mannequin, literally broke its back, appropriated a Port Authority worker's old uniform, added a pilot's hat, a pair of goggles, a snip or two of Mr. Chu's hair for a mustache, a dab of make-up here and there, and as quickly as that a mirror-image of the intrepid Orville Wright was strapped onto the plane and the marvelous moment of that eventful day, December 17, 1903, seemed to occur again.

The full-scale, accurate replica of the Wright Brothers' Flying Machine will be on display at Kennedy Airport for the rest of this year. Then, it will travel throughout the country to various educational and industrial sites for further display. Eventually, it will be housed in some museum or other. Now that the story of its construction has been told, it is hoped that those who do stop to look at the model, will also be able to see some of the fine detail and expert craftsmanship evident in its construction. Its magnificence brings credit to the team of teachers and students of August Martin High School who worked under Mr. Kelem's excellent supervision. At the same time, and no member of the team would hesitate to say it, the magnificence points again to the enormous vision and patience of the two daring young men who were so sure that their flying machine would eventually stay aloft long enough to affirm their conviction that man could, and would, fly. It is a fitting tribute that the achievement of the Wright Brothers makes up the official Bicentennial celebration of the aerospace industry. □

SUPER TURKEY

If simplicity is a virtue, you're going to have the most virtuous R/C aircraft on the field with this six foot span, all-balsa, Jedelsky wing sailplane for two-channel operation.

BY JOEL RIEMAN

In this world of computer designed model airplanes, simplicity is a virtue. Too many model glider enthusiasts are becoming concerned with Reynolds numbers and formulas. Their intentions are to design a super ship that will fly fastest on the slope or break a distance record in the desert. While competition and being top-seated are all well and good, and very American, it can also be nerve racking and expensive. So, while your Grand Esprit is still in one piece, set it aside and consider the advantages of having a model like the Super Turkey.

To begin with, the all-sheet construction and Jedelsky style wing make for easy and fast building. In fact, the model can easily be built in one full day. Financially speaking, $25.00 to $30.00 is all that is needed to buy the necessary materials — tools excluded, of course. When completed, you have a hands-off airplane. Its stable nature and good maneuverability make it an ideal trainer, although it is in no way limited to beginners. All told, the Super Turkey is a simple, inexpensive, good flying sport model, which, if demolished on the face of a slope, would be a relatively minor loss, assuming there is no radio damage.

It has taken approximately five years for the Super Turkey to reach its present state. Actually, the design combines the best ideas of four glider flyers, all of whom had been experimenting with all-sheet, Jedelsky winged flying machines. One of the four flyers was Bill Watson who added the final touches, drew the plan and supplied the needed information for preparing this article. It was Bill who tried the first V-tail on the Super Turkey. Although it looked sporty, it required a little more attention than the conventional tail version and was also more difficult to rig.

I first came in contact with the Super Turkey about four years ago, after watching Bill Watson, a superb pilot, perform incredible stunts with his model. Impressed, I built one, installed a used EK brick and set forth to fly my wood grain bird (it matched my radio). It had been a wise choice for my first RC glider. By the time I had mastered slope landings, I had inflicted several wounds, all of which could be repaired with a band-aid and some five-minute epoxy. Even a folded wing, the result of an attempted Hi-Start launch with 1/4" surgical tubing, was not too serious for this remedy. That wing had not been glassed.

My model was a bit on the heavy side, but 90% of the flying I did with it was on the slope. The Super Turkey, while well suited as a slope glider, was originally designed for thermal flying. If most of your flying will be of this type, build light, adding ballast for the slope or windy conditions. Use the recommended flying weight of 26 to 38 ounces as a guide in building your Super Turkey.

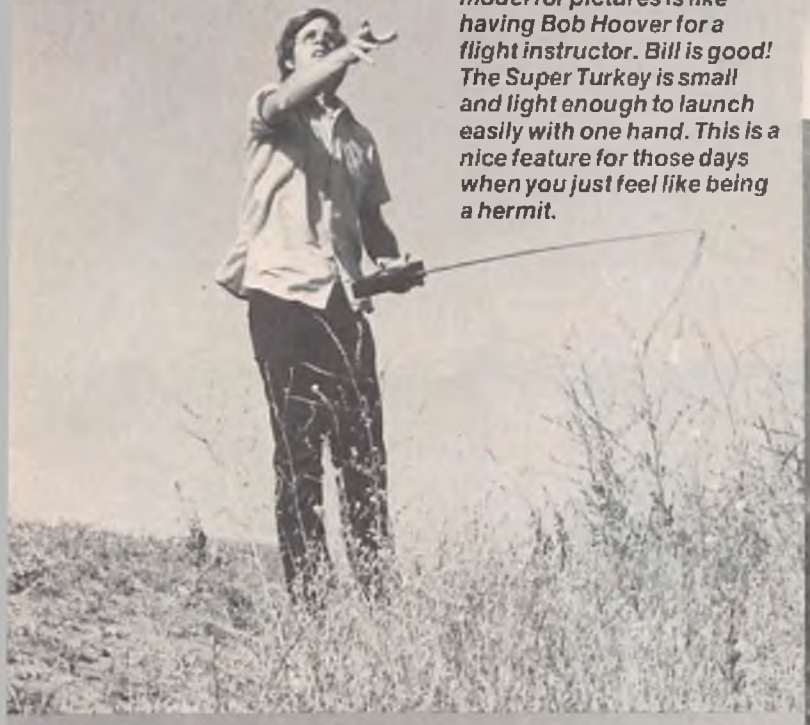
CONSTRUCTION

Wings: The wing plan illustrates the simplicity and ease of constructing a wing Jedelsky fashion — two planks with ribbing. This type of wing has been used successfully in the past on free-flight power ships, Nordics, and RC gliders. It's hard to beat for low cost sport models.

The wing shown spans 72" — two lengths of 3' balsa — and has an area of 500 square inches. An 8' wing can be built in the same manner if 4' stock is available. In either case, you will need two sheets each of 3/8" x 3" medium hard balsa and 1/8" x 4" light stock of the length you choose. Make sure when choosing this wood, that it is unwarped and that the opposed sheets are of equal weight.

Begin building the wing by tapering the 1/8" sheets as shown on the plan. This will automatically provide washout when the tips are raised. Now cut 8 long ribs from 1/8" hard sheet and 12 short ribs from 1/8" medium hard sheet. Using a ball point or felt tip pen, mark rib locations on both of the 3/8" sheets of wood and then glue the ribs in place using Tightbond or a similar adhesive. When dry, turn over and glue on the 1/8" sheet. At this point, turn the wing over once

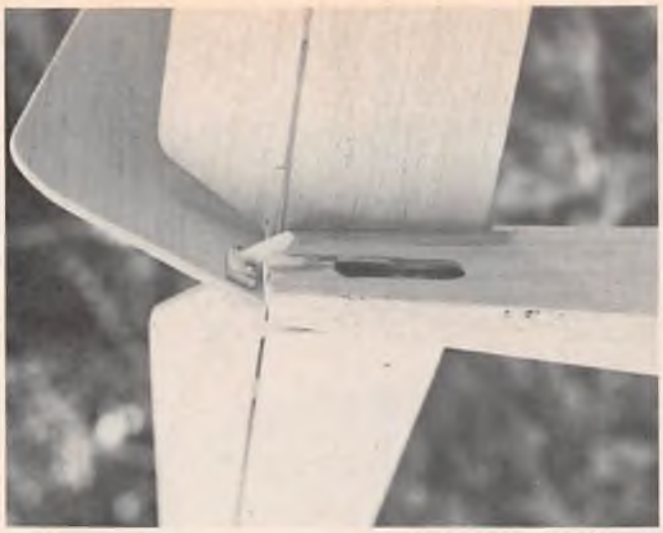
Having Bill Watson fly your model for pictures is like having Bob Hoover for a flight instructor. Bill is good! The Super Turkey is small and light enough to launch easily with one hand. This is a nice feature for those days when you just feel like being a hermit.



Although the Super Turkey was originally designed as a quicky thermaler, it is beautifully suited to slope flying. If you have a lush spot like this one in the heart of Malibu Canyon, it makes it that much nicer. The Pacific Ocean lies just behind the hills.

Drop the nose a bit and it penetrates well, but does not build up excessive speed. The model is quite capable of positive aerobatic maneuvers and will be especially strong if you glass the wing joints as described in the article.

The author (that's me) showing off the simple, yet clean lines of the Super Turkey. Note frequency flag. Yes, it was windy that day.



Close-up of tail group showing pushrods and horns. Small rudder horn was used on prototype, however, it had to be set on block for clearance.

Underside of wing showing how ribs are located and glued in place.

more and add a gusset of glue where the ribs meet the wing panel. Now add the leading and trailing edges and razor plane and sand the 3/8" sheet to the airfoil shape. To add dihedral, cut the wings at the designated locations, sand in proper bevel and glue up as indicated on the plan. The plywood wing tip plates can now be added and the center section filled with foam or balsa. Do not dope the finished wing; doing so will add weight and offer little in return in the way of performance. If you must use Monokote, limit it to stars and stripes. Covering the entire model with this material would only double your expenses.

The finished wing will be very rigid and strong enough to take the loads of any normal positive G maneuvers. I can make no such statement regarding negative maneuvers. To be extra safe, fiberglass all dihedral joints, top and bottom, using 6-ounce cloth for the center joint and 2-ounce cloth for the tip joints.

Fuselage: Cut out fuselage sides from 1/8" medium hard sheet. Put the two sides together to make sure they match and to drill holes for the wing mounting dowels. Now glue the 3/8" square longerons to the inside edges of the fuselage sides as shown on the plan. If you are building the conventional tail version, taper longerons to measure 3/32" at the back. Cut formers from 1/4" sheet. Join the fuselage sides together, using F2 and F3, being careful to keep the two sides aligned while the glue dries. When this is done, glue the tail together, then add F1. You may now add the bottom sheeting, making sure it is made from hard balsa. It is bound to take a lot of beating. The top sheeting is added after installing the pushrods. Finally, carve a nose block, make top hatch and add wing mounting dowels. Add a skid if you feel it is necessary, and, if you plan to tow your Super Turkey aloft, a towhook is a nice addition. Fiberglassing the forward section of the fuselage, once again, is optional.

SUPER TURKEY

Designed By: Ken & Don Hamlyn
Mike Reagan & Bill Watson

TYPE AIRCRAFT
Sailplane-Sport & Trainer
WINGSPAN
72"
WING CHORD
7⅜"
TOTAL WING AREA
500 Square Inches
WING LOCATION
High Wing
AIRFOIL
Jedelsky
WING PLANFORM
Constant Chord Center
Taper Outer Panel
DIHEDRAL, EACH TIP
2" First Break
5" At Tip
O.A. FUSELAGE LENGTH
42⅜ Inches
RADIO COMPARTMENT AREA
(L) 10" X (W) 2½" X (H) 2½"
STABILIZER SPAN
23¾ Inches
STABILIZER CHORD (incl. elev.)
4" (Avg.)
STABILIZER AREA
91 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6⅞ Inches
VERTICAL FIN WIDTH (incl. rudder)
5½ Inches
REC. ENGINE SIZE
Not Applicable
FUEL TANK SIZE
Not Applicable
LANDING GEAR
Skid
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder and Elevator
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa
Wing	Balsa
Empennage	Balsa & Spruce
Weight Ready-To-Fly	26-38 Ozs.
Wing Loading	7.49-10.95 Oz./Sq. Ft.

Tail Assembly: Here you have a choice between the V-tail or the conventional stabilizer. The conventional tail is the more practical application. It is less susceptible to damage since it is mounted more securely than the V-tail. It offers better control and is much easier to rig. Be sure to make your decision on which tail to use before building the fuselage.

All tail surfaces can be cut from 1/8" medium hard or 3/16" light sheet balsa, but not too light. After cutting these pieces out, round off the leading and trailing edges. The elevators can be cut out separately, connecting them with a piece of 1/8" x 1/4" spruce at the center. If you are making the V-tail, use the outer outline. After hinging the control surfaces to the stabilizers, epoxy it all on the fuselage. It is necessary to fiberglass the V-tail version as shown on the plan, using 2-ounce cloth, if you want it to last more than a couple of flights.

Radio Installation: Any two channel radio — brick or single servo — will fit in the Super Turkey's radio compartment. I've used both successfully. Your model will probably come out tail heavy, so mount the radio gear as far in front of the C.G. as possible, leaving some room up front for nose weight. Use servo tape to mount the servos, but before installing, smear Devcon epoxy on the floor of the compartment to make the surface stickable. Aim carefully when mounting because, once down, they are hard to "pry" up. If you use an inferior brand tape, the servos may need additional support. Place the receiver and battery pack, in that order, in front of the servos, and pad with foam rubber.

Make pushrods from 1/4" square hard balsa tapered to 1/8" at the ends. Epoxy and thread wrap wire ends onto each end using a clevis at the control horn end. Pushrods of this type provide posi-

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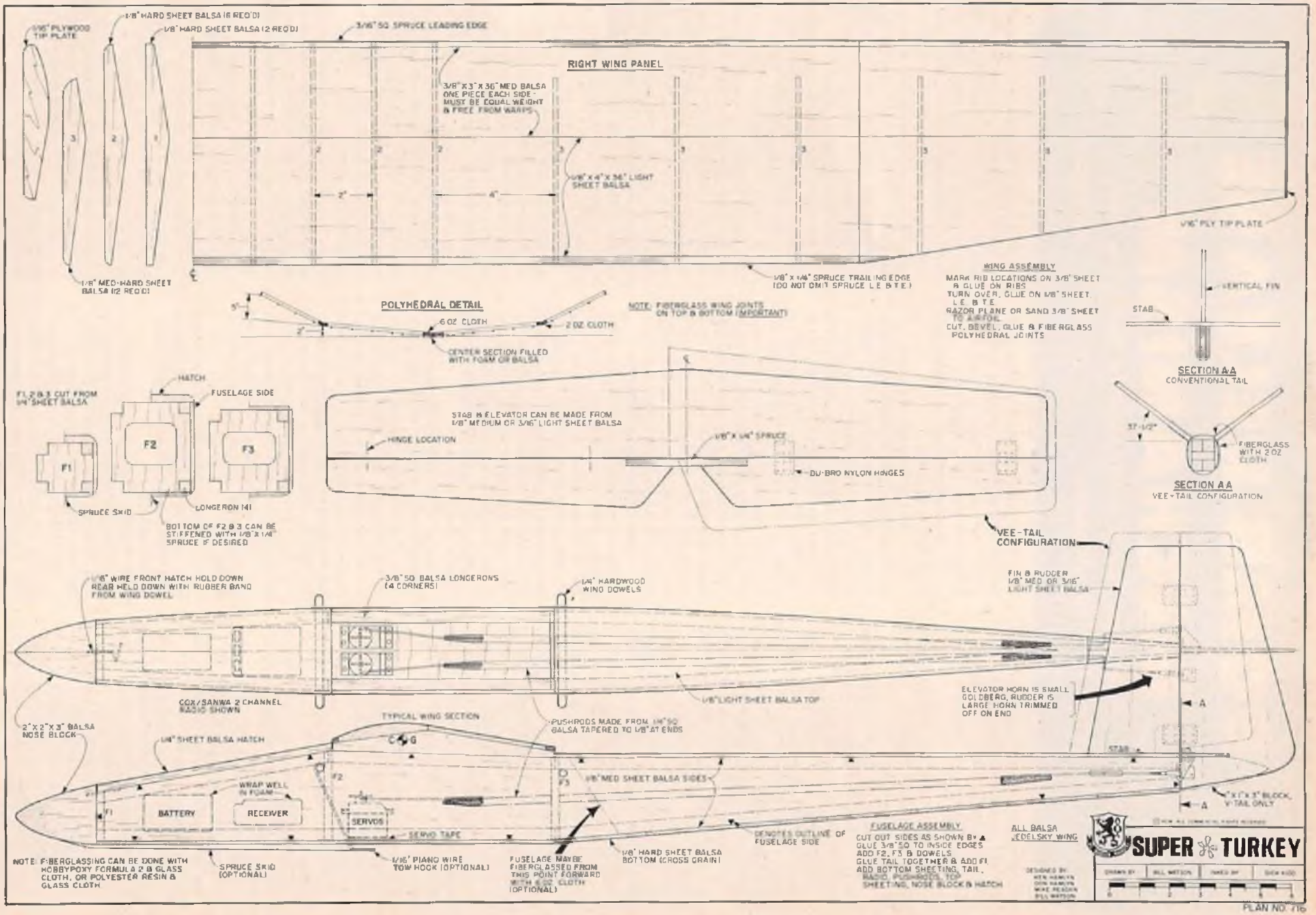

1/16" PLYWOOD TIP PLATE
1/8" HARD SHEET BALSA (6 REQ'D)
1/8" HARD SHEET BALSA (2 REQ'D)
3/16" SQ SPRUCE LEADING EDGE
RIGHT WING PANEL
3/8" X 3" X 36" MED BALSA ONE PIECE EACH SIDE - MUST BE EQUAL WEIGHT & FREE FROM WARPS
1/8" X 4" X 36" LIGHT SHEET BALSA
1/16" PLY TIP PLATE
1/8" MED-HARD SHEET BALSA (2 REQ'D)
1/8" X 1/4" SPRUCE TRAILING EDGE (DO NOT OMIT SPRUCE L.E. BITE)
WING ASSEMBLY
MARK RIB LOCATIONS ON 3/8" SHEET & GLUE ON RIBS
TURN OVER, GLUE ON 1/8" SHEET L.E. & T.E.
RAZOR PLANE OR SAND 3/8" SHEET TO AIRFOIL
CUT, BEVEL, GLUE & FIBERGLASS POLYHEDRAL JOINTS
POLYHEDRAL DETAIL
6 OZ CLOTH
2 OZ CLOTH
CENTER SECTION FILLED WITH FOAM OR BALSA
NOTE: FIBERGLASS WING JOINTS ON TOP & BOTTOM (IMPORTANT)
VERTICAL FIN
STAB
SECTION A-A
CONVENTIONAL TAIL
57-1/2°
FIBERGLASS WITH 2 OZ CLOTH
SECTION A-A
VEE-TAIL CONFIGURATION
F1, F2 & F3 CUT FROM 1/4" SHEET BALSA
HATCH
FUSELAGE SIDE
F1
F2
F3
SPRUCE SKID
LONGERON (4)
BOTTOM OF F2 & F3 CAN BE STIFFENED WITH 1/8" X 1/4" SPRUCE IF DESIRED
STAB & ELEVATOR CAN BE MADE FROM 1/8" MEDIUM OR 3/16" LIGHT SHEET BALSA
HINGE LOCATION
1/8" X 1/4" SPRUCE
DU-BRO NYLON HINGES
VEE-TAIL CONFIGURATION
1/8" WIRE FRONT HATCH HOLD DOWN REAR HELD DOWN WITH RUBBER BAND FROM WING DOWEL
3/8" SQ BALSA LONGERONS (4 CORNERS)
1/4" HARDWOOD WING DOWELS
FIN & RUDDER 1/8" MED OR 3/16" LIGHT SHEET BALSA
COX/SANWA 2 CHANNEL RADIO SHOWN
1/8" LIGHT SHEET BALSA TOP
ELEVATOR HORN IS SMALL GOLDBERG, RUDDER IS LARGE HORN TRIMMED OFF ON END
2" X 2" X 3" BALSA NOSE BLOCK
1/4" SHEET BALSA HATCH
TYPICAL WING SECTION
C.G.
PUSHRODS MADE FROM 1/4" SQ BALSA TAPERED TO 1/8" AT ENDS
WRAP WELL IN FOAM
BATTERY
RECEIVER
SERVOS
SERVO TAPE
1/8" MED SHEET BALSA SIDES
1" X 1" X 3" BLOCK, V-TAIL ONLY
NOTE: FIBERGLASSING CAN BE DONE WITH HOBBYPOXY FORMULA 2 & GLASS CLOTH, OR POLYESTER RESIN & GLASS CLOTH
SPRUCE SKID (OPTIONAL)
1/16" PIANO WIRE TOW HOOK (OPTIONAL)
FUSELAGE MAYBE FIBERGLASSED FROM THIS POINT FORWARD WITH 6 OZ CLOTH (OPTIONAL)
1/8" HARD SHEET BALSA BOTTOM (CROSS GRAIN)
DENOTES OUTLINE OF FUSELAGE SIDE
FUSELAGE ASSEMBLY
CUT OUT SIDES AS SHOWN B+A
GLUE 3/8" SQ TO INSIDE EDGES
ADD F2, F3 & DOWELS
GLUE TAIL TOGETHER & ADD F1
ADD BOTTOM SHEETING, TAIL, RADIO PUSHRODS, TOP SHEETING, NOSE BLOCK & HATCH
ALL BALSA
EDELSKY WING
SUPER TURKEY
PLAN NO. 716

BOMB RELEASE MECHANISM

A Design For A controllable Unit you can Tailor To Your Models.

BY ROY S. REICHERT

● *Here she comes . . . holding a steady track at constant heading, altitude and velocity. Ready now . . . release! . . Missed! That wind is stronger than I thought.*

Circle back, line up and try again. Ready . . release! Oops . . . overshot this time. Try again.

Third pass . . everything looks good . . . release! Bullseye! Third try, a direct hit. Seven bombs left.

Circle back for a final pass . . . remember that last mark . . . steady now . . . salvo! Perfect drop . . . all seven on target . . . eight out of ten bombs on the spot. Not bad!

Sound like an Air Force training mission? Not quite. It's just my Ugly Stik doing its thing at a Fun Fly.

Almost every Fun-Fly has a bomb drop event. Having noticed the different approaches taken by modelers in the design of bombs and bomb-releases, I find that the majority of designs are one-shot devices which drop all bombs at once on the first shot.

Certainly, for a model of a military aircraft which normally carries only one or two bombs, torpedoes, rockets, etc., these devices are adequate if properly designed. Admittedly, there is much to be said for the reliability of the simple rubber band holding the single bomb load.

However I have long been toying with the idea of designing a bomb relese mechanism which would have the following features:

(I) Able to carry a large number of bombs.

(2) Controlled release of one or two bombs at a time, or all bombs simultaneously, as desired.

(3) Mechanism must be light, compact and easily built into a wing.

(4) Mechanism must operate with negligible load on servo.

(5) Servo operation must be non-critical. There must be no need for precise positioning of the servo or the transmitter control lever.

(6) A minimum of moving parts.

(7) Should any bomb fail to drop, it should not jam the mechanism, preventing other bombs from releasing.

(8) Bombs must be easy to load into the mechanism.

(9) Mechanism must be adaptable to dropping other types of objects. (I like to drop hand-launch-type gliders from under my larger R/C models.)

(10) Mechanism must be simple and inexpensive to build.

After making many sketches and constructing models for testing, I have managed to work out a design which meets all of the above requirements. The following construction notes describe the 10-bomb unit installed in the wing of my Ugly Stik. I consider 10 bombs as the practical limit for this mechanism. By carefully reading the construction notes in their entirety before starting construction, you will easily see where you can make changes to tailor the unit to your particular needs; whether it be for a Fun-Fly type sport ship, or for that masterpiece scale military fighter-bomber.

Basic Operating Principle

The unit consists of a set of slots in the bottom of the wing, through which the bomb attachments are inserted. The bombs are held in place by a snap-in arrangement consisting of a spring-wire and strip of brass, shown in Figure 1. The brass strip is notched so that, as it is made to slide along its length, the notch will slip under the bomb attachment and release the bomb.

By carefully determining the exact location of the notches in the brass slide, the unit can be built to release one, two, or more bombs at a time with only a small movement of the slide. As the slide continues to move, successive bombs are released by their respective notches in the slide. The notches are cut so that the slide never covers a bomb slot once the bomb has been released. Thus, the first bomb release slot will have a wider notch than the successive one, and so forth.

With this arrangement, if the brass slide is made to travel its entire length in one rapid movement, all bombs will drop simultaneously.

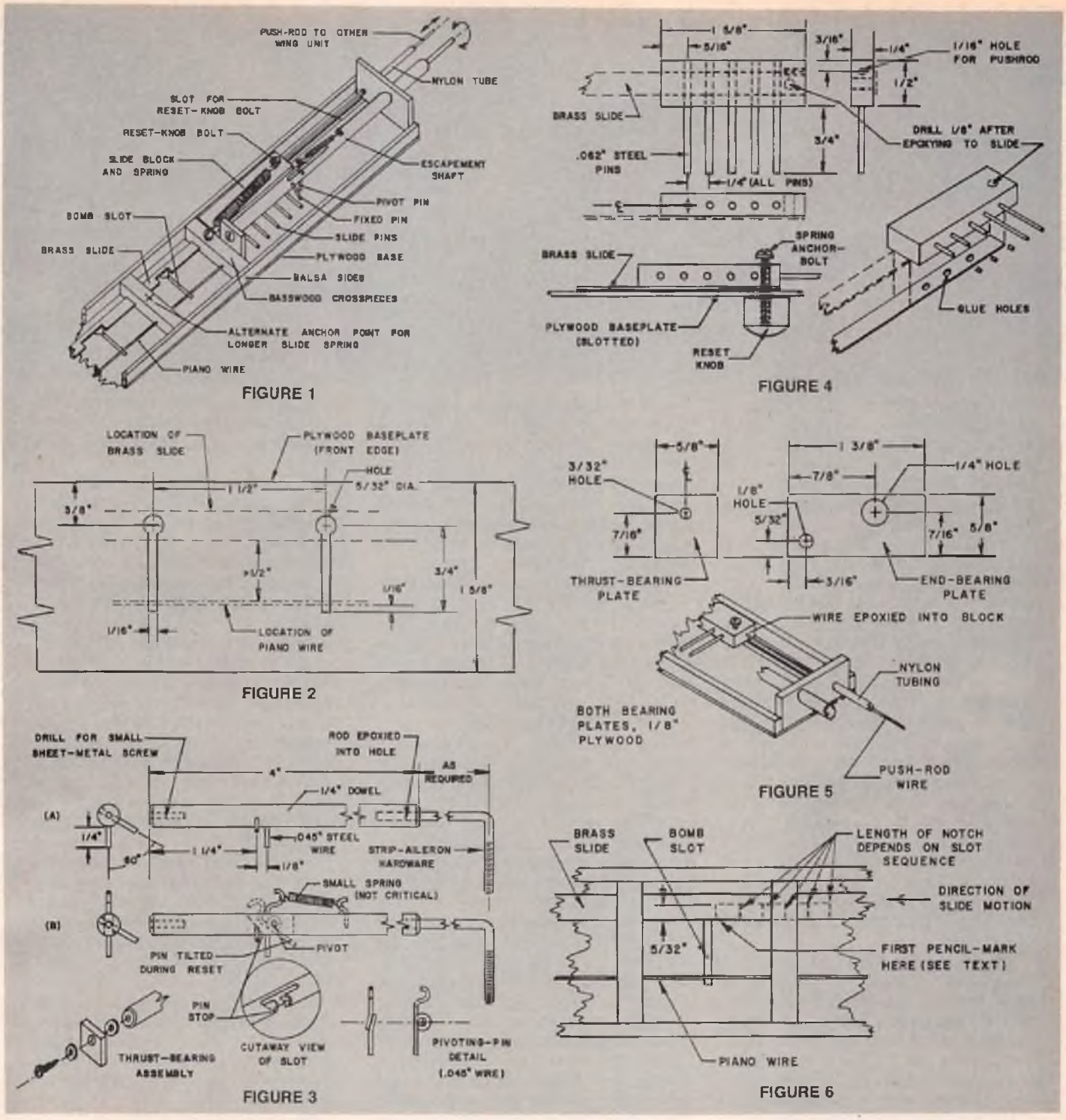
If, however, the slide is permitted to move only a short interval at a time, only one bomb will be dropped at a time, up to the total number of bombs carried.

The object is to provide the means for moving the slide in this controlled manner. For this, a simple "escapement" mechanism is used. The mechanism is no different from the type of device found in many pendulum clocks driven by weights. In the clock, the swinging pendulum moves a rotating shaft back-and-forth. This shaft holds two pins which alternately mesh with the teeth of an escapement gear driven by the wieghted gear-train. As the shaft rotates back-and-forth, the pins allow the gear to turn one tooth at a time, permitting the slow movement of the mechanics.

In this bomb release device, the rotating shaft is moved on command by the servo and the escapement "gear" is a set of "teeth" fastened to the brass slide and spring loaded to provide a motive force. In the same spirit that we must wind the clock by pulling up the weights, the bomb release is "wound" or "set" by moving the slide so as to stretch the driving spring. Thus, the load of operating the device is taken up by the spring and not the servo. The servo simply provides a controlled release of the energy stored in the spring.

Rotation of the escapement shaft by the servo is not critical. This design is such that the servo control on the transmitter (one of the auxiliary channel levers on your multi-channel beauty!) is normally kept in the **center** position. Thus, the airborne servo is in the center of its rotational range and the escapement has a pin engaged with the slide, holding the slide in position. As the transmitter lever is moved to one end of its travel, the airborne servo causes the escapement shaft to rotate correspondingly. This rotation disengages the first escapement pin while simultaneously engaging the second pin, but permitting the slide to be moved one interval by the spring, dropping a bomb.

Movement of the transmitter lever back to the center position causes the servo to move the escapement shaft back to its original position, permitting another interval of slide movement, dropping another bomb. Repetitive movement of the transmitter lever in this manner between these two positions, causes the successive release of the bomb load, as desired. If the transmitter lever is moved to the **opposite** end of its range, the servo rotates the escapement shaft so as to disengage all pins from the slide, permitting the spring to pull the



slide its full distance instantly, causing the simultaneous release of all remaining bombs.

Thus, by using the transmitter lever in a three position mode, we can accomplish the desired type of release for the bomb load. Also, the three positions are non-critical so that there is no need to take our eyes off the aircraft to look at the bomb-control lever.

Construction: The Slide

As I describe the construction of the mechanism I will deal with a single unit. Since you will probably wish to install a release device in each wing, you will have to make two of these units, but they must be **mirror images** of each other, except for the location of the notches in the slides. This will become apparent later.

Also, it is only necessary to build an escapement device into one of the units, but this too will be discussed later. For now, I will consider only the basic slide arrangement, common to both units.

Each unit is built on a base plate of 1/16" plywood, cut 1⅝" wide. The length of the plate is equal to:

$$L = (S \times N) + 4.5 \text{ inches}$$

where:

L = plate length (inches).
S = spacing between bombs.
N = number of bombs per unit.

The 4.5 inches is the space needed for the escapement mechanism.

Unless you are building to a specific scale for an ultra-special scale model, I recommend a minimum bomb spacing of 1½". I have used this on my Ugly Stik and it is a good spacing. Thus, for a 10-bomb load, 5 bombs under each wing, the length of the plate would be:

$$L = (1.5 \times 5) + 4.5$$

or 12". Lay out the slots for the bombs exactly as shown in Figure 2, the first slot being made 1.5" from the end of the plate. Drill the 5/32" hole at the forward end of each slot location, then cut out the slots. Although a saw could be used here, I prefer a modeling knife with a new blade. This makes the slots very precise

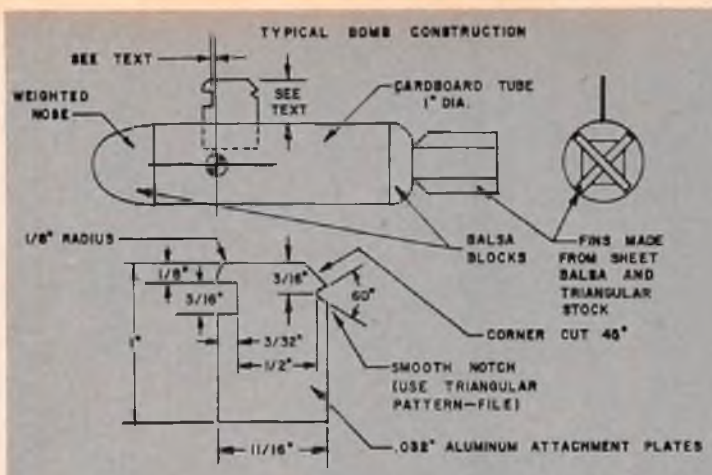


FIGURE 7

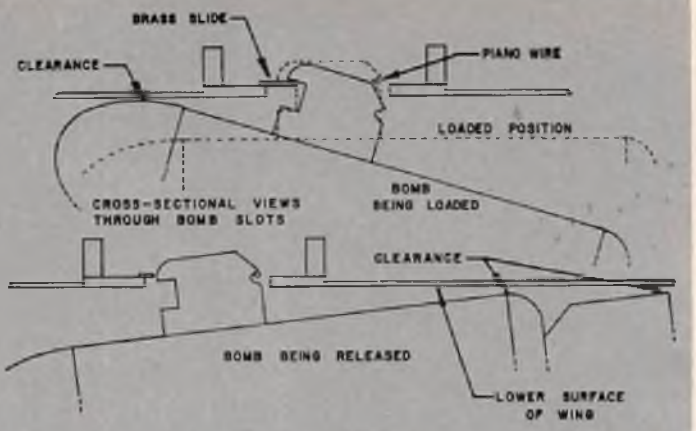


FIGURE 8

and provides extremely smooth edges for reliable operation. You should end up with a series of smooth keyhole shaped slots. The purpose of the end hole is to prevent the bomb attachment from catching on the side of the slot when the bomb is released.

Glue 1/8" x 1/4" strips of balsa along the edges of the plywood plate facing inside the wing. These strips are glued on their 1/8" edge. Cut a piece of 0.025" piano wire 2" longer than the distance between the two end slots; in the case of this 5-bomb unit, 8" long. Position this wire so that it lies across the slots **exactly** 1/16" from the rear end of each slot, and centered to protrude 1" beyond each end slot. Lightly tack the wire in place with a **small** dab of 5-minute epoxy at each end. (Do not use Hot Stuff or Zap here as it will creep along the wire. Glue only the very ends!)

Cut several pieces of 1/4" x 1/4" basswood of sufficient length to fit snugly between the balsa edge strips. Cut as many of these pieces as you have bomb slots, plus one (for our 5-bomb unit, 6 pieces).

Select a length of brass strip 0.025" x 1/4", equal in length to the plywood plate. Position this strip along the slots so that it lies directly over the centers of the holes in the front ends of the slots. Temporarily secure this strip in place with tape at the ends. The space between the rear edge of the strip and the piano wire should be slightly over 1/2".

Temporarily place the basswood pieces between the side strips of balsa, so that they lie across the brass strip and the piano wire (see Figure 1). Position these equi-distant between each slot and beyond the end slots. Be sure the brass strip and the piano wire are perfectly straight and parallel.

With a sharp pencil, mark each basswood piece where it crosses the brass and the wire. Remove each piece, one at a time, and cut away a channel to permit clearance for the brass slide. This should be a clean cutout to permit smooth movement of the slide but prevent sideways slop. A small flat pattern file is ideal for this work. With a saw blade make a shallow cut where the piece fits over the piano wire. Replace the piece in position and check the fit. Repeat for all basswood pieces. When all pieces have been fitted, remove the tape and check that the slide moves freely back-and-forth but does not wiggle sideways. Be sure the wire is not being distorted from a straight line. When all pieces fit properly, epoxy them in place. Be sure that there **is** epoxy where the wire passes under each piece, but that there **is not** any epoxy binding the brass strip! (Again, do not use Hot Stuff, or Zap, etc.) The slide assembly is now nearly completed.

The Escapement

The escapement is built into one wing-unit of a two-wing installation. The first part of the escapement to be made should be the rotating shaft with the two pins, as shown in Figure 3. There are two basic designs for this shaft, each performing as well as the other, but differing in the manner of setting the spring. The simplest design, shown in Figure 3A, is nothing more than a 1/4" birch dowel with the two escapement pins set into it with the proper spacing and angular offset. Since each pin is rigid, setting the spring requires that the transmitter lever be moved to the "salvo" position which rotates both pins free of the slide "teeth". The slide is then pulled back to stretch the spring, and held in place while the transmitter lever is returned to the center position. The bombs can then be loaded.

The second design (the one which I prefer and strongly recommend) provides for a pivot on the escapement pin used in the center position; see Figure 3B. This permits the slide to be pulled back and set without rotating this pin out of the way. Since the pin is spring loaded, it snaps back into positon automatically. This has the big advantage that the radio can be turned off. Thus, you can load up your bombs while waiting your turn to fly on that busy frequency. When the channel is yours, you are ready to go!

Either design you choose can be made by studying the drawing. Pay close attention to detail. If desired, a hollow fiberglass arrow shaft can be used in place of the dowel, but the ends will have to be plugged.

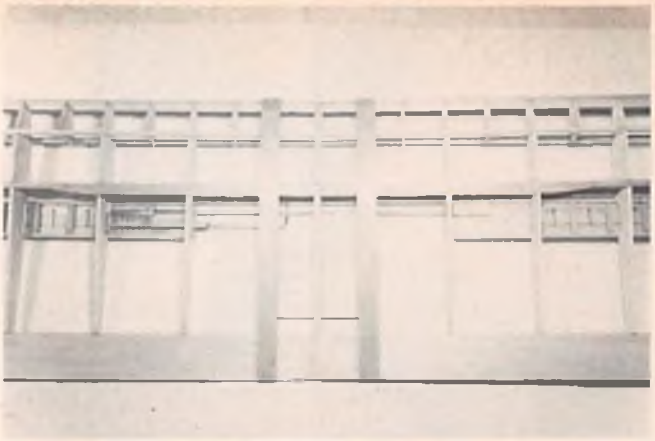
Epoxy the pins in place except where the pivot type is used. In this case, pay particular attention to the shape of the slot shown in Figure 3B. The left end of this slot is angled to act as a stop for the pivoting pin. The spring pulls the pin and the stop holds it 90° to the shaft. Before assembly, the wood can be saturated with Hot Stuff or Zap at this point to harden the wood and resist wear. Epoxy the fixed pin, the pivot shaft, and the spring anchor pin. Be sure the pivoting pin moves freely and stops firmly in the proper position when the spring is installed. Take care that the pins do not protrude from the shaft more than 1/4". Also, be sure the spacing of the pins along the shaft is exactly 1/8" and the offset angle is exactly 60°.

Next, make the "gear teeth" assembly for the slide. As can be seen in Figure 4, this is simply a hardwood block holding as many steel pins as there are bombs in the unit. (This assumes a two-unit installation, one under each wing. Actually, the mechanism requires one pin for every two bombs, plus another pin for any odd bomb. For a two-unit installation there will be an even number of bombs.) Since my Ugly Stik carries 5 bombs under each wing, the escapement requires 5 slide pins.

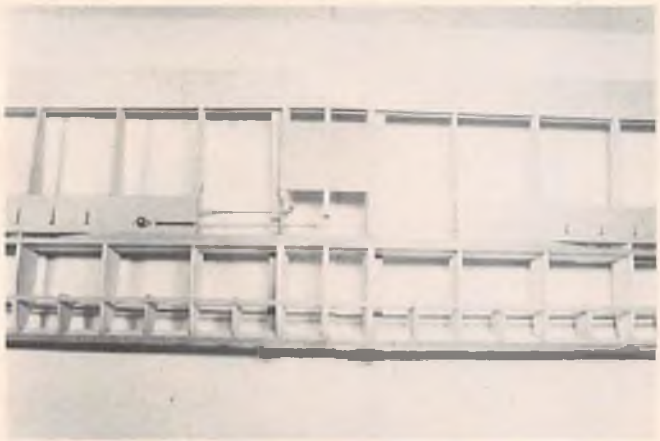
The slide pins are 0.062" steel wire set into the hardwood block with epoxy and protruding from the block 3/4". The pins are spaced exactly 1/4" apart. Drill two or three small holes near one end of the brass strip and epoxy the strip to the slide block as in Figure 4. Be sure that some of the epoxy fills the holes in the strip for a good mechanical bond. After the epoxy has hardened, smooth it down with a file until it is flush with the surface of the brass strip. Now drill a 1/8" hole through the block and the strip for a steel bolt as shown in Figure 4. This bolt will serve to hold the spring set knob and also to anchor the slide spring.

Insert the brass slide in place in the slide unit and insert a pencil point into

The right unit shown installed in a built-up wing structure.

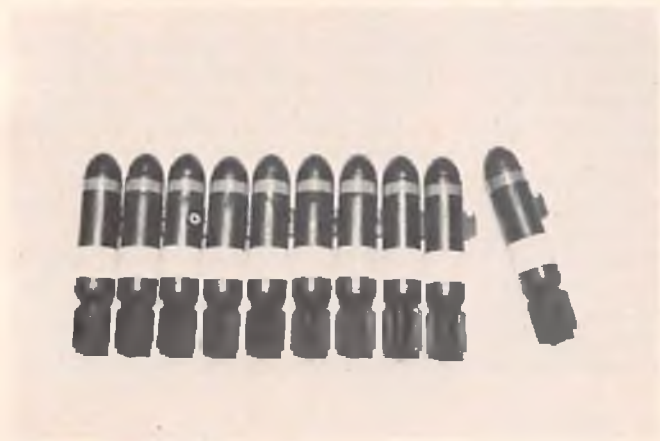


Top view of the completed wing structure with both units installed.



Bottom view of the completed wing structure with both units installed. Note the connecting push-pull wire running between the units.

Top of finished wing showing use of inspection plates.



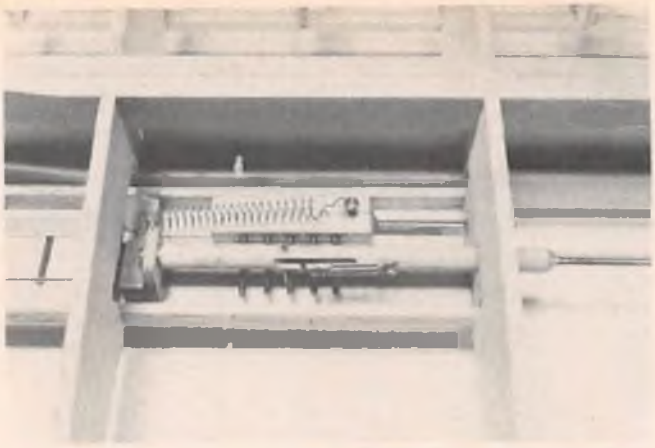
A set of ten bombs.

Three types of bomb construction.

the bolt hole in the slide block. Move the slide block back-and-forth over its full travel, thus, marking a line on the plywood with the pencil. Remove the slide and cut out a 1/8" wide slot centered on this line for its full length, cutting all the way to the end of the plate. Replace the slide and insert the bolt as shown in Figure 4. Be sure the slide moves freely over its entire range without the bolt binding in the slot. Epoxy the bolt into the slide block leaving enough room under the head to anchor the spring. Install the anchor for the other end of the spring, as shown in Figure 1.

The spring you use must be selected for the proper strength to move the slide easily, overcoming all slide friction plus the friction of the bomb attachments, when loaded. Do not use too strong a spring, however, or you will place excess strain on the escapement pins. The spring length must be long enough to handle the full movement of the slide without excessive loss of tension in the full release position. You may find that good results are obtained with a spring

Showing the correct way to insert a bomb into a slot.



Detail view of the escapement mechanism after it has been operated for five of its ten positions.

The left unit shown installed in a built-up wing structure.

Inserting the left unit in place in the bottom of the wing. Note the additional bearing plate supporting the push-pull wire and escapement actuator arm.

about 1" long and 3/16" diameter, close-wound with 0.025" spring wire. At least, this worked well for my Ugly Stik unit. The final choice will depend on the overall friction in the slide, so use care in construction.

Install the spring on the slide and temporarily thread the spring set knob onto the bolt protruding from the bottom of the assembly. This knob should have a broad surface where it touches the base plate, to provide stability to the slide itself. This prevents the slide block from "rocking" during operation. Do not tighten the knob so much as to bind on the plate, however.

It is now time to make the bearing plates for the escapement shaft. See Figure 5. Prepare the ends of the shaft for the thrust bearing screw and the servo horn wire. For the servo horn wire, I used Goldberg strip-aileron hardware. Assemble the thrust bearing as shown in Figure 3 and slip the other bearing plate over the shaft in its proper position. Temporarily set the larger bearing plate in place between the edge strips at the end of the base plate. **Do not glue!** Tape or pin this plate in position, as convenient. Hold the thrust bearing plate in place and check that the shaft lies directly over the centers of the protruding slide pins. Rotate the escapement shaft to be sure that the shaft pins do not touch the plywood bottom plate.

If you have used the pivoting escapement pin design, set the shaft so that this pin is pointing downward toward the bottom plate. Pull on the spring set knob to move the slide and stretch the spring. Check that the slide pins push back the escapement pivot pin freely, and that the slide moves far enough for all slide pins to clear the pivot pin.

If you used the rigid pin escapement, rotate the shaft so that these pins clear the slide pins. Pull the slide back all the way and rotate the shaft so that the shaft pin nearest the control horn wire, points down toward the bottom plate. Release the knob so that the slide pins engage this escapement pin.

Now test the mechanism by rotating the shaft so as to bring the other shaft pin down towards the bottom plate. The slide should move 1/8". Reverse the shaft rotation to the original position. The slide should move another 1/8". Continue this action for all slide intervals. Then reset the mechanism as before and rotate the shaft to move all shaft pins free of the slide pins. The slide should snap back to its full release position.

After making whatever adjustments are needed to obtain the proper operation, epoxy the thrust bearing plate in position. **Do not** glue in the end bearing plate yet!

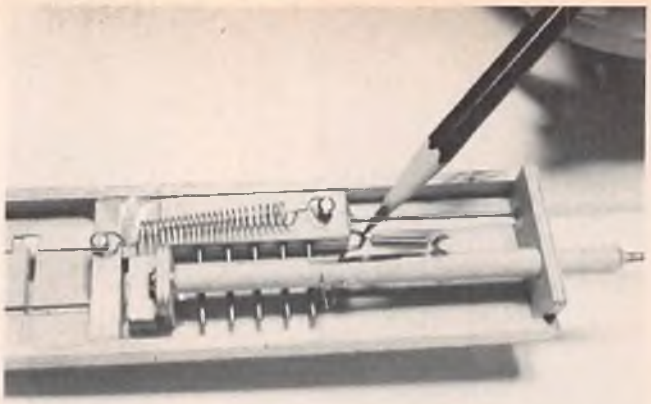
The slide unit for the other wing is identical to the one just described, except that it is a mirror image and has no escapement device. The slide does, however, have the 1/4" hardwood block fastened to it, but without the pins and reset knob.

Notching The Slide

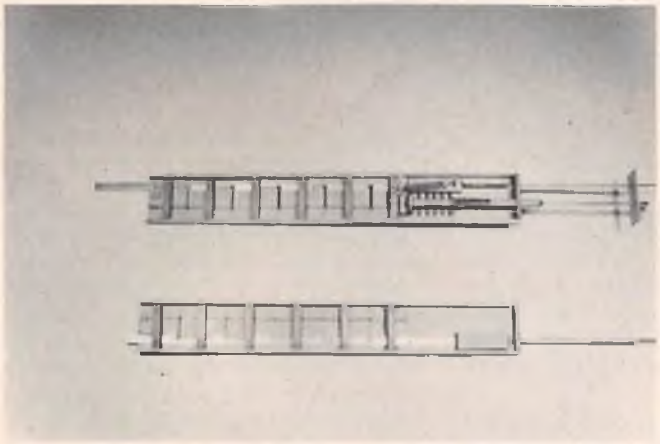
As installed in my Ugly Stik, the bomb release is designed to release one bomb at a time, alternately from each wing. The bombs are released from the outermost position first, working in towards the fuselage. This keeps the wings reasonably close in weight balance, and keeps the bomb load as close as possible to the Center of Gravity, at all times.

This means that for a given wing unit the bombs are released on each alternate rotation of the escapement shaft, starting at the tip end and working inward toward the slide-block end.

Bottom view of the left unit showing the reset knob and slot.



View of the escapement mechanism. The pencil is pointing to the pivoting pin and spring.



The basic units for left (top) and right (bottom) before mounting into the wing structure.

A full bomb load gives the plane a deadly appearance. Now, how about working machine guns?

Starting with the unit having the escapement, pull the slide back all the way to set it. Be sure the pivot pin (or inboard pin in the rigid-pin design) is set to engage the slide pins. Release the slide knob. The slide is now set for operation.

With a sharp pencil, mark the brass slide at the slot of the first bomb to be released. Make this mark at a point 1/32" inboard from the slot edge, as shown in Figure 6. Rotate the escapement shaft so the slide moves one interval. Check that the mark you made is now on the other side of the same slot. Rotate the shaft back again to move the slide a second interval. With the pencil, mark the slide at the next bomb slot, as before (this will actually be the third bomb to be released). Again, rotate the shaft and check that this new mark is now on the other side of this next slot. Continue the procedure until all slot marks have been made and checked on the unit. After the slide has moved its last interval to the full release position, mark the slide on the inboard side of **every** slot exactly as before. Remove the spring and end bearing plate, and remove the slide from the assembly. Holding the brass strip carefully in a vise so as not to bend it, file notches 5/32" deep along the rear edge between each pair of pencil marks corresponding to a given slot. Use care that the notches are accurate and that the edges are smooth and free of burrs.

Replace the slide in the assembly and install the spring and bearing plate. Check the action for proper operation and notch location and then glue the bearing plate in place. Cut a length of 1/8" nylon tubing (inner NyRod, etc.) and glue it into the small hole in the end plate as shown in Figure 5. The tubing must be long enough to reach from the installed bomb unit in the wing, through the wing into the center section where the servo linkage is located. Cut a length of 3/64" piano wire at least 4" longer than the nylon tubing. Crimp one tip end of the wire **slightly** flat and pass this end through the tubing and into the small hole in the end of the slide block (see Figure 5). Epoxy the wire into the hole. As the slide moves, this wire will also move through the tubing. The wire will serve as a push-pull rod to move the slide in the other unit. Be sure the wire hole is properly aligned with the tubing before gluing to prevent binding. Install tubing and wire in the same manner in the second wing unit.

Clamp the two units to the edge of a table or workboard so that the escapement and slide knob can still be operated. Space the units approximately as they will be when installed in the wing.

With the slide of the first unit in the full release position, set the slide of the second unit all the way in the **same direction!**

Temporarily clamp the two lengths of 3/64" piano wire together so that they will cause the two slides to move together as one.

Reset the slide mechanism with the knob, moving both slides together. Operate the escapement shaft so that both slides move the first interval. Starting at this point, mark the slide of the second unit with a pencil in the same manner as for the first unit. These marks are for the alternate release positions of the escapement.

Check that the positions are properly marked, and then check again! When sure of the proper sequence, remove the slide from the second unit, cut the notches as before and reassemble the

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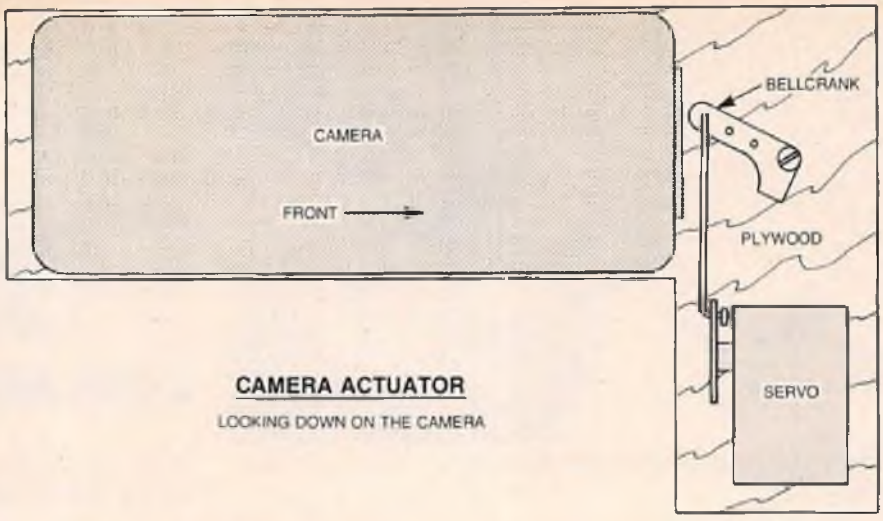


CAMERA ACTUATOR

LOOKING DOWN ON THE CAMERA

TAKING MOVING PICTURES FROM A SENIOR TELEMASTER

BY B.C. DRAPER **PHOTOS BY W.T. HILL**

●It was decided to get some aerial movies of our flying site using a Senior Telemaster Airplane. The first step was to check out the flight characteristics with a simulated camera. A 12" length of 2" x 4" was fastened on top of the Telemaster wing with rubber bands. The 2" x 4" weighed 1¼ pounds and the plane flew with no problems.

A Kodak Brownie 8mm wind-up type of movie camera was used. The camera was mounted on a 3/16" thick piece of plywood using a 1/4-20 screw into the tripod mounting hole in the bottom of the camera. A 90° bellcrank with one arm removed was mounted with a screw in the plywood in front of the camera so that as it rotated it depressed the camera actuation bar on the front of the camera (see sketch). A servo was mounted on the plywood base plate and connected to the 90° bellcrank with a short link. The servo had an extension wire added that was long enough to go down into the plane and plug into the receiver connection. A piece of canopy plastic sheeting the width of the camera was attached to the fuselage forward of the wing. It was used to streamline the front end of the camera and to keep oil off of the camera and servo.

The plywood base plate was padded with sponge rubber and, with the camera installed on it, was placed on top of the wing. The camera was aimed slightly down toward the propeller and was held in place by several #64 rubber bands knotted together and hooked over the wing mounting dowels. The radio used was an MRC 8 channel radio and the camera was connected to a channel operated with a toggle switch on the transmitter.

The camera would run approximately 30 seconds on one winding and the movies were taken in about 10 second increments. As the plane took off, a helper turned on the camera for about 10 seconds, then turned it off, working over the pilot's shoulder. A second scene was taken during a loop, and a third scene during a landing. The camera was rewound and scenes were taken from various angles of the flying site. One scene was made with the plane flying down toward the pilot standing on the edge of the runway.

The main problem during the filming was oil droplets from the engine forming on the plastic shield in front of the camera lens. The camera is being remounted on the left side of the fuselage under the wing and this should help the oil splattering when the next set of movies are made.

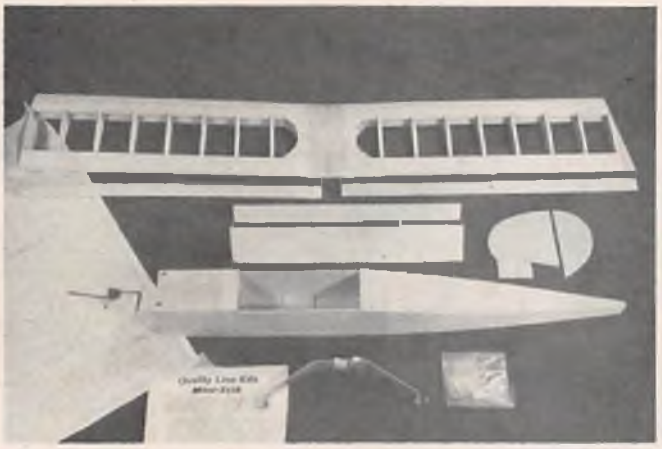
It was an interesting project and future plans include movies of a model in flight taken from the camera plane. □

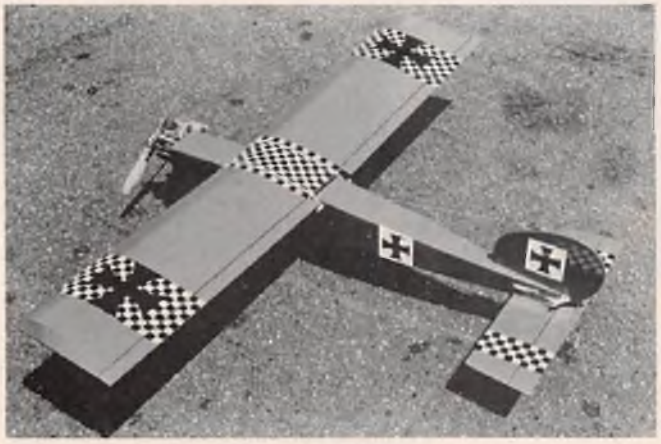
Camera connected to servo prior to rubber banding in place.

Camera in position ready for take-off.

RCM PRODUCT TEST

HOBBY BARN
MINI-STIK





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			NA			Ease of Assembly		●			
Quality of Fiberglass		●				Fidelity to Scale			NA		
Other Materials		●				Flight Performance	●				
Accessories		●				Overall Appeal		●			
Die-Cutting			NA								

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

The Mini-Stik, from Hobby Barn, comes in 2 versions, one as a kit and the one which we received to do a review on, their "Almost Ready to Fly" version. The kit sells for $29.99 with the ARF version selling for $59.99. Our kit arrived in good shape and, as shown in the photo, needed only engine mount, engine, covering material, wheels and radio to get it airborne.

The fuselage was completely finished with bulkheads, firewall, sheeting and hatch finished ply bottom with landing gear doublers in place, along with mounted nose gear bearing. The wing was completely assembled and the center section fiberglassed. The stab, elevator, fin, rudder and ailerons are precut, ready to install. Everything is rough sanded to basic shape and needs only the final finish sanding before covering. Included also is the main landing gear with axles, nose gear wire, bearing mount and steering arm, hinges and assorted fasteners.

Upon starting to complete our Mini-Stik, we ran into several areas where we felt some modifications were required. We also came upon a couple of problems that caused some modifications to be made, however, these have since been corrected according to Hobby Barn. Our ARF kit was one of the first ones which was hand-built. They are now being built-up using jigs. Of the modifications we made, some were necessary and some were our choice. The pre-shaped elevator was short 1/2" in length and everyone concerned was at a loss as to how that happened. Hobby Barn checked all their kits and ours was the only one this way. We cut a new piece. The firewall was installed with left thrust and the nose gear bearing was misaligned. This has been corrected, per Hobby

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SPECIFICATIONS

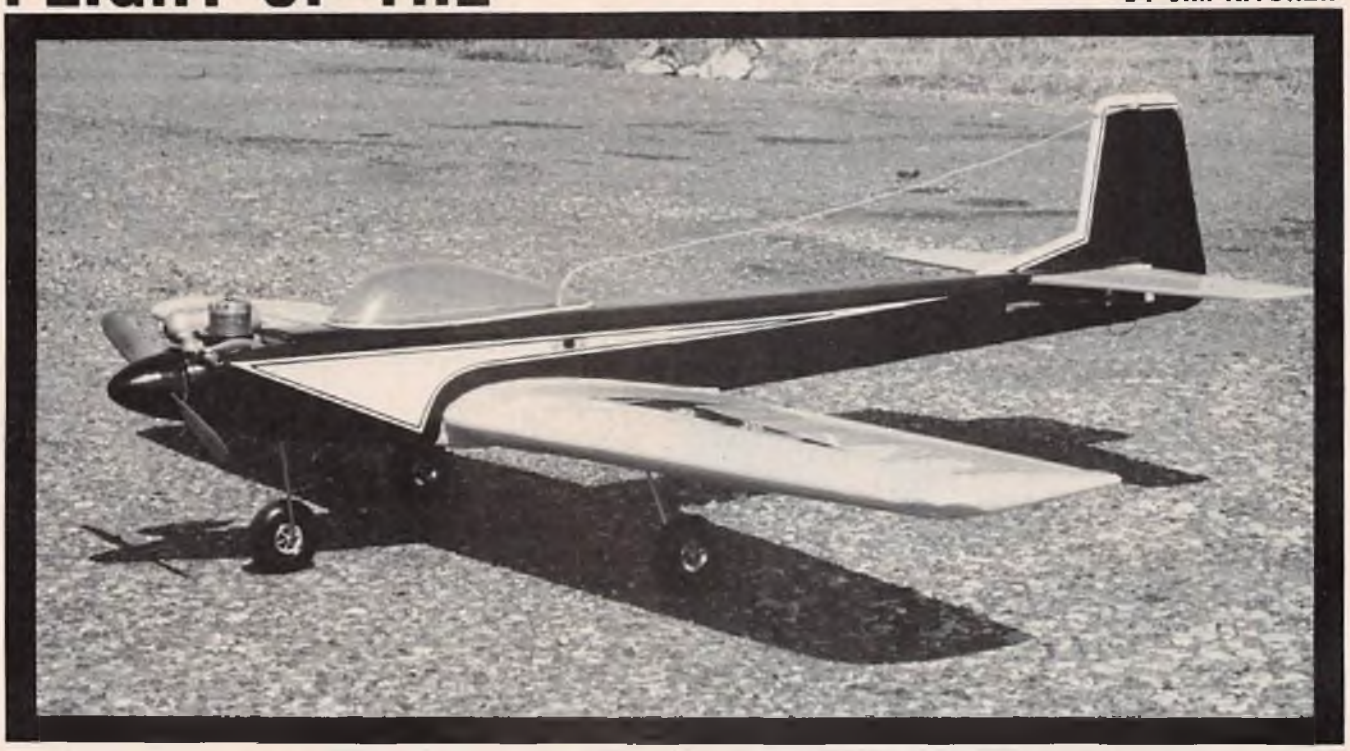
Name ..... Mini-Stik (ARF)
Aircraft Type ..... Sport/Trainer
Manufactured By ..... Hobby Barn
P.O. Box 17856
Tucson, Arizona 85731
Mfg. Suggested Retail Price ..... $29.99 (RIT); $59.99 (ARF)
Available From ..... Direct from Mfg.
Mfg. Recommended Usage ..... Basic Powered Trainer/General Sport
Wing Span ..... 46 Inches
Wing Chord ..... 8¼ Inches
Total Wing Area ..... 375 Square Inches
Fuselage Length ..... 36 Inches
Radio Compartment Dimensions ..... (L) 7½" x (W) 2⅝" x (H) 3¼"
Wing Location ..... Shoulder Wing
Airfoil ..... Flat Bottom
Wing Planform ..... Constant Chord
Dihedral ..... 2 Inches
Stabilizer Span ..... 16½ Inches
Stabilizer Chord (incl. elev.) ..... 4½"
Total Stab Area ..... 73 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Bottom of Fuselage
Vertical Fin Height ..... 5½ Inches
Vertical Fin Width (incl. rud.) ..... 7¼ Inches
Mfg. Rec. Engine Range ..... .15-.30
Mfg. Rec. Fuel Tank Size ..... No Recommendation
Landing Gear ..... Tricycle
Recommended No. Of Channels 4
Recommended Control Functions ..... Rud., Elev., Throt. & Ail.
Basic Materials Used In Construction:
Fuselage ..... Balsa & Ply
Wing ..... Balsa
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See text
Plan Size ..... 25" x 40" (1 sheet)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... Yes (4 pages)
Construction Photos ..... No
Kit Includes ..... See Text
Mfg. Rec. Flying Weight ..... 40-48 Ounces
Wing loading based on rec. flying wt. ..... 15.36-18.43 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 50 Ozs.
Wing Loading ..... 19.20 oz./sq. ft.
Covering & finishing materials used ..... Solarfilm & MonoKote
Engine Make & Disp. ..... OS .25
Muffler Used ..... Stock OS, Expansion
Radio Used ..... Cirrus Sport 6
Tank Size Used ..... 4 Ozs.

FLIGHT OF THE

BY JIM KITCHEN



BUMBLEBEE

● I celebrated my second anniversary of radio controlled flight by beginning work on a Bridi Super Kaos Jr., my seventh R/C model and first fully aerobatic ship.

I have been generally satisfied with my R/C progress. I can handle elementary aerobatics including straight inverted flight, but the old sphincter muscle starts to tighten when I try more than one consecutive roll or attempt a 180 degree inverted turn.

Pilot error crashes have been limited to my first six months of R/C flying thanks to good reflexes and recovering procedures combined with a healthy respect for the ground. For several months, the vague feeling has persisted that my R/C flying techniques have reached a plateau. Those weekend flying sessions are still as enjoyable as ever, but the challenge and exhilaration of completing a new or difficult maneuver has been missing.

I entered our hobby with the idea that smaller models with miniature R/C systems are the way to go. None of the R/C models I have constructed so far have exceeded .35's in power. If I ever succumb to the temptation to try a .60 sized pattern model, the Kaos will be the prime candidate. The appearance of a .40 sized version, in the form of the Super Kaos Jr., tempted me to compromise my principles with the reasoning that a .40 is really not that much larger than a .35. Here was a fully aerobatic model of a proven winner with graceful lines that were particularly appealing to me. Just the ticket to put some zest into my R/C activities. (Besides, it being a new product gave me the opportunity to indulge in the old first-kid-on-the-block-with-a-new-toy-gimmick.)

Two other events occurring at about the same time tended to firm up my decision to build a Super Kaos Jr. These events were 1) a fortuitous opportunity to acquire a nearly new O.S. Max .40 R/C Dykes ringed engine, and 2) publication of the RCM "Flight Training Course, Volume II". Volume II concerns itself with advanced stunting and pattern maneuvers. I decided that with a proper model, a "how-to" book, and the assistance of more experienced RC'ers, I was ready for the challenge of advanced stunting. (You might make the analogy of transitional training from propeller driven to jet aircraft.)

Once my mind was made up, I immediately ordered the RCM "Flight Training Course, Volume II" (which I'll call the *Course* for short), the Super Kaos Jr. kit, and acquired the O.S. Max .40 R/C engine. I was pleasantly surprised by the unexpected bonus of an O.S. muffler, plastic spinner, and Kavan propeller in the engine deal. The *Course* arrived in three weeks. The kit took several weeks longer because of back orders.

I enthusiastically started construction of this model. This time I was going to push for an early completion. However, I soon slipped into my old building habits which usually resulted in two to three months from initial set-up until the finished product is rolled out of the hangar. Two sons in different Little Leagues and a weekly Community College class cut into my building time. Also, I find that a proper frame of mind is necessary before attempting certain building chores such as fiberglassing, installing gas tanks, aileron servo installation, etc. It may take several days before the mood is right.

The Super Kaos Jr. is another excellent kit from Bridi Hobby Enterprises. Full scale working plans, detailed construction procedures, and most hardware are provided. This model was also the subject of an RCM construction article in the April 1974 issue. My only criticism is that a few of the balsa parts were of marginal quality. This is understandable because of the scarcity and high cost of today's balsa. I am sure that all kit manufacturers are facing some difficult decisions relating to kit qualilty and competitive pricing.

Misfortune struck a month later when my first and only low wing model, a Hotline Mini-Commanche, was wiped out while making a last minute familiarization flight before a club Fun Fly. I frantically grabbed low throttle and tried to recover the model during the split second that it took to spiral into an asphalt runway from an altitude of 100 feet. Put a little differently, before I could holler, "I

Conveniently located is that magic elixir which instantly cleanses your throat of balsa dust.

My wife, Ellen, watches as sons Stuart, left and Ross, right assist Tom Vincent in preparing the Bumblebee for its test flight.

don't have it!" I didn't need it! A shattered fuselage, broken left wing, and seized-up engine was the damage assessment with the only recourse being salvage and the trash barrel. The good news was that I saved the $3.00 contest entry fee. System failure caused by a broken ground wire to the battery pack was the post mortem verdict. Into the box and back to Kraft went the system for a complete check out. I decided to take advantage of the situation to change frequencies from 72.960 (shared with eight others) to 72.320 (only one other).

I recalled my Bridi RCM Basic Trainer from retirement for use as an interim model and as a test vehicle for the repaired system. I had forgotten what a fun model the Basic Trainer was. The Super Kaos Jr., which had advanced to the finishing stage, suffered some delay as I became re-acquainted with this old friend. It still gives me a thrill to see those tail draggers rocking up on their mains at take-off.

Every modeler has his own finishing techniques. If this is plastic film, then he probably has a favorite brand of covering. My preference is MonoKote. The model was finished with yellow wing, stabilizer and black fuselage, rudder. Yellow because it's my favorite color and has high visibility. Black because that was the color of the spinner which came with the engine. (It was the right size too.) I used black and white trim and striping to highlight the fuselage and upper wing surfaces. My wife named my new creation when she said that it reminded her of a "Bumblebee".

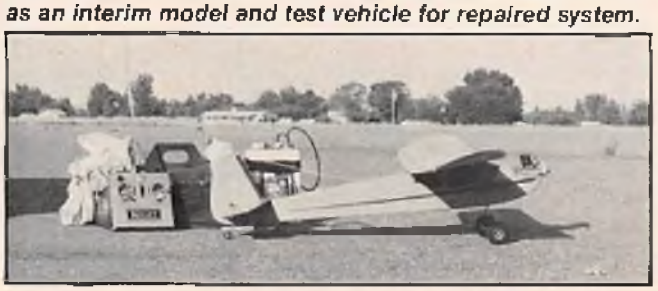
The nose gear is my old nemesis when it comes to installation of R/C equipment. This time was no different. A Kraft-Hayes engine mount is provided in the kit. To save space, the usual nose gear bearing is replaced by a vertical hole drilled in the mounting ring of the K-H mount. Movement is provided by a Goldberg nylon steering arm attached to the wire nose gear. Either the hole was bored slightly off or some flaw in my workmanship caused the steering arm to bind against the firewall. I had to insert a 1/16" plywood spacer between motor mount and firewall in order to free the steering arm.

Tom Vincent is our club's most experienced modeler. He is well qualified for his role as Building Consultant and Chief Test Pilot. Tom is a subscriber to the theory that positive incidence gives better control and overall flying characteristics. Joe Bridi's design calls for an incidence setting of zero-zero. As a civil engineer, my training tells me to follow the plans unless you know more about the subject than the designer. I also know that the best design is that combination of variables which comes closest to achieving the basic design objectives. Tom suggested that I check the incidence on the completed model. My estimate was approximately 1/2 degree positive incidence. I was curious to see the model perform with my minor building error.

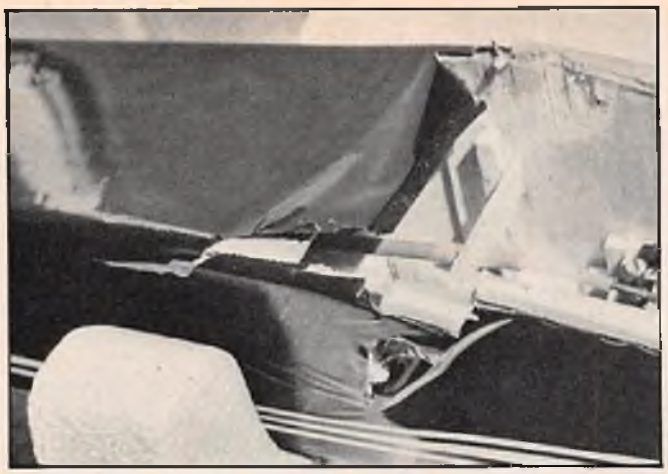
I asked Tom to add a Super Kaos Jr. to his long list of test flown models. Preflighting of the model consisted of checking the control surfaces for neutral settings, the servo for movement and possible binding, and the transmitter for range. The test flight was anti-climatic with the model passing all flight evaluation tests with flying colors. Only minor trim adjustments were necessary to groove the model. We can only speculate as to the effect of positive incidence on performance. Perhaps zero-zero is a requirement for some intricate maneuvers. However, according to Tom's theory, positive incidence should suit the model better for my purpose of advanced stunt training. Tom passed on flight control to me during the second flight. I treated the Bumblebee gingerly while trying some gentle turns. It gradually lost some of its mistique as my confidence increased, and those instinctive flying skills honed over 2 years of R/C flying began to re-assert themselves. I had always heard that the difference between aerobatic and sport models is that the former fly in any attitude until changed by you, the pilot. I can now attest to this diffference. This is evidenced in turning. I have been used to "blipping" aileron and elevator as required to hold a plane in turns. I now found that it was necessary to continuously hold aileron and elevator to make the same turns.

Speed is another difference between sport and pattern models. The ability to

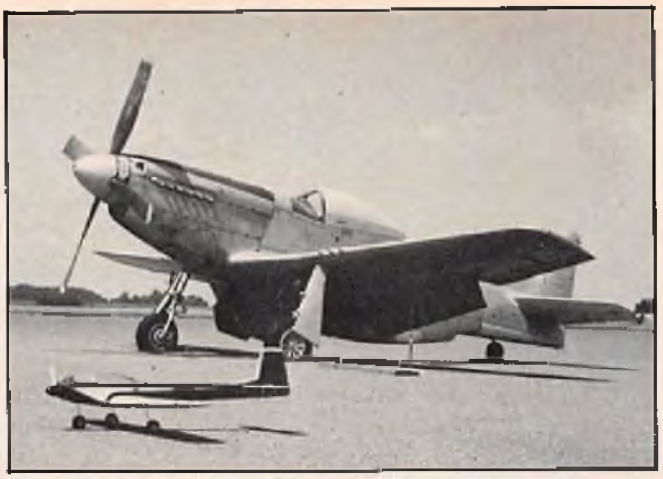
Bridi RCM Basic Trainer recalled from retirement for use as an interim model and test vehicle for repaired system.



The Bumblebee about to reward its pilot with a perfect landing.



Fractured fuselage caused by sudden departure of wing hold-down platform.



Bumblebee and friend. Note similiarity in canopies.

"think ahead", mentally planning your maneuvers in such a way as to keep the model under control within close confines, is basic to R/C flying. This ability must be accelerated to keep up with the speed of a pattern model, or perhaps mine was just slow from flying smaller sport models. The combination of speed, maneuverability, and distance, blew my concentration on several occasions. I gave Bill Shelby (my R/C instructor) a mental note of thanks as I was able to regain orientation through the recovery procedures he had taught me (left and up).

The next few flights were spent experimenting with basic aerobatics. First, those familiar ones such as inside loops, half and full rolls, and straight inverted flight. Next came aerobatics previously attempted, and seldom completed in recognizable form, because of power and airfoil limitations. It was a real pleasure to be able to do an outside loop of a diameter comparable to that of an inside loop. I even flew some horizontal Figure Eights reminiscent of control line days. I discovered that a reverse Immelman, in addition to the Split-S, is a convenient maneuver for losing altitude and reversing direction at the same time. Vertical rolls are a new addition to my repertoire. Two inverted circles around the field and three consecutive right rolls added to my sense of elation. That previously mentioned muscle was beginning to show some signs of relaxing. More practice on basics and back to the *Course* to tie it all together was the next order of business.

The only disappointment in my model-engine combination is the O.S. Max .40 gas mileage. I had been used to getting in the neighborhood of 12 minute flights from an O.S. Max .35 engine with a 6 oz. tank. I expected comparable times from the O.S. .40 with an 8 oz. tank. Instead flying times of 9½ minutes appear to be the best I can hope for. Had I known this, I would have tried to substitute a 10 oz. tank for the 8 oz. tank shown in the plans. Fellow modelers have consoled me with the comment that you can't expect fuel economy from a high performance engine. (Sort of like comparing a Volkswagen to a Porsche.)

An earlier statement about pilot error crashes being limited to my first six months of R/C flying is no longer true. Flight Number 9, of the Bumblebee, ended abruptly in tall weeds at the edge of the runway as a result of carelessness — a rich engine, cross wind take-off, and insufficient airspeed. The rich engine was caused by my failure to re-check the engine setting after fueling from a new can of a different brand of fuel. No excuse for the cross wind take-off other than habit as this was the direction that we normally use for take-offs. (Unfortunately, the wind was abnormal at the time.) Those plane grabbing weeds that seem to abound around R/C flying fields reached up and snared the left wing tip. The ensuing decelleration broke the wing loose by tearing out the wing hold-down platform and fractured the right side of the fuselage in the vicinity of the platform anchorage. Had the model cleared the weeds and lifted off, I would probably have stalled it out, causing even greater damage. The last thing I remember was giving full up and wondering why the model did not respond. This little incident illustrates a lesson of life: It seems that we have to so something dumb now and then in order to be that much smarter the next time. The secret is to keep these dumb things as infrequent as possible!

My favorite maneuver is spinning. Most of my previous models would not spin, or as it turns out, I was not fully aware of the proper procedures. Spinning is dependent on tail surfaces, both size and throw, and C.G. location. My

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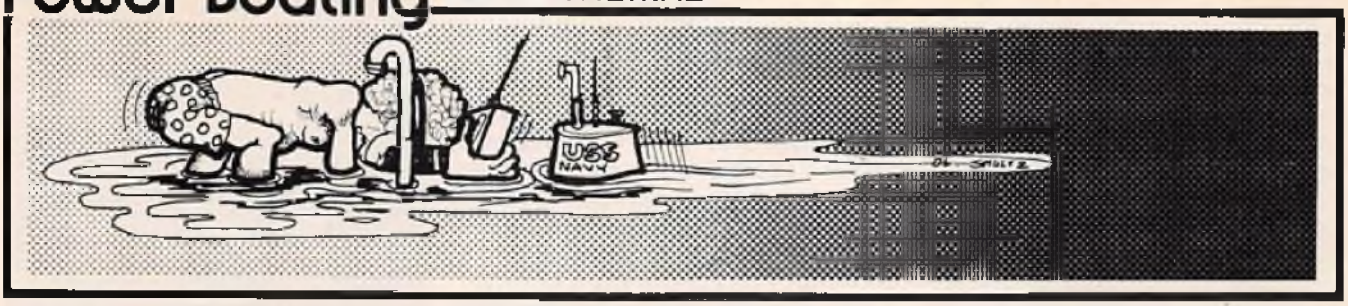
The Bumblebee survives an emergency landing caused by a broken stabilizer and loss of elevator.

The Bumblebee and I were among the winners at a club fun fly: (L/R) Joe Olschowka, the author, Gene Castain, Ken Lawyer, Darwin Evelsizer and Norm Trainer.

Power Boating

DAVID THOMAS



Boy, oh, boy! Did you ever have one of those days where you had the feeling that you would have done better to stay in bed? Well, I just had one, and it went something like this:

First of all, I got some fanmail — and we all know what hit the fan! Some guy saw my mention of the Chevron servo in the July issue and wrote to ask me where he could get one of them. Well, this letter arrived just as I was going away on a holiday, so it got laid to one side to await my return. And, somehow, it just didn't get answered. Well, I'm sorry about that, and even more sorry that the guy in question wrote a real hot letter to the Editor, complaining. Now, I did say that while we just love getting mail from all you out there, it has to be stuff that is of general interest. Quite honestly, if we had to sit down and write individual answers to everyone, we would end up with no time to do anything else, and there wouldn't be any articles! Not to mention that I have a wife and two nice kids I'd like to get to meet now and again, and a job to hold down so that I can feed them! So, come on, fellas, write by all means but, like I said in a recent edition, something general that we can all enjoy.

Anyway, this left me feeling a bit flat, so I decided to finish the hook-up on a new Deep V hull that I was planning to use for a ski boat. First, I over-tightened the last mounting bolt and stripped the thread in the mounting pillar, and then I burnt myself with the soldering iron fitting the aerial wire. Anyway, I got it finished and drove out to the lake. (Nope, I didn't forget anything like the transmitter, and I'm still trying to work out why not!) Having checked everything, I fired up the engine — electric starter, no trouble — and let her go. Fine, just great, real pretty boat — until I put on some rudder to turn the thing. She was running at about half-revs, and as the rudder came on, she went into a 60°-70° bank, and started to turn on her ear. But as she did so, the nose dropped, dug in, and overcame the rudder, so she straightened up. But the minute she straightened up, the rudder bit, and back into the bank. Well, it's a pretty big lake, and I was fascinated, so I just held that rudder stick right where it was, and watched. She went through the cycle about ten times before I'd had enough.

Highly experimental – a 3-pointer with a K & B .21 Outboard. Too early to give any results, but it could be a goer!

Throttling right back brought the hull off the plane, and I managed to persuade her to head for home.

Well, that's one boat that is no good whatsoever as a ski boat, so I'm still looking around for a suitable hull. The trouble is, I was hoping to use it to write an article I have been promising for a long time on model skiers. So, back to square one.

Anyway, I packed everything back in the car and headed home. Halfway there, I got a puncture! Would you believe that the spare was half flat, too? Sure you would; some of you must have had the same thing happen. So I limped home on 3½ wheels.

Around about now, I was beginning to think that maybe it would be a good idea to sit in an armchair and watch TV, or drink a few beers — anything to stay out of more trouble. But, I figured that on a day like that, either the TV was going to break down, or I would cut myself opening a can, so I went to bed instead, and read a book. Days like that I can do without!

However, it does bring up an interesting point concerning the behavior of Deep V hulls in model boats. We have known for some time that this kind of hull needs to be fairly heavy if it is going to behave properly. And, in fact, the faster it is, the heavier it needs to be. The one I was using was a model of the Fletcher ski boat, and while I have no doubt at all that the full-size job behaves admirably, the model was far too light and was perhaps using too much power, since it was equipped with a Rossi .60F, which is quite a healthy beast.

One of the best ways to overcome this difficulty is to increase the weight in the most useful way, by adding extra layers of fibergass to the hull floor. This not only adds structural strength, but it also cuts down resonance from the hull itself, and keeps the Center of Gravity low.

An analysis of the situation might go something like this: At speed, as rudder is applied, the hull will tend to skid, since it is riding on the very bottom of the hull, the spray rails holding it well up out of the water. As it skids, it leans into the turn. Now, since the V is really quite deep, the hull can easily bank right over until it is running on one face of the V, helped in this by the lift generated by the rudder and the action of the propeller. However, due to the hull configuration, in this banked attitude, the hull does not generate as much lift at the bows as when running level. Thus, the bows will tend to drop, allowing the very sharp V to dig into the water. This will act like the keel on a sailboat, and tend to bring the hull back into a straight line, since its effect is more powerful than that of the rudder. Thus, the hull will go nose-down and, at the same time, straighten up and try to run level. Then comes a point where the bows begin to generate more lift, the rudder starts to bite again, the speed picks up, and the boat goes back into its banked attitude. I noticed with mine that this happened very quickly, and the net result was practically no turn at all, the boat running in an almost straight line.

The question, of couse, arises: What are we going to do about it? Well, I have to confess one point before going any further — on my model, the propeller was down under the hull, since I wanted the boat to have a small radius turn, and this fact may well aggravate the fault. But I must add that I have seen a Dumas Deep V 60 with the rudder out behind the transom doing exactly the same thing. As I say, one solution is to add weight, but it is obviously not the best one. Another is to throttle back, because the trouble increases with speed, but this is not very satisfactory. A third, though I haven't yet tried it on this boat, is to use a rudder with a forward-angled leading edge, which should have a tendency to pull the rear of the hull down in a turn.

However, I think that it is safe to say that there is no real solution to this problem if a hull with a constant Deep V form is used. (I should very much like to hear to the contrary and will be delighted to

give space to anyone who can tell us what to do.) I say this because, for several years, I have been using Deep V racing hulls where the V is evolutive, or progressive, if you prefer the term. In other words, about 30% of the hull length back from the bow, the V is at a maximum, let's say 55°. It then starts to flatten out as it runs aft, until it ends up at the transom at about 25°. This is the case of the Jaguars and Cougars that I use for racing and, not only do they show no signs of this annoying behavior, but they don't even bank at speed, but stay dead flat, even in a sharp 90° turn. Now, there is an interesting point here; the Jaguar does not have multiple spray rails, and rides a lot lower in the water. In addition, to stand up to the rigors of multi-racing, we tend to build them pretty strong, which can be interpreted as heavy! Now, which of these factors — weight, progressive V, or absence of spray rails — is responsible for the difference in behavior? I really can't pretend to answer this one, but would guess that it is probably a combination of all three. So, if anyone has any ideas on the subject, let's hear about them.

★

Some of you may recall that in the November issue, I talked about diesel motors. Well, someone out there reads what I write, because I just had a very nice letter from Robert Davis of Davis Diesel Development. The first thing he said was that he quite agrees with me about all the advantages of diesels. (Now would you believe that?) Then, he goes on to suggest that I try a dieselized engine in one of my boats. Well, you'd better believe that I just jumped at this idea, and I have already sent off one of my engines. It is one of a pair, and when I get it back, I am going to try some very controlled comparative tests, using one engine after the other in the same boat to see just what sort of answers I get. Naturally, I'll tell you all about them when I have finished, but don't anyone try holding their breath - - - it's going to take awhile.

Robert then went on to tell me where all that black goo in the bottom of my boats came from. He says that it is due either to a leak past the contra-piston, or a leak in the exhaust system. While I partly agree with him, I do know of another place it comes from, and I have proved it. It seeps out of the crankcase through the crankshaft bearings. It may be less on a plain bearing engine, but all my diesels have twin ball-races, and that's where at least some of it comes from.

He also makes an interesting point about power outputs. He says that, in some cases, power may be up to 50% more than with the original engine running on glow fuel, but at lower revs. This agrees with my own findings and is important. It means that you can use a bigger and, hence, more efficient propeller on a diesel, due to the greatly improved torque low down in the rev-band. But it doesn't end there because lower revs mean less noise, and that's something we should all be thinking about.

Robert also says that the engines have been tried out in R/C cars with some success. Now this one I am more than ready to believe because the power available can be used by changing the gear ratios. But, even more important, is the fact that a diesel runs cooler than a glow, so no over-heating problems. And using a throttle exhaust system, as I told you, the acceleration is instantaneous, which has to be good. However, not being a car expert, I just mention that as the thoughts of an ignoramus in the field, and not to be taken as gospel; there may be problems I don't know about. Finally, lower revs must mean lower rate of wear, to my tiny mind. Anyway, when I get the engine, we'll talk some more about this one because I have a feeling that it could be the start of something big in the way of change. (How about a twin, 15cc, alternate-firing diesel helicoptor engine, Don?)

★

Since writing about the idea of balloon bursting and the sort of games that can be played, I have been doing some heavy thinking about a suitable method of construction for a boat to play the game with. After browsing through the archives, I put together some ideas and came to the conclusion that the best method of construction is a warped-bottom hull made from 1mm plywood. There's nothing new about this system, but it certainly makes for a very light, strong hull. However, when I got down to drawing the thing out, I came across difficulties. The boat needs to be stable, but as fast as possible on the somewhat limited power available — remember that the motive force is limited to keep costs down. Anyway, having decided on the underwater shape necessary, I found that there is a limit to how far you can warp a sheet of 1mm plywood, even when it is wet. So that was a bust, and I had to get down to doing it the traditional way. This adds slightly to the weight, but not too much, and the prototype is well underway.

While on the subject, it occurs to me that the Graupner Mini-Speed fits into this category since I used the RS 54 in that model. However, it was run on 8 nicads and not 6, and while the hull is ultra-stable, it is quite possible that with only 6 cells, that very stable hull is going to stick to the water too much and kill a lot of the speed. I'll have to take a couple of nicads out and try it - - - see what happens.

★

Talking about prototypes, the new boat for the Sea Ram is now just about finished, as you can see from the photo. I won't say too much about it at this stage except to tell you that the plans are all drawn up, and that I hope it will be published soon. It is pretty fast and, though especially designed for the Sea Ram, I have no doubt at all that it will run equally well with a 21 engine.

Preview photos of J.P.S. "Cobra" with Sea Ram electric motor (plans coming out very shortly). Very fast and stable.

★

Looking through the November issue of RCM, I came across some interesting items in the "Showcase" column. The first is the Buzbee Tachometer, which has to be a useful device for anyone interested in making their boat go fast. While I haven't even seen one, much less tried one, I should imagine that this would be just the job for finding out if the propeller size is right. Knowing the revs at which your engine peaks, from the manufacturer's data, you could then check, using the tachometer, to hear if the engine is, in fact, peaking when the boat is traveling flat-out in a straight line. (I believe there is a German firm which makes a very sophisticated and expensive electronic audio tachometer, much favored by the pylon racing boys, but I haven't yet come across one of these, either.)

The other item of interest is the range of water cooled exhaust throttles offered by the Other Pottles Throttle Shop. It was something of a coincidence that in the same issue appeared the photo of the ED Super Hunter, equipped with throttle exhaust. I have long thought that there is a need for this type of thing

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RCM PRODUCT TEST

CRAFT AIR
BUHL BULL PUP

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

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

The Buhl Bull Pup, manufactured by Craft-Air, is a Steve Crowe design of a "golden oldie" from the 30's. Designed as a .09 to .15 Stand-Off Scale model, this little cutie is relaxing to both build and fly, and is docile enough to be used as a basic trainer.

The kit is complete in all respects, requiring only engine, radio, covering and wheels to complete. All materials furnished are of excellent quality and complement the well-done plans and instructions.

The fuselage is constructed around a plywood and balsa crutch with plywood formers added top and bottom to provide support to the vacuum formed ASA (not ABS) plastic fuselage skin. This skin consists of an upper and lower section which, with a minimum of trimming and cutting, produces a surprisingly strong and durable rivet detailed fuselage. The ASA plastic used in this kit is relatively new and should not be confused with the old ABS plastics which taught so many modelers a new vocabulary when they tried to glue it or repair it. This stuff is strong, light and flexible without the aging problem associated with ABS. In addition, regular butyrate glue, such as Ambroid or Duco, is used for gluing. The formers and firewall are die-cut plywood which fit the shells nicely with a minimum of sanding.

The wing ribs and pre-cut spar webs are accurately machined from balsa. Balsa leading and trailing edges are complemented by upper and lower spruce spars to form a clean, strong wing. To help preserve the old-time look, only the center section is sheeted. This, in turn, is cemented to the removable cockpit section of the fuselage. The wing, fuselage section, and cabane struts, are doweled at the rear with a

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SPECIFICATIONS

Name	Buhl Bull Pup
Aircraft Type	Sport Scale
Manufactured By	Craft Air 7851 Alabama Ave. Canoga Park, California 91304
Mfg. Suggested Retail Price	$34.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	General Sport
Wing Span	42 Inches
Wing Chord	6¾ Inches
Total Wing Area	269 Square Inches
Fuselage Length	27⅞ Inches
Radio Compartment Dimensions	(L) 5½" x (W) 2½" x (H) 3½'
Wing Location	Shoulder Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	1¾ Inches
Stabilizer Span	15 Inches
Stabilizer Chord (incl. elev.)	4½ Inches (Avg.)
Total Stab Area	67½ Sq. In.
Stab Airfoil Section	Flat
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	6⅞ Inches
Vertical Fin Width (incl. rud.)	5" (Avg.)
Mfg. Rec. Engine Range	.09-.15 cu. in.
Recommended Fuel Tank Size	2 Ounce
Landing Gear	Conventional
Recommended No. Of Channels	3
Recommended Control Functions	Rud., Elev., & Throt.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply, Spruce, Plastic
Wing	Balsa, Spruce
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	35" x 47" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	Yes
Kit Includes	Shaped & Die-cut Parts
Mfg. Rec. Flying Weight	25-32 ozs.
Wing loading based on rec. flying wt.	13-17 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	38 Ounces
Wing Loading	20 oz./sq. ft.
Covering & finishing materials used	Top/Kote & Perfect Paint
Engine Make & Disp.	Enya .15
Muffler Used	Enya
Radio Used	RS 3 Channel with Brick
Tank Size Used	2 Ounce

Belt and Greenhouse hold walkie-talkies. Back Row (L/R): Ken Greenhouse, Luther Jackson, Glenn Scillian and Bert Belt. Kneeling (L/R): Dick Weber, Lloyd Charles.

Ken Greenhouse (L) and Dick Weber (R) walk toward Lake Elkhorn before record flight.

Walt Good, Father of R/C, directed the record attempt. Weber and Belt seated. Branch standing. Walt has lap counter in right hand.

SEAPLANE REC

Breaking All Three World Records For Seaplane Economy In Five Weeks

ABOUT THE AUTHOR

The author is 39 years old and is a Physicist with NASA Goddard Space Flight Center and holds A.B. and M.S. degrees. He has been in aeromodeling since 1950 and RC since 1970. He holds seven FAI World Class Records. Mr. Weber is a member of the Prince Georges RC Club and the Goddard Model Aircraft Club.

Take-off at Lake Elkhorn. Plane later turned right and took off downwind. Efficient hull makes small wake for such a heavy plane.

How far can a model seaplane fly without refueling? In the past 10 years, the answer to that question has grown by a factor of 24 for closed course distance and 12 for straight line distance. Take a look at the history of these FAI World Records.

FAI SEAPLANE CLOSED COURSE DISTANCE RECORDS

Year	Miles	Modeler	Country
1968	13.0	Leftwich	USA
1968	37.3	Hill	USA
1968	72.2	Gregory	USA
1971	121.0	Velitchkovski & Vyaziguine	USSR
1972	148.4	Kaiser	W. Germ.
1975	152.9	Petersen	USA
1977	315.7	Weber	USA

FAI SEAPLANE STRAIGHT LINE DISTANCE RECORDS

Year	Miles	Modeler	Country
1969	12.0	Aldochine	USSR
1970	26.5	Petersen	USA
1971	65.7	Velitchkovski & Vyaziguine	USSR
1972	83.2	Reed	USA
1976	135.2	Bowles	USA
1977	152.1	Weber	USA

The latest records were set in September and October 1977, with my seaplane Shark. Its design was inspired by the record-holding seaplanes of Petersen and Reed, and by my own record-holding landplane Tortoise. Under the wing, the Shark carries two tanks which can hold a total of 92 fluid ounces. A 1976 Kraft receiver along with servos for elevator and rudder are located midway between the wing and empennage. A servo-controlled needle valve for mixture control and an oversized battery are carried in the forward fuselage. The plane is covered with Super MonoKote.

In June 1977, using a .40 diesel with a throttle, the Shark had set a seaplane duration record of nearly eight hours, consuming only 58% of the fuel on board. The next objective was an attempt on the closed course distance record.

Bench tests were run on a new .29 diesel in the weeks following the duration record. The .29 contained parts from several manufacturers and special parts machined by team racer Henry Nelson, Dean Smith and myself. The tests showed the .29 to be more economical than the .40 used before on the seaplane, so a new engine pylon was made to accommodate it. A test flight verified that the 11 lb. Shark could take-off with a .29 on the same power setting wanted for distance flying, therefore, no throttle was necessary.

FAI rules for closed course distance specify a one-kilometer course around two points separated by at least 500

Frank Boykin (R) and Cliff Morris (L) check out Weber's digital tachometer as he seals the plane to keep out salt water and rain.

Dick Weber adjusts compression of diesel as Frank Boykin (directing official) holds Shark.

Moppets help Ken Greenhouse on walkie-talkie during record flight.

Standing (L/R) Floyd Branch (observer) and Bert Belt (official witness). Seated Dick Weber and Ken Greenhouse (official witness). Ken has walkie-talkie.

Dick Weber retrieves plane after end of 315.7 mile flight taking 9:07:37 (new time record) and new distance in closed course record.

ORD BLITZ

BY RICHARD WEBER

meters. They also specify that landing must be made within 500 meters of the release point. The safest bet then is a course on which the airplane never flies too far from the release point. Such a course was set up across Lake Elkhorn in Columbia, Maryland. NASA co-worker, Tom McGunigal, was enlisted to measure the course with a laser beam. The laser geodimeter which he used determines distance from the time needed for the light beam to travel out to a reflector and back. This accurate measurement allowed us to have a course length of 500.95 meters.

Two Records in One Flight

Preparations were complete, and on September 2, we met at Lake Elkhorn. We would try to break the existing closed course distance record of 152.9 miles and, as a side attraction, hope to extend my duration mark. The flight was scheduled for Friday, when few people would be at the lake. Walt Good of DCRC served as the directing official and photographer. The other witnesses were Glenn Scillian and Bert Belt of DCRC and Ken Greenhouse, Luther Jackson and Lloyd Charles of PGRC.

An 11/6 Power Prop was fitted to the .29 diesel and 82 fluid ounces of fuel were poured into the tanks. The weigh-in showed 10.67 pounds, comfortably under the FAI maximum of 11.02 pounds (5kg).

With pylons manned at both ends of the course, the engine started quickly and purred smoothly. After I set the model in the water, Bert handed me the transmitter as cameras and digital watches were prepared. Release was at 9:35:08 a.m. in a 4 mph crosswind. The Shark could not turn into the wind and the opposite shore was approaching rapidly. I turned downwind. On and on it went, finally limping off the water about 1300 feet after release. I settled my nerves for the first few laps, then walked to the east pylon. The trees near that end could be judged better from close up.

Communications were easy with a walkie-talkie at each pylon. As the plane approached the far pylon, someone there would radio ready and turn signals. At our pylon, a caller also announced "ready, turn" to keep me alert. The lap count was kept on three mechanical counters. Frequent radio checks verified that the counters agreed at both ends of the course.

Visibility of the airplane at the far end of the course, 500 meters away, changed dramatically during the day. In the morning, with the sun behind us, the white wingtips were easy to see against a clear sky. As the hot, humid day progressed, a haze reduced visibility severely. At a distance of 500 meters, only the fuselage could be seen as a black spot. Aircraft attitude was inferred from the direction the spot moved. It was then found that visibility was better at higher altitude. In the later afternoon, the haze lifted and lower flying was possible again.

For the first several hours, the engine ran without a whimper. Someone remarked that things were going too smoothly. Then as we neared a new record of 251 laps, 2% above the old mark, the engine sounded a little ragged. Still it kept running and, at 1:54, Lap 251 brought a round of cheers. The Shark had averaged 36 mph on the course, up to the new record.

More hours passed and the millions of propeller revolutions began to take their toll. Deposits were building up in the engine. Lap times increased from 60 sec-

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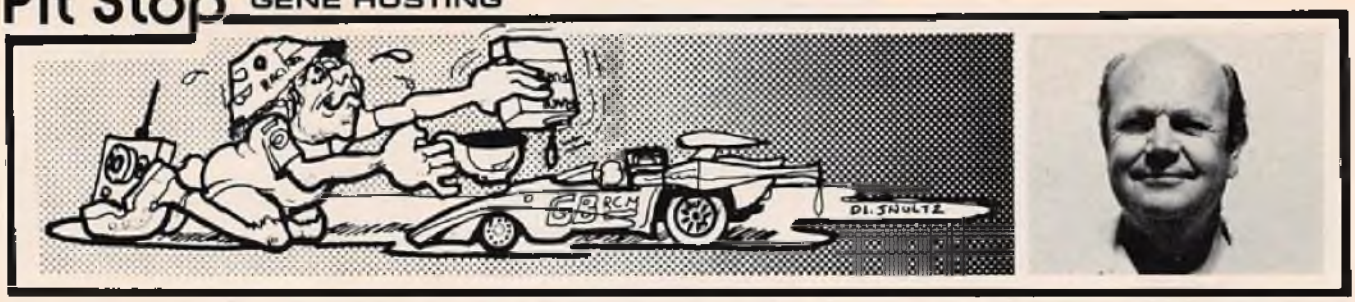
Dick Weber puts Shark in Magothy Bay as Frank Boykin waits to hand him the transmitter.

Shark takes off in southeastern Virginia.

Happy pilot holds plane at destination. Straight line record must land at specified goal. Landing was near Smyrna, Delaware.

Pit Stop GENE HUSTING



HOW TO BUILD A FUEL TANK

Probably the single hardest step, for most guys, in assemblying their new R/C car, is building the fuel tank. We want to take some of the mystery out of this, and show you how easy it can be when you know how to go about it.

The biggest mistakes made by most guys is that they'll use the wrong type of soldering iron or soldering gun or the wrong type of solder or flux. The best type of iron is Ungar #777 with a screw-in 50 watt tip #4033. These are available in hobby shops, hardware stores and electronic supply stores. The next item is called "Stay-Brite" silver solder. This comes in a package with a coil of silver solder and a bottle of acid flux. This is available in hobby shops and hardware stores. These two items make soldering simple. One word of caution — do not use Stay-Brite acid flux on any electrical type soldered connections because it will cause the connection to corrode. Always use a rosin core type solder on electrical connections.

Photos #3 through #7 are of the basic type fuel tank that I am now using, as well as a lot of the Expert Class drivers in Southern California. This is a muffler pressure, chicken hopper type tank, with a Du-Bro porous bronze type fuel filter #161. As you'll notice, there is a small "box" enclosing the fuel pick-up, except the back of the box is open. The reason for this box is to keep fuel around the pick-up all the time. Some tracks we run on have a very tight turn at the end of the straightaway. When you go from a high speed to maximum braking, it forces the fuel, in a 1/3 full or less tank, to the front of the tank. This leaves the pick-up exposed to air, which will generally cause the engine to die or at least lean way out and stumble. The box around the pick-up prevents this problem by keeping fuel around the pick-up.

The tank is made from the Johnson fuel tank kit, Associated Part #SP1. The quick-fill fuel cap is Associated Part #SP61. Take the wider of the two tank halves and mark the top of it to cut out for the cap, with the location as shown in Photo #5. There should be about 1/8" between the back side of the fill cap and the back of the tank. Drill a 1/8" hole in the top of the tank at the C/L (centerline) of the cap. Next, drill the 1/8" hole out to 1/2". Be careful here and go slow so the drill doesn't grab the tank; use a drill press vise if possible. Then use a pair of small tin snips to open up the hole to almost the size of the fuel cap. Then use a Dremel, with a small grinding stone, to fit the hole exactly to the fuel cap. If you do a good job here, you'll be able to use less solder and make your tank lighter. Take the cap and, using a Dremel or grinder, cut a "V" in the bottom of it to match the "V" shape of the top of the tank. This is so when you put the cap in the tank it will not protrude down into the tank at the center, which would not allow you to get a full tank of fuel.

Next, drill a 1/8" hole in the l.h. side of the tank even with the forward side of the fuel cap, as shown in Photo #5. This is for the muffler pressure, chicken hopper line. Then take the Du-Bro filter and mark the back of the tank to drill another 1/8" hole for the fuel line as shown in Photos #4,#5, and #7. Thoroughly clean the cap and tank with acetone, MEK, lacquer thinner, or whatever you have.

As you'll notice, the Du-Bro filter has a piece of 1/8" tubing coming out of it and we'll want to connect it to another piece of 1/8" tubing so we'll make a connector, as shown in Photo #3, out of 5/32" tubing. Make the connector about 1/4" long. K & S makes 1/8" **soft** brass tubing, which really bends easily for making fuel lines. This is available in all hobby stores. K & S also makes a handy tube bender tool. Also, get a piece of K & S .015 brass sheet to make the box, and a piece of .025 brass strip for mounting brackets.

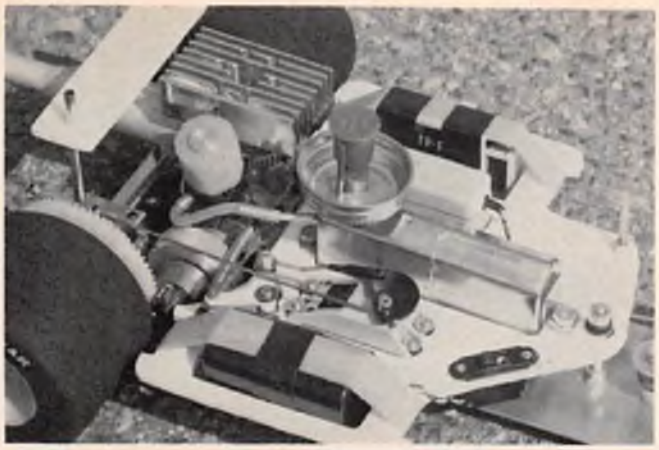
Slip the connector on the Du-Bro filter and the 1/8" tubing in the connector. Feed the 1/8" tubing through the 1/8" hole in the back of the tank. Bend the tubing to the shape, as shown in Photos #5 and #7, so that the outlet points towards the carb.

Make the box out of .015 brass sheet. The top and both sides are one piece with one other piece used for the front. The box will be 1/2" high, 1" long, and 3/4" wide. Slip the box over the fuel filter, as shown in Photo #6, to make sure everything clears okay. The back of the box should be about 1/8" from the back of the tank. This allows room for the fuel to get into the box. When all these parts fit okay, remove them from the tank. Take another piece of 1/8" tubing and form the muffler pressure, chicken hopper line, as shown in Photos #5 and #6. The inside end of the tube should be on the r.h. tank wall, 1/2" above the floor. The outside end of the tube should point towards the muffler. A "chicken hopper" type tank allows a carb to be adjusted and hold that setting without richening up or leaning down as the fuel level changes in the tank. This is controlled by the muffler pressure or vent line at the location where the air actually enters into the tank; in this case, on the inside of the r.h. tank wall, 1/2" above the bottom and 1/4" towards the rear of the center of the tank. This location is critical for proper chicken hopper operation. Refer to Photo #5. Muffler pressure allows the use of a larger carb without leaning out on acceleration.

Okay — we're ready to start soldering. Plug in the soldering iron. It will take 3 or 4 minutes to heat up. Take a paper towel and fold it into a 4" x 4" piece and soak it with water and lay it flat somewhere near where you'll be soldering. This wet towel conveniently and quickly cleans the soldering iron tip when it gets too much scale on it. A couple of quick wipes and the tip looks like new. This tip has a special plating on it, so **never** clean it with a file or steel wool. The iron should be hot now, so coat the tip with a coating of solder; it will flow on easily and freely. The first thing we'll solder is the box. Refer to Photo #3. Place the front piece of the box in place with the top of the box. We're ready to use the flux. Another word of the caution: this flux is an **acid**. If you get some on your fingers, it won't immediately eat your finger off, but it will eat holes in your clothing, table top, etc. You might do your soldering on a large piece of wood that you can save and only use for soldering. Try to keep the flux only on the parts you're soldering.

Place a drop of the flux on the box at the joint you'll be soldering. Place no more than a drop of **solder** on the iron tip. Now place the tip on the box at the joint to be soldered and you'll notice the solder will flow out immediately on the brass. Move the tip along the solder joint. Keep the amount of solder you use as small as possible to keep the weight down. Now, that was easy, wasn't it?

Now, we'll give you another easy one.

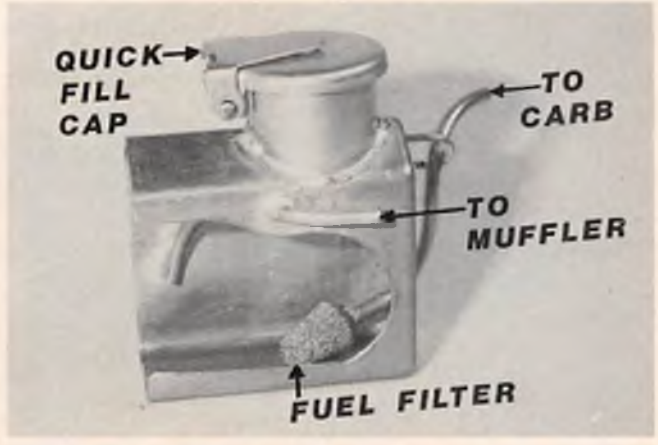


#1 This is the type of "Rat Fill" fuel that has been the most popular over the last few years. Now we'll show you the latest "Flip Top" fuel caps being used and how to build a fuel tank.

#2 An Ungar soldering iron with Stay-Brite silver solder makes fuel tank building easy.

#3 A Du-Bro fuel filter keeps all the dirt out of carbs. The box covers filter keeping fuel around it at all times.

#4 Cut-away tank shows position of fuel filter pickup and air vent lines.



#5 Cut-away tank.

#6 Location of box over fuel filter.

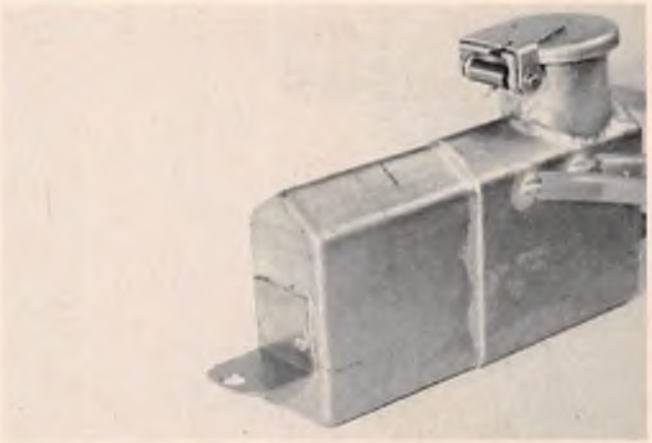
Take the muffler pressure vent line and place it in its correct location and solder it in, as shown in Photo #6 - - - that was easy. Now that you're an accomplished solderer, you get a hard one. Refer to Photo #3. You're going to solder the filter, connector and carb line together. What you don't want to do is plug up the filter with solder or flux. First, soak the filter part with oil, like 3-in-1 oil. This will help to keep the flux out. Place a very, very small amount of flux on the filter tube and lightly coat it with solder, then slip the connector on. You'll probably have to heat it with the iron to slip it on. Then slip the tubing in the other end of the connector. Place a very, very small amount of flux on it and solder it.

Slip the filter and tubing in the tank, locate it and solder it in. Take a piece of 1/16" piano wire and make a support for the fuel line and solder it on. Refer to Photo #7. Slip the box in the tank until it's 1/8" away from the back wall. You'll be able to hold it in place through the cap opening. Solder the box in along the lower front edge. Next, make an "L"

#7 Carb line is supported by 1/16" piano wire bracket.

#8 Another type of tank which uses an in-line fuel filter.

#9 Filler cap can be opened wide for super fast pit stops.



#10 Mounting brackets front and rear securely mount tank.

#11 A quick opening bracket is attached to top of filler cap. An overflow cap is also used with appropriate drain line. An efficient roll bar is also attached to this tank.

#12 If you don't think you can make a tank, you can always buy an assembled fuel tank, such as this Associated Part #SP 62.

bracket 1/4" long from 1/16" piano wire and solder it in on top of the box and against the back tank wall. That's all that's needed to hold the box in place.

Now take the cap and position it in the tank. Some racers like the cap to open towards the back and some like it to open towards the front. Take your pick. Take a small piece of tubing and use it to hold the cap open a little way while you're soldering. This will keep the heat off the rubber seal. Solder the cap to the tank.

The next step is very important. Take the tank assembly and hold it under a faucet of running water for 3 to 5 minutes. This will rinse all the flux acid off of the tank and stop any further etching action of the acid. Wipe off any excess water.

Now slip the front half of the tank into the rear half. Make the overall length of the tank 3⅞" long; this will make the tank capacity 4 ounces and race-legal. Solder the two halves together.

Make two mounting brackets out of

to page 139

RADIO SPECS

HOBBY LOBBY 6 DIGITAL PROPORTIONAL

ADJUSTABLE CONTROL STICK TENSION

RECEIVER CASE HAS 4 SERVO AMPS – VIBRATION PROTECTION

MAINTAINABLE DEAN'S GOLD-PLATED CONNECTORS

SIMPLICITY OF NON-AMPLIFIED SERVO

HOBBY LOBBY INTERNATIONAL
RT. 3, FRANKLIN PIKE CIRCLE
BRENTWOOD, TENN. 37027

FEATURES

TRANSMITTER

- Number of Channels: Six.
- Case Material: Blue vinyl laminated aluminum.
- Type Gimbals: Enclosed gimbal.
- Type Pots: Long life conductive plastic.
- Power Supply: 9.6 volt nicad supply.
- Type Meter: Voltmeter-battery condition.
- Modes Available: Mode I, Mode II.
- Frequencies Available: All 27 and 72 MHz.
- Weight: 1¾ lbs.
- Size: 5⅞"H x 1⅞"D x 7⅛"W.
- Unique Features: Customer adjustable stick tension.

RECEIVER

- Case Material: High impact molded nylon.
- Size: (includes four servo amplifiers in receiver) 1-5/32"H x 2½"L x 1-19/32"W.
- Weight: 3 oz.
- Type Decoder: SCS shift register.
- Type Front End: Double tuned with R.F. amplifier.

SERVOS

- Case Material: High impact molded nylon.
- Size: 1⅜"H x 1⅜"L x 23/32"W.
- Weight: 1 oz.
- Output: ±45°.
- Output Controls: Rotary or arm.
- Output Torque: 15 to 18 oz./in.
- Type Amplifier: Integrated circuit with PNP transistor drivers.
- Motor Size: 16mm.
- Servos: Primary four channels have servo amplifiers in receiver package. This makes system less liable to vibration effects and increases reliability.

SYSTEM

- Airborne Power: 4.8 volt nicad pack G.E. 500 mah cells.
- Type Connector: Deans gold plated.
- Type Charger: Internal enclosed.
- Servo Trays: 5 options available.
- Shipping Container: Special foam rubber packaging.
- Service Available: Hobby Lobby services all its radios at Hobby Lobby.
- Flying Weight: 11½ ozs.
- Range: Out of sight.

A Sumatran co-pilot gives the model a pre-flight inspection.

JUNGLE BIRD

BY ARNOLD P. MILTON

Yes, even here! In the jungles of Sumatra where it might be least expected, the sport of R/C modeling is being actively pursued and enjoyed by the employees of Caltex Pacific Indonesia, which operates the largest oil field between the Persian Gulf and the U.S.A.

But I am not writing to you about oil. For, in addition to being a geologist by profession and, thus, by inference, a teller of tall tales, I also fly R/C model airplanes. I would like to tell you something about my endeavors in this area.

I was transferred to Sumatra shortly after being arrested at bayonet point and questioned until after dark for flying in Libya just prior to the Yom Kipper war. Since I was not about to change hobbies, the transfer was probably a good thing. I miss the open desert flying sites, but my present assignment, as in the case of all foreign assignments, has posed its own special challenges from which one can benefit through experience.

Imagine, for instance, mentioning radio and airplane in the same breath as import items anywhere in S.E. Asia. I'll guarantee some incredulous looks and additional questions at least. Far better to humble yourself and call them toys that you like to play with or, at most, hobby items.

If one ignores the importation problem and the lack of readily available model supplies, the challenge of flying in Sumatra is reduced to choosing a suitable flying site and model aircraft. These are problems with which we are all familiar; I hope, therefore, that you will find some value in the following comments and ideas.

In Sumatra, choosing a flying site is a problem indeed, for one must contend with the jungle, which is everywhere with trees over 200 feet tall, as well as a dense population of curious people who are completely oblivious to the potential danger from a six pound model flying at thirty miles per hour. In this regard, a muffler is an essential piece of equipment since fewer people are attracted.

I finally settled on the company's new nine hole golf course as a flying site. The accompanying photographs were all taken there. It was not as smooth as I had hoped, and had numerous tall trees left standing. The runway was an old dirt road meandering through several large water filled holes which my plane has come to know and love.

It was apparent at the onset that this site would not favor a Mach 8 with retractable gear or similar high speed model. Instead, a robust high wing model with a high-lift airfoil and high power for short take-off runs was required. Of the several planes available, I chose the RCM Trainer .60 because of its symmetrical high-lift airfoil and associated good aerobatic qualities. A Super Tigre G60 ABC FI and a 12/4 nylon propeller have proven more than adequate for near-vertical climb-outs.

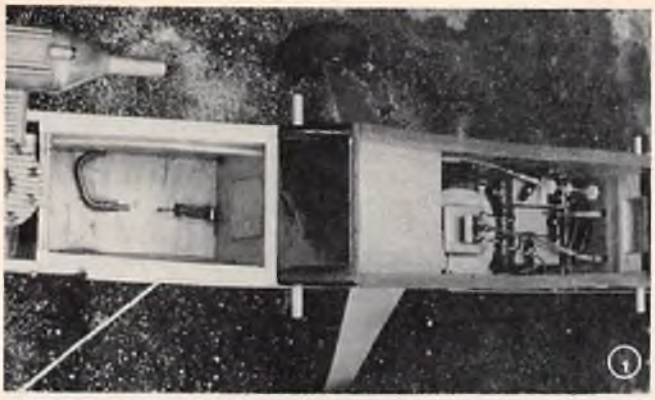
Landings on the golf course posed the greatest danger to the model with about a 55% chance for success considering the holes, stumps, and trees. With necessity being the mother of invention, the old idea of a parachute landing was reborn.

This idea is not new, and has been published in the past; but most of the systems I have seen in the past were not very reliable. One noteworthy weakness was in releasing the parachute from the top of the plane so that it tangled in the tail, that is if the chute did not get in front of the risers in the slipstream and form a streamer. The reason for releasing the chute on top was to get the plane to land on its gear. This is a good objective, but, as we shall see, not absolutely necessary if the rate of descent is slow enough.

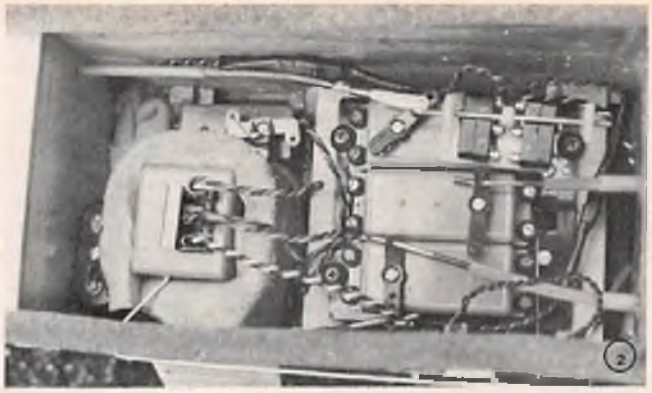
My goal was to design a parachute system which would be reliable. It has, in fact, proven highly reliable, and is recommended to others who must fly out of restricted, soft fields.

As apparent from the photographs, this system in its present form is adaptable to any large high wing model with a fairly large fuselage. For this reason no detailed plans are furnished since the concept is simple and part of the fun is adapting it to your particular design.

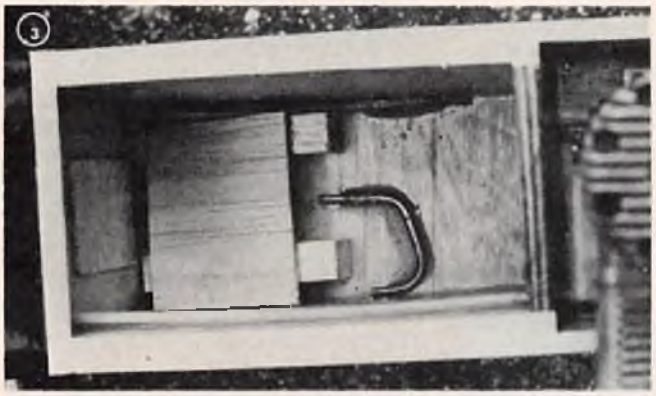
The parachute compartment is made of 1/8" balsa, and is located in the forward fuselage compartment where storage of the chute will have negligible effect on the Center of Gravity. This compartment should be at least 3½" x 4" x 4½" for this size model (see Photo #1).



The parachute box is located near the C.G. in the forward section of the fuselage. The release mechanism is shown on the floor of the fuel compartment. The Carl Goldberg release servo is located beside the receiver.

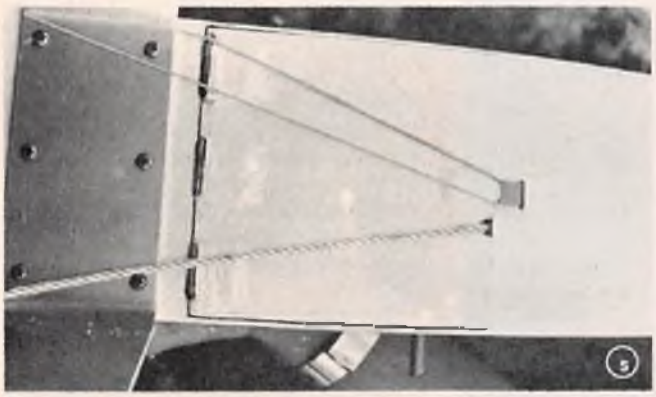


The release servo with the attached monofilament line is next to the Kraft dual conversion receiver. The extra pencell battery supply is forward of the receiver. The radio battery pack is beneath the servos. The micro-switch is attached to the throttle servo.



A scrap balsa secondary floor is used to protect the release mechanism from the weight of the fuel tank.

The loose fitting parachute box insures easy exit of the chute from the plane and deployment of the chute in the proper sequence. Thin plywood stiffeners along the outside of the lower fuselage edges can be seen at the bottom of the picture.



The primary parachute cord running to the attach point on top of the wing is visible in this picture, as is the small rubber band which pulls the parachute compartment trap door fully open and facilitates ejection of the parachute box by gravity.

The primary parachute cord is attached to the four wing dowels at a point about 1" forward of the C.G. and 8" above the wing. This requires slack in the two rearward dowel attach lines as seen in this picture. As indicated by the Experimental Aircraft Association decal, the author is also interested in full size aircraft, and he is in the process of building a Steen Skybolt.

A trap door made from 1/16" plywood and opening toward the front of the model, so the slipstream will force it open, is then built into the bottom in front of the main gear. This door has a raised 1/8" square balsa edge on the inside to keep out fuel draining down the sides of the fuselage (see Photo #4). The compartment and door are fuel-proofed with Hobbypoxy II glue.

The sides of the fuselage are reinforced with strips of 1/16" plywood approximately 5/8" wide by 10" long along the bottom outside edges to make up for the loss of bottom support due to the installation of the trap door (also visible at the bottom of Photo #4).

The trap door release is epoxied to the bottom rear of the fuel tank compartment, and is a simple spring loaded mechanism made from a 1/32" music wire plunger, a thin sheet brass base, and a Carl Goldberg landing gear retract spring, or similar weak spring. The plunger should move approximately 3/8" against the light spring pressure. The spring is positioned to hold the plunger in an extended position through a 1/16" hole in a thin brass tongue which is attached to the parachute compartment trap door. The following is a full-sized sketch of this apparatus:

A very important detail concerning the release mechanism and trap door tongue is the installation of two small 1/8" thick aluminum squares through which 1/16" holes have been drilled. As shown in the sketch, these holes center on the hole in the trap door tongue when the trap door is closed. This arrangement is necessary to prevent accidental opening of the trap door due to flexing of the 1/32" wire plunger and thin sheet brass tongue during take-off and landing.

The release is actuated by tension on a piece of 20 pound test monofilament fishing line which is routed through a U-turn formed from 1/8" O.D. copper tubing and then back through more tubing epoxied to the interior fuselage wall to a servo in the radio compartment (see Photo #2). The piece of tubing which forms the U-turn is epoxied to the fuel tank floor forward of the release mechanism. The release mechanism is protected from the weight of the fuel tank by a secondary floor made from scrap balsa (see Photo #3).

A Carl Goldberg retract servo and micro-switch attached to the throttle servo were used for the parachute control. This retract servo requires two pencell batteries as an additional power supply, but this is preferable to draining the radio battery. It was a lot cheaper than a fifth channel and servo for the radio. The micro-switch is easily installed, reliable, and finely adjustable. The release is set to close on high throttle and high trim, and to open on low throttle with a mid-trim setting. The engine stops with low throttle and low trim.

I tried actuating the release with the throttle servo only, but the spring loaded release mechanism imposes a load on the servo at low throttle settings, and there is enough play in the system to make it difficult to adjust. The chute was easily ejected at the wrong moment during throttle controlled maneuvers. By all means, use an extra servo.

Another very important part of the design is the installation of a loose fitting 1/8" balsa box inside the fuselage parachute compartment. This is done for two reasons. The first is to ensure that the chute will not fail to come out due to friction against the plumbing epoxied to the insides of the fuselage. The second is to make the risers deploy forward of the chute and avoid possible entanglements. This is done by packing the chute accordion style into the box with the chute apex at the bottom of the box and the risers looped into the box last (see Photo #4). The box falls free as the chute is pulled out, but it could be tied to the chute apex with a small tag line if desired.

In order to facilitate the ejection of the box by gravity, a thin rubber band is looped around one of the main gear legs and the trap door tongue (Photo #5). This opens the door fully backward and out of the way of the box. The system has operated successfully without this rubber band, but it does seem to speed ejection of the box.

The parachute is made from regular parachute silk bought in a surplus store for $3.00. It has a 6' diameter and eight gores, or panels. The hole at the apex is 3" in diameter, which seems about the right size. This small hole allows escape of sufficient trapped air to keep the chute from spilling and collapsing during descent.

The eight risers are 6' long, and made from 1/16" nylon string. They are attached to a 4' length of 1/8" nylon cord (which will be referred to as the primary cord) which is, in turn, attached at a common point to four pieces of 1/8" nylon cord which attach to the four wing hold-down dowels. The common point of attachment of these four cords to the primary cord should be about 1" forward of the Center of Gravity and about 8" above the wing. This location will tend to stabilize the plane in a horizontal position as it descends (Photo #6).

With the chute attached and loaded, the primary cord runs from its topside attach point, behind the wing, down the side of the fuselage, behind and between the main gear, through the notch in the edge of the trap door (See Photo

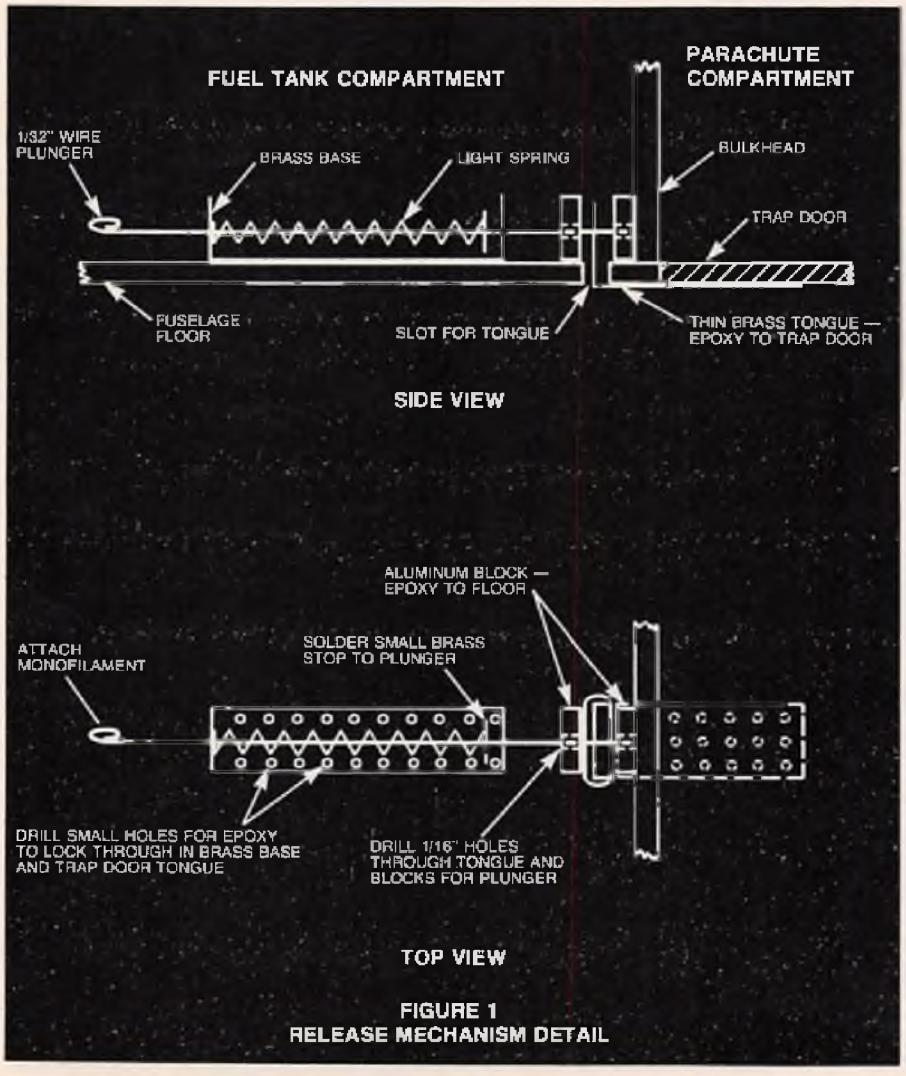


FIGURE 1
RELEASE MECHANISM DETAIL

The author surveys the hazardous flight area. Using the motorcycle avoids dings from car doors and disassembly of the model. It is much handier on jungle trails. The sign warns those who can read English.

#5), and into the box and chute compartment. There is no significant effect on the flight characteristics of the model due to drag from the exposed chute attachment cords or the extra weight of the system. No additional weights were required to adjust the Center of Gravity.

The parachute, therefore, is designed to fall from beneath the plane, swing below the horizontal stabilizer, and open. At this point, the horizontal stabilizer should slip off the primary attachment cord and allow the plane to swing into a horizontal position below the chute.

Although this sequence should work well with most models, the RCM Trainer .60 is a problem in that it is a very stable airplane with a very wide horizontal stabilizer. When the chute opens, this plane quickly slows and settles forward into a vertical nose-down attitude beneath the chute. Once below flying speed, the controls are no longer effective, and the plane cannot be shaken out of this position. In this attitude, the rate of descent is also somewhat greater since the wing is not providing a braking effect.

My first attempt at a parachute landing was done with an earlier 4' diameter chute. The chute was released at an altitude of about 20 yards, and I watched in helpless wonderment as the plane slowed, nosed down, and hit on its nose with sufficient force to cause it to bounce back on its tail and snap it off! The tail/fuselage joint is a weak point on the RCM Trainer .60, but it saves rebuilding tails.

The next trial was attempted with the present 6' diameter chute, and the chute was released at approximately 40 yards altitude. Again the plane assumed a nose-down position. I finally overcame my shocked disbelief to rush forward in a vain attempt to catch the slowly descending airplane. Much to my surprise, however, the plane lit gently on its nose and settled onto its wheels. Careful examination revealed only one crack in a weakly glued servo mount. There was no dirt in the exposed carburetor, and the nylon propeller was undamaged.

Following this test, my opinion of the value of a wheel landing changed. In many respects, a nose landing is preferable for unimproved flying areas. The delicate tail surfaces are farther from the point of contact, and the early removal of the engine weight gets rid of a lot of the shock load normally transmitted through the fuselage. In addition, the wing surfaces are not as exposed to branches, etc., in the vertical position. Some bracing for the servo mounts in the forward direction should be installed, however, as well as sufficient foam rubber for the batteries and receiver.

Depending upon direction of drift, it is possible for the plane to topple over sideways or backward after a nose-down landing. In this case, the early removal of the engine weight reduces the secondary impact such that no damage is done to the exposed wing tips or rudder. The chute exerts lift until the plane stops moving downward, and this also tends to soften the contact of the wing tips or rudder. Of course, a parachute landing should not be attempted in high winds.

The box has fallen free from the aircraft and the chute is just beginning to deploy from the box.

Therefore, although this system is designed to provide wheel landings, this seldom happens with the RCM Trainer .60 and, for the above reasons, it may not be desired. The only way to consistently make wheel landings with bottom parachute ejection would be to lay the primary cord back along the top of the fuselage, loop it around the elevator, and stretch it forward between the main gear to the parachute compartment. Unless the elevator is split at the rudder (the RCM Trainer .60 isn't), this is not practical since it would interfere with the elevator. It would not add to the appearance of the model in any case.

Conversely, a nose-down installation could be made less obvious by installing a single primary cord from the bottom parachute compartment straight back to a reinforced attachment point, such as a dowel, near the end of the fuselage. This would be of value in a low wing airplane or any configuration where it is desirable to keep the top of the fuselage clean of cords and rubber bands, and it is the logical next step in the refinement of my Trainer .60.

For now, however, I am enjoying flying out of small fields I would never have used previously with a reliable and proven landing system that is beyond the "emergency" category. Although one of the objections to parachuting is that things are out of control once the chute is deployed, I have found that if wind speed and direction is taken into account, it is very easy to literally drop the plane in my lap. I usually catch it if there is any question about youngsters or hazards in the area. This is really very easy to do providing you don't grab the hot engine. A cowl might help.

In closing, I hope I have appealed to the experimenters in our hobby. I think there is a lot to be done in modeling toward imitating the ability of a bird to land on a point.

Happy parachuting! □

A gathering such as this always materializes from the jungle when models are flying in Sumatra.

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- 102" Span
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- 1800 sq. in. wing
- 26¼" chord at root

- 4 channel radios required
- Designed for .60 engines with prop driver
- Very stable flyer
- Proof of scale 3 views
- Kit includes 21" canopy

- No foam or plastic
- 6" spinner is not included available direct only $16.95
- Huge rolled Plans
- Machine and die-cut parts
- Decals not included

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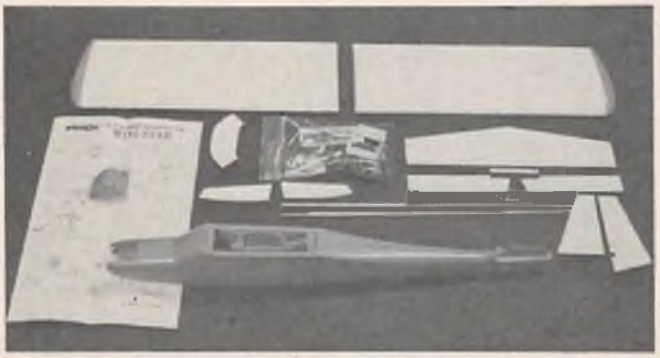
RCM PRODUCT TEST

Hobby Shack MINI STAR



IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts			NA		
Plans			●			Parts Match to Plans			NA		
Written Instructions			●			Overall Parts Fit		●			
Quality of Hardwood		●				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 ..... Mini Star
Type ..... Sport and Trainer
Manufactured By ..... Pilot
Distributed By ..... Hobby Shack
6475 Knott Ave.
Buena Park, California 90620
Mfg. Suggested Retail Price $27.96
Available From ..... Hobby Shack
Mfg. Recommended Usage ..... General Sport
Wing Span ..... 36½ Inches
Wing Chord ..... 6"
Total Wing Area ..... 209 Square Inches
Fuselage Length ..... 28 Inches
Radio Compartment Dimensions ..... (L) 9" x (W) 2" x (H) 2½"
Wing Location ..... High Wing
Airfoil ..... Flat Bottom
Wing Planform ..... Constant Chord
Dihedral ..... 2 Inches
Stabilizer Span ..... 14 Inches
Stabilizer Chord (incl. elev.) ..... 3¾"
Total Stab Area ..... 47 Sq. In.
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Top Of Fuselage
Vertical Fin Height ..... 5½ Inches
Vertical Fin Width (incl. rud.) ..... 4"
Mfg. Rec. Engine Range ..... .049-.06 cu. in.
Recommended Fuel Tank Size ..... 1 Ounce
Landing Gear ..... Conventional
Recommended No. Of Channels 2
Recommended Control Functions ..... Rudder & Elevator
Basic Materials Used In Construction:
Fuselage ..... Plastic
Wing ..... Balsa Built-up
Tail Surfaces ..... Balsa Sheet
Hardware Included In Kit ..... Horns, Screws, Motor Mount, L.G.
Plan Size ..... 8½" x 11" (1 sheet)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... No
Construction Photos ..... No
Kit Includes ..... Not Given
Mfg. Rec. Flying Weight ..... Not Given
Wing loading based on rec. flying wt. ..... Not Given

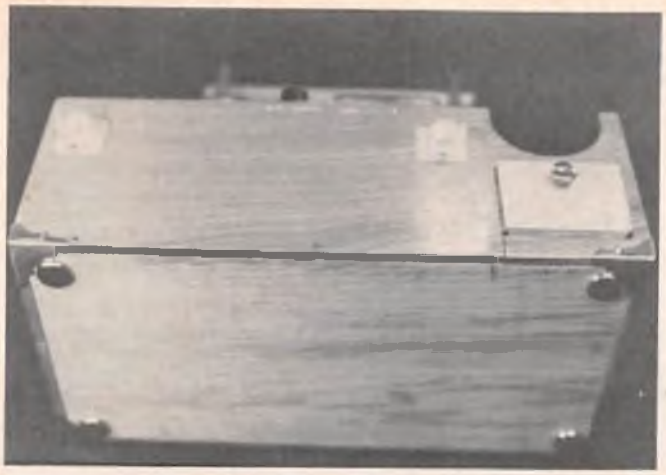
RCM PROTOTYPE

Weight, Ready To Fly ..... 23 Ounces
Wing Loading ..... 15.3 oz./sq. ft.
Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... Cox .049 Black Widow
Muffler Used ..... Cox
Radio Used ..... RS
Tank Size Used ..... Not Given

The Mini Star is a basic powered trainer manufactured by Pilot, and sold by Hobby Shack. It is priced at $27.96. The Mini Star is a 1/2A ARF kit and requires very little assembly time before it's ready to take to the air. We spent only about two hours putting it together, which indicates how easy it is to get in shape for flying. The wings are of factory hand-built balsa construction, covered with a heat shrink plastic and ready for joining with 5-Minute epoxy. The rudder, fin, elevator, and stabilizer are finished and covered also, and are ready to be hinged and joined to the fuselage. The fuselage is of vacuum formed ABS plastic with an excellent surface finish.

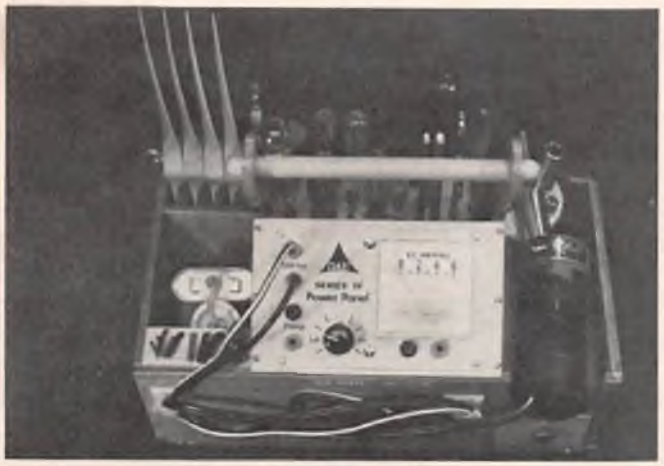
All hardware necessary to do the job is furnished: Control rods, horns, and formed landing gear to name a few of these items. The motor mount is already there on the factory built firewall, and we installed a Cox .049 Black Widow on ours.

All told, assembly of the plane was simple, quick, and easy. When finished, it performed exactly as you might expect - - - a low powered, slow, smooth, easy to fly airplane that will serve either as a fine trainer for the novice, or a sport flyer for those of you who might be looking for a change of pace. The Mini Star is one of several 1/2A ARF kits in Pilot's Mini-Plane Series. They are all available from any Hobby Shack store. Easy to build, fun to fly — that's the Mini Star. □



Bottom view showing glides and brass corners . . . clips on side hold starter cord in place while carrying.

Look at all the tools for field use that can go into this small field box. Note the coat hanger attachment for carrying transmitter at top of picture.



Completed field box outfitted for the line.

End view with transmitter holder slipped over box end.

runway. In a frenzy of brief but intense delirium, we were ready to go and the timer called us off the line. "Weber, you jughead, drove 1,285 miles to blow your flight . . . you'll only have a few more chances . . . if you are really serious about becoming a good pattern flyer, you'll have to get your act together, and set up a plan of preventative maintenance . . . have the right tools handy, and use them efficiently to get your plane airborne . . . it is impossible to score if you can't get off the ground!"

The lesson sunk in. From that day on, I observed every flight box that came along, and started a series of "security blanket" boxes that has evolved into the one presented herein. Step by step, I added tools and subtracted items not needed. Leave your fuel can under the shade of the tent. Keep your spare engines, nuts and bolts, and glue in another repair box in the back of the car or van, but, when you get into your pit area, have everything available that you'll need in a hurry. Have a place for everything, and everything in its place.

The basic flight line box is designed around the smallest, most compact and reliable basics needed for sure starts and fast maintenance: The Kavan Engine Starter, the pair of M.E.N. Gelled Electrolyte PB 660 Batteries (12 volts in series), a DAE Series IV Power Panel, the M.E.N. C-25 Automatic Charger, plus the glow plug clip and wire, and tools that you need and want with you on the line and under the sun canopy for quick checks and repairs. All this is condensed into the smallest and lightest practical neat carrying box that could be designed around the equipment. The M.E.N. cells are less than 4" in height and can be built-in neatly at the Center of Gravity under the handle. (The sealed cells can be transported via airline travel — another plus in their favor.)

The spare glow plug is readily available, along with the 4-way wrench by Fox. Every necessary tool is at your fingertips — in fact, so handy that you'll have to watch your flying buddies who will be borrowing items from your box rather than rummaging around in their own junk box. However, if something is missing, you'll know it immediately because of the empty space left from where it was removed. The power panel will give you 6 volts for your fuel pump while fueling up, then allow you to safely remove the leads from the pump to avert any possible fire or explosion at or around your bulk fuel container. Although I don't use the fast charge feature of the DAE panel, it is there if you want it. You can also adjust the amperage of your glow plug driver, and inspect same for shorts, flooding, or burned out element.

Choose the best lumber you can find at your lumber yard for the actual construction; you use so little that the **best** costs no more. I like 1/4" birch cabinet plywood, good both sides, for the sides and spacers, clear 1/2" pine for the bottom and tool racks, and the fine 1/8" ply for the little drawer. Mark out all parts carefully from the plan, cut on jig or band-saw a little oversize, then true up all the edges on your circular table sander, or belt sander with a guide. All the edges should be square and clean for neat assembly. Use Titebond or similar glue sparingly when assemblying the box, and cinch with small box nails being

READY-ON-THE-LINE

BY BUD WEBER

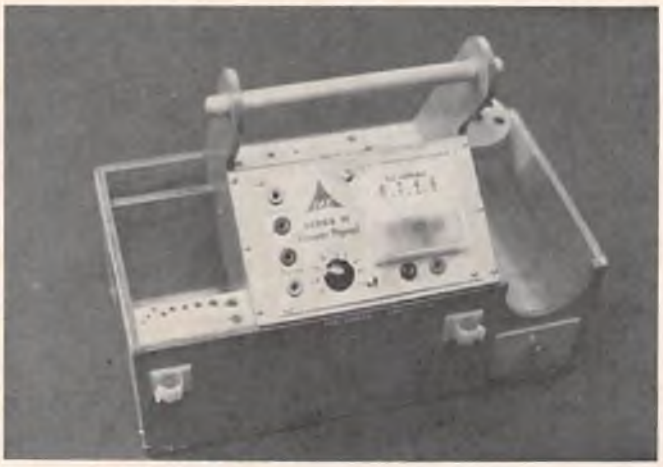
. . . Contestant Number 36 to the "ready box", please! Those words send a little chill down the spine of the R/C pilot, regardless of how many times he has been called to carry his plane and equipment up to the take-off area. The questions start jumping through his mind . . . Did I top off the tank? Is the prop nut tight? Is the spinner screw securely fastened? Is this really the glow plug I want to trust for this all-important flight, or should I put in a new one just in case . . . and yet, last week, a brand new plug went out on the first engine run! Will my engine start? Starting battery up to the task? Holy Cow! I'm nervous . . . where is my security blanket?

Well, if you have prepared properly, these nagging questions will start to fade, and allow you to get into the rhythm of your pattern and the feeling of confidence so necessary to perform correctly before the judges, fellow flyers, and to your own satisfaction as well. Watch the top pattern flyers . . . OK, they all have a little twitch here or there, like a tapping foot, shaky hands, body english . . . but most of their sweat goes into the finesse of flying, not into the agony and desperate hope that they'll get the engine started and "thank God, it's off the ground" sort of approach.

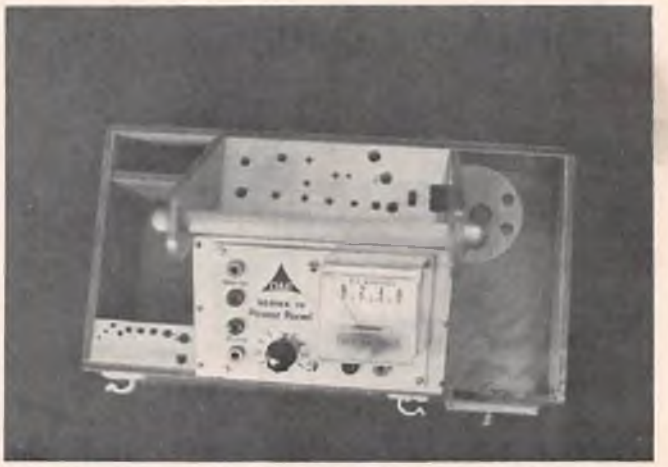
Thus, this article began taking shape at one of my first pattern contests . . . a Tangerine in Orlando, 1970. After driving 1,285 miles from snowy Wisconsin, I thought it only fitting that I ask the genial genius Jim Kirkland to call the Novice Pattern for me. Now here was a guy who was **never** too busy to help a newcomer, but became impatient with stupidity such as I displayed. Having flooded the engine, it finally popped, only to cut my finger . . . a nice clean cut, but bloody. The next pop, and the prop came loose, and we chased the spinner all over the

About The Author

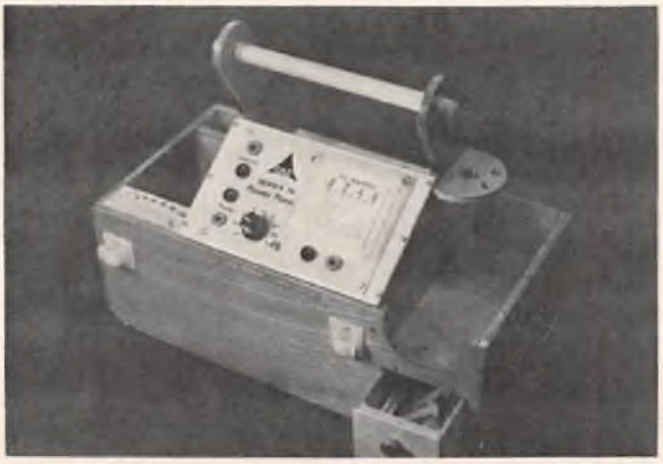
Carl "Bud" Weber is married and the father of 9 children. He is a native of Wisconsin and a graduate of Wisconsin University and the University of Chicago Meteorology, and has a Bachelor of Science in Mechanical Engineering from Marquette University. He served as a First Lieutenant in the United States Air Force. He has been an avid model airplane enthusiast, and in R/C since 1949. He is a charter member of the Lakeland R/C Club and Pebble Creek Flyers, Inc., and a member of the Milwaukee Flying Electrons. He is a founding member of the Pebble Creek Flyers, Inc., a 40-member R/C club which recently completed the purchase of a 33-acre flying site. He is a member of the AMA and the NSRCA. Bud's first contest was the Pattern Contest Circuit Nationals in 1970. He won 1st Place in R/C C Pattern Novice at the Glenview Nationals in 1971 and qualified for Masters at Rough River in 1975 and 1977. He is the designer and author of the Sequel, Sequel Two, and Super Sequel. Bud is presently self-employed as a Real Estate Broker in industrial and commercial properties, investments and construction.



Bare box with M.E.N. Power Pack and DAE IV Power Panel.



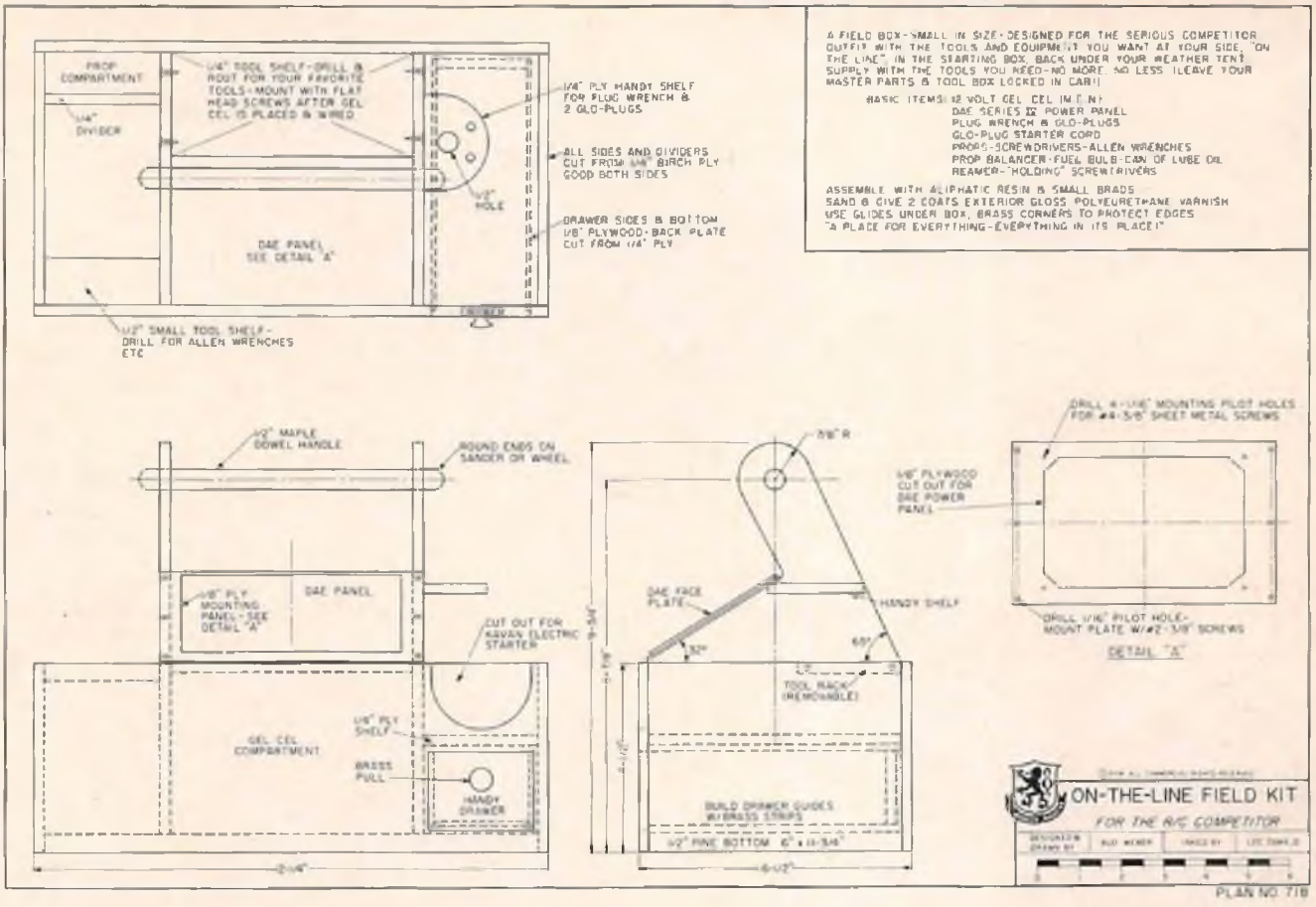
Top view with tool holes and slots cut into racks.



Looking into starter compartment. Drawer holds small miscellaneous parts.

Rear view showing M.E.N. Power Pack under DAE IV Power Panel. Makes into a nice compact package.

FULL SIZE PLAN AVAILABLE — SEE PAGE 187



careful not to split the plywood! Then, lightly sand all the edges, tack rag and apply one or two coats of a good exterior polyurethane varnish. If you wish, dress up the corners with cabinet hardware of brass, and add some chrome glides on the bottom so you don't scratch up the kitchen table on the way out to the field when you stop for that last sip of hot coffee.

There you have it . . . the magic box that will help you get and keep it all together . . . your security blanket on the flight line. Good luck on the circuit! □

The BIG CONTEST

. . . . From a New RC'ers Wife's Point Of View

BY JERI DENSON

● Being newly married to an R/C modeler, I wasn't too surprised when I heard of the forthcoming Big Contest.

He came home from the monthly meeting of his club with a, "By the way, they are having a big contest in a couple of months (to me anything over two people is a contest) and I volunteered your services, if that is okay with you?"

Of course I agreed. (Great! It will give him something to do for a while.) That was my first mistake.

Helping consisted of addressing and stamping what seemed to be 500 envelopes. He brought them home with, "As long as you don't have anything else to do, and they are due in the mail in 2 days." (By the time I was through I had cramps in my fingers and glue all over my tongue.)

The leaflets proclaimed a beautiful flying site which, translated to me, should mean a large, flat flying surface surrounded by neatly mowed lawns, a few picnic tables nearby covered with shade from leafy trees. Bring the family, a picnic lunch, and spend the day together in the fresh air from the blue Pacific Ocean — (that didn't sound too bad at all; might even be fun) my second mistake.

His spare time is now spent looking over catalogs, in hobby shops, on the phone to his flying buddies, and finally he made his choice. When he brought the kit home, he showed it to me with pride. (I don't know what it looked like to him, but to me it was a big box with lots of scraps of wood and not at all like the picture on the front.)

Then the work begins — the cutting, sanding, epoxying (5 minutes no less); friends drop by — long sessions on the phone — longer sessions out in the garage (which by now has been converted to a shop, and the cars sit out in the driveway). He walks around mumbling to himself, things like, "The trailing edge needs sanding," "Must get a new glow plug for the whatsit." (Whatsit: a wife's technical word for a technical something or another inserted where necessary to make a complete sentence.)

"The aileron horn needs adjusting." (Even when he talks in his sleep you'd think you would hear something interesting.) But, after a few nights of this, I am able to sleep through it with a, "If that's all he has to worry about, I feel lucky" attitude.

His clothes are spotted with white glue and covered with sawdust, he smells of dope and castor oil, and gradually everything takes shape. (Even I can recognize it as a model plane.) The new engine is run each evening to, "Break it in so it will purr like a kitten." (Like a kitten he says — it sounds like a cross between a lawnmower and dirt bike belonging to the kid next door.

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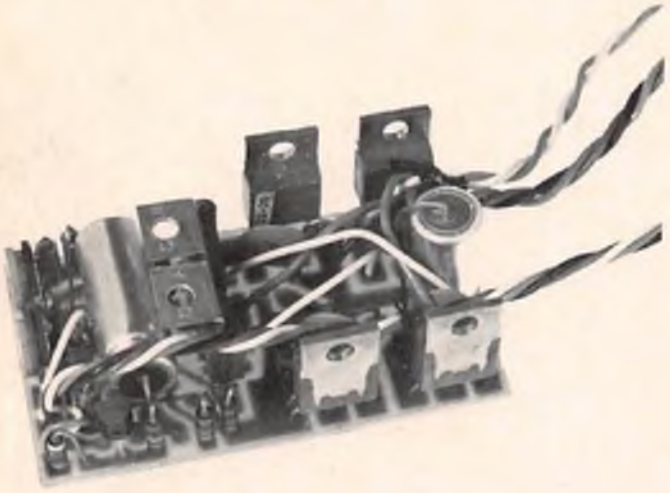
ELECTRONIC SPEED CONTROL

BY JAY W. EITELMAN



It all started back in December, 1975, while thumbing through my RCM where I found an electric car article. With electronics being one of my too many hobbies, I thought that building an electronic speed control would be an interesting and fairly easy project. Since then, I have suffered countless hot transistor burns, sleepless nights and generated several scrap boxes full of failures.

One of my major discoveries was a new and remarkably fast means of communication being telemodeler. Now the postman is suing me for a double hernia, and the phone company has charged me for replacing five miles of worn out phone lines and six sets of bells. The moral to this story is don't read RCM, and don't tinker with speed controls!

Being a newcomer to the sport of R/C, I thought that things with wings made the world turn. I was quite surprised to discover the world of scale boating, which suddenly appeared in my mail box and at my telephone. Meeting these fine modelers and their fascinating projects has been a very rewarding experience, and I guess that reading RCM isn't all bad.

From this experience, I have concluded that the major problem of the scale ship builders is the method, cost and reliability of the speed control which has also been indicated by several Radio Spectrum column comments. This article is intended to help those fellow soldering iron jockeys, and I don't recommend its construction or use unless you have a working knowledge of transistors and ohm laws, or at least have a friend who can help.

I have observed that the average modeler does not have a degree in electronics and, with this in mind, the so-called mechanical servo driven controllers are hard to beat since they are easily understood and repaired; there is relatively little loss and, excluding the servo, inexpensive.

The electronic controller, if home-built, can be inexpensive when compared to the servo that it eliminates; should operate relatively cool without requiring special cooling techniques; can provide instantaneous and a smooth response; and doesn't require any periodic maintenance or adjustments. On the other hand, it is more susceptible to destruction if mis-wired or mis-used and, due to its mysterical nature and quick response, it can be falsely accused of causing problems which can handicap its installation or field repair.

I have observed several installations using this controller and its similar predecessor. Some of these installations I would term a gross mis-use, and much to my surprise they are still working. My Chief Test Captain, Mr. Bob Schefke, accuses me of being too pessimistic and conservative in my recommendations and specifications. Since he has seen and used it with larger motors than recommended, I must conclude that this is an endorsement of its reliability but, Bob, I told you it wouldn't drive that starting motor even though it did operate for the full event.

CIRCUIT DESCRIPTION

The design objectives of this circuit was to provide both forward and reverse porportional speed control; to interface with either positive or negative pulse systems; to be compatible with motor voltage requirements of 6 to 12 volts; to provide in excess of 5 amps of motor current; and to consist of inexpensive and available components.

The control was built around the new Signetics NE 544N servo integrated circuit which has been discussed in several previous Radio Spectrum columns and can be obtained from many Signetics distributors for about $3.00

The circuit operates on the slow speed switching principle in which the motor is turned on and off at the frame rate of the transmitter. The percentage of on-time is varied to produce a variable motor speed. A complimentary bridge output configuration is used to provide the bi-directional current which enables

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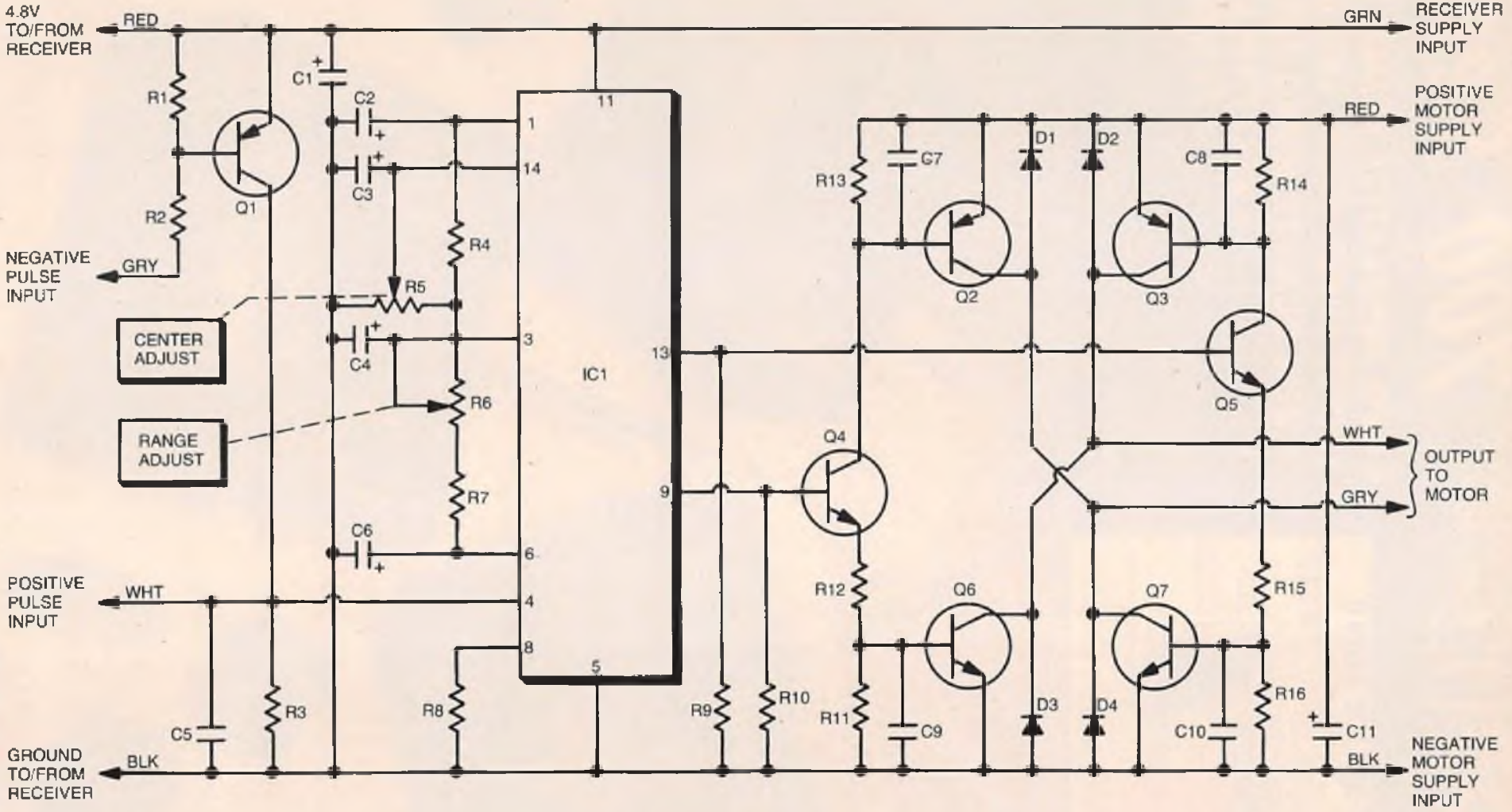
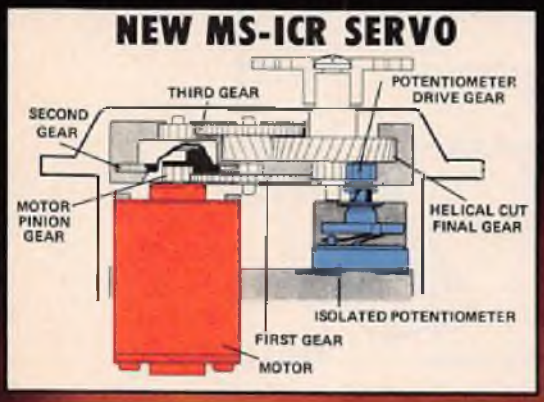


SCHEMATIC DIAGRAM

drawings continued on page 90

CIRRUS Hobby Shack 700 Series

- NEW INNOVATIVE DESIGN FEATURES
- TRIPLE TUNED FRONT END RECEIVERS
- NEW QUALITY SERVO ENGINEERING
- BEAUTIFULLY STYLED
- PRICED RIGHT •



New CIRRUS 700 SERIES
Which One Is Right For You?

The brand new Cirrus 700 series Radio Control Systems are revolutionary in new design features that have once and for all placed them into a class of their own. The 700 series has two main distinctive features that we feel are more advanced than anyone else's radio offered, and at a price that no one can even come close to for such new and innovative technology and state of the art engineering.

First we are introducing our new MS-ICR that is a real departure from the standard servos we have come to know over the past ten years. The two outstanding features of this servo are, (1) we have incorporated a totally new gear system featuring a helical cut final gear and, (2) we are driving the potentiometer off its own drive gear, allowing less travel and thus less wear for increased reliability. Next, all Cirrus radio systems will now come with a "Triple Tuned Front End Receiver." We know of no other single conversion receiver to have this high performance added feature that causes high image rejection and a high rejection of intermodulation distortion. What all this means to you is that you can have the newest innovative features now in radio control at a most realistic price.

The Cirrus Radio Systems' new features are: new triple tuned front end receiver; the RF amp is controlled by AGC (Automatic Gain Control), and the three and four systems have a new BA-633 decoder chip. The six channel alone features a double sided, copper clad, fiberglass PC board with the same decoder as our previously successful Cirrus radios, which in fact does have a special Custom Made chip. It's the only system we know of having a single conversion receiver with triple tuning, which causes high image rejection plus high rejection of intermodulation distortion.

Featuring the new innovative design utilizing "Helical Cut" final gear in a servo allowing more bearing surface for smoother mesh, less noise, better wear for ultimate reliability. This is a compact three wire servo that is still rugged and lightweight providint high power output with high resolution and low power consumption. It has two monolithic IC's, 74 transistors, 13 diodes, and 79 resistors for a total of 165 parts. Size - L: 41.5 mm, H: 35.5 mm, W: 19.5 mm.

❶ CIRRUS SPORT THREE . . . . it's loaded.

The Cirrus Sport Three is the perfect radio system for anyone wanting to get into radio control and be able to have three full functions for their models. The Transmitter is outstanding in that it looks exactly like the more expensive six channel radio systems, featuring two complete sticks with throttle control on the left stick and ratchet trim for ALL controls. The transmitter is also complete with a battery voltage meter, screw-on antenna, and is made with a rigid construction, as one can quickly observe as soon as the back cover is pulled off. You get two of the new MS-ICR servos, and of course the all new 700 series triple tuned front end receiver. For real economy, get our Three.

CIRRUS THREE (DRY BATTERIES) WITH 2 SERVOS $109.99
CIRRUS THREE (AIRBORNE NI-CAD & CHARGER) WITH 2 SERVOS $124.99

❷ CIRRUS SPORT FOUR . . . . most versatile.

Our new 700 series Cirrus Sport Four Channel Radio System with two (2) MS-ICR servos and ALL NICADS with Dual Charger has to be one of the best genuine bargains offered on any radio equipment today. We sell it with two servos because it allows the modeler to get into an ALL NICAD full four channel system at a modest price. With the addition of two servos later for other types of models, you'll complete this system and not have to purchase another radio system to 'step up.' Of course, the new Cirrus Four also comes with the all new CR-742 triple tuned front end receiver.

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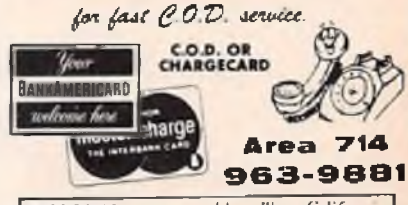

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Add $3.00 postage and handling. California residents please add 6% State Sales Tax.

Double Warranty

NEW WARRANTY: good for 180 days after purchase covering FREE parts and labor if anything is found to be defective in factory workmanship or parts.
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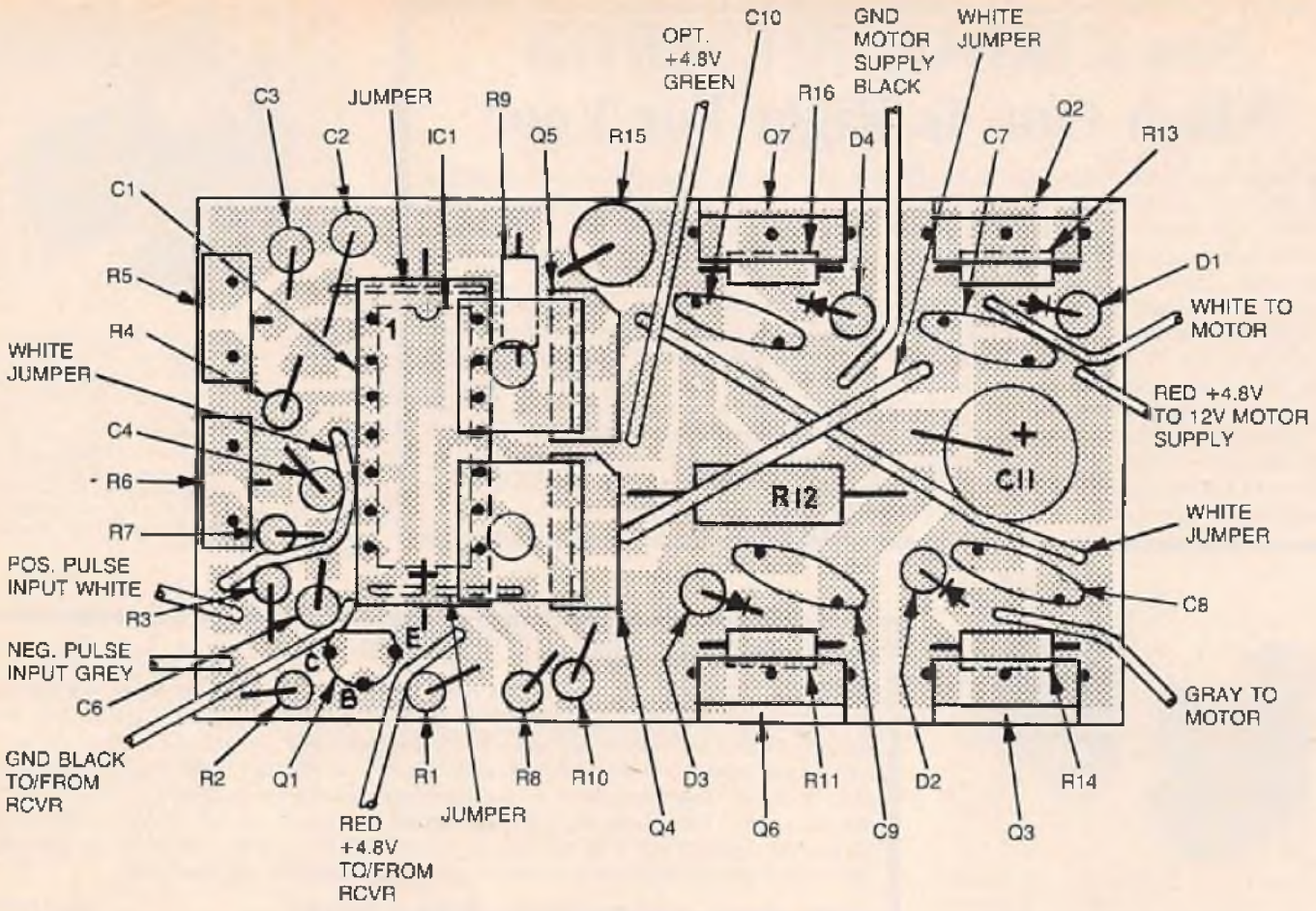
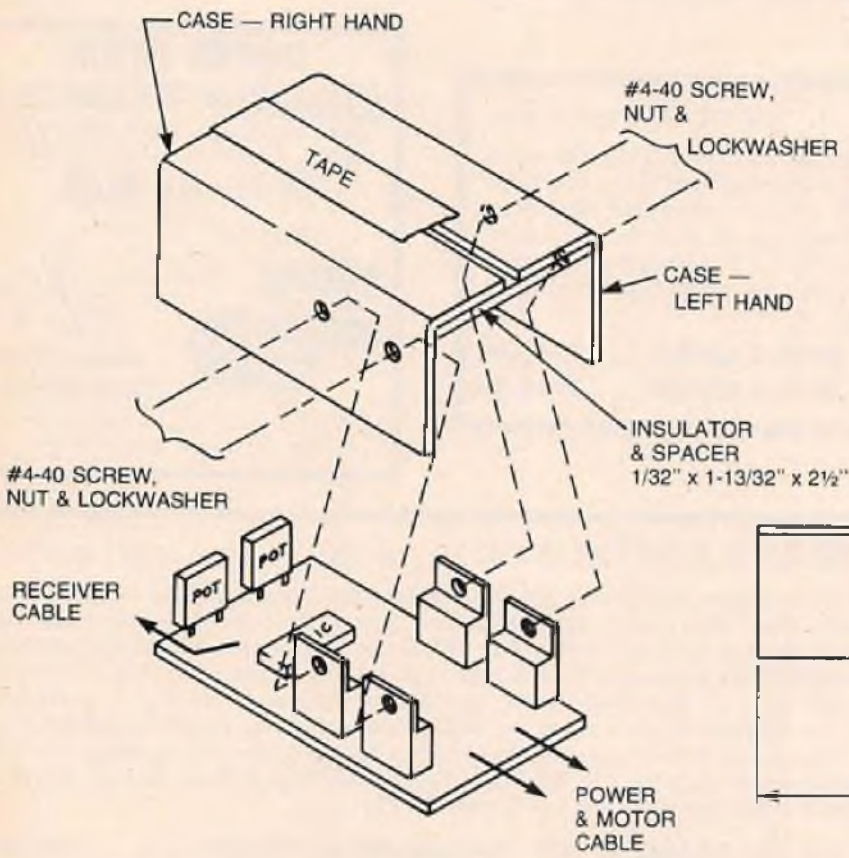
❸ CIRRUS SUPER SPORT SIX . . the ultimate.

The 700 series Super Sport Six is for those seeking the ultimate system at outstanding super value prices. This system will provide you with all the control functions that you will most likely ever need as a sport flyer. This system is compact, lightweight, and built with absolutely first class, quality parts making Cirrus Dependable. As soon as you hold a Cirrus you know it's beautifully styled, and you can appreciate the quality craftsmanship. The Six Channel Cirrus is complete with an easy-to-use top mounted switch for retract gear and a special front case mounted lever for flap operation, bomb drops, etc. The new six is complete with the CR-762 Triple Tuned Front End Receiver and our new MS-ICR servos. For the top of the line you'll want the Cirrus Six.

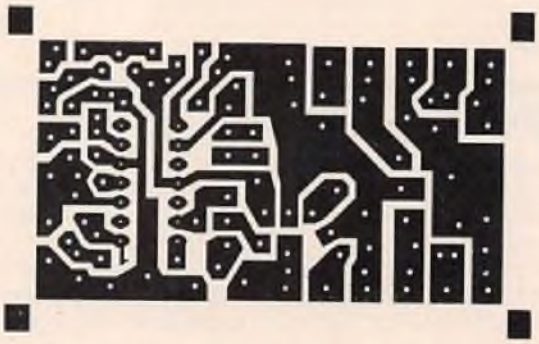
CIRRUS SIX (ALL NI-CADS & DUAL CHARGER) WITH 4 SERVOS $209.99



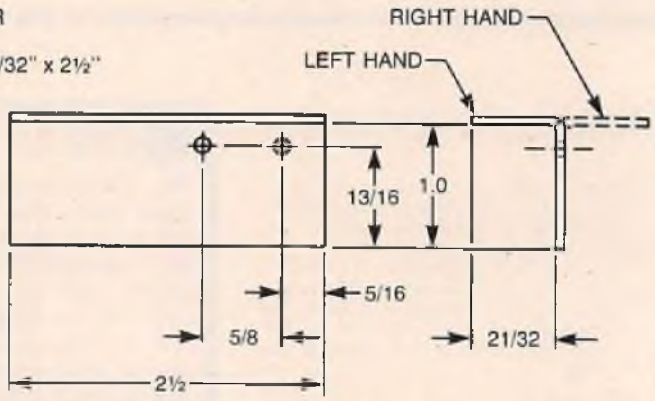
COMPONENT OVERLAY



CASE INSTALLATION



P/C BOARD — ACTUAL SIZE



CASE LAYOUT
(NOT SHOWN FULL SIZE)

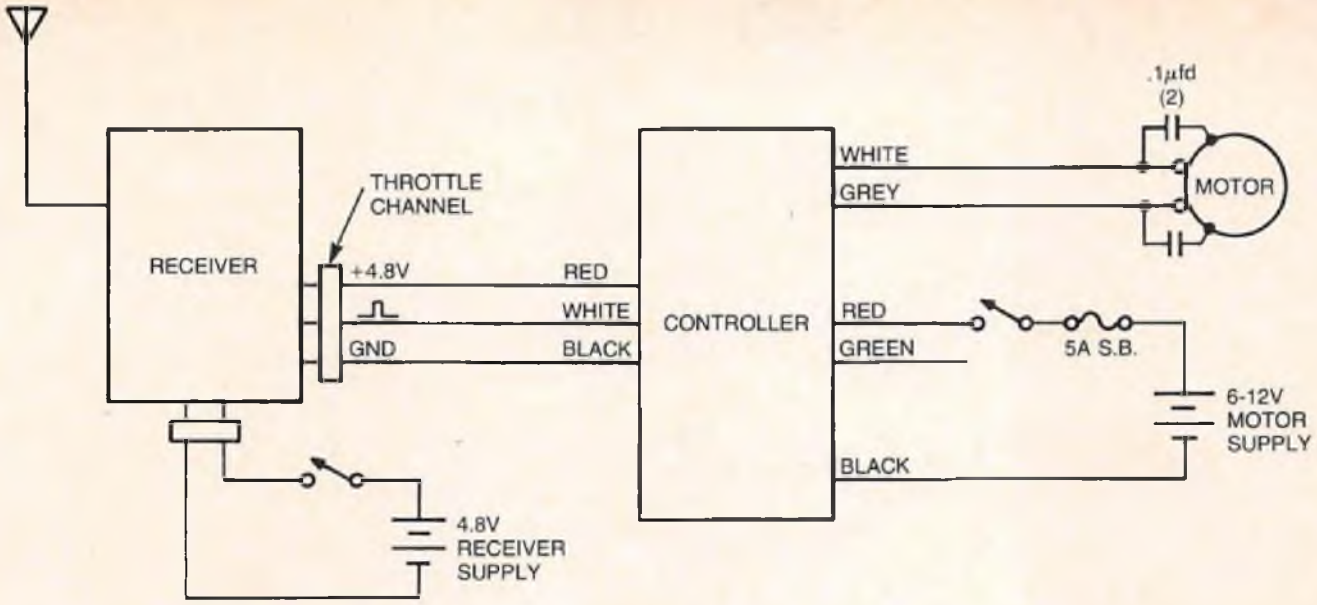


FIGURE 1

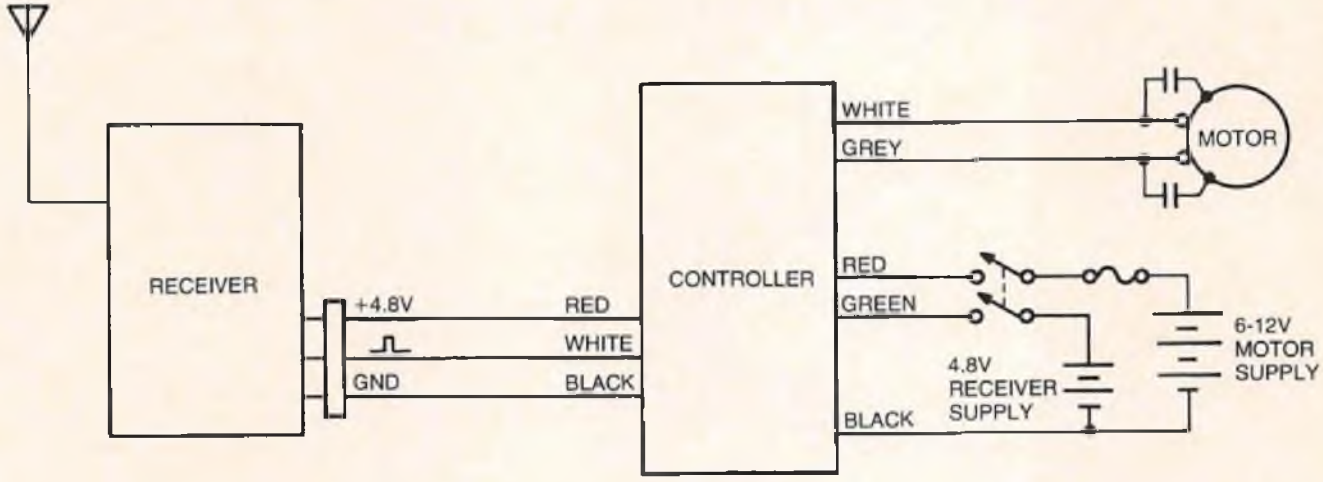


FIGURE 2

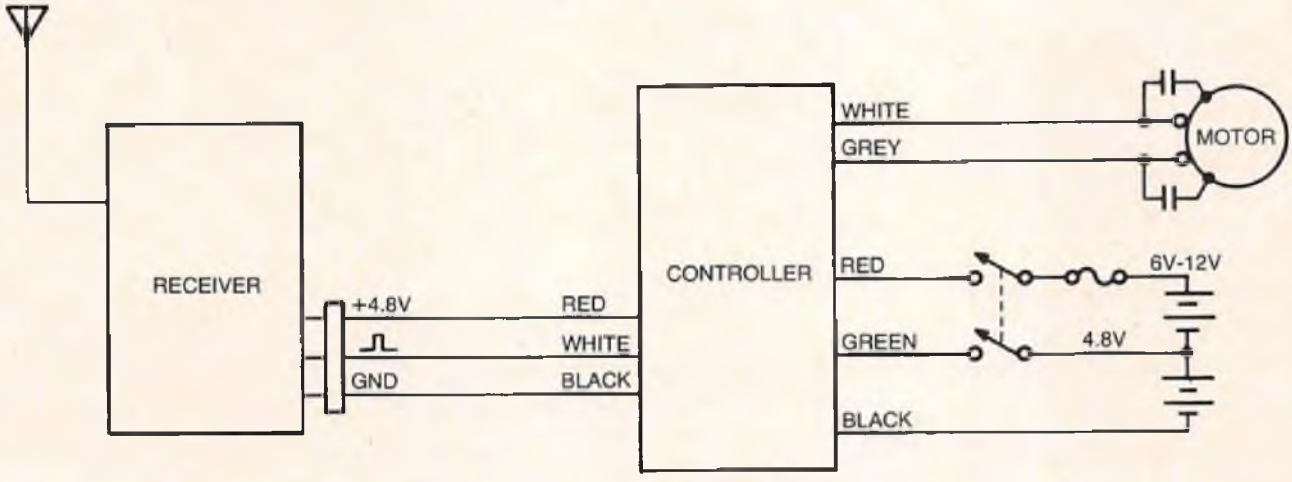
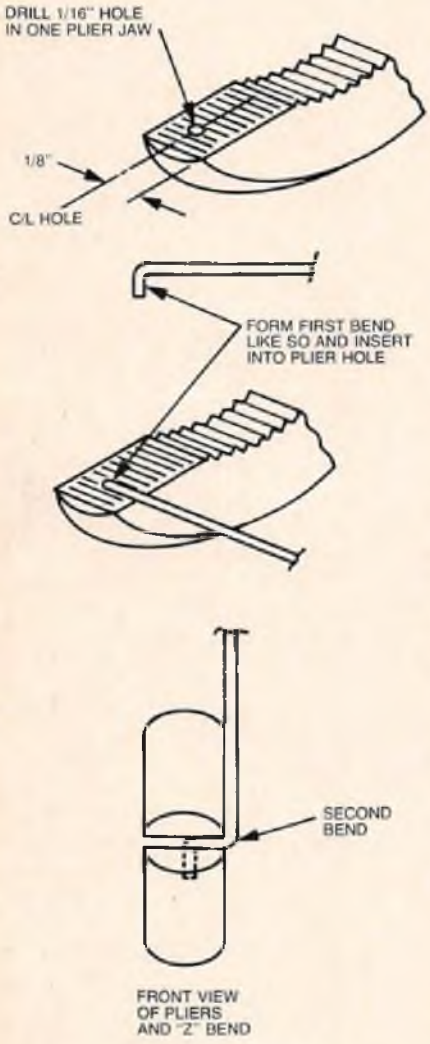


FIGURE 3

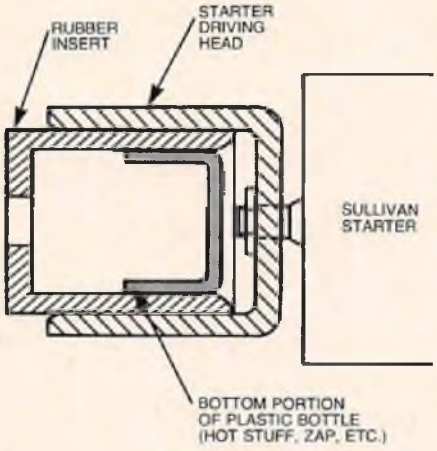
FOR WHAT IT'S WORTH

Jack Goodrich of Troy, Michigan, submitted this idea for modifying a pair of pliers to produce excellent "Z" bends on 1/16" control wire. One must use cheap, unhardened pliers to facilitate drilling the 1/16" hole as shown in the sketch.

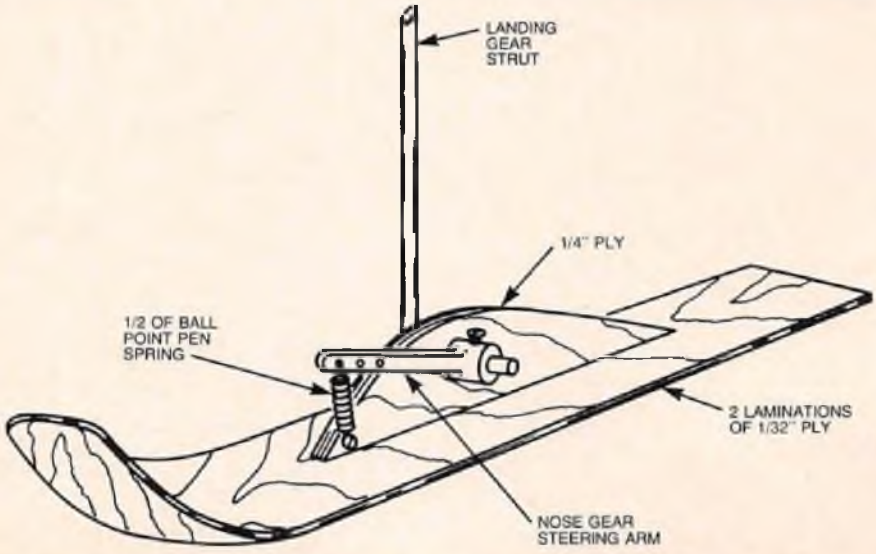


When trying to drill holes in a wing for hold-down screws, there are times when the holes in the wing do not line up well with the blocks in the fuselage. Stanley Duszczak of Elma, New York, has solved this problem by leaving the top planking off of the fuselage. He puts the wing on, and from the open top of the fuselage, marks the hold-down blocks already glued in the fuselage on the wing. He then drills the holes in the wing from the inside out. Then he puts the wing back on the fuselage, and drills through the holes in the wing into the mounting blocks. Tap the blocks and the wing lines up every time. While the top planking is still off, he also puts the pushrods into the elevator and rudder. He also mounts the servos at the same time. In this way, he can check for clearance between the elevator and rudder pushrods and also aileron pushrods. In the past, this has caused him problems, especially on the smaller type aircraft but, by leaving the top open until his installation is complete, he is able to make sure that everything has ample clearance.

R.F. Clason of Altamonte Springs, Florida, writes that when the rubber insert on his Sullivan starter was reversed — to crank an engine without a spinner — it usually slipped out and went flying. His simple cure was to cut an empty Hot Stuff bottle in two, about 1/2" from the bottom. The lower portion was pushed into the insert, open end first, far enough to clear the shaft in the driving head. The insert was squeezed back into the head with the help of a little saliva and it now stays firmly in place.



Here is a simple way to keep snow skis level and still be flexible. This idea comes from J.F. Cahill of Berlin, New Jersey, and the sketch is self-explanatory.



Here is a suggestion from Ed Huffman of Spokane, Washington, that he found by accident, so now he keeps a cellulose sponge handy on the work bench when painting, gluing, etc. The sponge he uses is about 3" x 5" x 1/2" and comes four to a package. He found that this sponge will pick up excess cyanoacrylate type glue quickly, and will not get stuck to the work. Just touch the corner to the pool and it disappears. After several uses, the corner of the sponge will become stiff and slower to absorb the glue; at this time, trim the stiff part away with scissors and go back to work again. It will also pick wet glue off your hands. Ed has used this idea for several months and still has most of the first sponge left.

Being an avid scale modeler, Norman J. McCormack of Boston, New York, has always used fillets around the wing saddles, tail sections, air scoops, etc. He likes Epoxolite because it is practically indestructible and adds much strength to the joint, but is not the easiest thing to handle after being mixed, and it does not sand easily after cured. A few years ago, Norman ran across an idea on how to solve this problem, and he has used it successfully ever since. After knifing some of the Epoxolite into the joint to be filleted, he draws a glass light bulb of chosen diameter, dipped in thinner, through the Epoxolite to make a perfect smooth fillet that requires almost no sanding or shaping afterwards. He keeps a variety of light bulb sizes on hand but finds a #93T, used in a high intensity lamp, is the one he uses the most; it gives him a beautiful 1/2" radius. The bulbs are glassy smooth and, when dipped in thinner, will not drag and pull the Epoxolite. Being a sphere, they will go around curves, such as leading edges, without leaving a washboard effect such as a washer or flat tool would

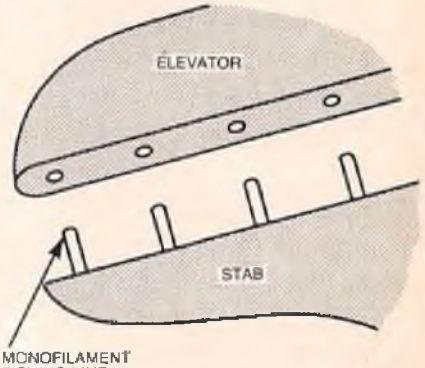
leave. Pressure can be applied to squeeze out the excess material without denting or gouging the surrounding balsa. On larger fillets, he glues scrap pieces of balsa or foam into the joint, keeping them just below the finished surface (using the bulb as a gauge) to save weight and Epoxolite. Excess material squeezed out from under the bulb is removed with a flat blade before the material sets.

This idea from Tommy Patterson of Tuscumbia, Alabama, is for when you are doing fiberglassing and resin work. Instead of using small, throw-away type brushes, buy yourself a couple of inexpensive, 1"-2" wide natural bristle brushes from the local paint store. While you are there, also purchase a quart or so of acetone. After using one of these brushes to apply resin to your latest creation and, before the resin begins to harden, pour a couple of ounces of acetone into a metel or glass container, and clean your brush just as you would if it had paint on it and you were putting it in thinner. You will find that you can use the same brush many, many times. Note: Be sure to read the cautions on the acetone container. **Do not** use a brush with nylon bristles or a plastic container with acetone, as it will destroy both.

Ronald Bednarczyk of Utica, New York, has come up with a very simple method that has helped him hold down the leading edge sheeting while building his wing. First, you put on the bottom leading and trailing edge sheeting and top trailing edge sheeting as you normally do. Next, pin your wing to your work bench; this is where his idea comes in. Put a pin into your work bench directly in front of each rib at the leading edge and about 2" back from each rib at the trailing edge. Before you epoxy down the leading edge, have ready a rubber band for each rib. Finally, epoxy down your leading edge using a few pins to prevent it from sliding. Now, take your rubber bands and stretch them from the pin at the trailing edge over the top of the wing to the pin at the leading edge. The sketch shown will illustrate how this is done. Be sure to repeat for all ribs and allow to dry thoroughly.

To simulate cockpit combing on a biplane, a cheap and easy to find tubing is the rubber vacuum line found in auto parts stores. Its cost per foot is very inexpensive and it comes in several sizes. Hot Stuff or Zap adheres it to the plane with a strong and invisible joint. This idea was sent in by David Reid of Geneva, New York.

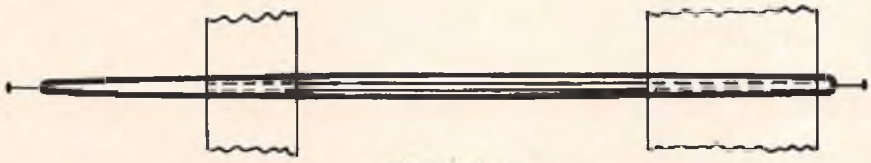
With the trend to smaller models, unique problems must be solved. Hinges in surfaces as thin as 1/16" are easily produced by using a tiny wire drill and monofilament fishing line. This transparent material can be bought in many gauges at any sporting goods store. Drill holes holding the drill bit with thumb and forefinger of one hand; the other thumb and forefinger hold the surface on both sides of the area to be drilled. If the drill wanders off center, it can be sensed by the feel. Dip pre-cut 1" lengths of line in mixed epoxy and insert into one surface. When set, cut the extra length to fit the depth of the holes in the second mated surface. Apply glue and insert. The number and gauge of the monofilament lines will determine the strength and flexibility of the hinge. This idea was suggested by Roger Claude of Tucson, Arizona.



From Robert Wargo of Parma, Ohio, comes this suggestion for the Kraft fuel tank. He has used this method several times and it has permitted the use of his Kraft fuel tank where he normally could not have used it. The Kraft tank is designed to stand upright for a 3-line system, however, space is not always available. To modify to a side mount, leave over-flow (top fitting) as is and install a Tatone Stick-A-Tube fitting at the top edge you decide on. This then becomes the new over-flow line. The feed line to the carburetor is still at the center of the tank. The tank now has a lower centerline which could be of help in many installations.

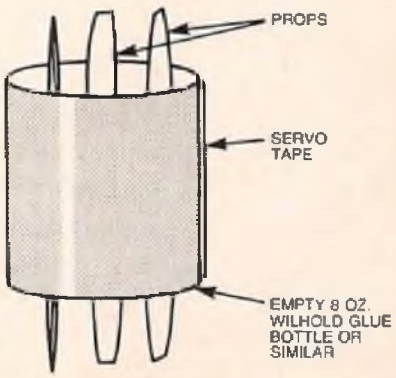
You can make an excellent prop holder from an empty 8 oz. Wilhold glue bottle or with just about any plastic bottle. Simply cut both ends off and servo tape the remaining tube in a corner of your flight box. Flatten or bend it to conform to your space requirements. This suggestion was sent in by Mike Corbett of Nashville, Tennessee. □

FRONT VIEW



TOP VIEW

SIDE VIEW



THE FABULOUS

LOCKHEED CHEYENNE

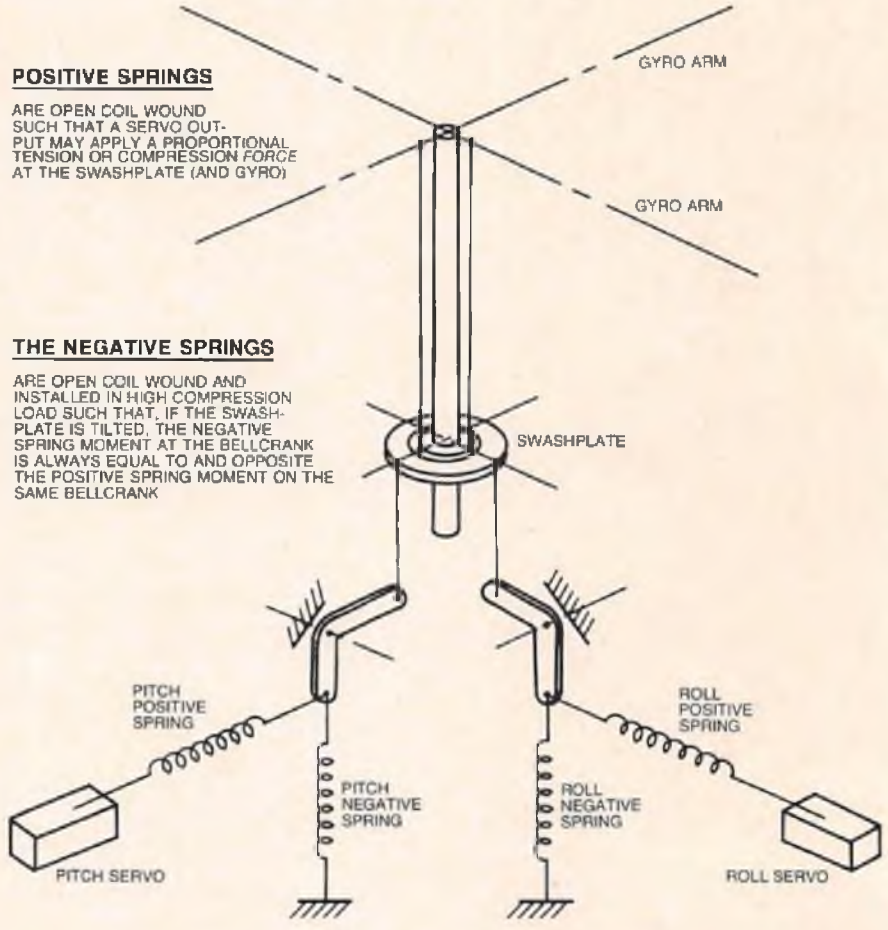
BY DON LODGE

ABOUT THE AUTHOR

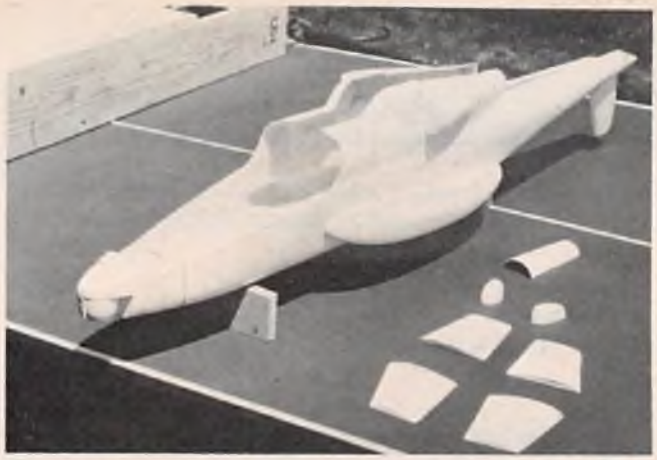
Don Lodge's modeling experience goes back quite a ways, the author having set an FAI gas powered endurance record in 1937. A flying instructor during World War II, Don holds degrees in aero-engineering from Purdue University. He is also a helicopter flight test engineer and pilot with twenty years experience at Cessna, Hiller and Lockheed. Don taught rotary wing theory at the U.S. Navy Test Pilot School, PAX River, Maryland, from 1961 to 1962. He is also the author of a text on rotary wing flight entitled "Introduction To The Helicopter," which was copyrighted in 1962. In addition to his modified Kavan Jet Ranger helicopter, Don also flies scratch-built fixed wing aircraft.

Why don't you scratch-build an R/C model of the Lockheed Cheyenne helicopter?" The hobby store owner had made the remark rather flippantly, and I had taken it the same way. In fact, the idea was almost preposterous, after all, the Cheyenne was really a far out design by anybody's stardards with its wings, pusher propeller, retractable gear, four blade tail rotor and the famous Lockheed Rigid Rotor concept.

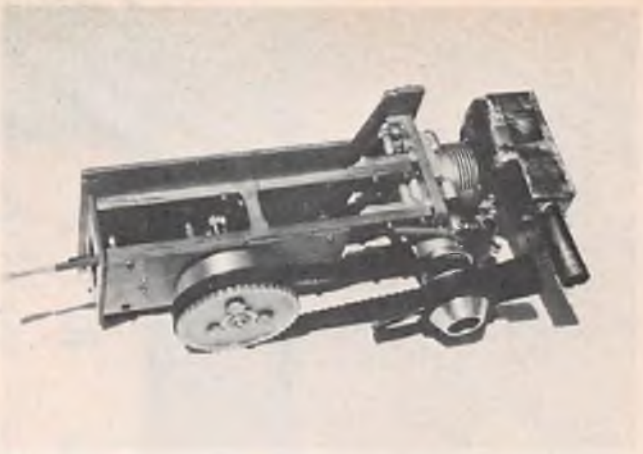
I think it is most unfortunate when any beautiful new fuselage is patterned from a full size helicopter, and then the same old two bladed rotor with its control paddles is installed, regardless of what kind of rotor system the original machine had (I've been guilty, too!). No, that simply



SCHEMATIC OF CHEYENNE CYCLIC CONTROL SYSTEM



Cheyenne molded fiberglass fuselage halves. The horizontal stabilizer shells and the engine air inlets are molded separately. The canopy has already been removed and will become a mold for a transparent copy.

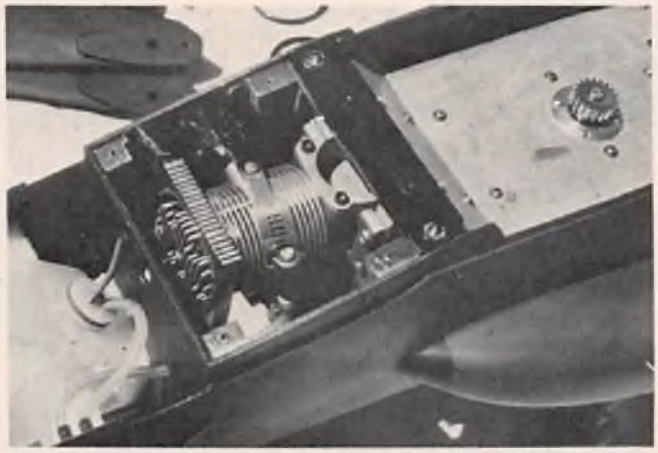


Power plant assembly. All gears, bearings and belt drive parts were obtained from Stock Drive Products Company. The muffler was specially designed for the Cheyenne because of limited space available.

Cheyenne Rigid Rotor head assembly.

An unconventional tail - - even for a helicopter.

That narrow gear looks scary, but it didn't give the full size machine any problem.



Cooling baffle plate is removed here to show engine installation.

The top panel in the canopy was removed to accommodate cooling air to the engine.

The Kavan cooling fan was turned to a smaller diameter before installing.

wouldn't do here. The Cheyenne must have its four bladed Rigid Rotor. I was thoroughly familiar with the full size machine having been involved in flight testing it from the very beginning of the program, so I knew the fantastic capabilities (and the problems) of the concept.

For the reader who is not familiar with the principles, I might digress for a moment here and explain that all full size

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Tail assembly details.

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3 3 CH. EXPERT W/2 SERVOS - $239.95. Read the copy below for a surprise announcement and a nice combo offer.

1

2

3

The picture in the ad above is our Mulligan, an OS 35 engine, and a 3 Channel Expert Series R/C System. A quality combination semi-scale outfit for the Sunday flyer or for the vintage air race enthusiast who gets turned on by Mulligan, Howard Ike's and the likes of Roscoe Turner. We are pushing our supplier OS engines to get a supply of OS 35's to us about the first of 1978. We are then going to be offering a combo offer on the above Expert 3 Channel and the Mulligan. This special which will be available to your dealer below his regular price is a nice buy. So, see your dealer after the first of the year.

We are announcing at this time the introduction of a new radio under the 'WORLD label. This radio system will use the OS precision bale type stick assembly. It will use basically the same receiver and electronics all the way through as in the Expert Series. The World System will come complete with the Mitsumi connectors, will have nickel cadmium batteries and a battery charger for the flight pack and will be powered by dry cells in the transmitter. The transmitter will have a meter. This system will be built around our S-11 servo using a very strong Panasonic motor and is something we would recommend to anyone operating a car or a boat where the loads are heavy or for any airplane from a 15 size to one of Bud Nosen's giants. This new radio will be sold as a 3 Channel with two servos at $165.00 list or as a dual stick 4 Channel with three servos for $229.95 list. Dealers will be interested to know that these new radios will be available at the same price and discount structure as the Expert Series 5 and 7 Channel radios. The buyer's will be interested to know that, packed with each radio, will be a coupon. This coupon will entitle the purchaser of one of these radios to purchase one servo at a special price of $18.00 so that he can fill out his system to a full 3 Channel or a full 4 Channel when he is ready to make the move. The 3 Channel purchaser can change his radio to 4 Channel for the $65.00 in price between the system and this change would include one additional servo. The 4 Channel System can be expanded to a 5 or 6 Channel System. The price to increase from a 4 to a 5 Channel will be $30.00 or from a 4 to a 6 Channel will be $60.00. The dry cell batteries in the transmitter should really last all summer if you just fly on the weekends but, of course, replacement of these batteries will vary with the amount of time you spend in the air. Provisions will be made so that those who wish to convert to nicads at a later time will do so and this price will be announced.

We hope to show this new system at the Toledo Show and hopefully at the WRAMS Show. First delivery should be about February 1, 1978.

Photos Michael Maloney.

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Running take-offs and landings should be very interesting.

Left hand stabilizer is removed showing tail drive shaft and control details.

Upper servo is for tail rotor. Servo below it is for collective and throttle. Bottom servo (sitting upright) controls the pusher propeller.

The main rotor drive gear has been removed to show the cyclic control system. Reading from top to bottom: roll positive spring, roll negative spring, pitch negative spring, pitch positive spring. View is looking up. Forward is to the right.

Rigid Rotor whirl stand on which the rotor, gyro and cyclic system were developed prior to installation in the aircraft.

LOCKHEED CHEYENNE

from page 95/94

rotor systems, at the present time, utilize articulated blades or semi-articulated (teetering) rotors. In addition to the normal feathering motion, these blades are hinged to permit vertical displacement (flapping) and in the case of the fully articulated blade, in-plane motion (lead-lag). Almost all R/C model helicopters have evolved down to the two bladed teetering rotor with its small control rotor at 90 degrees to the main blades. Of course, there are many variations on the theme. In the Rigid Rotor, however, the blade feathering spindle is an integral of the hub and mast so that the blade is not permitted any flapping or in-plane freedom of motion (other than that due to blade flexibility). This means that rotor pitching, or rolling moments, are transmitted through the hub directly into the airframe providing tremendous control power. The reader may recall a Lockheed Rigid Rotor performed the world's

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Blades are folded for transport and stowage.

showcase '78

All items appearing in Showcase '78 are press releases supplied by the manufacturer of the product and/or their advertising agency unless otherwise specified. The appearance of an item in Showcase '78 does not necessarily constitute an endorsement of that product by R/C Modeler Magazine.

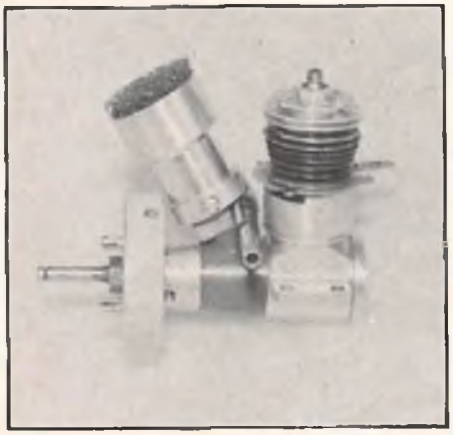
RC BUYERS GUIDE

The new edition of the R/C Buyers Guide has just been released. The Buyers Guide includes listings describing more than 2000 radio control products. Aircraft, boats, cars, radio systems, and accessory items are pictured and described. More than 200 manufacturers are represented, and the Guide includes descriptions of the new products displayed at this year's trade shows. The Guide is carefully organized and indexed to make it easy to use. Listings include all of the important information as well as retail prices. The Radio Control Buyers Guide is an important addition to any serious modeler's library. Suggested retail price is $4.25 at hobby stores or $5.00 post paid from: Boynton & Associates, Clifton House, Clifton, VA 22024; Phone: (703) 830-1000.

ECONOKOTE

EconoKote, a new economical low-heat covering for use on foam surfaces, solid areas and strong open-frame structures, is now available from Top Flite Models, Inc., 1901 North Narragansett Avenue, Chicago, Illinois 60639.

EconoKote is light, weighing only one-fifth ounce per square foot, and it's so pliable that it can be easily applied around compound curves. While weighing less than regular covering and finishing materials such as paint or dope, EconoKote still has tensile strength of 25,000 P.S.I., making it ideal where extra strength isn't required. The low heat needed to apply this covering makes it easier to use. EconoKote is puncture resistant, having many times the tear-strength of silk and dope coverings. EconoKote's film and adhesive are fuel-proof, stain-proof and moisture-proof. As a trim material on any surface, it works beautifully without solvents. Its ease of application assures successful covering of solid wood areas and fuselages. EconoKote provides a professional-looking finish while eliminating the usual tedious work involved in sealing, doping, sanding and polishing. A six-foot roll of EconoKote costs only $6.95 (suggested list price). EconoKote is available in six ultra-high gloss colors. Where extra covering strength is necessary (glider wings, free flight or light-weight structures that twist or flex a great deal, open wing and frame structures), there's no substitute for Top Flite's Super MonoKote. That strength means greater puncture and tear resistance, actually adding significantly to the overall strength and durability of the model. The Super MonoKote range of colors meets almost any conceivable color scheme or need, including paintable clear, opaque, flat and transparent finishes.



AIR INTAKE FILTER

A must for all 1/12th Scale car racers is an Air Intake Filter that will prevent the rubber from electric starters and track dust and grime from entering the engine intake tube. The Thunder Road Division of Tatone Products Corporation now has a new air intake filter to take care of this problem. It is made of machined aluminum, has a special replaceable filter and is easily attached with two screws. This air intake filter is an absolute necessity for prolonged engine life, now available at $2.95, catalog number TRA-504 from Tatone Products, 1209 Geneva Ave., San Francisco, California 94112.

THE OTHER END

With all the attention lavished on the glow plug end of the battery leads, Harry B. Higley & Sons, Inc., 433 Arquilla Drive, Glenwood, Illinois 60425, decided to focus their efforts on the other end, which seemed an appropriate product

name. The Other End is a simple solution to a very old, yet overlooked, problem of a fast, convenient way to connect glow plug leads to a power source. This eliminates the accidental shorting of the glow plug clip as the leads are not connected to the power source when stored. The product consists of two special terminal nuts, custom machined from brass bar stock, and a clip then insures a positive trouble-free connection. Two sizes are available - - - one fits a standard ignition or hobby battery, the other is for the Fireplug. Price is $1.49

FREE HEATHKIT CATALOG

The latest Heathkit catalog lists nearly 400 electronic products in kit form, plus a variety of Heath recommended assembled electronic products. Among the new kit products in the catalog are: an entire line of personal computer systems including software and peripherals, an active audio signal processor to enhance the performance of most hi-fi systems, a digital electronic scale for the home, and new test equipment including an FET multimeter and oscilloscope. Heath-recommended assembled products include a microcomputer based electronic chess game, a videocassette recorder, telephone answerer/recorder, two new cassette recorders and an electronic indoor greenhouse. The catalog also describes other kit form and assembled products including automotive and marine accessories, amateur radio equipment and a computerized, digital, programmable color TV. The catalog is available free from Heath Company, Dept. 350-420, Benton Harbor, Michigan 49022.

THE DOGFIGHT PAIR

Ikon Northwest, P.O. Box 566, Auburn, Washington 98002, announces the first of the WW II "Dogfight Pair" - - - the famous Hawker Hurricane Mark II and the Macchi-Castoldi M.C. 202 Folgore (Lightning).

These airplanes met in mortal combat 35 years ago and those dogfights can now be re-created at your local R/C field any afternoon. Just get a buddy to purchase the other airplane and have at it. Be warned - - - just as it was 35 years ago, the M.C. 202 Folgore is faster but the Hurricane will turn inside of the Italian fighter. So, here is your chance to test dog fighting tactics with a realism only attainable in 3 dimensions. Also, the sturdy airplanes can take weekend sport flying and still win contests — they don't need to be babied.

If you have been wanting a break from the run-of-the-mill types, here they are. The first is a Hawker Hurricane Mark II. The Hurricane served the RAF throughout WW II in many versions. The Mark II can be converted to almost any of the other Marks that were made, mainly by altering the type of wing armament. The version pictured is in Battle of Britain markings, as is the kit. The R/C kit has a 65" wingspan and requires a .60 engine. The kit is fiberglass and foam with the wood parts cut out; the balsa for the wings is included. The model is scale, except for a slight enlarging of the stabilizer and elevator. The Hurricane flies very well without any problems, its speed range is remarkable; construction is simple and uncomplicated. The canopy is molded with raised framing lines and the decals are color matched with flat clear final coat. There is a detailed building booklet with photos, a formed landing gear and hardware package complete the kit.

The M.C. 202 Folgore is the second airplane. This was one of the finest fighters of the Regia Aeronautica to see combat. The Folgore was used in all theaters of war. The Folgore has a wingspan of 60" and requires a .60 or a good .40 for power. The kit is fiberglass and foam; all wood parts are cut out. The only deviation from scale is the slightly enlarged stabilizer and elevator. The canopy is a molded canopy with raised framing lines. The decals enable the builder to prepare either a tan and green color scheme or the green with tan camouflage. The landing gear is preformed, a hardware package is included and there is a detailed instruction booklet. The M.C. 202 quickly makes into an unusual aircraft that will be a change of pace for the contest circuit.

If your dealer does not have the kits, they may be obtained direct from Ikon Northwest. The price of the Hawker Hurricane Mark II is $129.95 and the price of the M.C. 202 Folgore is $124.95.

NEW ADHESIVE TUBE DISPENSER TIP

A new adhesive tube dispenser tip introduced by Education Products, P.O. Box 606, Mineola, New York 11501, has a 0.5mm opening to permit precision gluing accuracy for most tubes of adhesive such as Permabond, Duco, Bond, Pliobond, Testors, etc. The 47.5° radius of curve of the semi-transparent Tennite Polypropylene Micro-Tip permits the entire adhesive tube to be held and used like a pencil, with syringe-like precision. Most adhesives will not adhere to the inside of the tip when dry and the "sleeve" of material can either be removed or the tip replaced for the next application. The Micro-Tip's radius of curve may be reduced or increased by bending the dispenser body under hot water. A set of 20 Micro-Tips are available at just $2.00 postpaid from Education Products.

TOP FLITE'S NEW "FRESHMAN TRAINER"

The all-new "Freshman Trainer" created by Top Flite Models, Inc., 1901 North Narragansett Avenue, Chicago, Ill. 60639, offers a fine model with "eye-appeal" as well as "fly-appeal." It's simple to build, yet smart looking. Its slow, stable flying makes it an easily manageable plane for R/C beginners. This new model is built from an all-balsa wood kit containing many machine finished and precision die-cut parts. To minimize neophyte confusion, the kit contains a separate, fully illustrated instruction booklet that explains the assembly procedure in step-by-step fashion. Flying hints are also detailed. Designed for slow, stable, yet responsive, flying, the "Freshman Trainer" gives the new R/C pilot time to think and react while guiding it in flight. Two years of design and testing have gone into making this "forgiving", yet good looking trainer. The model features shaped leading and trailing edges, ailerons, stab and elevator, solid wood wing tips, formed landing gear and steerable nose gear, 1/4" five-ply firewall, shaped rock hard maple engine mounts and all required hardware such as nuts, screws, nylon horns, wing bolts, hinges, steering arm, mounting bearings, etc.

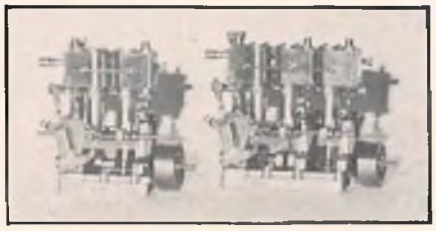
The "Freshman Trainer" can be flown from a small field with either three or four channel radios. It requires a minimum distance for take-off and landings and can even be hand launched. An important feature is that it is tough enough to stand up to beginners "flying knocks." Wingspan of the model is 48", with a 504 sq. in. wing area. Engine size ranges from .29 to .40, with appropriate ready-to-fly weight of 3 pounds. This entirely new "Freshman Trainer" (Kit RC-20) is available for only $44.95 at all leading hobby shops.

COX RADIO CONTROL CAR

Finally, there is a radio control .049 fuel engine car that has full control capability and sells at a popular price! Cox brings a giant 15" R/C car that turns to the exact degree it's steered. This R/C marvel will wind and weave through tight obstacle courses. Furthermore, the R/C car has Cox's new Quick Starter, the Q.S., and runs on a 15:1 gear ratio for speed, spin outs and thrills. These cars, built with the rugged Sanwa total steering systems are fully backed by the Cox warranty and the toll free Hot Line. For further information, write: Cox Hobbies, 375 Park Avenue, New York 10022.

KLAMPON KAI

Midwest Products Company, 400 South Indiana Street, Hobart, Indiana 46342, announces their entry into the radio-control boating field with the availability of the Klampon Kai. The Klampon Kai is designed for the 3.5cc outboard engines, and was designed by Charles E. Pottol. This boat has been raced successfully in competition and is the ideal starting point for the model boater. The kit consists of aircraft quality plywood and hardwood parts. A special feature of the kit is the inclusion of a foam building jig for quick assembly. It is designed for use with 2-channel radios. Overall length is 31" and the beam is 13". Illustrated step-by-step assembly instructions and decals are included. Available at your dealer now.



STEAM POWER FOR BOATS

Polk's International Distribution Center, 346 Bergen Ave., Jersey City, New Jersey 07304, proudly announces the first production run of "Small" Marine Steam Engines in 2 and 3 cylinder versions. These superb engines are made with cylinders cast from hard zinc alloy with brass liners. Both models come equipped with Stephenson reverse gear which allows you 2 speeds forward and 2 speeds in reverse. For those who would radio control their models with these engines, the speed and reversing controls will be most easily handled by direct connection to a servo. The dimensions are 105mm long, 88mm high, 62mm wide for the 2 cylinder, and 130mm long, 62mm wide, and 88mm high for the 3 cylinder. These engines will come completely equipped with boilers and burners and will retail at $219.95 for the 2 cylinder and $299.95 for the 3 cylinder.

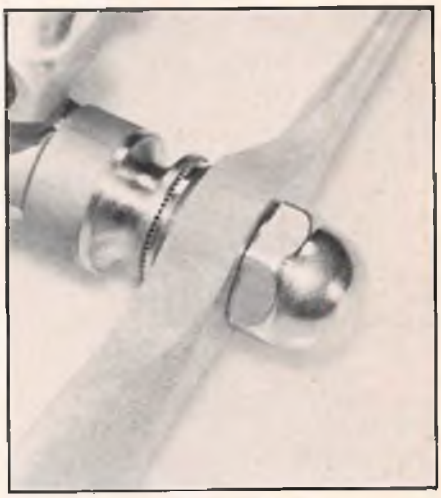
SE-1P SAIL CONTROL

Enthusiasts of radio-controlled sailing and large flying models will be eager to outfit their rigs with Sail Engineering's proportional control — the newest and best in high power servos. Designed for

use with today's digital radio systems, each unit comes equipped with a Kraft-Multicon servo connector, although adapter pigtails for all radio systems are also available. There is a variety of output arms available for any use and amount of movement desired. The pictured units have 9" arms for sail control in model sailing yachts, and 135° travel is standard on these. For easy adjustments or removal of the output arm, the arm is secured to the output shaft with a clamping collar which prevents burring of the output shaft during adjustment. The proportional sail control systems give the sailing skipper precise sheet control with minute sail adjustments possible. No more hit and miss sheet adjustments or jerky changes translate into increased boat speed, while the main boom and jib positions are proportionally related to the transmitter stick position. These high power servos, featuring separate power supply to drive the motor, make them especially suitable for very large control surfaces and giant size model planes. They are also adaptable for "exotic" design concepts such as V/STOL type aircraft with tilt wings; and with this servo, even variable sweep wing designs are now possible. Units to handle heavy nose wheel steering and heavy retract landing gear mechanisms are also offered. These servos are suitable for many RPV and RPRV airplanes also (Remote Pilotless Vehicles and Remote Pilotless Research Vehicles). All components are extra heavy duty for long life and service. Solid state electronics are used throughout the circuits. Proportional servo units plug directly into the radio receiver. The response, power, and accuracy experienced with Sail Engineering controls are only possible from Sail Engineering, the first and best in the high power servo field. Be certain to specify radio make and model, output arms and type of yacht or model in which the unit of your choice will be used. For more information, contact Vincent J. Serio, Jr., P.O. Box 8439, Richmond, Virginia 23226.

MINI BELL

The "Mini Bell" R/C model from the "Peanut People" Peck-Polymers, well known for their Peanut scale rubber-powered kits, now have a new R/C model designed especially for the miniature radios. The "Mini Bell" is a 1/3 size version of the famous Carl Goldberg Senior Falcon "Liberty Bell" model which made the record-breaking flight across the United States. The model has a wingspan of 25" for two or three channel mini radio; can be powered by either a Cox Pee Wee or the T.D. .020 engine. The model is stable and easy to fly for beginners and for the advanced flyer is quite acrobatic, despite its small size. The kit includes such special features as die-cut balsa and plywood parts, formed landing gear and canopy, a booklet on building with photos, and clear and easy to understand plans. The kit sells for $14.95. Ask your local dealer for the "Mini Bell". If not available, order direct from Peck-Polymers, P.O. Box 2498, La Mesa, California 92041.



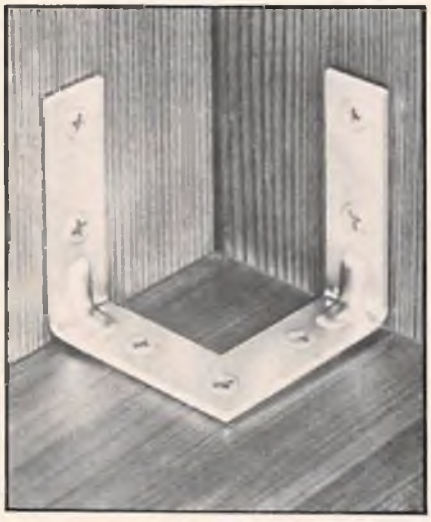
A.M.A. SAFETY PROP NUTS

Tatone Products Corporation, 1209 Geneva Ave., San Francisco 94112, is once again making available the A.M.A. Safety Prop Nuts. This prop nut is acorn shaped, is machined from aluminum, and it is bright finished. Now made with 1/4-28 threads to fit 98% of all popular engines. Price is $1.89 each, Catalog No. 14. Available at hobby shops or direct from Tatone.

QUICK FIL FOR GAS CARS

Quick Fil for all gas powered cars. Pick up valuable seconds on those pit stops with BoLink Quick Fil. Available

now — retails for 99¢. Write for further information to BoLink Industries, P.O. Box 80653, Atlanta, Georgia 30366.



THREE-SURFACE CORNER BRACE

A new product in reinforcement hardware is the all new three-surface corner brace CD998, two inch. Specifically designed for do-it-yourselfers, one brace securely reinforces three-surface joints. With more home uses than mending or T-plates, it is designed to reinforce cabinets, drawers, tables, benches, chests, tool and planter boxes, etc. Made of solid one-piece, zinc-plated steel, it fits inside corners perfectly. Just drop into place and secure. No need to measure or to align. Inside application provides solid reinforcement while out of sight. $1.06 for package of two. Stanley Hardware, Department PID, P.O. Box 1800, New Britain, Connecticut 06050.

ENGINE COWLINGS

Tatone Products Corporation, 1209 Geneva Ave., San Francisco 94112, is introducing a new series of engine cowlings. These are lightweight, spun aluminum, and ready to paint. These are realistic and add a finished detail that cannot be matched — even against hand-made cowls which are heavier and take hours of time to make. Now available in three sizes: 3½" diameter . . . $4.79, 4" diameter . . . $5.17, 4¾" diameter . . . $5.89. Available at all hobby shops or can be ordered direct from Tatone Products Corporation.

1/2A HORNET

Mile High Models, 4805 Baja Ct. N.E., Albuquerque, N.M. 87111, introduces the 1/2A Hornet and Partenavia P-68 Victor. The 1/2A Hornet has a 37" span, and is 220 sq. in. Good on a grass field for sport pylon or just for fun. The P-68 Victor — 1/2A Twin — is for .049 to .051 engines (non electric). It has a 42" span and is 260 sq. in. For Stand-Off Scale. It flies great on one engine. All hardware is included in both kits including engine mounts. Prices: Hornet — $20.95; P-68 — $32.95 from hobby shops or direct from Mile High Models.

NEW "D-VISE" FROM DREMEL

Striking four-color packaging with application illustrations is used for the new "D-Vise" just introduced by Dremel Manufacturing, Division of Emerson Electric Co., 4915 Twenty First Street, Racine, Wisconsin 53406. Designed for attention-getting counter-top or case display, the sturdy flip-lock carton dramatically illustrates the "D-Vise's" full turn and tilt capability. Hobbyists or technicians can quickly observe how this specialty vise easily holds any part for soldering, sanding, drilling, grinding . . . practically any operation. Also illustrated is the versatile swivel base which accommodates a new "Moto-Tool" holder. Further information on the handsomely packaged Dremel "D-Vise" may be obtained from Dremel Manufacturing Co.

NEW GLUE GUN

Yale Interior Art, 217 Costanso St., Woodland Hills, California 91364, announces their new Glue Gun that features a curved spout for hard to reach spots; fine tip for accurate placement; and a dual ring plunger for smooth, easy flow. Priced at 98¢ each, they are available at your local hobby shop or you can order direct.

SOUTHERN KITE

From Southern R/C Products, Rt. 3, Box 47, Nims Lane, Pensacola, Fla. 32503, comes the Southern Kite for the beginner, sportsman or competitor. The "Kite" is an easy to build Class C sailplane with excellent wind penetration and a wide maneuvering speed envelope. Capable of tight turns without stalling, the Kite is easy to fly and will launch almost hands-off. Construction is of balsa, plywood and spruce, with all parts machine cut or sanded to shape. Included in the kit are two 1/4" diameter music wire wing pins and complete full size plans. The Kite features removable tail surfaces and plenty of room for radio and flight accessory installation. The span is 144"; area, 1200 sq. in.; length, 52½"; rec. wt., 5-6 lbs; price, $74.95.

"TEF-REED"

Davis Diesel Development, Inc., Box 141, Milford, Conn. 06460, introduces "Tef-Reed" the non-stick reed of Teflon for all Cox .049 and Testor's 8000 series .049 reed valve engines. This new reed from Davis Diesel Development will provide easier restarts and improved needle valve control. "Tef-Reed" improves with age and top end performance will usually increase after a number of runs. Easy installation. For both glow and diesel operation. Priced at 4 for $1.00 direct (including postage), or ask your dealer.

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K&S FOR TUBING·SHAPES AND TOOLS!

"There Is No Substitute For Quality!"

TUBE BENDER KIT

This kit will solve your Tube Bending Problems. Bends 1/16, 1/32, 1/8, 5/32, 3/16 Tubing

#321 — $1.25 Set

SILKSPAN

An excellent covering material for models

HEAVY	MEDIUM	LIGHT
SGM	GM	GG
#402	#401	#400
.30/sheet	.25/sheet	.12/sheet

AEROSILK

Heavy duty 100% Pure Silk. Made of the finest silk available.

#600 White
#601 Orange
#602 Blue
#603 Green
#604 Yellow
#605 Red

$6.95/yd.

SANDPAPER

Assortment of all popular grits

#475 — .39 ea.
24 pkg/box — $9.36

BUTYRATE SHEETS

(Clear Plastic)

Handy 8" x 10" Sheets for Forming Canopies, Windows, Windshields, etc. #301 .25 ea.

10/pkg. — $2.50 pkg.

FUEL TUBING

Non-Hardening, Transparent, Flexible. The Finest Fuel Tubing you can Buy.

	Per Ft.	Per Roll
#410 Small-50 Ft.	.10	5.00
#411 Medium-25 Ft.	.15	3.75
#412 Large-25 Ft.	.20	5.00

TUBING CUTTER

NYLON BODY makes CUTTING EASIER BY REDUCING FRICTION. CUTS round BRASS, COPPER or ALUMINUM TUBING

#298 — $3.95

TOOLS

STANDARD TOOL SET

Sets of K & S top quality tools with individual swivel handles. Ideal for home, workshop, and field use.

		Per Set
Set of 5 Nut Drivers	#422	$4.95
Set of 5 Open End Wrenches	#423	$4.95
Set of 5 Phillips Allen	#424	$4.95
Set of 6 Screwdrivers	#426	$4.95

KWIK-CHANGE TOOL SET

Handy package of five different types of tools. These sets are the right size for the Hobbyist. Perfect for the R/C Flight Box.

		Per Set
Tap Set	#421	$3.95
Screwdriver Set	#425	$3.95
Nut Driver Set	#427	$3.95
Open End Wrench Set	#428	$3.95
Phillips Allen Set	#429	$3.95

OUR CAREFULLY ENGINEERED LINE OF METAL PRODUCTS HAS UNLIMITED USES IN THE DEVELOPMENT OF ALL TYPES OF PROJECTS. ALL OF YOUR METAL NEEDS AVAILABLE IN ONE PLACE.

ALUMINUM TUBE (12")

STOCK NO.	SIZE	PRICE EACH
100	1/16	20
101	3/32	25
102	1/8	25
103	5/32	25
104	3/16	25
105	7/32	30
106	1/4	30
107	9/32	35

ROUND BRASS TUBE (12")

125	1/16	20
126	3/32	25
127	1/8	35
128	5/32	35
129	3/16	35
130	7/32	35
131	1/4	40
132	9/32	45
133	5/16	50
134	11/32	55
135	3/8	60
136	11/32	65
137	7/16	70
138	15/32	75
139	1/2	80
140	17/32	85
141	9/16	90
142	19/32	1.00
143	5/8	1.00
144	21/32	1.10

COPPER TUBE (12")

120	1/8	10

SOFT BRASS FUEL TUBING (12")

121	1/8	35

RECTANGULAR BRASS TUBE (12")

STOCK NO.	SIZE	PRICE EACH
262	3/32x3/16	1.10
264	1/8x1/4	1.95
266	5/32x5/16	2.10
268	3/16x3/8	2.20

BRASS STRIPS (12")

230	016x1/4	15
231	016x1/2	20
232	016x1	35
233	016x3/4	30
234	016x2	65
235	025x1/4	20
236	025x1/2	30
237	025x1	55
238	025x3/4	50
239	025x2	1.00
240	032x1/4	20
241	032x1/2	35
242	032x1	65
243	032x3/4	50
244	032x2	1.20
245	064x1/4	30
246	064x1/2	55
247	064x3/4	1.00
248	064x1	1.40

SQUARE BRASS TUBE (12")

149	1/16	35
150	3/32	50
151	1/8	65
152	5/32	90
153	3/16	1.00
154	7/32	1.15
155	1/4	1.30

BRASS STREAMLINE TUBE (12")

122	SMALL	75

SHEET METAL (4"x10")

STOCK NO.	SIZE	PRICE EACH
250	.005 Brass	60
251	.010 Brass	90
252	.015 Brass	1.20
253	.032 Brass	2.10
254	.008 Tin	65
255	.016 Alum.	85
256	.032 Alum.	65
257	.064 Alum.	95
258	Asst. Brass	95
259	.025 Copper	2.20

BRASS ANGLE (12")

170	1/8x1/8	30
172	5/32x5/32	35
173	3/16x3/16	45
174	7/32x7/32	55
175	1/4x1/4	65

BRASS CHANNEL (12")

181	1/8	40
182	5/32	45
183	3/16	55
184	7/32	65
185	1/4	75

SOLID BRASS ROD (12")

159	020	08
160	1/32	08
161	1/64	12
162	1/16	20
163	3/32	25
164	1/8	40
165	5/32	50

ROUND PLATED SPRING WIRE (12")

192	.032	06
195	.047	06
197	.055	06
199	.063	06

SOLDERING TOOLS

FIELD IRON - 12 VOLT

#212 12 volt field iron. Plugs into car lighter for quick field use.

Model M 212 — 30 Watt — $3.95

PENCIL TYPE - 110 VOLT

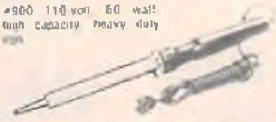
#300 110 volt, 30 watt light weight pencil type iron.

Model M 300 — 30 Watt — $3.95

#284 Assorted tips for #300 iron, four per package. Price $2.20/pkg.

BENCH IRON - 110 VOLT

#900 110 volt, 60 watt high capacity heavy duty iron.



Model M 900 — 60 Watt — $5.95

KWIK HEAT GUN - 110 VOLT

Instant Heat 110 volt 100 watt. Two tips included.

Model M 1200 — $11.95

EXTRA TIPS FOR GUN #1201 (small 6/pkg.) $4.84/pkg.

IF NOT AVAILABLE AT DEALER ORDER DIRECT. SEND 25c FOR CATALOG

K&S ENGINEERING
6917 West 59th St., Chicago, Ill. 60638

from page 102/99

SCALE DOCUMENTATION

Classic Models, Box 681, Melville, New York 11746. Exclusive Scale Documentation Booklets contain a brief history of the subject airplane, rare photographs, 3-View drawings and aircraft Cut-a-way. Subject booklet contained in each Classic Model Kit and are also available separately at $2.00 each (8½ x 11). An invaluable aid to building and scale judging, these booklets end the need for further research. Reproduction of booklet Center Spread are available as Art Prints. Suitable framing 11 x 17 printed on buff stock, they add an interesting touch to Shop, Den, or Office. $2.00 each or 3 for $5.00 from dealers or direct.

NICAD FLITE PACK

Robinaire, Box K, Boca Raton, Florida 33432, announces a radical new nicad flite pack, the first truly new pack in many years. The first production version, the RFP-1, is a flat-pack measuring .5" x 2.5" x 2.5", shown in the photo sandwiched neatly between two servos in a new Goldbergh Mark II Falcon 56. Included with each pack will be a special foam pouch which will reduce or eliminate the need for foam wrapping. If desired, it may be cemented in place in the plane and the pack easily inserted or removed. Attached to one servo is the Robinaire steering shock-link which may also be used as an over-travel device. It is precisioned machined of brass with threaded end for Kwik Links and the other end machined to take standard solder connectors. The special foam pouches will be made available in several sizes to fit most conventional battery packs and receivers. A second flite

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Hobby Shack

SAITO Gasoline Ignition Engines

Saito, the manufacturer of precision model steam engines, has just released their newest line of Gasoline Model Ignition Engines. These are absolutely superb, as is their way of doing anything, and we are delighted to be able to introduce these engines to the American modeler.

At this time we have in stock the G-60 in a Front rotor and Rear rotor version, and also offer both as an air cooled engine for model airplanes or a marine type for model boating. The marine type comes complete with a flywheel machined, universal joint, and of course is fitted with a water cooled head. These are the most economical engines to run, because they run on regular gasoline! Thus, instead of paying up to $12.00 a gallon for model fuel, your gallon of gas for the G-60 will cost you about 60¢ per gallon. At those prices it won't take long until you have paid for your engine in gas savings alone!

ALL ENGINES COME COMPLETE EXCEPT FOR BATTERY CASE, BATTERIES AND SWITCHES.

YOU GET: Engine, Carburetor, Muffler, Coil, Condenser, Spark plug, Spark plug cap, 10K ohm resistor, Connector, Shrink tube, High tension wire, Neoprine fuel line & Tools — Puller, Box wrench, Hexagonal wrench and gauge board.

GASOLINE IGNITION ENGINES	Retail	OUR PRICE
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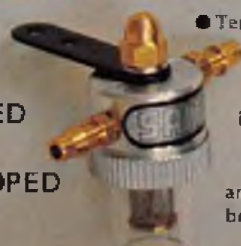

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from page 104/99

pack, the RFP-2, will follow the RFP-1, sized .9" x 1.25" x 2.5". Orders are now being accepted and will be filled on an order-priority basis. For information on these products, write to Robinaire.

CLASSIC-MODELS COMPLETE KITS

Two of Classic Models well-known kits soon to be released as complete kits are the Heath "Super Parasol" and the Church "Mid-Wing". Originally designed as rubber free-flight models, manyRCers with sub-miniature equipment (Ace, Cannon, etc.) have been converting these fine models to R/C as the school yard trend gains momentum . . . our Church Mid-Wing is equipped with Ace 4 channel equipment which fits easily, using a .049 Cox the entire model weighs just under 16 oz. and has a wing loading of 10 oz. Included are vacuum formed spinner, engine, cowls, pilot and wheels, which make this kit one of the best bargains in the scale market. The rubber version of the Heath Super Parasol, won 1st place at the 1976 California Flightmaster R.O.W. contest. Both models are super stable and build 4

oz. rubber free-flight models. Decals, reproduce all markings, each kit contains Classic Models "exclusive" Scale Documentation Booklet and contest grade balsa, tissue, plastic rubber prop., etc. Retail price of the complete kits will be $18.95. Plan kit versions still available at $15.00 including cowls, less stingers until supply is exhausted. Available from Classic Models, Box 681, Melville, N.Y. 11746. □

LOCKHEED CHEYENNE

from page 98/94

first helicopter loops and slow rolls. There are other advantages to this concept including fantastic CG range, rock-solid hover stability, rapid control response in all flight regimes, and a mechanically simple rotor hub. On the other side of the ledger, the rotor hub, mast and transmission, must be configured to transmit the tremendous rotor moments, and unless clever design work is employed, the weight penalty can be appreciable. Perhaps the most serious problem is encountered in design of the blades, because in this concept, where the blades have a relatively high degree of restraint, the rotor as a whole is particularly sensitive to blade dynamic characteristics. In other words, if the rigid rotor designer isn't on the ball, he may very well end up with a system that has unstable tendencies.

I mulled over all these ideas for the next few weeks. Could I build such a model and incorporate the basic concepts of the original machine? Would the model have the same advantages (and problems) as the full size helicopter? Then one day at a hobby show in Southern California, I overheard two "experts" pretty much agree that a four bladed rigid rotor model probably wouldn't work unless two sets of "Hiller" paddles were installed on it. Well sir, to recoin an overworked cliche (or whatever), I suddenly knew what I had to do!

The design phase required about 5 months. My shop (garage) equipment is limited to a 6" lathe, a pretty good drill press, and a homemade band saw, so the biggest problem was to avoid designing something that was beyond my capability to make (which I sometimes ended up doing anyway!).

The basic airframe, including the fuselage sponsons, the canopy, and the vertical fin, were molded from fibreglass using the classical male plug and female mold method. The fibreglass canopy was then separated from the fuselage and became the mold on which the transparent canopy was vacuum formed. I was totally unfamiliar with these processes, so after I made the

male plug, John Minasian did most of the fuselage and canopy work for me. He sure knows what he is doing.

Since the main rotor and cyclic controls must be developed as a matched system, and because this involves a number of unknown design quantities, I decided to do the development testing on an electrically driven whirl stand which I set up in the garage for this purpose. Test objectives were to look for blade dynamic instability, assess control power whereby the positive and negative springs could be correctly sized, and determine phasing so that when installed in the airframe, cross coupling would not be a problem. That is, when a pure pitch input is applied, the rotor must have a pure pitch response with no roll influence. The decision to go whirl stand was most fortunate, because it was only after testing eight different configurations, that I had a happy, docile, and yet very responsive rotor and control combination.

Let's very briefly discuss the basic concept. First, as can be seen from the photos, the swashplate displaces vertically by collective command and carries the gyro with it (just as on the full size machine) and, of course, this motion collectively changes the pitch of all blades. Now then, all conventional R/C models, as far as I know, use what I will call a "displacement" cyclic system. A servo output actually displaces the swashplate because it is connected to the servo by hard linkage. The Cheyenne control system, in contrast, uses a "force" system, in which the servo output generates a tension or compression *force* (but *no displacement*) to the swashplate and to the gyro, since they are directly connected by hard (see schematic) linkage. Okay, now we have a *force* applied to the gyro and because it is free gimbaled, and behaves just like any gyro in space, it precesses with a displacement 90 degrees later. The gyro, having 100 percent authority, as a result of this dis-

to page 112

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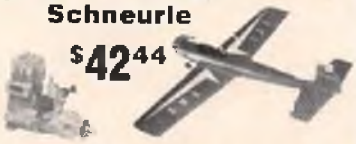

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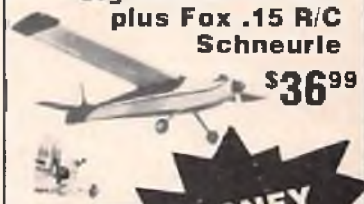

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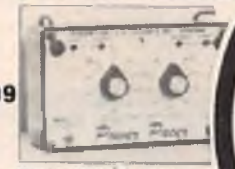

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THE HOBBY MARKET

from page 108/94

placement, now forces the blades to respond (in feathering) to the cyclic input. Notice that, when the gyro displaces on this opposite axis, it does not feel the resisting force of the positive spring on that axis because the force created by the negative spring as it goes off center negates the effect of the positive spring and the gyro, therefore, looks at no resistance. The essence of such a system is to have the gyro operate with minimum friction and aerodynamic forces, consequently, each movable hub contains a thrust bearing in addition to the conventional two radial ball bearings. Furthermore, the blades were jig drilled to assure that each blade feathers about the mean aerodynamic center for minimum air loads. The outboard blade attachment bolt carries the centrifugal load. The inboard brass sleeve maintains lead-lag alignment and serves as a shear pin permitting the blade to fold on impact. For storage and transport, the bolts are removed on two opposite blades permitting them to rotate about the shear sleeves. The tail rotor and its control are pretty straightforward and thus the photos should be self explanatory. A meticulous static balance is a must because of the unconventional location of the tail rotor at the stabilizer tip.

The pusher prop is controlled by the fifth channel on the transmitter and is rigged to operate from zero thrust for hover, to about 6" pitch for forward flight. I wonder how long it will be before someone puts a controllable pitch prop like this on a pylon racer — interesting prospect.

Well, that's the status to date. The next phase will be tie-down runs to check rigging and general operation. After that, the first flight! I'll keep you posted on the first Cheyenne uprising!□

MS READ-a-thon– a simple way to start youngsters reading.

The MS READ-a-thon is a nationwide reading program for boys and girls 6 to 14. That alone is a commendable project, yet it has another purpose, too: to raise money to help find a cure for multiple sclerosis.

How does it work? Young people who register are called "Mystery Sleuths" – enrolled in the search to solve the mystery of MS. Mystery Sleuths read books for their own pleasure. At the same time they ask relatives and friends to give them a donation – ten cents, a quarter, a dollar or more – for every book they read, which provides funding for MS research and patient services.

To date, over 4 million children have participated. More than 11 million books have been read, which has produced over 11 million dollars for the MS cause. The youngsters themselves get two important rewards – the enjoyment of reading, and the satisfaction that comes from helping others.

Originated and developed by the National Multiple Sclerosis Society, the MS READ-a-thon is supervised by local MS chapters in conjunction with local schools. It has the support of the U.S. Office of Education and the International Reading Association who consider the program to have unusual educational and social value.

If you're a parent or educator and would like to help, you can start an MS READ-a-thon for youngsters in your area. Just call your school or local MS chapter, or call toll-free (800) 243-6000.

Kids can help, too!

National Multiple Sclerosis Society, 205 East 42nd St., N.Y., N.Y. 10017

SIG LEADS THE FIELD IN THE CURRENT ENTHUSIASM FOR SCALE AEROBATIC BIPLANES AND MONOPLANES

More and more builders are getting into the swing to scale-like models. Sport and Sunday fliers prefer their realistic appearance and more contests are being held for entries copied after full-scale stunt prototypes. The International Model Aerobatic Club is actively promoting this style of competition and the 1978 Las Vegas Tournament of Champions will switch from RC pattern models to scale types. Sig scale models have been fine-tuned during their development so that they are top-notch competitors, as can be seen by some of the contest victories listed below. But they are still docile enough to be handled by the average RC flier.

SMITH MINIPLANE

Designed by MIKE GRETZ

OUR NEWEST SPORT-SCALE KIT

SIG
KIT RC-38

ENGINES: .40 - .45 Cu. In.
TOP WING SPAN: 44 In.
TOTAL WING AREA: 650 Sq. In.
LENGTH: 40-3/8 In.
TYPICAL WEIGHT: 5 to 5-1/4 Lbs.

$49.95

1ST SPORT SCALE 1976 NATIONAL MULTIWING CHAMPIONSHIPS by Maxey Hester
1ST SPORT SCALE 1976 CANADIAN NATIONAL CHAMPIONSHIPS by Maxey Hester

SUPER CHIPMUNK

Designed by MIKE STOTT

SIG
KIT KBRC-1

ENGINES: .61
WING SPAN: 64 In.
WING AREA: 690 Sq. In.
WEIGHT: 7 Lbs.

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2ND SPORTSMAN MONOPLANE at 1977 SIG IMAC
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SKYBOLT

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SIG
KIT RC-34

WING SPAN: 51 In.
LENGTH: 42-1/2 In.
WING AREA: 790 Sq. In.
ENGINES: .45 - .60

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WEIGHT: 7-1/2 Lbs.

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SIG MANUFACTURING CO., INC.

THE WORD IS GETTING AROUND . . . . .

KADET - FIRST CHOICE FOR BEGINNERS

New! CHECK LIST

If your Kadet kit does not have this check list, send a self-addressed large size stamped envelope and we will send you a free copy.

During the past year, the Sig Factory Fliers have been teaching a group of modelers from the surrounding area how to fly RC with Kadets. We found many small things, often taken for granted in kit directions as being too elementary to mention, are really essential information to an absolute novice at the hobby. This turned out to be particularly true in preparing a model for the first flight. Notes were kept on things our students did wrong or didn't understand while building the model, installing the radio equipment and making their first flights.

From this practical experience, a comprehensive check list has been prepared. If the Kadet builder will go down the list and verify each item before flying - just like a careful pilot does a walk-around inspection and runs his check list in full size aviation - we feel the chances for successful flights are greatly improved. Additional building tips are also provided with this check list.

Another improvement in the kit is a completely new plastic wing tip. The old one was hard for an inexperienced builder to fit in place and was heavier than necessary. The new wing tip slips easily over the end of the wing for a neat, finished appearance.

WHY RUDDER CONTROL?

Some expert fliers think beginners should learn to fly by starting with an aileron-controlled model. Maybe this will work out if an instructor pilot is available to make the takeoffs and landings and stand by every minute of a flight, ready to take over if the student gets disoriented, until his pupil gets skilled enough to manage by himself. But this process takes a lot of flights. Most beginners do not have someone willing or able to spend so long a time with them.

We think a stable, rudder-controlled model is a lot less likely to get a novice into trouble from overcontrolling or not controlling. If the flier freezes up momentarily and can't decide what to do next, a flat bottom sectioned, high wing model — like the Kadet — will right itself, or partially do so, if the sticks are allowed to snap back to neutral, giving him time to think. Most aileron-controlled models need immediate and proper corrective control movement to make them recover, an automatic reaction that a beginner has not yet developed.

Many club instructors and hobby dealers have told us that two or three check-out flights on a Kadet are sufficient to allow a student to practice fly and learn without constant attention. And we know of modelers in isolated areas, with no one to help them, who have taught themselves to fly with the Kadet.

So remember---you may dream of darting around the sky with a sleek P-51, but first you must have some flying time with our boxy buddy, the dependable Kadet. It's the standard trainer-nationwide!

In club newsletters across the country, the Kadet continues to be the most recommended trainer for RC novices. But perhaps the biggest boost comes from the word-of-mouth advertising of those who have learned to fly on the Kadet. They tell their flying buddies to get the Kadet and the list of many thousands who have successfully soloed grows longer.

Designed Specially For Rudder Control---Not A Compromise.

From the number of Kadet-like trainers now appearing on the market it is obvious that other kit companies have gotten the word also! And some of our competitor friends are advertising their 4 channel aileron trainers as suitable for rudder control on three channels. An aileron trainer converted to rudder will never be as good a trainer for the beginner as the Kadet, which was designed--from the start --for rudder control.

SIG Kit RC-31 **$34.95**

And, of course, every Kadet kit has a copy of this Building & Flying manual, fully illustrated with construction photos, detailed isometric drawings and step-by-step directions. Also included: Big full-size plan.

New!

WEIGHT: 4 Lbs. LENGTH: 42"
ENGINES: .19-.35 WING SPAN: 57"

In appreciation of the steady increase in Kadet sales, we are adding a further improvement to the kit - a strong, heavy-duty injection molded cowling.

The molds for the plastic wing tips have recently been redone for lighter weight and improved fit of the tip to the wing.

SEE YOUR DEALER FIRST! TO ORDER DIRECT, ADD $1 POSTAGE UNDER $10, POSTAGE FREE OVER $10. NO C.O.D.

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ELECTRONIC SPEED CONTROL

from page 86

both the forward and reverse directional control.

A constant current driver configuration is employed to provide interchangability between systems using different motor supply voltages. A pulse inverter stage is included for either positive or negative input pulse operation. This control was built primarily for the electric scale boat applications, which use the lower current motors, and where a slight voltage loss can be tolerated or compensated for by increasing the motor supply voltage. The relatively low output current capability and the voltage loss of the bridge output would be a serious disadvantage in an application where speed or power is a primary concern.

This control should not be used to drive motors which consume more than 5 amps when stalled and operated at the desired voltage.

SPECIFICATIONS

Receiver supply voltage: 4.8v nominal, 6.0v maximum.

Receiver supply current drain: 6ma to 50ma depending on throttle position.

to page 118

Out Of The Skies Of History

Chance Vought F4U-1A

CORSAIR

Kit FS-36
Wing Span 36"

$29.95

36" Stand-Off Scale R/C Model

About The Airplane:

The prototype XF4U-1 was first flown on March 29, 1940. The Corsair was to become the most important Naval Attack Fighter of W.W. II, and remain in production for 13 years, yet its first service trials had ended in failure in its chosen role. It did not reach maturity as a great fighting machine easily. It gave notice that it was to be flown and tested at all times like a true racing stallion, and was an airplane for inexperienced pilots to reckon with. Because it was an advanced design—and had a new and untried high horsepower engine the Corsair required many perplexing and difficult flight tests and service changes before assuming the role of the Navy's first line fighter.

The Chance Vought Corsair had a service life spanning two wars, performing every conceivable mission possible for a military flying machine. The Corsair had a 15 year life span of battle victories unequaled in the annals of aviation history. Vought ceased production of the F4U-1 Model on Feb. 2, 1945 with the delivery of the 4,996th airplane. In air-to-air combat the Corsair had destroyed 2,140 enemy aircraft with the loss of 189.

The Corsair's distinctive whistling war cry, caused by the wing-root inlets for engine air, earned it the nickname "whistling death" among the Japanese.

The Corsair's most unique feature was the bent (gull) wing which was necessitated by the most powerful engine ever installed in a piston-engined fighter, coupled with one of the largest props in the world. Thus the inverted gull-wing permitted the short, sturdy landing gear required for carrier operations.

The first combat unit to receive the Corsair was VMF-124 and the first 12 machines arrived at Henderson Field on Guadalcanal on Feb. 12, 1943. On Feb. 13, VMF-124 demonstrated their superiority over the Wildcat by escorting PB4Y-1 Liberators all the way to Bougainville. The following day they saw combat for the first time, and the inexperienced Corsair pilots were badly mauled by some 50 Zeros. Two Corsairs, two Liberators, two P-40s and four P-38s were lost in this "Saint Valentine's Day Massacre", but the Corsairs soon gained superiority over the Japanese which was never lost. VMF-124 was subsequently credited with 68 kills against a loss of four aircraft and three pilots. Within six months, all Pacific-based Marine Fighter Squadrons had been re-equipped with the Corsair and the list of aces and the airplanes legend began to grow.

About The Kit:

Designed expressly for 2 channel R/C with plenty of room for just about any R/C up to 4 channel miniature units. Maintaining top quality and simple construction, (even the inverted gull wing), all Balsa and Plywood parts are accurately die-cut. Hardware Package including R/C Hardware, full-size step-by-step Plans and a flat finish Decal sheet for Major Gregory "Pappy" Boyington's Lulubelle as it appeared after the Oct. 17, 1943 raid on Kahili Airfield, Solomons. Recommended engine sizes for maximum performance .09 or .10. Minimal performance achieved with stock .049 or .051 Tee Dee. Diesel conversion of Tee Dee Engines is suggested.

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PHILA. PA 19134 U.S.A.

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- ☐ "Secrets of Model Airplane Building" including design, construction covering, finishing, flying, adjusting, control systems, etc. 25¢ enclosed.
- ☐ "Secrets of Control Line and Carrier Flying" including preflight, soloing, stunting, Carrier rules and regulations, Carrier flying hints and control line installation instructions 25¢ enclosed.

No checks. Only U.S. money orders or currency accepted.

Name _____

Address _____ City _____ State _____ Zip _____

ELECTRONIC SPEED CONTROL

from page 116/86

Motor supply voltage: 6.0v to 12.0vdc.
Motor supply current drain: 0 to 200ma in addition to motor consumption.
Maximum output current: Not less than 5 amps.
Voltage loss, typical: .5v with 2 amp load, 1.0v with 5 amp load.
Input pulse polarity: Positive or negative.
Size: 1½" x 2½" x 1⅛".

CIRCUIT THEORY

The operation of the Signetics' IC is basically the same as its typical servo application in which it compares the input pulse width to a reference pulse width and produces an error pulse. This error pulse is stretched producing an output with a variable duty cycle.

R1, R2, R3 and Q1 comprise a pulse inverter stage which will accept a negative pulse and provide the positive pulse required at pin 4 of IC 1. Since this PNP stage is normally biased off, it will not effect a positive signal at its collector and the control can be interchanged between positive and negative pulse systems without modification other than providing the correct input wiring. These components may be omitted for use with only positive pulse systems.

C5 is employed to reduce the susceptibility to radiated noise pulses which can be picked up by the input wiring. This effect is dependent on the specific application and installation, and proper motor noise suppression must be included for a complete cure.

The NE 544 will produce a regulated 2.0vdc output at pin 3, which is used for the external components.

C1, C3, C4 and C11 are used as AC bypass capacitors for their respective DC signals. For those scrap box builders, these values are not critical.

The time constant of R4 and C2, in conjunction with the DC voltage returned to pin 14, determines the width of the internal reference one shot multivibrator, which is normally set to about 1.5 msec.

The time constant of R6 + R7 and C6 determines the amount of pulse stretching, which controls when full throttle is achieved relative to the width of the error pulse.

The value of C6 will establish the amount of dead band. This dead band, as related to a speed control, determines the amount of control stick movement required before minimum throttle is applied. The very tight dead band of the typical servo application would make it practically impossible to

to page 120

Nimbus Sport from EK-logictrol

The new radio that offers you American engineering at import prices!

Nimbus Sport is a new 4-channel radio control system, which EK Products is offering you at a most economical price. And best of all, we didn't compromise on quality to bring this low priced radio to you.

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This system comes complete with 4 of our famous ultra small *EK SM* servos, for greater than 4 *pounds of output thrust!* With control accuracy of one percent or better the SM servo is designed for years of reliable use.

The highly reliable receivers and servos use the 3 pin Deans gold plated plugs. The Nimbus transmitter is equipped with our unique *adjustable tension* control stick, which allows each control to be independently and easily adjusted. The EK control stick features a high quality conductive plastic potentiometer for the highest reliability and the lowest wear.

The Nimbus Sport comes equipped with 4-channels, but can be converted to five channels at our many service centers throughout the world.

EK logictrol, the most experienced company in digital radio control systems, is proud to offer you this quality package in the new, low priced Nimbus Sport.

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EK·logictrol

Reliable radio control systems

ELECTRONIC SPEED CONTROL

from page 118/86

obtain a neutral setting. The specified value of C6 will provide about a 10% dead band relative to the total stick travel. For those who may wish to change this dead band, increasing C6 will increase the dead band, and R7 may need to be reduced to restore the range adjustment.

R8 determines the amount of minimum output pulse (throttle) that can be achieved. R8 was chosen to produce a very short pulse.

Pins 9 and 13 of the IC provide the forward and reverse output pulse. These outputs are floating when the control is in neutral, and R9 and R10 are employed to pull these outputs to ground.

Q4 and Q5 comprise the constant current drivers for their respective sides of the bridge output stage. The amount of drive current is established by the 3.9v output from IC 1 –9 or 13, and the value of R12 and R15. The D42C1 driver was chosen for its high free air power rating of 2.0w. This power limitation determines the maximum motor supply voltage and drive current.

to page 122

MERCO Mk IV...

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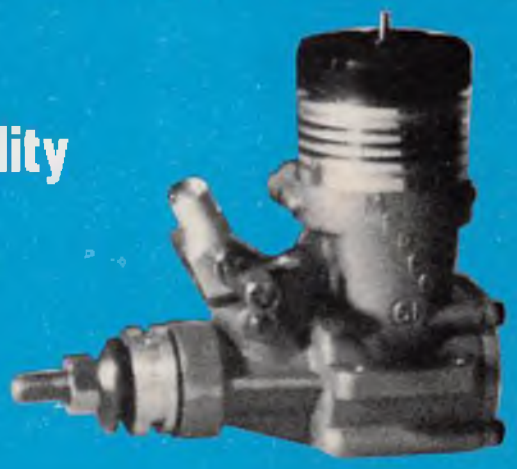

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At 5.5 amps, this battery is perfect for use with electric starters.

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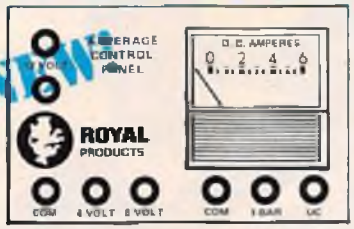

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8.95 PER SET

ELECTRONIC SPEED CONTROL

from page 120/86

The D44H2 and D45H2 output devices were selected on the basis of their cost, high beta, and saturation characteristics. The actual circuit performance will depend on the pot luck parameters of the specific devices used. The several units that have been assembled indicate that a 5.0 amp output and a total saturation voltage loss of about 1.0v at 5 amps represents the minimum performance of this circuit.

For those experimenters who may wish to try some changes, I will mention that the circuit board was designed to accommodate the larger TIP35 and TIP36 transistors, and there is room for a separate heat sink for the two drivers. The three unused holes just happen to fit several of the 5v regulator IC's for back-powering the receiver. The maximum current, and minimum input voltage must be carefully considered to avoid receiver problems or destruction if a regulator is to be used.

ASSEMBLY HINTS

(1) C5 (which is not shown) will occupy the same holes as pins 4 and 5 of IC 1. Drill accordingly and install C5 and IC 1. Observe that pin 1 or the index of IC 1 is toward the top of the circuit board.

(2) Using two spare resistor leads, install the jumpers adjacent to the ends of IC 1.

(3) C1 is installed on top of IC 1 with its positive end toward the bottom of the board.

(4) C2, C3, C4 and C6 are installed with their positive end up and positioned as shown.

(5) If the control is to be used with only positive pulse systems, the components Q1, R1, R2 and R3 may be omitted. The jumper wire to IC 1-4 will be replaced with the white positive pulse input wire which will connect directly to IC 1-4.

(6) Install the receiver input wires as desired. The white wire may be omitted if the control is to be used in only negative pulse systems.

(7) When installing R12, position it about 1/8" above the circuit board.

(8) R15 may require sleeving to prevent a short to the collector tab of Q5.

(9) Complete the resistor, potentiometer, disc capacitor and jumper installation as shown.

(10) C11 is installed with its positive end down and positioned as shown. Check for case clearance.

(11) Install the four diodes, observing the polarity as shown.

(12) Bend the collector tabs of Q4 and Q5 as required to clear the case and C1. Note that the index (or emitter) is positioned toward the top of the circuit

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SERVOS, RECEIVERS, COMPLETE FLITE PAKS REGULAR OR MICRO, ASSEMBLED OR KITS

Litco flite paks or components can be purchased assembled or in kit form. Assembled units are pretuned and ready to use with transmitter specified below. All units use Deans connectors. Servos are supplied with extra female Deans connector to simplify installation.

Litco Systems has pioneered the concept of fully assembled flite paks custom matched to various transmitters. Our servos are electrically adapted to match the transmitter specified. There is no universal servo that operates properly with all transmitters since throws and pulse spacing vary with each make. Please order from table below.

PLEASE CIRCLE THE MAKE OF YOUR TRANSMITTER: **KRAFT EK ROYAL FUTABA WORLD MRC RS ORBIT HEATH ACE UNICOM CANNON (PRO LINE COMPLETE FLITE PAK ONLY) SANWA CIRRUS MICRODAVIONICS KRAFT KP4A**

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MICRO COMPONENTS

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- 4.0 lb. power, 0.5 sec transit
- 8 mA drain
- Fast, precise, high resolution
- Gold plated Deans connectors

REGULAR Size: 1.5x1.45x.73 Wt. 1.2 oz.
MICRO Size: 1.28x1.3x.6 Wt. 0.7 oz.

RECEIVER
- Double sided PC boards
- Double tuned front end
- 1.5 μV, AGC on 4 stages
- Gold plated Deans connectors
- High selectivity and rejection
- 5 channels, 8 available

FREQUENCY: 72.08, 72.16, 72.24, 72.32, 72.40, 72.96, 75.640

REGULAR	Size: 1.9x1.7x.8	Wt. 1.5 oz.
MICRO	Size: 1.75x1.14x1.0	Wt. 1.5 oz.
MODULAR RF	Size: 1.6x1.0x.55	Wt. 0.5 oz.
DEC.	Size: 1.5x1.0x.21	Wt. 0.5 oz.

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- Nylon D&R case
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- Nylon D&R case
- Gold plated Deans connectors

Size: .85x1.45x1.45 Wt. 2 oz.

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- Noble high quality switch
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We have purchased a large volume of parts at low prices and we are passing the savings on to you. The prices will hold as long as this supply of parts lasts.

Our flite pak approach has been immensely popular and many modelers have purchased their 4th or 5th flite pak. If you have not yet tried our approach now is the best time to do it and save. Flite pak prices are the sum of component prices and all parts can be mixed.

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	S5443	Rotary Dunham micro servo, assembled	544 IC	29.00	
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	S1003	Rotary D&R servo, assembled	543 IC	25.00	
	S1005	Rotary Dunham micro servo, assembled	543 IC	33.00	
	R2000	Receiver regular, assembled	Frequency _____	36.00	
	R2001	Receiver micro, assembled	Frequency _____	39.00	
	R2001A	Modular receiver RF module, assembled	Frequency _____	22.00	
	R2001B	Modular receiver decoder module, assembled, 2 channels		13.00	
		Each additional channel for R2001B		1.50	
	B1000	Battery regular, assembled		13.00	
	B1002	Battery micro, assembled		13.00	
	H1001	Switch harness, assembled		5.00	
	S5441K	Kit of S5441 servo	544 IC	17.00	
	S5442K	Kit of S5442 servo	544 IC	19.00	
	S5443K	Kit of S5443 servo	544 IC	25.00	
	S1001K	Kit of S1001 servo	543 IC	20.00	
	S1003K	Kit of S1003 servo	543 IC	20.00	
	R2000K	Kit of R2000 receiver	Frequency _____	30.00	
	H2010	5 male & 5 female Deans 3 pin connectors & assortment of wire		6.00	
	S2000	Trays for all regular servos 5 pcs.		4.00	
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ELECTRONIC SPEED CONTROL

from page 122/86

board and install these devices so that their collector tabs cannot short to each other or any other component.

(13) Install Q2, Q3, Q6 and Q7 so that their collector tabs face the outside edges of the circuit board. Solder only one lead of each device since they will probably require repositioning for true case alignment. Q2 and Q3 are the PNP's which will be the green pair.

(14) Install the three motor supply input wires and the two motor control wires. Use 22 gauge stranded or larger to avoid wiring losses.

(15) Install the case assembly by mounting to the four output transistors. The two case halves must not short to each other or any other component.

(16) Reposition the four outputs as required for case alignment and complete the soldering. Be sure to tin all exposed copper to prevent oxidation and increase the conductivity.

(17) Be sure to use lock washers for the final case installation.

INSTALLATION SUGGESTIONS

Figure 1 illustrates the standard speed control installation which uses two separate power supplies to power the receiver and motor. A positive pulse system is shown using the white receiver input wire to the control. The grey wire is either removed or disconnected. A negative input system would use the grey input wire and the white wire would remain disconnected. The optional 4.8v input is left unconnected and this green wire may be removed.

Adequate noise suppression must be installed at the motor and the antenna and receiver wiring must be positioned away from the motor and its associated wiring. Using a single capacitor across the motor terminals is recommended by a few of the motor manufacturers, but has been inadequate in a few installations due to motor case radiation. The two capacitor arrangement with each capacitor connecting to the metal motor case has been sufficient in these problem installations.

Figure 2 illustrates using the controllers power input wiring to back-power the receiver through its servo output connections. This option will simplify the power switch and charging connector wiring if the receiver power could be included in the motor battery pack. In order to use this option, the receiver's 4.8v input must be wired straight through to each servo output. If the receiver's wiring is unknown, it should be visually traded or checked with an ohmmeter.

Figure 3 illustrates using a tapped motor supply to provide the 4.8v receiver power. This arrangement may result in problems due to voltage fluctuation created by the current drain of the motor. This problem is generally a shift in servo position caused by throttle position or motor loading. The extreme problem is erratic operations due to glitches in the receiver's decoder. These problems are determined by the design of the R/C system, amount of current consumed by the motor and the capacity of the batteries used. If the R/C system is a late design which uses a servo IC that provides internal regulation, the odds are that this arrangment can be used without any adverse effects.

to page 126

Featured on the January '78 cover of RCM was an outstanding Royal Super Cessna Skymaster built by Roy Gilbert of Covina, Calif. We inadvertently omitted the builders name of this beautiful aircraft in that issue — Sorry, Roy!

Impossible:

Impossible to fly a paper glider with radio control? Well, we are not suggesting it. Impossible to make an airborne system so small and lightweight that you might consider flying a paper glider with it? Not at all impossible, in fact that's what we've done. Kraft Systems, long time pioneer in the field of R/C, is proud to announce the first truly sub-miniature servo, and the world's smallest, the KPS-18. Measuring 1.103" x .514" x 1.2" and weighing only .582 oz., this servo has the accuracy and dependability inherent with all Kraft servos. Combine this sub-miniature servo with the KPR-7L receiver, and the KB-4L battery pack and you will be able to put a Kraft R/C system where you never thought it possible.

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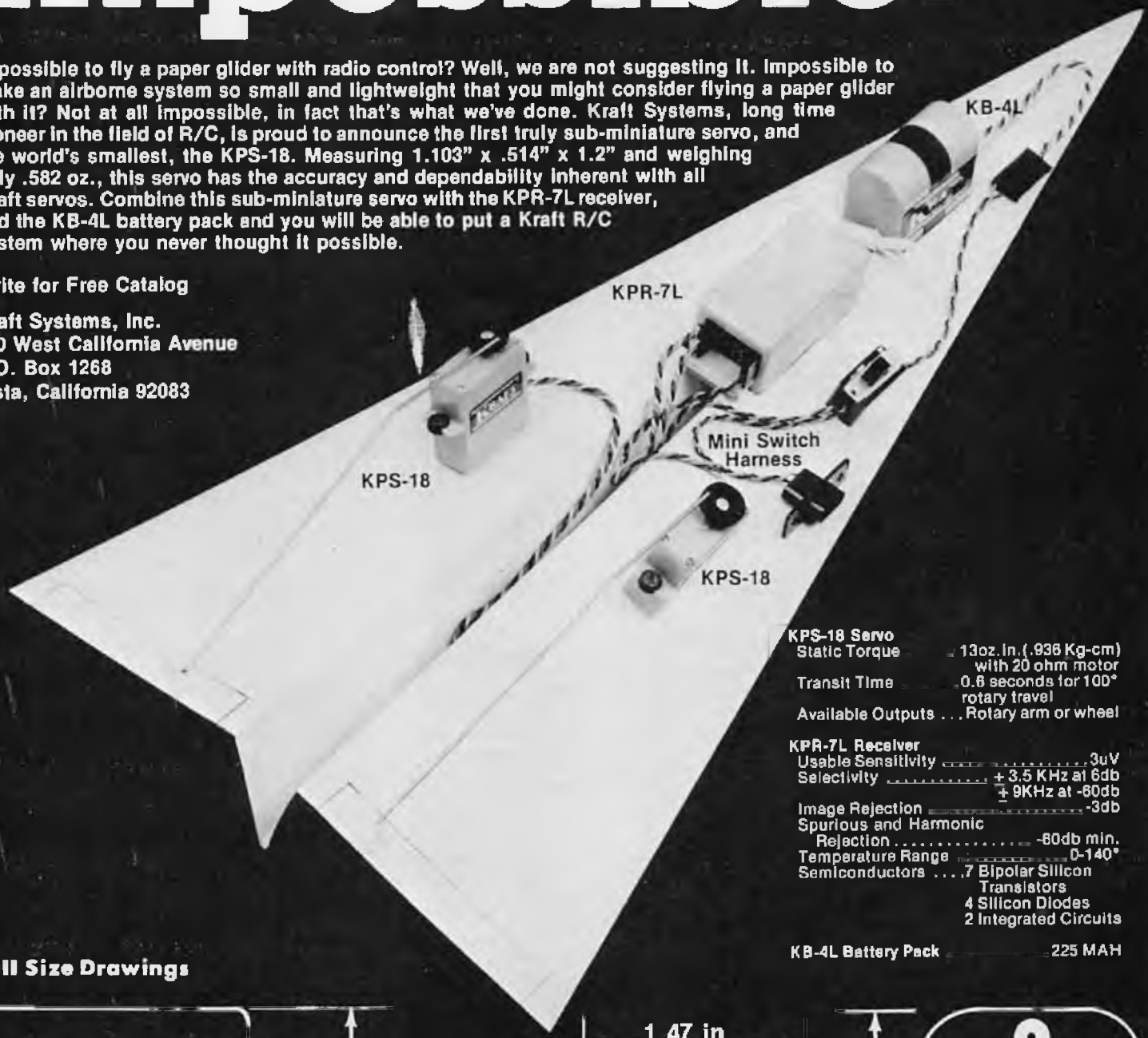

KPS-18 Servo

Static Torque	13oz.in.(.938 Kg-cm) with 20 ohm motor
Transit Time	0.6 seconds for 100° rotary travel
Available Outputs	Rotary arm or wheel

KPR-7L Receiver

Usable Sensitivity	3uV
Selectivity	± 3.5 KHz at 6db ± 9KHz at -60db
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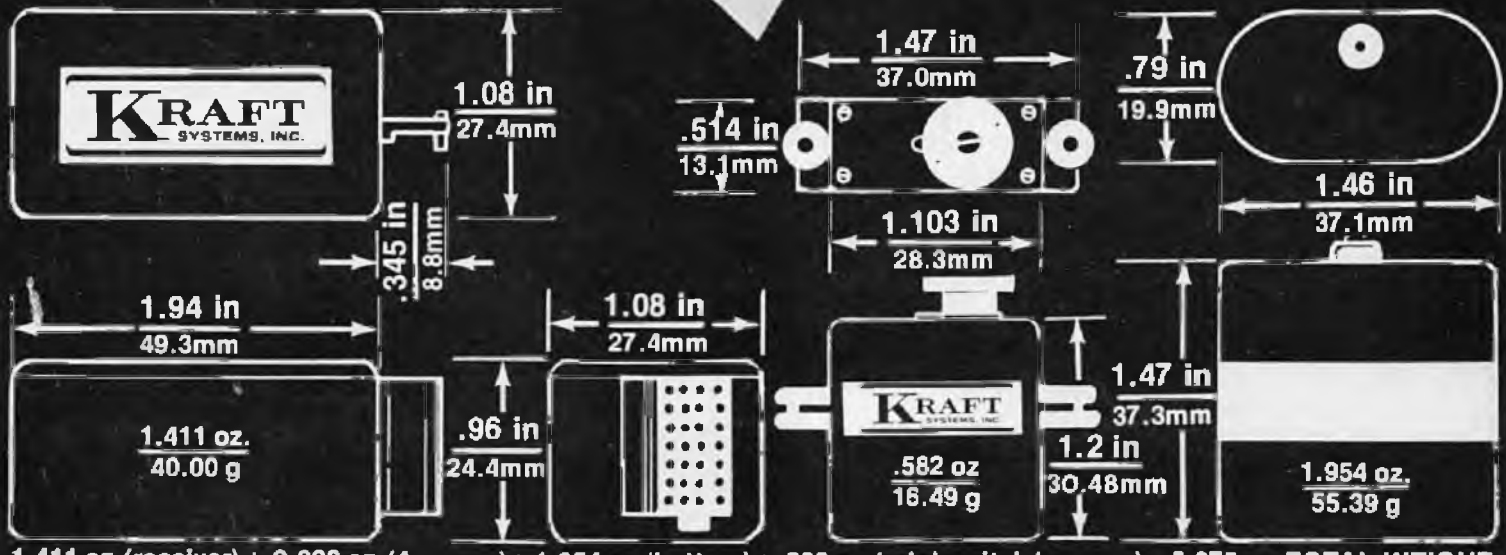

1.411 oz.(receiver) + 2.328 oz.(4 servos) + 1.954 oz.(battery) + .282 oz.(mini switch harness) = 5.975 oz. TOTAL WEIGHT

from page 124/86

This control has been used in several systems which use the same 4.8v to power the motor and receiver. As designed, this control will suffer about a 20% reduction in output current capability if the motor supply voltage equals the receiver supply voltage. For the experimenters, a resistor in series with base of each driver (Q4 and Q5) would eliminate this reduction.

In any installation, the motor supply power switch may be omitted since the control will not draw any current when the receiver is turned off. This method is only suggested for those installations where this switch would be difficult to include. A quick disconnect is strongly advised for possible malfunctions or for periods of storage. It has been experimentally proven that a 5 amp Slow Blow fuse would have prevented a fire caused by temporary and sloppy wiring.

The case of this control is electrically connected to the two motor drive wires. This control case must not be allowed to short to any other electrical components or wires and this definitely includes antennas.

ADJUSTMENTS & OPERATION

The initial control check-out and adjustment should be performed using the hook-up configuration of Figure 1. The phasing of the white and grey motor drive wires will determine the direction of motor rotation relative to the desired direction of control stick movement. For this reason, temporarily connect the motor until the desired phasing is established.

Again — be sure to insulate the control's case from any other component or wiring and apply power to the transmitter and receiver-control system.

Adjust the centering pot (R5) to obtain a neutral or zero throttle condition.

Apply about 3/4 forward control stick throttle and adjust the range control (R6) to achieve a setting where the motor just attains maximum rpm. This maximum throttle setting may be observed with a voltmeter across the motor or monitoring the voltage at pins 9 or 13 of the IC. It is not advisable to operate a stalled motor any longer than necessary. With this in mind, the range control may also be adjusted by applying 3/4 forward throttle into a stalled motor and adjusting R5 until the motor just stops humming.

If the direction of motor rotation is reversed, with respect to the desired direction of control stick movement, the two motor drive wires must be reversed, and the final motor connections can be completed.

to page 128

TOP FLITE

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TOP FLITE MODELS, INC. 2635 S. WABASH AVE. CHICAGO, ILLINOIS 60616

from page 126/86

If the control is operating correctly and the motor does not consume more than 5 amps, the case temperature should remain relatively cool. If the case temperature becomes painful to touch, it means that the motor is requesting more current than the control can provide. This condition should be checked at both low and full throttle continued operation into a loaded motor. If the case temperature (at the transistors) sizzles water, it's time to turn everything off, find out what's wrong, and hope the outputs are still good.

TROUBLESHOOTING HINTS

The two case halves provide the interconnections between the collector tabs of the two pairs of output transistors. If the control is to be operated without the case, these collectors must be jumpered accordingly.

The motor supply voltage is not required to operate the integrated circuit stage. The operation of the IC can be monitored at pins 9 and 13, which are the servo motor outputs when this IC is used in a servo application. A small servo motor across pins 9 and 13 could also be used.

With 4.8v applied to pin 11, pin 3 should provide a regulated 2.0 to 2.2 volt output.

The voltage at pin 14 should agree with the setting of R5. The voltage at pins 9 and 13 should be variable from 0 to 3.9v corresponding to a neutral to full throttle setting. One output will respond to a forward command, and the other will respond to a reverse command.

The driver stage can be tested by measuring the base to emitter voltage of each output transistor. This voltage should be from 0 to .6vdc, depending on a zero to full throttle position, which may be either a forward or reverse command. If the voltage exceeds .6v, it indicates a faulty output device.

The output devices may be tested by removing the case halves and disconnecting the motor. A 12v auto tail lamp (borrowed from the family grocery cart) can be used to test each output device by connecting one lead to the collector tab. The other lead of the lamp will be connected to ground when testing the green pair (PNP's). When testing the red pair (NPN's) this remaining lead of the lamp will be connected to the positive motor supply voltage. For each test, the lamp should respond to either a forward or reverse transmitter command. If a 0 to 10A ammeter was used instead of a lamp, it would indicate the approximate

to page 130

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ELECTRONIC SPEED CONTROL

from page 126/86

maximum current capability of each device. If the ammeter is used, the test must be performed quickly since the transistors are operating out of saturation and maximum power is being developed in each device.

This unit is being kitted by Davis Engineering Co., P.O. Box 1232, Kokomo, Indiana 46901, at a price of $37.50. For additional information on the availability of the kit, write to Davis Engineering Company. □

COMPONENT PARTS LIST

IC 1	Signetics NE 544
D1-D4	IN 4001
Q1	MPS A 70
Q2	D45H2
Q3	D45H2
Q4	D42C1
Q5	D42C1
Q6	D44H2
Q7	D44H2
R1	2.2K
R2	4.7K
R3	10K
R4	16K
R5	10K — Potentiometer
R6	10K — Potentiometer
R7	10K
R8	100Ω
R9	100Ω
R10	100Ω
R11	47Ω
R12	15Ω, 1/2w
R13	47Ω
R14	47Ω
R15	15Ω, 1/2w
R16	47Ω
C1	100μfd, 10v
C2	.1μfd, Tantalum
C3	.1μfd
C4	1.0μfd
C5	.001μfd Subminiature Disc.
C6	2.2μfd Tantalum
C7	.05μfd
C8	.05μfd
C9	.05μfd
C10	.05μfd
C11	100μfd, 16v

THE BIG CONTEST

from page 85

Then the big decision of what to cover it with arrives. Should it be MonoKote, Coverite or silk? Friends drop by, the phone keeps ringing, each advantage is carefully weighed, then the decision is

finally made and it is put on with loving care. (I didn't know he could iron.)

Finally it is complete, sitting on his workbench in all its glory. Now for the big question — will it fly?

Again more conferences. "Where would be a good flying site?" "What day would be best for you?" (I thought women were the only ones who couldn't make up their minds.)

Saturday morning finally comes, a final dial of the phone to the weather bureau to make sure, "It would be clear with no wind."

We are ready to go. I have to take my car; his is loaded with a fuselage, wings, transmitter, fuel, tool box, batteries, starter, flight box, and, of course, so is the car of his flying buddy. (We look like a small safari heading into the outback.)

Arriving at the test site you hear, "Wow! What a fabulous place." (To me, it looks like a strip of black-top parking lot out behind two Quonset huts in the process of being wrecked by the neighborhood kids.) Everyone starts unloading and they put the masterpiece together. (You'd think with all that equipment they could find something better than rubber bands to hold it together.)

They finally decide it is ready to fly — the engine is started and it taxies down the runway, gains speed, and is airborne. Up it goes and around in a big circle and then is brought in to land. (After all that, I really expected to see something spectacular.)

"That was a test flight to see if it needed trimming," he said. After a few minor adjustments he puts it into the air again. This time he does a few loops, a Figure Eight, a spin and even flys it upside down. (Boy! it really looks great, but I wonder why he is flying it through the Quonset hut window).

I hear the cry of disbelief, "I gave it full up instead of down." (I thought everyone knew up from down.)

Back to the shop for the post mortem — a new stringer here, a balsa patch there, get the iron out and so it goes into the late afternoon. Around bedtime he suggests a little ride. (Great! thinks I, he wants to spend some time with me.)

I couldn't believe my eyes when we arrived back at the test field, it seems his flying and landing wires were missing and he wasn't sure he could get new ones. (If anyone had told me a few months ago I'd be holding a flashlight at 11 p.m., while he crawled around a deserted Quonset hut, I wouldn't have believed them!) He finally comes up with one, we found the other one Sunday morning. (Doesn't a modeler ever sleep?)

After a week, it looks like new, but before the second test flight he decides to take a few pictures, just in case. (But two rolls of color film and two of black and white?). Another Saturday morning and another test flight, all goes well.

to page 136

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THE BIG CONTEST

from page 131/85

Finally, the day of the "Big Contest" arrives, the car is loaded (it seems as though he has been loading it for days), and we are on our way. Just as we are turning on the freeway, I hear this sickening groan (I wonder if he has become violently ill), but all I get is, "Oh! no, I forgot my transmitter." Back home we go, the forgotten part is picked up and we are off once again.

When we arrive at the contest site, the thought of the green grass and a cool shade tree to sit under vanishes into thin air. I find myself in dry weeds and plenty of soft dust. (I sure am glad I didn't wear good shoes and nylons.) After the long ride plus a second cup of coffee, one of my first questions while helping to unload the car is, "Where are the facilities?"

"Well, behind that bank over there the men usually . . ." "Why don't you ask some of the other wives, someone usually brings one out for the contests." With that he takes off in the direction of the registration table. I take a second look around, spot the club's tent with a few wives already there, I gather my book and knitting, and head in that direction.

to page 138

MAGNUM POWER

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SOMETIMES IT'S HARD TO TELL THE DIFFERENCE BETWEEN FUELS — the well-known brands are all good. But contest modelers are always looking for something better. So when a brand new fuel, just starting to get around, wins 12 firsts and seconds at the '77 Nats, there's something going on!

Check out these 2 tables, showing the performance of two popular engines on the most widely used glo fuels in the country with approximately 10% nitro.

K & B FRONT ROTOR 40

Brand A fuel	*11,700 RPM*	*425°*
Brand B fuel	*11,700 RPM*	*440°*
Brand C fuel	*11,600 RPM*	*440°*
Brand D fuel	*11,600 RPM*	*440°*
MAGNUM POWER	*12,200 RPM*	*400°*

OS60 FSR

Brand A fuel	*11,800 RPM*	*425°*
Brand B fuel	*11,800 RPM*	*445°*
Brand C fuel	*11,800 RPM*	*420°*
Brand D fuel	*11,600 RPM*	*450°*
MAGNUM POWER	*12,300 RPM*	*390°*

Notice that MAGNUM POWER produced 500-600 RPM more — proof that its special secret lubricant system reduces friction! Not only that, but after the OS60 was run on MAGNUM POWER, a re-test showed the other fuels all picked up 100 RPM over their first test!

Now notice the head temperatures — MAGNUM POWER ran the coolest — which makes it easier on your engine and glow plug!

There's much more to the story, but let's sum it up for now: MAGNUM POWER is the first **truly superior** fuel in 25 years.

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THE BIG CONTEST

from page 136/85

After what seemed a long time, the contest starts. At first I watch each flight, but as the time wears on I start losing interest and, apparently, so do the others because this is when the small talk begins. Knowing I am new to the modeling game they give me some of their views. One veteran of 20 years said she had been warned by his mother "You'd better like modeling if you are going to marry him."

"She was right, I have spent my life walking around, eating with, cleaning up after, and even sleeping with R/C models."

"The first 5 years are the hardest," another told me. If I had known he was addicted to toy airplanes, I'm not sure I would have married him." (My gosh, before I gave up my freedom for wedded bliss he had told me it was a great hobby and made life worth living, next to me, of course.) I was told that if I really got him to tell me the truth, I'd find that I came third after building and flying, in either order. But then the veteran assured me that with time I would mellow and might come to enjoy it. After all **she** was there.

It is my husband's turn to fly (I think his plane is the best looking one around, although I'll try and not show it), he is doing well, and I can feel his confidence building when all of a sudden something comes loose. Whew! he managed to bring it down safely.

I went over to see what had happened. He is able to borrow a whatsit and, with a half roll of masking tape, is able to repair his plane so it will fly again, so we are still in the contest.

By lunch time I am hot and tired and getting that dusty feeling in my throat. The picnic lunch I had slaved over is eaten from the cooler out of the trunk of the car. (Boy, how I'd like to get under a shade tree. Trees in the area are a no-no, since they have a way of eating airplanes, I am told, so you avoid them like the plague.) The afternoon drags on and each wife lives through the excitement of her husbands flights, his good ones and his near tragedies.

As the contest draws to a close and the trophies are handed out, the back slapping and the "Wait until next time," are done, it is finally over. I help to load the equipment into the car and listen to a running commentary all the way home. When he tells me of the agony of a near defeat, I sit quietly and listen and try to console him. Or, in the triumph of his small victories, I share his laughter.

And, when in the quiet of the night I hear, "Wasn't that the greatest day you ever had — thanks for just being there," I forget how tired I am, and how my sunburn itches and, looking back over the day, I know he is somehow right. □

from page 74/72

.025 brass, as shown in Photo #10, and mount them 1/2" up from the bottom of the tank and solder in place. Again, thoroughly rinse the tank off inside and out, in running water.

Now we'll check and see how good of a soldering job you did. Take two pieces of fuel line hose, one about 1" long and another about 6" long. Plug up the 1" piece with something like a 4-40 screw and slip the other end onto the tank fuel line. Slip the 6" piece of fuel tubing onto the pressure line. Fill a pan with water and, while holding the tank completely submerged under water, blow as hard as you can through the 6" piece of fuel tubing. If no bubbles come from the tank, you're a first class solderer. If bubbles do appear, note where they come from and re-solder that joint. Then pressure test again.

You're now ready for the last very important step. Fill the tank with fuel, slosh it around and then empty it out. This will oil it up and keep it from rusting until you're ready to use it.

Some guys would rather run in-line fuel filters that they can get at easily and clean periodically. If you'd rather run an in-line filter, then you can make a tank similar to the one in Photos #8 and #9. You can easily see the locations of the fuel lines. A lot of guys run the tanks just like you see in Photos #8 and #9, but I would suggest that you also make a box for the fuel pick-up line so it stays covered with fuel. Photo #9 also shows how wide the cap opens, allowing those easy, fast one second pit stops.

Photo #11 shows a few trick things that you might want to use. On top of the cap is soldered a "U" bracket out of 1/16" piano wire which makes it much easier to flip the cap open. Around the fuel filler cap is an "overflow" cap. If the tank is over-filled, the overflow is caught in this cap and then is drained out the back of the car, preventing the fuel from getting all over the radio gear. You can also attach your roll bar to the fuel tank. If all else fails, you can buy a ready made fuel tank, Associated Part #SP62, as shown in Photo #13. Good luck in your racing. □

SEAPLANE RECORD BLITZ

from page 71/70

onds to over 70 seconds as the rpm of the dirty engine fell. Despite lower speeds, the laps continued to pile up.

to page 140

Around 3:30, distant thunder caused some concern, but it passed us by.

We reached more milestones: 300 laps; 400 laps; a new duration record, 500 laps, 9 hours. Then sudden, strong winds threatened rain and lightning. Not wishing for any of us to become lightning rods, I killed the engine with the mixture control. A landing was made on the lake, just in front of our pylon at 6:42:45 p.m. We packed up quickly and hurried back toward the cars. By the time we arrived, the threat of rain had passed, but after flying 508 laps, more than twice the previous record, and adding more than an hour to the duration record, who's complaining?

A check of the fuel supply showed that 17% of the fuel remained, enough for about 100 laps and two more hours.

Tri State Express

After the Shark had proved capable of flying more than 300 miles in closed course flight, the straight line distance record of 135.2 miles was the next target. Maps were scanned for a good route to follow with car and plane; one clear of cities or heavy traffic. The closest one was along the DelMarVa Peninsula. A reconnaissance trip to the southern end of the peninsula, north of Norfolk, located several good take-off spots. Hobie Steele put me in touch with his fellow MARKS members, Frank Boykin and Cliff Morris. Record attempts scheduled for September 24 and Oc-

tober 1 were both cancelled because of the regular weekend rain. The next attempt was set for Saturday, October 8, and the weatherman said that the rain should not start until late afternoon, so Friday evening, Ken Greenhouse and I drove over to the eastern shore.

Frank and Cliff met us in Pokomoke City, Maryland, early Saturday morning. We drove south into Virginia, to near the north side of the Chesapeake Bay bridge-tunnel. A strong wind was blowing from the east, so we chose a take-off site on the ocean side of the peninsula, on the Magothy Bay.

The kicker in FAI straight line RC distance rules is that the landing point must be specified before the flight. Because rain was due later in the day, we chose a point closer than originally planned. The aircraft was assembled, fueled to two-thirds capacity, and weighed in at 9.62 pounds. After a short run into the stiff breeze, the Shark was airborne. Then we realized that the compression was adjusted too low for the cool air temperature. I landed the plane in the salt water and retrieved it, wearing a pair of borrowed hip boots found at the deserted site. The engine was restarted and the compression increased. The second take-off was at 12:01 p.m., and the engine sounded fine. We got into the two cars and began the long journey. Frank Boykin, the Contest Director, drove my car. I sat beside him watching the plane

through the open sun roof. Ken and Cliff followed in the other car.

The Shark flies at an airspeed of about 40 mph. As we drove toward our destination, the ground speed varied from 25 mph to 55+ mph, depending on the direction of the road relative to the east wind. At 1:50, we left Virginia and entered Maryland, then at 2:54, we reached Delaware. In Delaware, the road turned slightly west and our speed seldom dropped below 50 mph.

Steady rain fell for most of the drive through Delaware, but the plane was sealed tight and had no problems. Surprisingly, little rain came in through the open sun roof of the car; air from the windshield blew it away. The chief effects of the rain were to make driving more demanding and to reduce visibility of the model.

We flew just east of the Dover AFB, and were relieved when it was behind us without incident. However, a few miles further north, Frank told me there was a C5A coming in on final approach. We stopped the cars and watched closely to see whether it would go east or west or directly overhead. Meanwhile, the Shark was orbiting a field at 300 feet, ready to come much lower if necessary. Finally, we saw that the C5A would pass well to the west. We waited until it had passed, mindful of the turbulence behind such large aircraft. Then we climbed in the cars for the last leg of the flight.

Our goal was the intersection of Route 9 and the Smyrna River, about 14 miles north of Dover. When we finally arrived, we saw that the riverbanks were grown up with 8' tall reeds, and the wind was blowing parallel to the river. Landing in the river might make recovery difficult. FAI rules permit a landing anywhere within 500 meters of the specified point, so a landing was made on the mowed grass beside the road at 4:25 p.m., 68 meters from the center of the short bridge. The record flight was complete! The straight line distance covered was 152.1 miles, the road distance about 175 miles.

In two flights, the Shark had broken all three FAI seaplane economy records: closed course distance, duration, and straight line distance.

What does it take to set world records? People who think there is a secret are absolutely right. But the secret is not a special airplane or engine or fuel or radio. It is simply long, hard work and experimentation, with careful attention to details.

Just as important as the right hardware, one must have friends interested in the challenge of doing what has never been done before. Friends who will wake up early to watch a plane bore holes in the sky all day long. The crews for these attempts, headed by Walt Good and Frank Boykin, kept their humor and alertness throughout the long flights. Thanks again, fellows. □

from page 69

single bolt extending through a 1/2" square balsa post which is glued into the center section of the wing, into a blind nut on the bottom of the plywood nose crutch, for a simple, clean and effective mounting.

The tail surfaces are constructed entirely of balsa, inset neatly into the rear of the upper shell and glued to the crutch. The pre-formed aluminum landing gear legs slide through the sides of the lower shell into a pocket formed by back-to-back formers with plywood upper and lower spacers. Four self-tapping screws are used through this sandwich to provide permanency. Hinges, horns, control rods, nylon collars, rubberized rigging cord, tail wheel and windshield are also provided.

Construction is simple, easy and straightforward, as are the plans and instructions. One feature we particularly liked was the introduction to the instructions which described the various adhesives to be used. To take this a step further, the specific type of glue to be used is identified in each step of construction. The instructions state that slow drying butyrate cement will do an effective job of gluing the plastic shell to the crutch and formers, and to itself. We found this to be completely true with none of the "skinning" effect encountered with ABS plastics. We also used Carl Goldberg's "Jet", instead of pins or tape, for tacking parts in place until the specified adhesive had dried. This was our first trial of this "instant" glue and we were very satisfied with its penetration, holding power and drying time.

The open framework on the wing and tail surfaces was covered with Ace Topkote and the entire airplane was airbrushed with white Perfect Paint. After the white had set, the top of the fuselage was masked and painted with light blue Perfect Paint. The top of the wing tips were given similar treatment with red Perfect Paint. Aileron lines were dummied in with striping tape and the license numbers were applied using press-on vinyl numbers.

Although our test model weighed in at 38 ounces as compared to the 25-32 ounces specified by the manufacturer, we found no handling problems and all three channel maneuvers were possible in a scale-like manner without difficulty.

This airplane is a joy to build and fly. We found only one omission in the kit — the fact that the Center of Gravity, although called for as being shown on the plans, was not. When we called this to the manufacturer's attention, he was "completely chagrined" and has since corrected the oversight. We also suggested that the desirable control

throws be given, which he also agreed to do. For those who may have a kit which does not show these items, the proper C.G. at the spar and the elevator throw is 1/8" up and down with the rudder throw 3/8" left and right. These throws are suggested for the first flights and may be altered to suit individual tastes later.

Overall, we found this to be a very well done kit, well worth the price and capable of bringing pleasure to both the builder and flyer.

We look forward to testing other models from the same era, in the same size, that are now on the drawing board. □

POWER BOATING

from page 68/67

since, while most of the R/C carbs around work reasonably well, it has to be admitted that they are nearly all a compromise between high speed performance and low speed mixture control. It seems obvious to me that a plain venturi is by far the best way of getting the mixture into the engine, but does leave us with the problem of low speed.

I know from experience that a throttle exhaust on a diesel engine works very well, but am not in a position to say the same about a glow motor — remember that the exhaust temperature of a glow motor is considerably higher than that of a diesel. However, I see absolutely no reason why it shouldn't work, particularly if it is water cooled, and I wonder if we may not see something of a minor revolution in the state-of-the-art. The only obvious thing that I can see against them is the fact that they are somewhat expensive; but no doubt if demand increases, then, as with most other things, the price will drop.

★

Changing the subject completely, I have been taking an interest lately in gas engines and their use in model boats.

to page 146

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Width: 7.08 inch	Rear gear ratio: 18.7 : 1
Height: 3.54 inch	Radio: 2 channel
Wheel base: 8.14 inch	Engine: .09 – .10

SAITO

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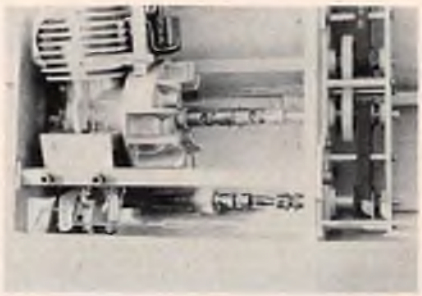
from page 144/67

We don't hear too much about this aspect of the sport, and I feel that it is rather a pity since there are so many of these engines around. Just think of all the equipment that uses a gas engine of between 20cc and 35cc capacity; there must be dozens of different types. They could nearly all, with a bit of adaption, be used as power plants for model boats.

However, there is one difficulty — most of these motors would require an extremely large propeller, and it is very difficult to find suitable ones on the market. What brought this up was a letter I received recently from a modeler in the Gold Coast in Africa, Alain Degiovanni. He has spent some time adapting a 26cc Homelite XL2 to drive twin shafts, with contra-rotating props, and he sent me photos of his progress. As you can see, it is a neat job, but he tells me that he has troubles because the engine needs bigger props than any commercially available. I should add that he is one crafty guy, because he gave the motor to a friend who is an expert in tuning kart engines, and the engine now peaks at 13,000 rpm instead of 8,000. This seems to me to be a pretty good trick!



Homelite XL2 26cc gas motor and gearing. The starting pulley is behind the bulkhead. There does not appear to be any gearing, but this is difficult to tell from a photo.

Anyway, he has made a couple of props, but now has very severe vibration problems because the props are dynamically unbalanced. He asked me what I thought about the situation.

Well, I must confess that I have spent an awful lot of time just sitting and looking at the photos and doing what passes for heavy thinking in my tiny mind. Finally, I noticed the obvious - - - if you look carefully at the gear train he has used, you will see that the engine speed and the prop speed are identical. In other words, he has used that train to get contra-rotation of one shaft, but he hasn't used any gearing. Now, most gas engines of this type develop a lot more torque than purpose-made model engines, but at relatively low speeds,

around 7,000-9,000 rpm normally. Okay, then, the whirlybird guys using glow motors use gears to gear down because of the high peak speed of this type of engine. In the case of a gas engine, why not gear the prop-shafts up? This would have two advantages to my mind; first, it would allow the use of a perfectly standard engine, turning at its most efficient revs, and second, by choosing the right gear ratio, the boat could use standard commercial props. The contra-rotation idea should be retained, because this will eliminate a lot of the difficulties caused by torque reaction. As far as calculating the probable pitch and diameter of the props, this will depend on the engine used, and its power-output but, as a rule-of-thumb guess, I would reckon around 1:1.5 for the less powerful engines, going to maybe 1:2 for the bigger jobs.

Looking again at the photos, there would appear to be another possible source of vibration and that is the angle of the shaft compared to the angle of the gear box. While a coupling is used to compensate for any small angular misalignment, it should not be used to obtain this order of angle. It would have been better, in this case, to use a flexible shaft, which would avoid this difficulty and which would also mean a lesser power loss. I hope to try out a similar system in the near future, using the same basing principles, but with geared-up props and flexible shafts. I'll tell you all about that one, if and when I get around to it. Until then, remember that the winter season is for building, so get out the tools and get with it. □

FLIGHT OF THE BUMBLEBEE

from page 66/64

initial attempts at spinning the Bumblebee only resulted in spiraling. I consulted the *Course* and learned that a normal pre-requisite to spin entry is a near stall attitude. This is achieved by low throttle and gradually feeding up elevator. (The biggest surprise to me from studying the *Course* is the fact that throttle is used in many maneuvers. Up to now, the only times that I have used throttle in flight have been for landings and stall turns.) A little practice, and I was treated to the enthralling sight of the Bumblebee, with flashing yellow wings, a spiral plume of exhaust trailing, boring a hole through the sky in its earthward plunge. The hypnotic effect of a spinning model must be resisted at time of recovery. My spin recovery is text book with "hands off" followed by up elevator. The *Course* offers the following advice if your model should continue to spin after neutralizing the controls: "One thing to

to page 150

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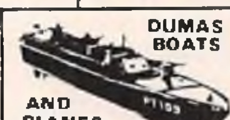

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[illegible]	47 25	37 80
[illegible]	57 95	46 36
[illegible]	20 95	16 76
[illegible]	19 95	15 96
P 51	57 95	46 36
[illegible]	59 95	47 90
[illegible]	39 95	31 96
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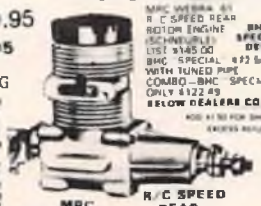

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from page 147/64

try is to open the engine to full throttle to get more air moving over the elevator. Then give down elevator to get your nose down. If this won't work, check your C.G. more carefully on your **new** plane."

Touch-and-go's are always a favorite. They help perfect spot landing techniques, contribute to a better understanding of the model, increase your confidence, and (besides all that) are just plain fun. I try to get some in at each flying session as field conditions permit. Early flights of the Bumblebee were plagued with an unreliable idle which interfered with touch-and-go's. Some improvement resulted from tinkering with the carburetor, but it wasn't until I resorted to muffler pressure (thanks to the suggestion of fellow RC'er, Jim Keck) that a reliable idle was achieved. Muffler pressure has the extra advantage of a more consistent engine run. A minor problem is a lack of warning as your gas tank approaches the empty level.

The Bumblebee behaves like a spirited thoroughbred during landings, responding best to a light hand on the reins. If you can set the proper heading coming out of the final approach turn, maintain a constant rate of descent by controlling your sink rate with a slight amount of up elevator, and flare at the proper time, you will be rewarded with a perfect landing. Meanwhile, passable landings can be made during those other times (about 50% for me). When you constantly correct for heading, your descent looks like a roller coaster ride, and your flare is about 10 feet too high because you think you may not make the field. My main landing problem is flaring about a foot too high. There are also those times when my flares are a foot low. Consumption of wooden propellers has substantially increased since I began advanced R/C stunt training.

After thirty flights and four hours flying time on the Bumblebee, I feel confident in my ability to domesticate the beast. I have mastered most of those remaining elementary aerobatics that were beyond the capabilities of previous models. An exception is the in-flight rudder required for slow and point rolls. I look forward to long and faithful service from the Bumblebee. The *Course* has been a valued aid in my learning process, and well worth the cost. I have also decided that precision aerobatics are not my thing. My satisfaction comes from performing recognizable maneuvers while retaining full control of the star performer. In the meantime, I will join Ken Willard, and consider myself as having achieved the rank of Advanced Sunday Flier.

to page 154

Coverite fabric vs. plastic film.

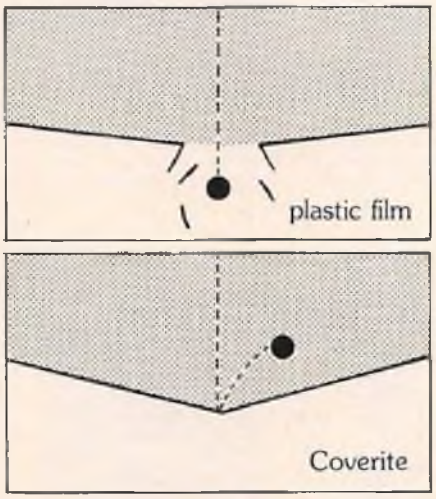
Study these facts about iron-ons. Then make your own conclusions.

W. Rijk of Amersfort, Holland says: "Can a newcomer believe your ads? After first using, then yes they know. These are my planes, all with Coverite."

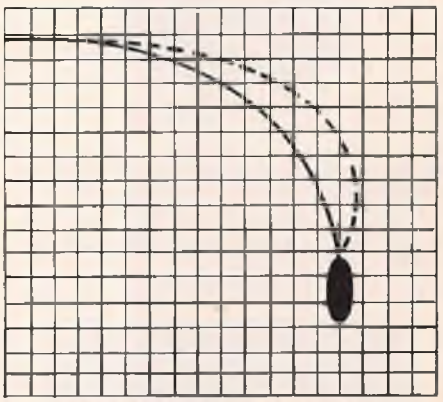
Middle age sag. Sometimes it doesn't even take that long for plastic film coverings to sag. Sorry, but it's the nature of the beast. Only one iron-on remains drum tight, month after month, in all kinds of weather. Only Coverite's 100% polyester fibres have the ability to shrink and stay shrunk permanently. Without warpage. Coverite stops shrinking when it meets ½ gram of resistance.

Who needs turbulation! Everyone needs turbulation, even a pylon racer. Aerodynamically the fabric texture of Coverite has superior handling characteristics. Unlike plastic films which are overly smooth, Coverite's texture allows for greater turbulation, hence better maneuverability. Gliders, for example, ride the thermals better with Coverite. That's about as pure a test as any. But don't take our word for it. Ask the guys who continually win NATS & INTERNATS why they use Coverite. Guys like Roth, Platt, Titus, Moucha, Weiss, Ellis, Peterson, Vandever, etc., etc., etc.

Ever have a crash? Why not buy an insurance policy? Crashes are inevitable (bite our tongues). But if the model was Coverited, chances are better than 50-50 the plane would survive; and with minor repairs, live to fly again. Not so with plastic films. They usually shatter. In many pieces. What's more, even normal landings cause plastic film to scratch, scuff, tear and puncture. That's a bitter pill to swallow after spending all those hours building and finishing a fine model. It's also unnecessary.



Coverite's tensile strength (far in excess of 25,000 PSI) helps models survive crashes.



Coverite fabric allows for tighter, better controlled patterns.

There's a lightweight Coverite for nearly every model: Silkspun Coverite looks like tissue, but is 10x stronger. It can be used as is (filler coat is built-in) or painted, requiring 1/3rd the paint. It's the most economical of all iron-ons. Super Coverite looks like silk, weighs the same when both are painted, but is 100x stronger. Like Silkspun it can be used as is, or painted. Being a woven fabric, it's very authentic. Permagloss Coverite looks like painted silk. It actually has 4 coats of special Permagloss paint on it, which is fuelproof, rotproof, fadeproof. It's 150x stronger than any other covering. Available in trim sheets, too. Camouflage Coverite looks like WWI German lozenge pattern. Made out of Super Coverite with Camouflage pattern silkscreened in 4 colors, just as it was done in the war. 1½" or 2" scale.

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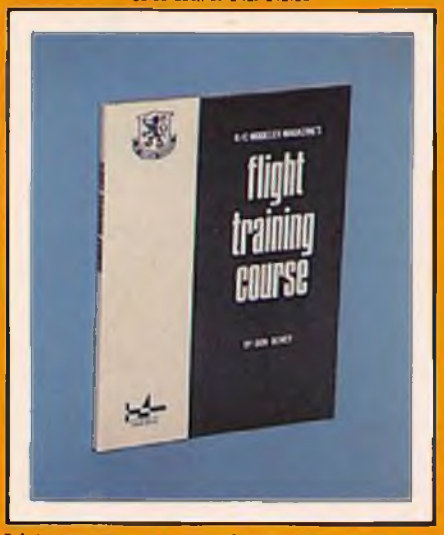

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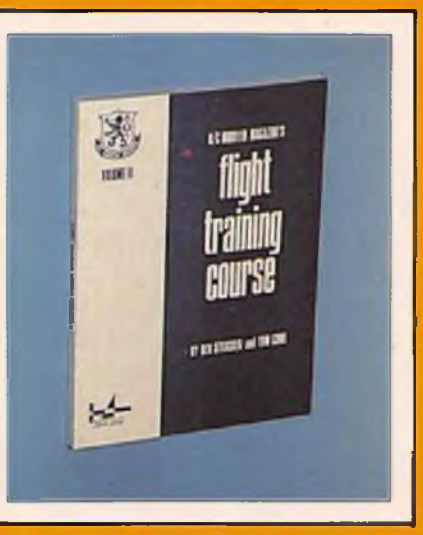

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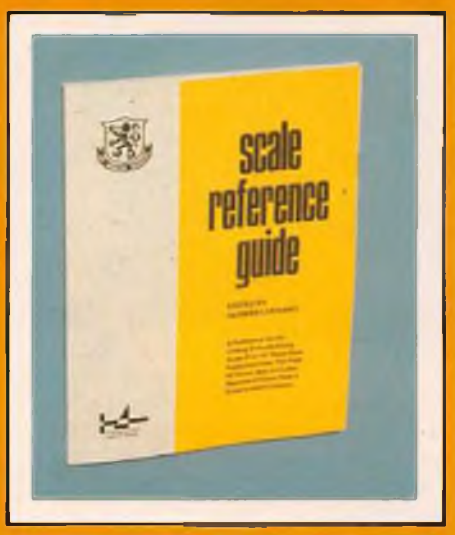

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FLIGHT OF THE BUMBLEBEE

from page 150/64

Epilogue

The sudden loss of elevator during Flight Number 34 almost caused an early end of the Bumblebee, and put my newly achieved advanced pilot rating to the test. Luck in the form of plenty of altitude, good advice from fellow flyers, and a stable aircraft enabled me to retain enough control using throttle and ailerons to make an emergency landing in some nearby weeds. Landing damage was a broken propeller and bent nose gear. Other damage was a broken left-half stabilizer bent up at a 20 degree angle and loosely held in place by the elevator and MonoKote covering. Pressure on the weakened stabilizer had broken the elevator pushrod (Gold 'N-Rod). The elevator was wedged in a slightly up position which was probably the Bumblebee's saving grace. □

MINI-STIK

from page 63

. . . . Barn, as the fuselage is built in a jig now. We just shimmed the engine mount for the correct right thrust and bent the nose gear so it was on the vertical axis of the fuselage. The following modifications were made as our choice, however, are not necessary. We removed the bottom sheeting to install the stab flush to the fuselage sides. The cap strips on the wing were glued at each end only. We re-glued them the full length of the ribs. On the wing, we also vented all wing ribs through to the servo box before covering. Only once have we had a wing blow up like a balloon when taken to a different altitude. By making a small hole in each rib and venting the inside of the wing to the outside air can someday save you from building a new wing. There was no tail skid indicated on the plans. A wire skid was fabricated to protect the bottom mounted stab. As stated before, Hobby Barn was informed of the problems we encountered, and they stated that the corrections have been made. It was otherwise a good kit (ARF) with good materials.

With a flat bottom wing and an O.S. Max .25 up front, we expected it to R.O.G. like a Jato and it did — minus only the cloud of smoke. Weighing only 3 lbs., 2 oz., half throttle is ample to pull out all of its capabilities (which are many). It is extremely stable under power and also in its flat steady glide, making landings a cinch for beginners and displaying varied flight capabilities for the intermediate student. Plenty of fun for the experienced flyer can also be obtained with this model. It would certainly fly well with a .19 size engine and we suspect it would also be quite manageable with a .15 around sea level. □

BOMB RELEASE MECHANISM

from page 61/56

unit. The units are now ready to be installed in the wing, but before doing so, you should make the bombs and thoroughly test the operation.

Bomb Design and Construction

There are four basic factors to consider when designing the bombs: size, shape, weight and balance. For our purposes the size is chosen to be in the proper relationship to the size of the model and the weight is kept light enough to avoid overloading the model with the full bomb load.

The shape of the bomb is determined by the prototype in the case of a scale model. The bomb should be aerodynamically designed to fall properly when released. Since the bombs are suspended from the wing in the moving air stream, good aerodynamic design will also minimize drag on the aircraft during flight.

The term "balance" is used here to indicate the relationship of the bombs' Center of Gravity to the attachment device. This relationship, as used in the bombs for my Ugly Stik, is shown in Figure 7, which shows the construction of the bombs. I used vacuum-formed plastic for the round nose of each bomb, but a rounded balsa block will do nicely. The bomb is made nose-heavy by pouring about a tablespoon of Hobbypoxy #2 into the end before adding the rear fins, and letting it harden in a nose-down position. This also serves to fill the vacuum-formed nose pieces which I used, protecting them from breaking when dropped.

Note the position of the bomb attachment in the drawing. This is the last part added when the bomb is made. A slot is cut in the side of the bomb with a Dremel Tool and the aluminum attachment plate is inserted. Slide the plate in the slot until the Center of Gravity is just behind the forward attachment notch. Be sure the plate is not set too deeply into the body of the bomb, as this will cause difficulty in both loading and dropping of the bombs.

Before epoxying these plates in place, it is important to know how they attach to the bomb release. Refer to Figure 8. After setting the slide mechanism on the release, bombs are loaded by inserting the forward corner of the attachment plate up into the bomb slot, hooking the notch over the brass slide. The rear of the bomb is then pushed upward until the rear notch in the attachment plate snaps over the piano wire at the back of the slot.

Depending on the size and shape of the bomb, the attachment plate must protrude far enough to permit inserting the bomb at this angle without hitting the bottom of the wing.

When the slide is moved to release the bomb, the forward notch of the attachment plate falls free in the slot. The

nose of the bomb rotates downward and the rear notch slips off the piano wire. Here again, the attachment plate must protrude far enough to allow the bomb to rotate free without hitting the rear fins against the bottom of the wing. Once you have determined the proper positioning, epoxy the bomb attachment plates in place. The bombs should now be painted, but do not paint the attachment plates.

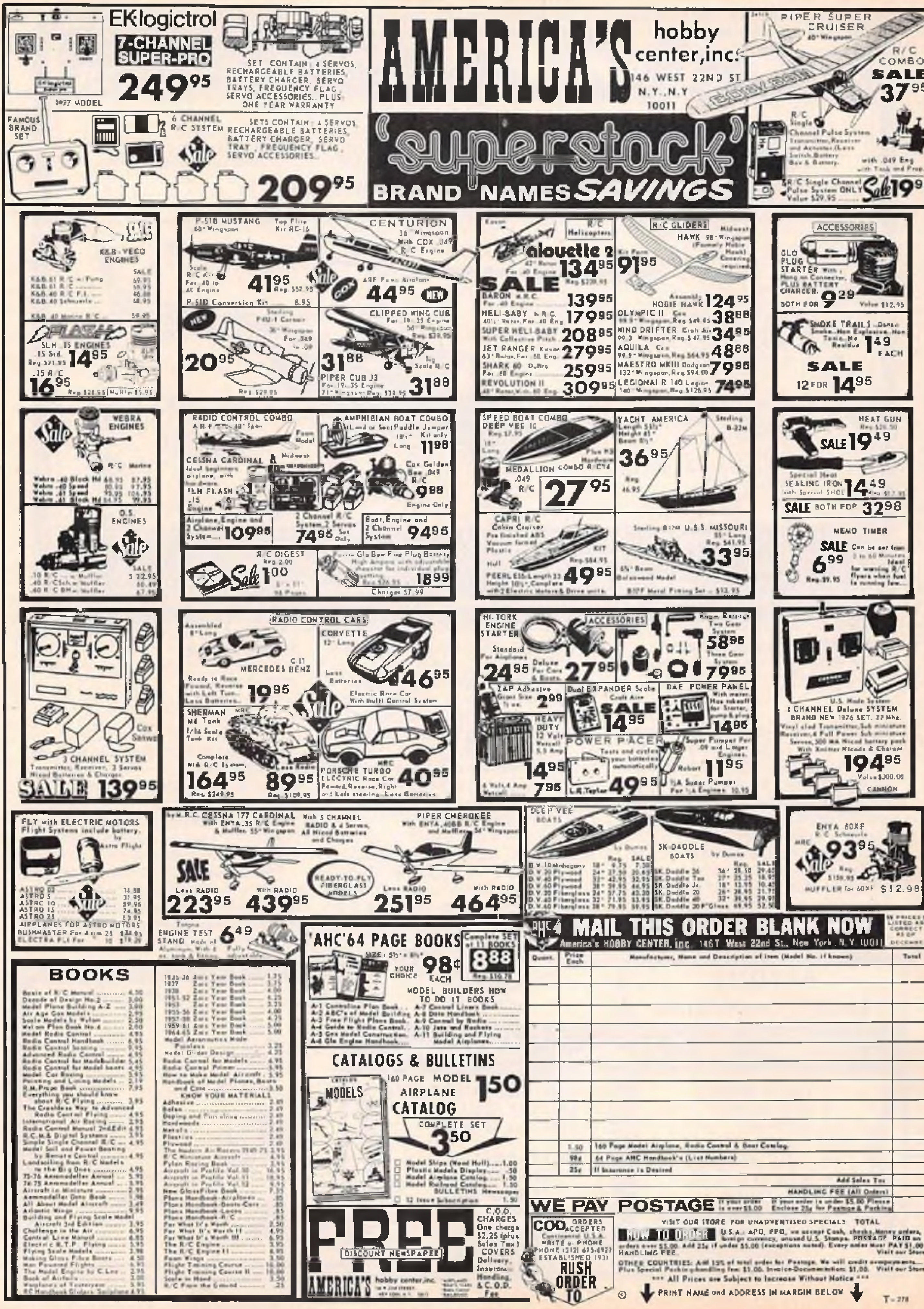
When the bombs are loaded into the release mechanism, they will hang down noticeably on their attachment plates and may wiggle slightly as the aircraft taxies on the ground. If this is objectionable to you, make a small foam rubber collar to go around each attachment plate. Glue to the **body** of the bomb but **not** to the plate, so it can compress slightly as the bomb is loaded. Be careful not to make it too large. Excessive pressure between the bomb and the bottom of the wing will increase the friction on the slide, requiring a stronger spring. Properly fitted collars will hold the bombs steady as well as improve the appearance of the attachment.

Don't worry about how these foam collars look when the bombs are released. You won't notice them when the bombs are falling and after they hit, the bombs are no longer scale anyway . . . they should have blown up!

Installation In Wing

Before installing the release units in the wings, be sure that the slides work freely and the escapement is adjusted properly. If you are using an open structure or built-up wing, any adjustments can be made easily after installation, if desired. If using a foam wing, cut away enough material to avoid interference with the action. If desired, you can cut all the way through the wing and install an inspection plate in the top surface. Recess the units into the lower surface of the wing in their proper position and glue in place. Route the 3/64" wires, attached to each slide block, through the center section of the wing. Pull back on the slide knob to set the mechanism for loading. Note the positions of the slide notches for each slot and move the slide on the second unit to the corresponding position. Cut the wires to length so that they overlap about 1" and wrap tightly with soft copper wire. Solder the copper-wrapped joint scurely. (Be sure this wire-joint is located to one side to permit adequate movement of the wire without interfering the the full operation of the slide.) Now, as the escapement shaft is cycled, both slides should move so as to open the bomb slots on alternate units. Check the operation by resetting and installing the bombs. Try one-at-a-time releases as well as salvo releases. Check for binding, poor spring tension, burrs on bomb attachments and erratic escapement action. Use of additional slide stops or guide blocks can be

to page 158



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BOMB RELEASE MECHANISM

from page 156/56

helpful in solving binding or snagging problems. A longer slide spring anchored further away from the slide block will solve any problems of tension variation. A little time spent now in correcting any sign of these problems, will result in reliable operation later.

The use of the piano wire to connect the two slides together permits operation by one escapement and servo, even where there is considerable dihedral in the wing. If you prefer, however, each unit can be built with its own escapement and both operated from a single servo. By simple modification of the notches in the slides, the number and sequence of bombs released can be set for any desired order during initial construction. Try to preserve the "salvo" feature, however. If you are ever caught over the trees dead stick, it is nice to be able to lighten the load quickly to stretch that glide to the field.

You will find this design to be quite adaptable to many models and wing configurations. The degree of flexibility achieved may even result in forcing some rule changes at your next Fun-Fly. □

SUPER TURKEY

from page 54/52

tive control and cannot expand and contract, causing trim changes. If you choose to go with the V-tail, these pushrods cannot be used. You will need to devise a workable linkage using one of the various V-tail mixing units now available from your hobby dealer.

Flying: Before that first big heave, check all surfaces for proper alignment and security; also check the C.G. location. If it is too far aft, add nose weight.

For testing purposes, it's safer for your model to be slightly nose heavy. This is especially true if you are flying off of a slope where you may need the ballast for penetration. If the winds are brisk, add ballast to the C.G. location. Keep in mind that adding ballast increases the wing loading. Doing high G maneuvers while the plane is heavily loaded could cause a wing failure to an unglassed wing.

A slope does provide excellent conditions for trimming a model like the Super Turkey. Providing the wind is up, you need not land until you have determined the model's ballast needs. And, if the approach is not to your liking, you can opt to go around and try it a second, third, and fourth time. Because of the large elevator and rudder, control response is immediate, allowing easy escape in the case of a balked landing.

Off the slope, the Super Turkey is a competitive thermal ship, if built light. One of its attributes is that it does not gain speed quickly when the nose is low. Because of this, it does not easily get ahead of you when thermaling. Good launches are attainable with both winch and Hi-Starts. Light back pressure while on tow will assure optimum height.

For an exercise in fun, not futility, build the Super Turkey and leave the computers to the people at IBM. □

SCANNER

from page 47

routine of stall turns, four-point rolls, knife edges, five-plane length tail-slides, etc. Going into a spin to lose altitude, he leveled out over the sand dunes to set up the first leg of his landing approach. About ten feet over the dunes, his plane did a perfect slow-roll. Now, those who saw it thought that was a little brave — even for Ken. Quickly picking his jaw off the ground, Ken landed and started

mumbling four-letter words and incoherent phrases. That last maneuver was done without Ken's moving the sticks. A quick check of the remaining transmitters showed that everyone was off, but a check of the scanner showed that someone was operating on Ken's frequency, but where was he? Picking up the scanner, they headed off for the racing pits, where, sure enough, they found the culprit. Here was a young man operating an electric car, oblivious to the trouble he had caused. The group approached him and explained, as calmly as possible, the gravity of the situation. Obviously not giving a rat's patooty, he made a comment about their having the wrong kind of liquid refreshments at the field. Luckily for him, the Smasher (named for the unique way he stops runaway planes in the pits) wasn't along or else his model Porsche might have been quickly chopped and lowered. On that note, the group went back across the runway and went home.

Was the scanner worth buying even though we have no use for it other than monitoring our every weekend flying? The answer should be a big YES. The scanner would not have stopped Ken's plane from crashing, but had it crashed and hurt someone or damaged somebody's property because of outside interference, then the finger could be pointed in the right direction. Also, it probably saved Ken's radio an unnecessary trip to the repair shop.

In conclusion, if your club has some extra money burning a hole in its pocket, you might consider buying a scanner. The liability suit you avoid could be against you. □

ANSER

from page 45

. . . . not recommending that modification be done; it was just a thought that, if we ever damage the wing and have to build a new one, we may try it.

The flight performance on the Anser was most rewarding. After a few flights on the heavy duty hi-start, we went to the standard hi-start and found that the results were more satisfactory. Although the Anser is a little quick when launched, the wings have minimum flexing and the climb out is straight and high. We found the Anser to have good penetration when balanced as shown on the plans, and its flying speed is on the fast side. One must maintain flying speed for good thermal turns. When flown on the slope, a little weight was added at the C.G. which helped penetration. In general, this little beauty loves to fly fast, so let it go.

We feel it is a good buy at $29.95 and should be a good sailplane to get the beginner and novice flyer into the air. □

from page 42/40

The pine spacers in the wings should allow the bolts to be tightened firmly without crushing the wings. Apply Hot Stuff to the balsa around the holes in the wings to make the surface harder (remove the bolts first).

The entire airplane can now be covered with Super MonoKote or your favorite covering material. I would suggest that the trim on the top of the airplane be different from the bottom for better visual reference in the sky.

Prepare and install the 8-oz. fuel tank so that the brass fuel lines pass through the firewall. The fuel tank can be positioned by gluing in balsa supports or it can just be supported with foam rubber as I do. Epoxy the two pine or hardwood servo rails across the fuselage with the rear rail up against the rear bulkhead then install the three servos, using the servo trays designed for your radio. Use 1/16" wire pushrods with Du-Bro TC-25 threaded couplers soldered onto the servo ends and threaded Kwik Link clevises to attach to the servos so that both the nosegear steering and throttle can be adjusted for throw. When installing the wire pushrods, slip scraps of NyRod over the wire to keep it from binding up in the foam packing. Make the 1/4" square balsa pushrods for the rudder and stabilizer using the plan as reference. The wire ends are bound to the wood shafts with thread and glue. Note that there are short 90° bends in the ends of the wire sticking into the wood shafts.

The aileron servo is mounted in the lower wing and connected to the aileron linkage by Kwik Links to Du-Bro #103 aileron horn set connectors. The upper and lower ailerons are connected to each other on each side about 2" from the sides of the fuselage. Small plywood tabs are epoxied onto each aileron and drilled with a 1/16" drill, or standard short control horns could be used. The two ailerons are then connected by an adjustable rod and clevis with a soldered clevis on the other end. The lower ailerons are then adjusted at the servo so that they are straight with the trailing edge. With both wings in place, the connecting links are then adjusted until the upper ailerons are even with the trailing edge. Check the ailerons at the tips as they all should be straight with the airfoil. With four ailerons and the short span, it does not take much movement of the ailerons for roll. 1/8"-3/16" in each direction for the ailerons should be sufficient. The rate can be adjusted by moving the #103 connectors up or down on the aileron linkage arms or by using different output holes on the servo. The elevator should move 1/2"-3/4" in each direction and the rudder should have maximum throw.

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(All engines have ball bearings and come with muffler.)

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CHARGE IT!

DOUBLE TROUBLE

from page 161/40

Double Trouble has been a real pleasure for me and it is still flying after two years of Sunday flying, having survived numerous mishaps like running out of fuel and hitting a fence and other thumb-induced encounters with the ground. I hope you will enjoy your Double Trouble also. □

SUNNY

from page 39

..... ripping out the bottom of the fuselage. The nose block has been sawed at an angle so that when the engine mounting rails are epoxied in place the engine will have the correct downthrust.

The accuracy of the fuselage components was so good that only very light sanding was necessary to align the wings and tail.

After installing the Cox radio and servos, and the O.S. Max .15 engine, our prototype was tail heavy. We moved our flat battery pack into the tank compartment and placed 3 ounces of lead in a cavity under the engine. We covered the cavity with heavy paper and coated it

with epoxy to prevent fuel seepage. Our prototype met the design ready to fly weight of 56 oz.

The first 2 flights were hand launched so the trim could be set. Elevator was very sensitive so the pushrod clevis was moved to the outer hole in the control horn. The rudder was set for maximum throw. At this time, we were ready for the "take-off" on a grass field. The lift-off was very quick and the pilot has to be alert to keep the nose down. It will lift-off before sufficient flying speed is obtained. Using the specified downthrust on the engine that the plans call for, it still wants to climb. It has tremendous lift for its size and power. The rudder area limits the roll rate and we couldn't snap roll it. It will fly inverted and, when brought into a stall attitude, the left wing will stall first and drop. If the engine is throttled back, or if the tank runs dry, the Sunny will soar with a flat glide which gives you ample time to set up for landing. As an experiment, we added 3 sq. in. to the rudder area. This enabled us to do tighter turns, rolls and snap rolls. We do not recommend this modification. It was done simply to see what the snap roll capabilities were on this little bipe. This modification made the rudder extremely sensitive. Some of our landings were very rough, however, the Sunny came through very well. It has a strong airframe and wing structure.

All of our flight testing was performed using K & B 500 fuel and a Taipan prop. The Sunny is a nice little bipe and a good buy at $32.95 that will provide a lot of enjoyment. □

CERVIA

from page 38

. . . . 2 channel set to operate the rudder.

Retail price for the Cervia boat kit, including all the fittings, is $90.00. Hobby Shack's price is $59.99. The OE1 steam engine and OB1 boiler list at $36.95 — Hobby Shack is $27.99. Hobby Shack offers a special combination package of the Cervia kit and steam set for $79.99.

Think about it - - - you may enjoy a go with a steam boat as much as we did. Also, there are a lot of projects that might be fun with steam power. □

HITACHI DESERT CLASSIC

from page 36

(Can you imagine 100 ladies spraying perfume in a small room?)

Outside of a tremendous steak dinner, the highlight of the banquet came when over $3,000.00 in gifts were given out to the contestants. A special word of thanks to A & L, K & B, and Pactra, for donating the silver platter awards. Following the banquet, the majority of people adjourned to the club room where they continued the party.

Sunday morning the 5th round started at 7:00 and by 2:00 the last flyer had landed, completing 6 rounds for the 93 contestants.

While the scores were being tabulated, Chip Hyde of Yuma, Arizona, put on a super demonstration flight flying a Dirty Birdy. Chip made one of the nicest take-offs and landings that anyone has ever seen. The reason that Chip's flight is so outstanding is that Chip is only 5 years old.

Following Chip's flight, Joe Hildreth, the Assistant C.D., was putting on a demo flight when LaNeal Russ grabbed his transmitter and proceeded to show everyone how easy this flying really is. After a few super low passes, a few loops with snaps, it was evident she was only part of the show and that Otto Dieffenbach was actually flying the plane.

Curt Sidles of the Hitachi Sales Corporation presented color televisions, microwave ovens, or AC-DC black and white television sets to the top three flyers in Novice, Advanced, Expert, Masters and Sport Scale. Sterling silver platters ranging from 8" to 16" were presented to the first five places in each class.

The 1977 Hitachi Desert Classic winners were as follows:

NOVICE

1. Tom Purkiss
2. Jim Zahorik
3. Dave Wilson
4. Larry Perkings
5. Rick Anderson

EXPERT

1. Ken Hirose
2. Bill Simpson
3. Geoff Nelson
4. Rusty Van Baren
5. Curt Oberg

ADVANCED

1. Marty Wittenberg
2. Frank Morris
3. John Lockwood
4. Tony Lopez
5. Dave Shadel

MASTERS

1. Jim Oddino
2. Bill Salkowski
3. Phil Kraft
4. Jim Kimbro
5. Bruno Giezendanner

to page 170

HITACHI DESERT CLASSIC

from page 169/36

SPORT SCALE

1. Don Lien
2. Ron Gilman
3. John Lockwood
4. Col. Robert Thacker
5. James Bronowski

★

ABOUT HITACHI

Hitachi Ltd., sponsors of this Desert Classic, is Japan's major high technology manufacturer, and is the third largest industrial corporation in Japan and the 18th largest outside the United States.

As a multi-national company with manufacturing operations in many parts of the world, their current annual sales are over $6 billion.

Hitachi Sales Corporation, the home electronics division of Hitachi Ltd., manufactures and markets consumer electronic products and appliances throughout the world. In the field of television, it was Hitachi engineers who were responsible for developing the very first 100% solid state TV set as well as one-button tuning. In the U.S., a complete line of Hitachi black & white and color TV's are marketed by Hitachi Sales Corporation of America, the U.S. subsidiary of Hitachi Sales Corporation. □

from page 33/32

cal fin, cover only one side until the T-tail and control linkage is hooked up.

In modifying the tank tubes, there is an extremely sharp bend required to stay inside of the cowling. It may be necessary to replace the original tubing with a softer brass or aluminum tubing. Be sure not to pinch the tubing as to restrict the fuel flow.

Finishing is, naturally, the builder's choice. I did design the airplane to give minimum glue joint exposure so finishing resin would be practical. This model has small fillets everywhere, around the floats, engine strut, T-tail and wing. Microballoon fillets are small, lightweight, and easy to make. Be sure and use a bead of silicone around the wing saddle to make the wing mount watertight.

The windshield is simple and, with a little time and a piece of light cardboard, a pattern can be made. The aluminum frame is made from a piece of 3/32" tubing. File one side flat until the tube is split. Then slip it over a piece of light metal and flatten it. It will then slip right over the windshield. Leave about 1/4" on each end and embed them in the fuselage to add strength to the installation.

The full size prototype was bought by the Navy and makes a very attractive model. However, there are several others around so color isn't a problem. The most serious problem I have encountered is resisting the temptation to build a full size Air Skimmer!

When flying, you will find it very responsive to control, so start off carefully. The airplane has very large control surfaces and it reacts accordingly. I use an 8/6 Tornado pusher prop and Missle Mist fuel in my Tigre. Trim the gear so the airplane rolls straight under power at first. Then the rudder will handle it. On take-off, feed the power in slowly and fly it off easily. The airplane rotates freely and has a tendency to come off at low airspeeds which means I stall it frequently! Don't hurry the take-off.

On this type of pusher design, caution should be taken on running the engine in the stationary position for any length of time. Keep it to a minimum, especially at full throttle. There is not sufficient cooling unless the aircraft is flying.

My inexperience dictates that I not tell most of you more, for I'm not certain I can distinguish my own inadequacies. I cannot honestly recommend it as a beginner's plane, but can't imagine a better second airplane. It flies more like a Quarter Midget than a trainer. The power loadings and weights are very comparable. Mine weighed 2 lbs., 15 ozs. before it was flown. The airplane is small enough to throw in with the fishing tackle or vacation gear and enough fun that you won't leave it home. □

RACING AT RANDOM

from page 30

than 8 ozs. if the builder is weight conscious.

To see exactly what weights were necessary, I got out my scale and started weighing engines, radios and other parts to see what the fixed weights of components were.

Engine	7 oz.
Accessories	7 oz.
Radio	10 oz.
Fixed Weight	24 oz.
Airplane	16 oz.
Total 2½ lbs.	40 oz.

The accessories include all additional components to get the airplane in the air. This includes the fuel tank, motor mount, screws, pushrods, control horns, foam padding, spinner, prop, exhaust extractor, wheels, and landing gear. To this, add another ounce if wheel pants are used. As you can see, after all of the components are added up, there are only 16 ozs. left for the airplane and I already decided that 8 ozs. would be necessary for the wing which also leaves only 8 ozs. for the finished fuselage and tail. This is really difficult because the lightest epoxy glass fuselages weigh 4½ ozs. and some weigh as much as 6 ozs. I would expect most finished fuselages to weigh 9-10 ozs., which is not bad. The result here is that we must be very careful about adding anything that adds weight during construction. Finish must be minimal. Sand all wood parts first with #220 paper followed by #400 paper. Apply only one coat of primer and, when dry, sand with #220 and again follow with #400. Apply one thin spray coat of Super Poxy or Hobbypoxy sprayed for color and then quit. Additional trim can be applied with DJ Trim or MonoKote trim.

A 9 oz. wing on a 9 oz. fuselage should weigh out not more than 2 ozs. over the 2½ lb. minimum and, if an ounce can be saved by careful accessory selection or lightening and possibly another ounce in radio equipment, the magic weight can be achieved.

Light weight is helpful, but it is not everything. In fact, I would guess that most of the really competitive Quarter Midgets weigh closer to 2¾ lbs. and that engines and flying ability will more than compensate for a couple of ounces of weight. However, I would consider anything over 3 lbs. to be too heavy, in spite of the fact that many 3-pounders really move. The heavier racers suffer in the turns and in the first lap drag race. □

NORTH AMERICAN YAT-28E

from page 27

..lesser extent, plan details. Several parts were poorly identified on the plans and unmarked in the kit. With the numerous parts included in this kit, proper identification can be a problem. The instruction manual needed extensive rewriting - - - some important steps were missing and others are somewhat vague, requiring the builder to read "between the lines". We are pleased to report that Tri R has completely rewritten the instruction manual and resolved problems of parts identification. We have reviewed these changes and feel that the new instruction booklet meets the highest standards of clarity and completeness.

In recent years, the trend in scale and sport scale has tended to be directed toward flyability. The day of the flying "dog" in scale is (hopefully) past. The YAT-28E fits such a criterion with ease. It is light, big, not too fast, and has tricycle landing gear to boot. It has no ugly characteristics on either take-off or landing and will require very little trim or balance adjustment. It's a scale model that can serve equally well as a sport flyer. □

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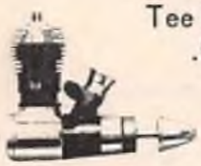

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9	4,5,6,7	5.62	1.04
10	4,5,6,7	5.99	1.12
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from page 28

Spoiler/flap assembly available from Wanitschek. Unit in foreground has flap in fully deployed position. Unit in rear fully collapsed.

Statistics of the unit are: length, 13¾"; width of body, 7/16"; width of lip, 13/16"; weight, 1 oz.; closed height, 13/16"; open (fully deployed), 1¾"; force needed to open unit to full deployment, 5 ozs.; travel of control point for full deployment, 5/8".

When the spoiler is fully deployed, there is a 5/16" air gap between the bottom of the spoiler and the top of the wing. As the spoilers are being pulled up, it opens with an arc motion so that when the spoiler is fully open, the arc length is 1¼". The unit is precision made from molded fiberglass material, white outer case and red color center section.

Instructions supplied are in German, but the pictorial diagrams are completely self-explanatory. Being a spring return devise, they can be used as flaps on the bottom side or spoilers on the wing top surface. They work very smoothly, no hang-ups at pivot points; control cable or dial cord is attached through access hole in the end of the unit.

If interested, write Pete Bechtel, c/o Windspiel Models, Rt. 3, Box 457, Coeur d'Alene, Idaho 83814.

★

The building season is in full swing now and the 1978 contest calender just around the corner. This leads me into my next comments aimed toward C.D.'s and contest coordinators. I attended many fine contests last year, met a lot of fine people, made new friends, saw many new ideas, and had a great time with my son and our sailplanes. What ticked off most of the pilots and spectators were the delays in starting contests on time. Most of the delays were caused by a very few, or select group of pilots who arrive after registration is supposed to be closed. Naturally, these people are signed up with very little expediency and much visiting. This action is not really fair to the pilots who did register on time and were ready to do their thing at the announced and planned starting time. The aforementioned pilots are always the majority; why

to page 176

TOLEDO

TWENTY-FOURTH ANNUAL RADIO CONTROL EXPOSITION

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The 1978 edition of the world's greatest radio control exposition promises to be better than ever. Plan now to attend and bring your latest completely finished model to display and enter the competition for awards. See and meet the leading radio control manufacturers and personalities. This years exposition features complete refreshment centers with excellent food and fast service, the Saturday Night Auction, one of the world's largest Swap Shops and we've eliminated the parking charge...FREE PARKING. During the course of the exposition complete r/c systems, engines, radios and accessories will be raffled off. So, come, join us and enjoy yourselves at, unquestionably, the world's greatest radio control show. We're open to the public for all three great days.

APRIL 7, 8 & 9, 1978

Friday	9 am to 6 pm
Saturday	9 am to 6 pm
Sunday	9 am to 3:30 pm

WEAK SIGNALS R/C CLUB
p.o. box 5772, toledo, ohio 43613

SOARING

from page 174/28

should this group be penalized by a few?

When a registration time is set to close, it should close, stop, desist. Anybody after that becomes a spectator or helps run the contest. Sure, emergencies do arise and a pre-arrangement time conflict can be worked out with the C.D. - - - but give the flyer who arrived on time the courtesy of being able to fly and finish the assigned tasks of the contest before the mad hustle prior to darkness.

Another very vital point is the importance of the pilot's meeting. Discuss the points that need discussing and the rules and regulations of that particular field. If at all possible, publish the assigned tasks prior to the contest date; this will considerably cut down any misunderstanding about the tasks. And, by all means, inform contestants how the contest is going to be scored: individual or teams.

Good Lift. □

RADIO SPECTRUM

from page 25/22

You've done a lot to bring RC electronics out of the closet for us average types.

R/C MODELER MAGAZINE'S
MODEL OF THE MONTH CONTEST

The Model of the Month Award Program is designed to encourage the sport and novice competition flier to submit details of his most recent kit or scratch-built model to RCM in order to encourage general model craftsmanship and the overall promotion of R/C flying.

Each month Dremel will award a 371 Variable Speed Moto-Tool as illustrated in the photograph. The second and third place winners each month will receive a one year subscription to R/C Modeler Magazine or, if they are a subscriber, an extension of their current subscription. If you would like further information concerning the winning models, write to us giving us the winner's name and what month he won, and we will forward your letter on to the winner.

FEBRUARY 1978

1ST PLACE
Mario Sali
Mississauga, Ont. Canada

Stand-Off Scale Messerschmitt Bf 109E of 1/JG27, made from a drawing by Brian Taylor. Wingspan: 63", Length: 54", Weight: 8½ lbs., Radio: Kraft 7-ch. Series 76, Power: Super Tigre .60. The model was modified with the addition of flaps & landing gears (Goldberg), and the complete construction of the cockpit obtained through research from various books.

2ND PLACE
Ross N. Pierce
Huntington Beach, California

Scratch-built Stand-Off Scale model of a Great Lakes 2T1A built from Model Airplane News plans. Wingspan: 48", Length: 40½", Weight: 6½ lbs. Power: O.S. .60 Blackhead, Radio: Kraft KP7C. The model is covered with Coverite silkspan and painted with K & B Super Poxy.

3RD PLACE
Tony Shortell
Middlesex, England

Scratch-built model of what could have been a "Super Hannibal" HP 43 (Handley Page). Wingspan: 69½". Powered by six (6) O.S. Max .15 engines, each engine supplied from its own 2 oz. fuel tank. The model is finished in K & B Epoxy satin finish aluminum paint.

I'd like to ask you to go back to some basics other than those you've already covered. My problem is with that technical terminology that is unique to RC. Most of us are familiar with transistors and resistors, etc., but I have never seen a text or an article that goes into such nitty-gritty as what is a Deans versus Mitcom connector. I like to do my own building (I currently have a Heath 1057), but can't find sources for the small stuff and don't know what to ask for when I do. Can you give us some advice, either in the form of an article or some references?

Also, I have a situation with my Heath (1057 series) where I must unplug my battery every time that I want to recharge. I've seen advertisements for systems which have a charging jack on the exterior of the model. Could you print a schematic or article on how to construct such a set-up?

Thank you for your attention

Sincerely,
Eric Miller
Governors Island, New York

As far as I'm concerned, the charging jack is a must, not only for charging, but also for testing your batteries at the field. If you must take the wing off and unplug to gain access to the battery, you won't test and, sooner or later, you'll fly one too

---

many. With the jack, there is no excuse not to test and recharge if necessary. What you need then is leads that go directly to the battery. These are usually connected to the back contacts on a two pole-double throw switch. A four pole-double throw is often used to add redundancy, as shown in Figure 4.

The switch is shown in the "off" position, which connects the jack to the battery and disconnects the receiver. I made random pin assignments, so make sure yours is compatible with your system. A slide switch is recommended for this application because of its self-cleaning properties. The white wire can be eliminated in a three wire servo system.

As far as learning the RC jargon, keep reading RCM and asking questions. When you're as old as I am, you can start answering the questions. □

SUNDAY FLIER

from page 18/15

my father, "Chet" Willard, crashed on his 3rd solo flight on March 4, 1919!

I asked Ed Manulkin by mail how come they selected that particular number for their kit.

Ed replied, "It was the long arm of coincidence."

But throughout the United States, every one of you modelers who have built a Sterling Jenny model and put thereon the serial number of the Air Service Mechanics School Curtiss Jenny No. 2805 have unknowingly created a model of the aircraft which was assigned to the father of your old Chief Sunday Flier on the day that he crashed on his 33rd birthday.

I have just completed my own Sterling scale model of that aircraft, with Cannon Super-Mini radio control for it, and I flew it at the World War I Jamboree at the Hill Country Air Museum at Morgan Hill in September 1977, in memory of, and in dedication to, my father, "Chet" Willard, who flew the original 2805 on its last flight in 1919.

For those of you who are interested in the construction details:

I took a standard Sterling kit and built it according to the plans, and then modified it. The modifications consist of adding 1/64" plywood to the sides of the fuselage forward from the rear cockpit to the front end; making the lower wing and the landing gear removable and attached to the fuselage with rubber bands; cutting away the stringers and formers forward from the rear cockpit up to the radiator on the top and replacing that structure with a block balsa structure to which the upper wing is attached with a cabane structure of 1/16" wire.

to page 180

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MASTERCHARGE BANKAMERICARD

SUNDAY FLIER

from page 178/15

Balsa fairings have been added to give the cabane structure appearance of the Jenny.

The wing struts are permanently attached to the upper wing and when the upper wing, together with the cockpit and hatch cover, is attached to the fuselage, the wing struts fit into wells on the lower wings. Rubberized bead stringing material was used with silver covering to simulate the fine landing wires, rigging was developed. With these relatively minor modifications, it was possible to put a Cannon Super-Mini block, plus an additional Super-Mini Servo for engine control, and a 100ma battery pack, in the fuselage. The model, with a Cox Baby Bee engine up forward, and with an exhaust constrictor for motor control, results in a flying scale version of the Curtiss Jenny which weighs-in at approximately 13 ounces, complete with radio. It is capable of flights approximately 4 minutes long at a slightly reduced throttle setting. For Stand-Off Scale, it is an excellent model, since the requirement is that you can't get any closer than 10' to it. From 10', you can see the rigging; you can see the radiator with the radiator

cap; you can see the fuel tank cap, fuel gauge, the OX-5 engine, and the cooling louvres. All the rigging appears to be scale. In the cockpit, you can see the instrument panels and the control wires are there, going back to the control surfaces, in simulation of the full-scale control wires.

All in all, it makes a very effective 1/2A Stand-Off Scale model and will stand-up well in any Stand-Off Scale competition. My father would have loved, Ed Manulkin would have loved it, and so will all you Sunday Fliers.

ENGINE CLINIC

from page 14/10

can locate one of these in a hobby shop, it should help. If not, I do have them available for 50¢, plus a self-addressed stamped envelope. See my ad in Reader's Exchange for the mailing address.

As far as the Perry carburetor — is it any big deal to stretch the spring? This usually stops any problem with vibration causing the needle to change settings or back out. This will not happen unless the

to page 183

COMING SOON FROM THE PUBLISHERS OF RCM:

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If you're a tropical fish hobbyist, or have a friend who is a freshwater or marine aquarist, you won't want to miss this brand-new and unique monthly magazine from RCM Publications. Written by aquarists for aquarists, Freshwater And Marine Aquarium Magazine is a how-to publication geared to the beginning, intermediate, and advanced hobbyist. Loaded with specific, step-by-step "how-to" material, and pages of full color photography, this magazine will also present new product information as those products are released; product tests, and specific information on how to use these products properly in a successful freshwater or marine environment. Freshwater And Marine Aquarium Magazine is intended to be totally unique as a continual dialogue between aquarium hobbyists on all levels - - - a totally objective publication open to wide and varied opinions on every facet of aquariology. It is dedicated to promoting tropical and marine fish keeping as an enjoyable and rewarding hobby for the entire family.

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ENGINE CLINIC

from page 181/10

vibration level is higher than it should be. Be sure you are balancing your props and spinner if one is used. An out of balance spinner or one that does not track true will not only cause the needle valve to back out but tear up servos as well. A lot of unexplained crashes have been caused by nothing more than an out of balance spinner — the vibration usually getting to the aileron servo, which generally is more solidly mounted (on its side rather than upright).

A click type ratchet on the Perry carburetor would be a desirable feature, but the design of the carburetor makes this a problem. The needle rotates as you close the barrel. Any type of ratchet mounted to the body or idle mixture disc would keep the needle from moving with the barrel changing the mixture setting. This could be compensated for, but no really good bullet-proof method of mounting a ratchet has been worked out.

Dear Mr. Lee,

Several years ago, I bought two O.S. Max .29 control-line engines. Since I fly R/C now, I'd like to put on throttles. I cut the venturi down on one, mounted a throttle and got fair results, even though I didn't have a muffler or restrictor on the engine. What I'd like to know is: will a control-line engine convert to R/C use, in the manner I used, with any reliability? If so, what would be a good carb for a .29 and will the O.S. 30 muffler fit the older .29?

Second, I have a 6-year old K & B .45 (with about 2 hours on it) that backfires and runs backward with a bit too much prime on a cold start. When it fires backwards, it spins the nut, washers and prop completely off. What causes this and can it be cured?

Any help you could give me would be greatly appreciated.

Sincerely,
Arthur W. Strong

This is a question that I have answered many times in past columns, but I average three or four letters every month asking the same thing. Many times I do have to repeat letters of this type due to new readers who cannot be expected to have read all of the past columns. So, the old time readers will have to bear with us when occasionally I do run letters that are similar, or the same, as ones used in the past.

Just about any of your old U-control engines can be converted to R/C use as long as they were intended for sport or stunt use. Engines intended for combat or racing events do not work out well.

Perry, Tarno, and Kavan all make replacement carburetors that can be adapted. I am not sure of the venturi size

on the O.S. Max .29, but I imagine a carburetor intended for the O.S. Max .30 would fit. The same thing pertains to the muffler. I do not know if the O.S. Max .30 muffler will fit or not, as I do not have an O.S. Max .29 to check. I would imagine they are the same. You will have to find a local hobby shop that stocks the O.S. line and check this for yourself.

Kicking and running backwards are characteristics of any engine that is flooded or over-primed. These are compression ignition engines. If you get too much fuel in the combustion chamber, it raises the compression ratio. As you turn the engine over, it fires before the piston is anywhere near top center and the engine takes off backwards. This is quite common with the 1/2A engines and larger high performance engines. Many fellows start their engines by intentionally flipping them backwards so that they fire and start running forwards. However, in the case of your K & B .45, it's just a matter of improving your starting technique. You probably have a low starting battery that requires the over-priming to get the engine running. Try a fresh battery and less choking and priming. □

CUNNINGHAM ON R/C

from page 7/6

batteries, etc., until it is about 2" from the throttle servo. Next, make a pushrod from .045 music wire (about the size used for U-control lead-out wires) and a piece of 2/56 bolt, about 1" long. Solder the bolt to the wire by overlapping the wire and bolt by 1/2"; wrap a few turns of soft wire around it, and solder. Do this on the work bench. When it is cool, thread a plastic clevis onto the threaded portion of the bolt, and then slip the push wire into the plastic tube from the firewall side. Connect the other end to the throttle servo with either an S bend or, better yet, by using a Du-Bro E-Z Connector. You know the little fastener that slips into the servo arm and then you slide a piece of wire through it and then clamp it down with a set screw. By using the lighter wire, you make it easy to slide into the plastic tube and allow it to kind of bend or wrap around the foam packing; best of all, the wire will flex if your servo arm moves farther than the throttle arm can move. If you use a piece of 1/16" wire for a throttle pushrod, then, rather than flex if the movement is too great, the servo will stall, causing a large battery drain and shortened life for the servo.

It's a pretty good idea to look at all of the hardware displayed at the hobby shop, because a lot of thought has gone into creating these gadgets, and many of them will solve a lot of problems. If you take care of your radio and battery, then they will take care of you, flight after flight after flight. □

from page 2

model and cleared the plane from the street.

Both witnesses, who had been following the whole flight, confirmed that the landing was performed within the boundary of the community of Airolo and, gave their congratulations to the crew for their successful operation.

The elapsed time for the non-stop flight was exactly 52 minutes. Half of the fuel was used. A big goal, long dreamed for, happily ended in a complete success. For the whole team, this exciting experience will remain long in their memories.

Last, but not least, our thanks to the Police Department and the Tourism Office of the community of Andermatt for their understanding and cooperation.

•

The author of the "Super Libelle" Autogyro that appeared in our November 1977 issue has been hard at it again. We received a letter from him giving us information on his latest creation. We felt this would be of interest to many of our readers so, in turn, we have included a portion of his letter as follows:

Dear Dick:

I tried to modify the Super Libelle and now my autogyro is powered by two electric motors and flies! I think this is the first time an electric powered autogyro showed real flights.

The main dimensions are the same as the Super Libelle; I tried only to save as much weight as possible and built very light rotors (without a separation mechanism) and a light fuselage. As it is shown in the picture, two Mabuchi Motors are located at the ends of an engine-bearer, driving 7" x 4" nylon props. The battery is of 10 NiCd-Cells 1.2 Ah and both motors are supplied by this one battery to save the weight of the second battery. Therefore, a very high current is going out of the battery and only flight times of 2 minutes are performed. The weight of this electric version is 1630g instead of 1450g of the original Super Libelle, but the flight characteristic is nearly the same. In the future, I will try to improve the flight time by some modifications of the electric motor and the battery.

Sincerely,
Helmut Meyer
West Germany

□

RCM PRODUCTS

RCM WING JIG II — PRICE: $34.50

The original RCM Wing Jig, first published in the August 1967 issue of this magazine made it possible for many modelers to build their airplane wings warp-free and in far less time than it had previously taken. The RCM Wing Jig II offers many design improvements on the original version that greatly extends both its versatility and the accuracy of the wings produced. It is now used exclusively in the RCM shop for all building projects.

Since the accuracy of the jig depends almost completely on precise fabrication and fit of the parts, RCM has made arrangements to have a limited quantity of these Wing Jigs manufactured which are now available through the RCM Product Division.

The RCM Wing Jig II consists of two sections hinged in the middle. Each section consists of a front and back "L" shaped base piece. A jig rod support is located at either end of each wing jig section to mount the rods that support the wing ribs.

The switch to a double length jig that's hinged in the middle makes it possible to build an entire wing, complete with the dihedral called for in the plans, in one operation. Or, the Wing Jig II can be set up flat to use both sections to build up a wing panel for one of those big powered or glider jobs. Or, with the dihedral set, a polyhedral wing can be accurately built. It can even be used to join foam wing halves to get the dihedral as it should be.

A uniquely designed rod end support makes it possible to true the wing jig rods to order. A simple protractor device makes it possible to set the dihedral even when it is given in degrees. The addition of adjustable end legs make it possible to set the dihedral accurately for each wing panel. New "L" shaped base pieces assure a warp free jig to start with. A yardstick attached to the front of the base pieces helps in spacing the ribs when the wing is set up on the jig. A bubble leveling arrangement assures both wing panels will be true to each other. A new design rod support makes it possible to move the two wing jig rods from as close as you'd want them to 6½" apart. And, a new technique makes it possible to build those small cord wings with ribs too narrow for two wing jig rod holes.

To use the Wing Jig, holes are drilled in the wing ribs, the proper dihedral is set on the jig, and, the ribs are slid onto the wing jig rods. The rods are aligned and clamped down, the ribs are properly spaced, and, the spars, leading and trailing edge and top sheeting is glued in place. The wing is removed from the jig and the bottom sheeting is glued in place. Finally, glass cloth and resin is applied to the center section, and, the wing tips are installed.

That's it, the RCM Wing Jig II — the most versatile, easy to use and convenient wing jig ever designed. Assembly time is approximately one hour and you'll be ready to build your next wing faster and with more accuracy than you ever dreamed possible. **This is the only Wing Jig endorsed and manufactured by RCM.**

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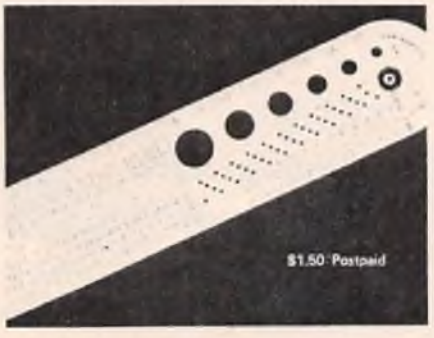

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Joy Stick	18.95	14.99
Super Joy Stick	36.95	25.95

KITS
Indy's Special Low Prices

MK

Spirit St. Louis	98.50	73.50
Zero	54.95	42.95
Mattlas 40	54.95	42.95
Mattlas 20	43.99	34.99
Curare 40	79.95	63.00
Curare 60	98.50	79.00
Blue Angel Jr.	54.95	42.95
Hoppy 20 S	29.95	23.95
Astro 20	45.00	35.50

MIDWEST

MIDWEST MODELS

Lil T. Glider	26.95	21.00
Tri Squire	29.95	23.50
Lil T. Squire	22.95	17.50
Pitts Spec.	94.95	74.00
Cardinal Squire	84.95	66.00
Strikemaster	69.95	54.50
Cessna Cardinal	29.95	21.00
Mach I	94.95	74.00
Das Lil Stick	32.95	25.70
Sweet Stik	39.95	29.00
Chipmunk	29.95	21.00
Attacker	39.95	29.00
New Hawk Glider	139.95	104.00

MRC
Ready to Fly/engine included

Cherokee	325.00	249.00
Cessna 177	265.00	199.95

BUD NOSEN MODELS

¼A Aeronca Champ	99.95	84.00
Cessna 310	169.95	135.96
Citabria	99.95	84.00
Gere Sport	129.95	110.00
Jenny	129.95	110.00
Mr. Mulligan	139.95	112.00
J-3 Cub	119.95	95.99
Trainer	79.95	65.00

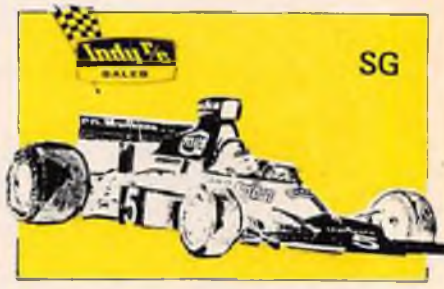
SIG

Super Sport	19.95	15.95
ktipper	20.95	16.75
S. Chipmunk	59.95	46.00
Sig P-51	57.95	45.00
Kadet	34.95	27.95
Kormendor	39.95	31.00
Kougar	44.95	35.75
Smith Mini plane	49.95	39.95
Zlin Akrobat	54.95	43.99
Yak 18	73.50	59.00
Citabria	57.95	45.00
Liberty Sport	64.95	51.50
Ryan STA	73.50	59.00
Clpd Wing Cub	39.95	31.00
Skybolt	62.50	49.95
Piper J-3	39.95	31.00
Doubler II	24.95	19.95
Cessna 150	69.95	55.00
Minnow	27.95	22.25

The original Safari was ready to fly at 129.95. We have a limited supply of almost ready to fly Safari's. Differing only in that the fuse must be painted and the rudder glued on. 40 engine 590 sq. inch wing, symetrical trainer section joined wing, aileron hinged; all the hardware less wheels and tank. a $90.00 value for only $39.95. While they last.

MACH LINE RACER
Shown in photograph. 1/8" scale. Engine 15 to 29. Quality Japanese product. Price less engine. List $129.95. Indy $89.95

IZUMI RACE CAR
1/8" scale Porsche. Engine 15 to 29. Engine not included. A nice quality Japanese product. List $129.95. Indy $89.95.



SG FERRARI
1/8" scale R/C race car. Holder of many European records. With Supertigre engine. List $175.00 - Indy $129.00. Without engine - List $149.95. Indy $111.95. The decals that are included with this kit are really great and make the car authentic.

Pump - 2 oz. per revolution so you can partially fill tank if you desire. Extra heavy duty gear train for rugged service. Fast pumping not necessary as with most hand pumps. These manual hand pumps are always ready to go - no batteries to worry about. List - $12.50. Indy - $8.95.

INDY R/C, 10620 N. COLLEGE, INDIANAPLIS, INDIANA 46280

$1.00 handling on all orders. Prepaid domestic orders postpaid; foreign orders allow $10.00 (excess refunded)
Orders - check, M.O. or C.O.D. Also, Bank Americard or Master Charge (bank number) Ind. Residents add 4% Tax

Indy r/c

CALL TOLL FREE
1-800-428-4682

SEE INDY ADV. 3RD COVER

Indy r/c SALES

Indy r/c

RADIO CONTROL SYSTEMS

WORLD EXPERT MARK II

	List	Indy
7 Ch. D.S. (5 servos)	$464.95	$279.95
7 Ch. D.S. (4 servos)	$432.95	$260.00
5 Ch.D.S. (4 servos)	$399.95	$239.95

NEW EXPERT RADIOS

3 ch. 3 servos, nicads	$239.95	$169.95
2 ch. 2 servos, nicads	$179.95	$129.00
4 Ch. Glider,S.S., 3 servos, all nicads	$234.95	$169.95

FLIGHT PACKS

7 Ch. 5 servos	$264.95	$188.95
7 Ch. 4 servos	$258.95	$162.95
5 Ch. 4 servos	$249.95	$157.96

SERVOS

S-10 & S-11	$45.00	$36.00
Retract	$52.00	$42.00

COX SANWA

2 Ch., 2 servos, all dry	$99.95	$73.00
4 ch. 4 servos, nicads	$299.95	$199.95
6 ch. 4 servos, nicads	$369.95	$245.00

KRAFT

KP-3C dual stick	$219.00	$175.95
KP-5C dual stick	$375.43	$295.00
KP-5CS single stick	$375.43	$295.00
KP-7C dual stick	$515.43	$399.00
KP-7CS single stick	$515.43	$399.00

NEW FROM KRAFT

KP-4A dual stick, 4channel, 4 servos, all nicads	$299.95	$214.00

SERVOS

KPS-11,12,14 & 15	$44.95	$38.00
KPS-15H & 16	$49.94	$41.00

RADIO CONTROL SYSTEMS

PRO LINE ELECTRONICS
(SPECIAL SALE)

PLN-3C 3 Ch. S.S. closed gimbal, all nicads"$250.95 $169.95
PL-5-O 5 ch. dual stick, open gimbal competition $559.35 $369.00
PL-5-OS 5 ch. single stick, open gimbal competition $559.35 $369.00
PL-7-O 7 ch. dual stick, open gimbal competition $597.50 $389.95
PL-7-OS 7 ch. single stick, open gimbal competition $597.50 $389.95
PL-5-II 5 ch. dual stick, semi-open gimbal Challenger II. . 394.40 $269.95

MICHIGAN HOBBY HANGAR SMALL WONDER

MICHIGAN HOBBY HANGAR

Quickie	28.95	20.25
Quickie Bipe	35.95	25.17
Miss Vintage	54.95	38.47
Small Wonder	33.95	23.75

WORLD ENGINES KITS

MULLIGAN

GLASS HAWK

WORLD ENGINES
DAS 60X FLY SERIES

20-L (low wing)	34.95	28.00
20-W (Biplane)	39.95	31.00
10-MG (motor glider)	24.95	19.95
20-S (shoulder wing)	29.95	23.95
15-H (high wing	22.95	18.50
ARF 60X FLY	34.95	28.00
Miss World	49.95	38.95
Mr. Mulligan,	47.95	38.95
W.E. Cub	39.95	31.00
Lil John (H wing)	54.95	43.00
Lil John (L wing)	59.95	47.00

GLUE & FILM

ADHESIVES

	List	Indy
Willhold R/C 56	1.50	1.25
GMP Styro Stik	2.30	2.00
Hobby Poxy II	4.00	2.99
Hobby Poxy IV	2.00	1.75
Willhold Aliphatic	1.80	1.50
GMP 6 mn. Epoxy	5.95	4.75
GMP ½ fast	5.50	3.75
Devcon 5 mn. lg.	2.50	1.85
Devcon 5 mn. sm.	1.35	1.00
Devcon 5 mn. 9oz.	5.80	3.99
Devcon slo cure	5.80	3.99
Hot stuff	3.50	2.75
Blue Line H.S.	4.95	3.50
Giant Zap	3.50	2.75
X-30 Adhesive	1.15	1.00
Ambroid 4 oz.	1.15	1.00
Ambroid ¼ oz.	.60	.50
Super Cement	.55	.45
Blue Goo	2.95	2.59

COVERING MATERIAL

INDY SILK

1 yd. pkg.	3.25	2.75
2 yd. pkg.	6.50	5.00

COVERITE

Super 38 x 47	7.75	6.20
Silkspun	7.75	6.20
Permagloss	9.10	7.25
Day-glo permagloss orange, yellow, olive drab & aluminum	9.95	7.95
Camouflage 1½ and 2" scale	9.95	7.25
Balsarite ½ pt	2.95	2.75

MONOKOTE

Opaque	9.00	5.50
Transparents	9.00	5.50
Metallic	10.50	7.00
plain trim sheets	1.19	1.10
Checkerboard trim	1.59	1.50

SOLARFILM

Opaque	7.80	6.00
Transparent	9.00	6.50
Metallic	10.00	7.00

MIDWEST

MicroLon	1.95	1.75

BUTY – FLEX DOPE
22 colors

quarts, colors	4.95
quarts clear	3.95
Gallons clear	9.95
gallons Thinner	5.95

GLIDER ACCESSORIES
AIRTRONICS

Std. launch rail	34.95	27.99
HD launch rail	36.95	28.00

CRAFT AIR

Del. Hi-Start	37.95	31.00
Std. Hi-Start	34.95	25.00
Para Pod	9.95	7.00

ASTRO-FLITE

HD Hi-Start (real heavy duty)	41.95	31.95
Astro-start	39.95	31.00

CARS & BOATS

JEROBEE CARS

CARS WITH RADIOS

MK-8B	177.50	142.00
Challenger	187.50	150.00
Alfa	226.95	181.00
Vette	215.95	172.00

CARS LESS RADIO

MK-8B	55.00	44.00
Challenger	65.00	52.00
Alfa	97.50	78.00
Vette	87.50	67.00

CARS LESS RADIO AND ENGINE

MK-8B	27.00	21.50
Challenger	32.00	25.50
Vette	50.00	40.00

JEROBEE – BODIES

MK-8B Body	7.95	6.50
Porsche	4.95	4.00
VW Bug Body	12.95	10.50
Vette Body	12.95	10.50

ACCESSORIES

Tank heat sink	2.50
wing with decals	2.95
brake kit	1.95
remote tank kit	2.95
Aluminum flywheel	2.95
mount for Tee Dee	6.95
Bumper	2.49
Chassis Frame	3.95
Lexan Chassis frame	7.95
Starter Rebuild kit	1.60
Eng. rebuild kit	7.55
Rear Axle kit	1.49
Clutch shoes	.98
drive shaft w/rot	.89

HUGHEY

	List	Indy
20 Rigger	100.00	85.00
40 Rigger	110.00	93.50
19 Hydro	77.00	67.00

SAIL BOATS

Blue Sonic 900	129.95	
Indy special	99.95	

STARTERS PUMPS

STARTERS

Std. Sullivan	33.95	23.99
Del. Sullivan	36.95	26.99
Sonic Tronic	38.50	27.00
Kavan	45.00	32.00
Astro-½A	15.00	12.00

FUEL PUMPS

Sonic Tronics MK II electric fuel pump	13.95	10.95

HAND PUMPS

Du-Bro	10.95	8.50
Six Shooter	10.95	8.50

HELICOPTERS

DUBRO	List	Indy
Shark GO	325.00	275.00
Tri-Star	229.95	189.00

ACCESSORIES

Conversion kit	75.00
Update Kit	34.95
Blade Set	15.00
Tri-Star Blades	12.00
Alum. paddles	18.00
FlyBar	6.00

KAVAN

Bell Jet	320.00	275.00
Alouette II	160.00	139.95

ACCESSORIES

Instrument panel	12.00
T.R. blades	3.00
Reg. main blades	18.00
Expert main blades	19.95
Nylon tail cone	5.95
Comp. window set	20.00
window channel	2.95

RETRACTS
ROM – AIR

2 gear mains	85.00	57.75
3 gr. firewall	114.00	79.95
3 gr. belly	114.00	79.95
pressure gauge		13.50
Freon		2.75
1¼ oz. Oil		1.65
line coupler		1.90
quick disconnect		2.00

GOLDBERG

2 Gear	14.95	10.50
3 gear	24.95	17.50

POWER PANELS
DAE

Dual range	24.95	18.00
Mini panel	15.95	11.00
Series IV	34.95	24.95
Std. panel	18.95	14.95

ELECTROSTAR SYSTEMS

Super Cycle	89.95	59.95

STEVE MUCKS

Lil Lightning	48.95	38.95
Buschwacker	109.95	74.95

THESE SPECIAL PRICES GOOD THRU 3/25/78
SUPPLIES MAY BE LIMITED

Indy 32% OFF
Master Kit Hyper-Bipe
L. 59.95
I. 40.77

Indy 30% OFF
OS FOUR CYCLE
L. 199.95
I. 139.95

Indy 30% OFF
Steve Mucks Lil Sulphin
L. 32.95
I. 23.06

Indy 35% OFF
S.T. 23 R/C w/muffler
L 49.95
I.32.47

Indy 30% OFF
OS 10 FSR Std.
L 2095
I.14.66

Indy 38% OFF
Andrews A-Ray
L. 44.95
I. 27.87

INDY R/C, 10620 N. COLLEGE, INDIANAPLIS, INDIANA 46280

prices subject to change without notice

FRANCHISED INDY DEALERS

INDY R/C

CALL TOLL FREE 1-800-428-4682

INDIANA RESIDENTS call (317) 849-0756

Below are listed our enthusiastic Indy Franchise Dealers. Note that we have organized this page by state. We still have many counties in the U.S.A. that are not franchised. Dealers inquiries invited. In working with these dealers we feel we are surrounding ourselves with some of the friendliest, and most helpful hobby dealers in the United States. We would like to welcome aboard the seven new dealers who have joined us this month.

OS ENGINES / MUFFLERS

	List	Indy
OS 10 FSR std	21.	16.75
OS 10 FSR R/C	27.	21.75
OS 15 std.	28.	22.50
OS 15 R/C	34.	28.95
OS 20 std.	29.	22.75
OS 20 R/C	36.	28.75
OS 25 std.	33.	25.50
OS 25 R/C	39.	31.00
OS 25 FSR R/C	54.	43.00
OS 25 FSR std	45.	36.00
OS 30 std.	39.	31.00
OS 30 R/C	44.	35.00
OS 35 std.	48.	32.00
OS 35 R/C	65.	35.50
OS 40 std.	55.	43.50
OS 40 R/C	65.	50.95
OS 40 FSR R/C	75.	59.75
OS 50 R/C BLK. MD.	85.	66.00
OS 50 FSR R/C	110.	85.00

OS MARINE ENGINES

	List	Indy
OS 20 Marine	45.	36.00
OS 10 Sch. Marine	34.	26.95
OS 30 Marine	46.	35.75
OS 60 RSR Marine	130.	105.60
OS 65 RSR Marine	130.	105.60
OS 45 RSR Marine	98.	78.00

NEW OS ENGINES LESS MUFFLERS

OS 60 RSR	125.	98.50
OS 85 RSR	122.	99.95
OS 40 SR Av	75.	59.50

OS FOUR CYCLE

OS 80 FS	169.95	139.95
OS 80 R/C	120.00	95.00
OS 80 FSR R/C		
W/Pump & Carb	140.	110.95
OS WANKEL	100.	78.00

SUPER TIGRE ENGINES

	List	Indy
X-15 ST std. std	55.	43.95
X-15 ABC R/C	62.	48.00
G-35 R/C	38.	31.00
ST 23 std.	35.	26.00
ST 23 R/C	43.	34.00
X-29 RV ABC	74.	58.00
ST 35 std.	50.	39.00
ST 35 R/C	56.	44.00
ST 40 R/C	56.	44.00
ST G21-35 std	50.	39.00
G60 61 PYP R/C	85.	67.00
G60 ABC PYP R/C	93.	74.00
G60 BH w/pump & carb	104.	83.00

NEW RELEASE SUPER TIGRE ENGINES WITH MUFFLERS

G21 FS R/C	99.	78.00
ST 60 FS BB R/C	70.00	55.00

Indiana Residents 1-800-382-2682

K&B (VECO) ENGINES

Veco 19 std.	40.	29.00
Veco 19 R/C	47.	33.00
K&B .35 pie bearing	30.	21.00
K&B 40 R/C Sen 25	62.	44.00
K&B 3.5 R/C w/muff	67.	47.00
K&B 3.5 Inbd mar.	69.	49.00
K&B 4.9 FR std	95.	66.00
K&B 5.0 FR std	95.	66.00
K&B 8.5 RS II	92.	64.00
K&B 9 Sec Outbd	98.	69.00
K&B 61 R/C w/muff	85.	59.00

JIM GOAD SEZ:

By way of saying HAPPY NEW YEAR, we suggest that you take stock of the situation and, as in making all good New Year's resolutions, try to figure out what you want to get done by the way of model building in 1978 in the three winter months that lie ahead you should be able to get a project well along for the spring and summer flying months. Here are some trade show dates. WRAMS - N.Y., 2/25, 26, TOLEDO OH., 4/7, 8, 9, MACS, LA, CA. 4/22, 23 - INTERNATIONAL LA. CA. 4/28, 29, 30.

Reports are flowing back from our first shipment of Como engines. This engine is being met with a substantial degree of enthusiasm which is evidenced by many orders from both mail order customers and dealers alike. We are making a second run which will include some U/Control engines. These will be shipped without mufflers at lower prices than the muffler R/C version. R/C $43.00 - U/Control - $35.00.

Our inventory situation on our less expensive US-2 servo is better than our former supplier of US-1 servos. The US-2 servo seems to be gaining in popular acceptance. Our stocks of pencell batteries continues to be reasonably good. We now are shipping the larger 12v. and 2v. Gell Cell heavy duty starting batteries. We direct your attention in this month's advertisement to the special purchase we made on the Archaeopteryx Phoenix 40 kits. This is a substantial value. It is a selling situation. This is a nice docile aerobatic trainer.

CALL TOLL FREE 1-800-428-4682

INDY FRANCHISE HOBBY DEALERS

ARIZONA
Hobby Den Inc.
3347 W. Greenway Road
Phoenix, Arizona 85023
ph. 602-993-6630

Whistle Stop Hobby Shop
2241 Avenue "A" Space 7
Yuma, Arizona 85364

ARKANSAS
Family Hobby & Toy Ctr.
Route 5 Box 348
Conway, Arkansas 72032

Ron's Hobbies
300 N. Wright St.
Siloam Sprgs, Ark. 72761

Cash Auto Supply Inc.
P.O. Box 155
Cash, Arkansas 72421

CALIFORNIA
Dave's Custom Models
1844 W. Glenoaks Blvd.
Glendale, Ca. 91207
ph. 213 240-5810

Root's Hobby Hut
5036 Telegraph Ave.
Oakland, California 94609

O & D Hobbies
8781 Cuyamaca St.
Santee, California 92071
ph. 714-449-5555

Active Hobby
717 E. Main St.
Santa Maria, Calif. 93454

The Hobby Shop
9295 12th Ave.
Hanford, Calif. 93230
ph. 582-6571

COLORADO
G. Al. Inc.
Musick Drug & Hobby
309 E. Fontanero St.
Colorado Sprgs, Co. 80907

Jansen Cycle & Auto Parts
Box 182
Granada, Co. 81041
ph. 303-734-5337

FLORIDA
Action Hobbies
4301 A. North Dixie Hwy.
Ft. Lauderdale, Fl. 33334
ph. 305-561-5611

The Hobby House, Inc.
360 U.S. Hwy. 17-92
Maitland, Fl. 32751
ph. 305-647-3442

FLORIDA, Cont'd
A & J Models, Inc.
4527 Del Prado Blvd.
Cape Coral, Fl. 33904
ph. 813-542-8858

GEORGIA
Hangar 7 Hobbies
6125 Roswell Road N.E.
Atlanta, Ga. 30328
ph. 404-255-8033

INDIANA
ABC Hobby Craft
2155 E. Morgan Avenue
Evansville, Ind. 47711
ph. 812-477-9661

Craft & Hobby House
510 Main St.
Vincennes, Inc. 47591

Franks Hobby Shack
Highway 6
Hamlet, Ind. 46532
ph. 219-393-3845

Hobby Hangar
509 S. Monroe St.
Hartford City, Ind. 47348
ph. 317-348-1931

Hobby World
164-13A W. Hively AVe.
Elkhart, Ind. 46514
ph. 219-293-3715

Hobbyland
340 Lincolnway West
South Bend, Ind. 46601
ph. 219-287-0180

Kirks Hobby Shop
117 E. Main
Muncie, Ind. 47305
ph. 317-282-4121

Wings N Rails, Inc.
1824 E. Main St.
Plainfield, In. 46168
ph. 317-839-5383

IOWA
Family Craft & Hobby
2034 S. Saint Aubin
Sioux City, Iowa 51106
ph. 712-276-7086

Howards Hobby Shop
313 W. 5th St.
Waterloo, Iowa 50701
ph. 319-236-0695

A-Z Hobby, Ltd.
1314 Army Post Road
Des Moines, Iowa 50315

KANSAS
Clay Center Auto Parts
527-31 Court
Clay Ctr. Kansas 67432

The Modeler Hobby Shop
1726 South Hillside
Wichita, Kansas 67211
ph. 316 681-2941

LOUISANA
Ron's Hobbies
713 E. McNeese
Lake Charles, La. 70605
ph. 318-478-8651

MAINE
Pets 7 Pastimes
Sunbury Mall 6 Central
Bangor, Maine 04401
ph. 207-942-0346

MASSACHUSETTS
Hobby City
115 Western Ave.
Lynn, Mass. 01902
ph. 617-581-7361

Bill's Hobby Supplies
600 N. Main St.
E. Longmeadow, Mass.
ph. 413-736-7711

MICHIGAN
Barry's Hobby House
3535 10th Avenue
Port Huron, Mich. 48060
ph. 313-982-1237

Avco Model Supplies
1885 Dyson St.
Muskegon, Mich. 49442
ph. 616-726-3400

Hobbies Unlimited
2624 W. Michigan Ave.
Kalamazoo, Mich. 49007
ph. 616-344-8711

Models & Things
516 Meadowlane
Charlevoix, Mi. 49720
ph. 616-547-9658

MINNESOTA
Mac's Models, Inc.
1322 N. Rice St.
St. Paul, Minn. 55117
ph. 612-489-6060

Wicklund's Hobby House
Route 1
Lake Lillian, Minn. 56253

MISSISSIPPI
H & S Models
317 W. Main
Tupelo, Miss. 38801
ph. 601-844-7946

Creative Sources
1092 Jackson Avenue
Oxford, Miss. 38655
ph. 601-234-2475

MISSOURI
Smiths Hobby Supply
830 Chestnut
Joplin, Mo. 64801

MONTANA
Viking Hobbies, Inc.
1745 E. Main
Billings, Mont. 59101

NEBRASKA
AnMar Sporting Goods
RFD
Homesville, Neb. 68374

NEW HAMPSHIRE
Hobby Hill
1 Cannon Drive
Nashua, N.H. 03060
ph. 888-3576

NEW JERSEY
Franks Hobbies
28 Fairfield Road
Fairfield, N.J. 07006
ph. 210-227-1978

NEW YORK
Custom Hobbies
785 Broadway
Kingston, N.Y. 12401

King Arthur Ceramics &
Hobbies - Co. Bridge Road
Hudson Falls, N.Y. 12839
ph. 518-747-5818

Thompson Outboard S&S
Upper East Street
Oneonta, N.Y. 13820
ph. 607-432-5368

Rays Hobby Supplies
468 Jerusalem Ave.
Uniondale, N.Y. 11553
ph. 516 486-4047

NORTH CAROLINA
B & J Hobby Enterprise
4909 Western Blvd.
Raleigh, N.C. 27606
ph. 919-851-4492

Thornton's Hobbies
100 N. Main St.
Four Oaks, N.C. 27524

NORTH DAKOTA
Crafts Etc.
Northport Shopping Ctr.
Fargo, N. D. 58102
ph. 701-293-7121

OHIO
American Modeler
2 Berea Commons
Berea, Ohio 44017
ph. 216-826-3088

Dad's Toy Shop
129 E. Auglaize St.
Wapakoneta, Ohio 45895

Flight Box Hobby Shop
9009 Springfield Pk.
Cincinnati, Ohio 45215

Hobby Road Hobby Shop
2483 E. Dublin-Granville
Columbus, Ohio 43229

Lafayette Escadrille Hby.
1414 S. Avenue
Toledo, Ohio 43609
ph. 419-385-8739

Lighthouse Hobby Supply
507 E. North St.
Prospect, Ohio 43342
ph. 614-494-2110

Lima Radio Control Spls.
307 N. Cole St.
Lima, Ohio 45805
ph. 419-229-5117

Paul's Hobbies
Route 4 Box 125
Lucasville, Oh. 45648
ph. 614-259-5298

S & M Print Shop
7154 Calvary Road SE
Amsterdam, Ohio 43903
ph. 614-543-4024

The Model Hanger
321 N. Market
Galion, Ohio 44833
ph. 419-468-7694

OHIO Cont.
White Beech Tree Hobbies
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H & S Sales & Service
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Hobby World, Inc.
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Indy r/c

INDY POWER PANEL

This flite panel is designed to panel mount onto your tool box. It acts as a terminal board to distribute current from a 12 volt battery. The Indy 12 volt gell cell is an excellent battery choice. The panel services your engine starter; fast field charger and glo plug. The ampmeter monitors the plug and charger. The glo plug current and the charge rate have variable control. The fast field charger is built into and supplied with this panel. List $34.95. Indy $23.50.

U.S.-1 SERVO U.S.-2

Indy U.S.-1 (Universal Servo) is built in Bob Dunham's dual rack output mechanics. The circuit is the new Signetics 544 amplifier. Width .76 in., length 1.52 in. and weight 1.52 oz. Mitsumi 16mm motor. List 27.95 - Indy 19.95.

UNIVERSAL

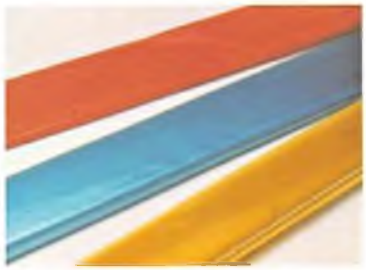
Indy Universal Servo U.S.-2. This servo is built into OS servo mechanics. The 544 electronics are similar to the Indy U.S.-1 servo and the connector polarization is the same. This servo has long been popular with car and boat fans. Not a kit - assembled. List 23.95 - Indy 16.95

CALL TOLL FREE
1-800-428-4682
Indiana Res. - 317-846-0766

Battery - lower right.
Panasonic pencell w/tab
4 pcs. ea. 1.80 - 7.20
8 pc. ea. 1.65 - 13.20
12 pc. ea. 1.55 - 18.60

INDY FUEL CADDY

Indy's Fuel/Pump and Caddy is powered by a Pitman 202 motor which uses four AA pen cell batteries. Fuel capacity approx. 3 qts. List 24.95. Indy 18.95.



INDY FILM MK. 2

Indy Film MK 2 is a new product.It features a new low temperature adhesive which is excellent for bonding on foam. The big news about Indy Film MK 2 is that we have made these colors with the K&B epoxy colors. The solid colors are white, yellow, green, orange, black, royal blue, and Navy blue. The metallics are aluminum, red, gree, and blue..The transparents are red, and yellow. Solid colors - $2.50/roll. Introductory 3.99/roll, 3/rolls for $9.99. Metallic film prices: List $8.50/roll. Introductory $4.88/roll. Transparents $8.50/roll Indy Special $4.88/roll.

GELL CELLS & NI-CADS

Pictured here is a new line of Indy gell cells and our charger. Our tapped 12 volt battery is a real break-through as it can be used also as a 6 volt battery and a 2 volt battery. This large 12 volt gell cell is excellent for engine starters. List $25.95. Indy $18.50.

Indy 2 volt battery pictured on right excellent for glow plugs. List $9.95. Indy $6.95.

Indy charger. Will charge 12 volt battery listed above. List $9.95. Indy $6.95.

Not shown - 2v charger. List 9.95 - Indy 6.95.

CURARE

MK's all balsa kit of Hanno Prettner's famous Curare. MK's quality really shows on this kit that Mr. Kato is building under an agreement with Hanno.

60 size..L.$98.50 I. $79.00
40 size..L.$79.95 I. $63.00

CAPILLO .09

The Capillo .09 cu. in. is an Italian engine which takes a 7x3 or 7x4 prop. List: 14.95. Indy: 11.95.

We now have carbs for the Capillo engines. List: 3.50 - Indy: 2.98.

MILLS .075

All time sentimental favorite in small diesels. Excellent for small R/C. Complete with tank. Featured originally in Debolt's Live Wire Champ. List - $19.95. Indy - $15.95.

MILLS 1.3

We announced delivery by Sept. 1st. on this engine in last month's advertising. This delivery is moved back to Nov. 15th.

This engine is a nice sport R/C engine - being a diesel it requires no glo plug or battery. Fuel is not hot. List: 28.95. Indy: 19.95.

COMO R/C 40
w/Muffler

About the engine - the bore stroke ratio is over square in a speed configuration. The engine features boost ports and the piston is a cast aluminum of low expansion alloy - single ring. Conrod is bar stock with oil groove. High alloy steel crankshaft supplied in twin ball bearings. Note the cool touch on your dish-shaped head styling. Engine is standard with Perry carburetor and is available with a Tigre carburetor at slightly extra cost. Our introductory price is listed after the list price.

W/ST Carb. L-69.95 - I-43.50

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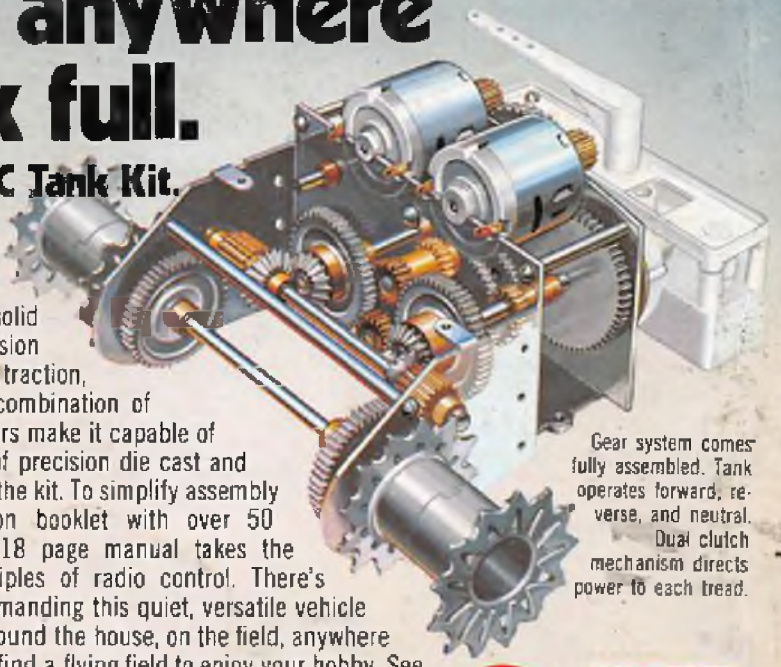
MRC Tamiya Electric Powered R/C Tank Kit.

Arm yourself with this 1/16 scale Sherman M4 and you'll be adding hours of enjoyment to your R/C hobby . . . 12 months a year. Run it indoors, outdoors, on any solid terrain. Get the whole family involved with this precision engineered model. Plastic and metal treads provide the traction, workable coil spring suspension for a smooth ride, a combination of lightweight aluminum chassis and powerful electric motors make it capable of taking on 40 degree inclines. . . with ease. Hundreds of precision die cast and stamped metal parts make up the kit. To simplify assembly there's a complete instruction booklet with over 50 diagrams. In addition, an 18 page manual takes the modeler through the principles of radio control. There's nothing like the fun of commanding this quiet, versatile vehicle around the neighborhood, around the house, on the field, anywhere at all. You no longer have to find a flying field to enjoy your hobby. See this precision engineered, MRC—Tamiya kit at your hobby dealer . . . and make sure your next R/C addition is built like a tank. Available with or without MRC radio control system.



Gear system comes fully assembled. Tank operates forward, reverse, and neutral. Dual clutch mechanism directs power to each tread.

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