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RCM radio control MODELER

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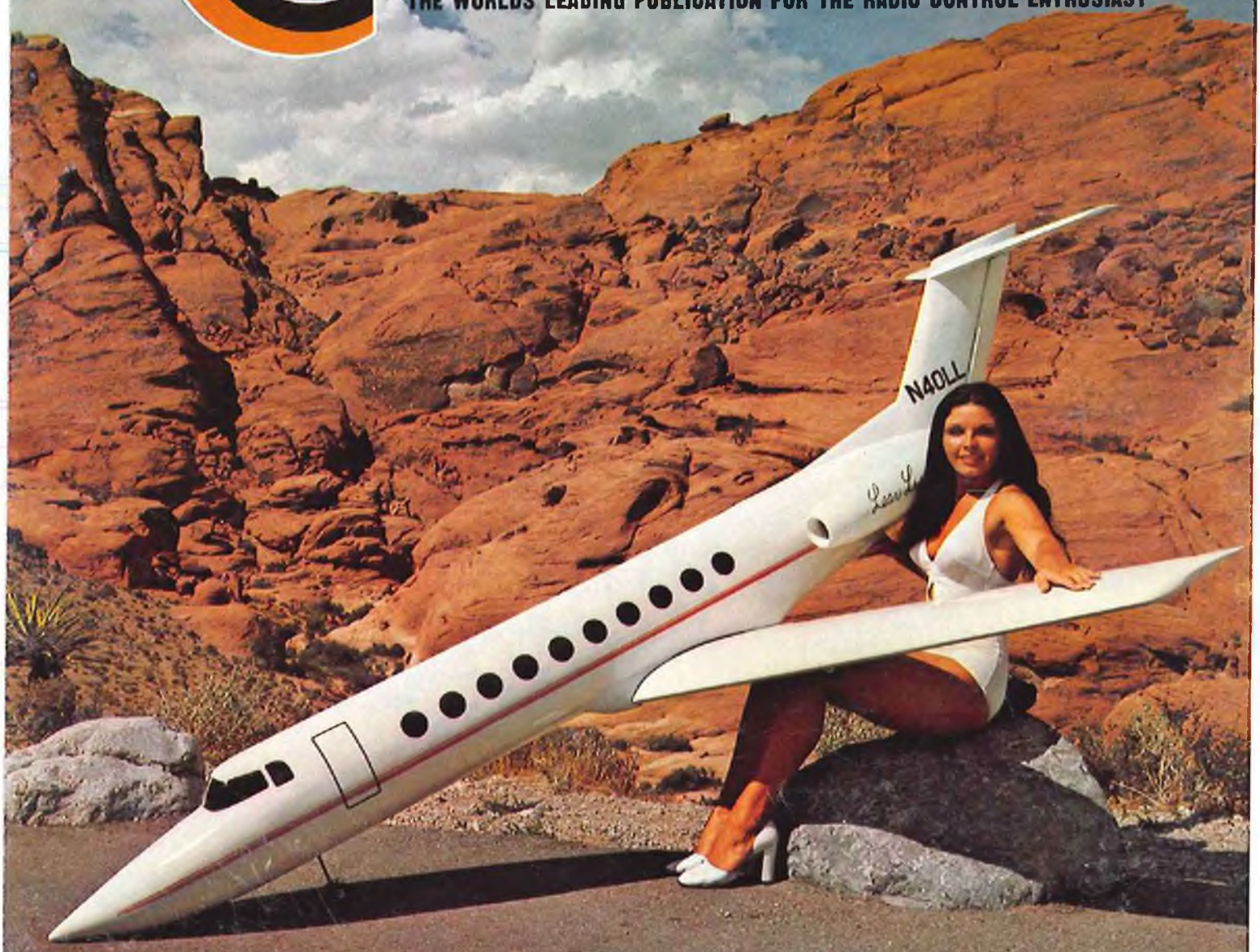

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LEAR JET LINER

Coverage Of Nations Largest Helicopter Meet
THE 1976 NRCHA CHAMPIONSHIPS

VOLUME 14 1977 NUMBER 1

RCM MODELER

FEATURES

THIS MONTH'S COVER

Teresa Albers poses with a model of the Lear Jet built from RCM plans by Tom Bunker of Las Vegas, Nevada. The plane weighs 19½ pounds and is powered by two Enya .60's and is guided by a Kraft radio. Ektachrome transparency by Bill Root.

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JANUARY

From The Shop

DON DEWEY

● The following article was originally published by Boeing Aircraft Corporation and has appeared in several other aviation magazines. We are reprinting it from the Mercer County Radio Control Club newsletter "The Prop Wash," who, reprinted it from Crosscheck, the safety publication of Pan Am. Entitled *Classics From The Classroom.* The author, a grade school teacher for many years, often required his students to write themes on aviation and provided Boeing with excerpts from some of those themes. The following reprint is truly classic for anyone interested in aviation:

•

Did you know that the first lady aviator was Kitty Hawk? That Roger Wilco invented the "language of communication?" Or that one of the chief by-products of the aviation industry is going places?

This information has been gleaned from test papers and essays during the 11 years that I've taught elementary school youngsters.

Kitty Hawk and Roger Wilco may have their admirers, but Baron Von Richtofen, the German ace of World War I, has also come in for his share of adulation. A 10-year-old girl summed up her feelings like this: "In a uniform or not, Baron Von Richtofen was a dashing figure."

If history repeats itself, it usually does it with some unexpected twists when grade-school pupils tell the story:

"Spinning jennies were flying jennies that did not work."

"People talked about flying in balloons for centuries. Finally there was enough hot air to get them off the ground."

QUESTION: On his first flight, how long was Wilbur Wright in the air?

ANSWER: I'm not sure. Five feet something with his shoes on.

One of the fringe benefits of being an elementary school teacher is the possibility that the next paper I correct will contain a wrong answer that is twice as witty and delightful as the right one. When members of the grade school set turn their attention to men notable in aeronautics, youngsterisms seem to come as thick as chalkdust. Three examples:

"Euclid thought out how to make geometry help people to fly. He was born in the 300's and died in the 200's. That is another thing he thought out how to do. He though out how to do it by using B.C."

"Charles Lindbergh is the most famous person in flying history and so are the Wright Brothers."

"The Wright Brothers made their first flight in 1903. 1903 was really in the 20nd. century but everybody was behind the times in those days."

The elementary school youngster's mind is a vast storehouse of information . . . half true, half false and wholly delightful. Sometimes he isn't wrong at all. It's just the way he puts it:

"During the Twenties, people started walking on airplane wings and things like that. I know it is crazy but this was before television or anything so what else was there to do?"

"Back in 1924, eight men tried to fly around the world but they only ended up where they started."

"Floyd Bennett comes from the year 1926. He is a famous aviator few people have ever hear of."

Ever heard of the word "pecally?" I hadn't until I came across this in a paper: "When I first started studying about airplanes, pecally things began to happen. First I heightened by their vast hugeness. By and by I put on my thinker and thought how important they really are. I then heaved a sigh at how it would be fun visiting at where they are made."

Much of the juvenalia that I've collected through the years has been devoted to comments about Charles Lindbergh's historic first solo flight over the Atlantic. Here are three of my favorites:

"Charles Lindbergh was the first to fly to Paris. He did it by the airplane method."

"When they asked him if he would like to fly to Paris, he rolled his eyes and flashed his teeth and said Sure."

"A straight line is the shortest distance between two points unless you are going with Lindberg to Paris. Things are different there."

In commenting on the duties of the navigator, a girl who claimed she was one of aviation's "Starchest supports" wrote: "The navigator figures out the latitude and longtitude. Latitude tells him where he is and longtitude tells him how long he can stay there."

Her best friend once concluded: "Three main crewmen on a plane are the pilot, navigator and percolator."

If any of these definitions have caused Webster to turn over in his grave, he would have to do it with a smile. Here's what I mean:

"Drone is a spare name for when people cannot think how to say pilotless airplane."

"When anybody says plane, what he is saying depends on whether he is saying it to a pilot or a carpenter."

"I know what a sextant is but I had rather not say."

"A visa is a passport permitting an airplane to leave the country. For round trips you need a visa versa."

One chap absorbed the information regarding the many uses for airplanes in our modern world, but his skepticism showed: "How many uses they have for airplanes these days is more for saying than believing."

Three years later his younger sister wrote: "The number of aircraft in the world today is an absurdly large fact of a number."

Ramjets have certainly come in for their share of comments recently. The remarks have proved to be unexpected, unconventional and undeniably true:

"Until it is decided whether ramjets are rockets or jets, we must continue to call them ramjets."

"The way ramjets work, as I understand it, is not very well understood."

"In ramjets the air rushes out when the fuel is ignited. So would anybody."

A couple of years ago there was a tiny moppet in my class who had a delightful way of expressing her thoughts. Here's how she summed up her feelings: "From now on I will put both gladness and wonder in my same thought about airplanes."

More than one eager young scholar has started out with a discussion of air travel and ended up in outer space. The following astronomical observations are fresh from the minds of four fourth graders:

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FROM THE SHOP

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"The North Star is, as a mattery fact, almost straight North. This is quite a coincidents."

"Our Mother Earth has small poles and a large equator because of the tremendous speed as she hurdles through the space. Since we are along for the ride, we too tend to be flat at our poles and round at our equators."

"Some people can tell what time it is by looking at the sun but I have never been able to make out the numbers."

"Through the years people have guessed that Venus might be inhabited by women, dragons, or other strange creatures."

No one looks to the future as eagerly as youngsters do. Last year I received these two predictions about future air travel:

"Thanks to what we are learning from aviation, we should soon be able to look forward to having ceilings made out of fog."

"So far planes have only been able to fly in circles of no more than 360 degrees. This could be the next big breakthrough in air travel."

●

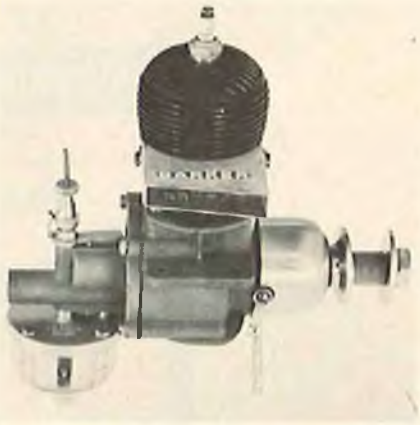
The following letter was received from F.E. Carter, Senior Research Engineer, Lockheed Missiles & Space Co. Inc.:

The Foam Cutter, described in the November 1976 issue of RCM, is potentially lethal. Please note that the recommended autotransformer schematic shown, places the cutting wire at 110VAC with respect to ground (concrete floor, metal frame of nearby power tools, etc.). Normal house wiring has one side of the circuit at ground (earth) potential, while the other side is at 100VAC with respect to both the other side and (earth) ground. Regardless of which way the plug is inserted in the outlet, the cutter wire will be "hot" with respect to earth ground. The "small" shock that author Hinckley relates, was probably leakage current to an incompletely grounded metal table. He was lucky; if he had been thoroughly grounded, he would not be around to write his article.

Before someone gets hit really good, please advise potential constructors that an Isolation Transformer should be used between the Speed Control box and the home wall outlet. These transformers are sold by electrical supply houses. Allied Electronics (Chicago) sells a suitable isolation transformer for $33.00 (Stock #705-0026). A little expensive, but so is any kind of life insurance. □

Engine Clinic

CLARENCE LEE



● This month we have another old time engine for you — the Barker Man-ul-matic. The Barker now being the 5th engine in this old timer series. So far these reviews of the old time engines have been received favorably. In fact, many fellows have written in and asked that we expand the articles making them longer or to do them more often. I am afraid I cannot make the articles any longer as I can only present the facts that I know. For that matter I have many engines in my collection such as the Invader .45, Trident .60, Black Panther, Atomic .60, and many, many others about which I know little or nothing. Trying to do a report on one of these would be almost impossible. However, I will, from time to time, run pictures of these various "factless" engines just in case some of the readers out there might be able to pass on some information. Many fellows have also written and asked that we review a specific engine such as the McCoy .60, Ohlsson .60, etc. Many fellows had engines as a kid that they would like to know more about. The McCoy, Ohlsson, Super Cyclones, etc., were all large production engines without any really unusual features. This, in turn, would be getting away from the original intent of this old time review business. I am going to try to keep covering the lesser known engines and those with different or unusual features. So, along that vein, let's get on with the Barker.

The first Barker engines appeared prior to WW II in 1940. This engine was of .690 displacement and called the Model C. This was followed in 1941 by the Model B, Model A, and Spitfire. All four of these engines were basically the same, varying only in type of gas tank (metal or plastic), etc. They were of conventional side port design common with engines of that era. In late 1945, the first ads for the new "Wonder Motor of the Model World" appeared. In 1946, this new Barker Wonder Motor now called the "Man-ul-matic" appeared in the hobby shops. The revolutionary feature was the ability to change the intake timing of the engine while the engine was running. For easy starting the intake closing timing was retarded. Then, when the engine was running, the intake closing timing was advanced, resulting in "extremely high volumetric efficiency, tremendous power and terrific rpm." (The preceeding quote directly from Barker's ad.) This timing change was accomplished in the following manner: The Barker used a drum type rotor in the back plate for intake. A drum rotor is simply a short "shaft" type section that runs in a bearing in the back plate and is driven by a thin metal disc. Openings in the shaft or drum line up with the intake slot in the bearing for fuel induction. The K & B .15 and O.S. .80 both use drum type intakes. The driving disc had an elongated drive pin slot. The crankshaft drive pin could move from one end of the elongated slot to the other and was held at either end by a tension spring. The back plate had a spring loaded ball arrangement with a small stamped metal arm. By pushing down hard on the arm, pressure was applied to the spring loaded ball, in turn, applying pressure or drag to the intake drum. In actual application, before starting the engine, you would push on the Man-ul-matic mechanism and turn the engine over backwards. This would allow the crank drive pin to move to the retarded side of the drive slot. Then, with the engine running, you would again press on the Man-ul-matic mechanism and the drag would cause the crank drive pin to move to the advanced side of the slot. All this, if everything went according to theory. Things such as the engine kicking back could goof up the whole procedure. Even so, once the engine was running, applying pressure to the Man-ul-matic lever would return the timing to the advanced position. In the retard position

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the intake opened just about bottom center and closed a few degrees before top center. In the high speed position the intake opened about 58° after bottom center and closed 55° after top center. This closing timing being in line with many of your present day glow engines. Many of your present day .60's, such as the Webra Speed, K & B .61, Super Tigre Bluehead and O.S. Schnuerle have intake closing timings in the 55° range. However, the opening timings are considerably sooner to allow a longer induction period. Most modern day .60's opening 30°-40° after bottom center. With an opening timing of 35° and closing timing of 55° an engine would have an induction period of 200°. The old Barker with an opening timing of 58° and closing timing of 55° had only 177°. The size of the intake openings were also very small which, in turn, would cause a considerable loss of efficiency.

The engine had a bore of 15/16" and stroke of 7/8" for a displacement of .603, somewhat smaller than the pre-war Barkers. The engine had a cast iron piston lapped to a steel sleeve. Overall the engine was extremely well made. The crankcase was cast of magnesium. The cylinder was machined from steel and painted black. The engine had a sheet aluminum exhaust stack held on by a loop of piano wire around the cylinder and two screws. The engine also sported a very large spun aluminum timer cover. The combination of the black painted cylinder, magnesium crankcase, and aluminum exhaust stack and timer cover made for a very attractive engine. This was topped off by a small aluminum name plate staked to the front of the engine with the serial number. The small embossed plate having a red background gave the engine a real aircraft engine type look. However, although the engine was very well made and certainly was good looking, its performance left a lot to be desired. It would not turn up with other competitors of the day such as the Ohlssons, Super Cyclones, etc. Many things probably contributed to the demise of the engine. In 1946 U-control was "The" modeling activity. The Barker, with the low tank position, made mounting of a gas tank in a U-control model very difficult — especially in a stunt model where the center line of the tank has to be in line with the spray bar. This problem alone probably caused many modelers to shy away from the engine. I know that this was one of my first comments when I first saw the engine in 1946 and one of the reasons I never gave a second thought to purchasing one. Then, too, many modelers were

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Cunningham On RC

CHUCK CUNNINGHAM

● Each year a new facet of this great hobby/sport seems to jump to the forefront of interest, and to begin to grab all of the headlines and pictures in the model press.

First there was the swing to reed radios, then the giant leap to proportional systems (thank heavens for this addition to the state of the art). Next came the interest generated by Formula I racing, then a bit later Quarter Midget racing made itself known. Next, or perhaps at the same time, soaring became popular and, this past year, the great emphasis has been upon the Old Timer aircraft. Helicopters, boats, and race cars have all been waiting in the wings for the real big push.

Perhaps in some modelers fertile brain is lurking the next really big modeling activity - - - I'm waiting to see. But, in the meantime, I for one have been enjoying flying my Powerhouse, while thinking of what to build next. If you are interested in Old Timer aircraft, then by all means write to John Pond and order his plan book. His address is, John Pond, Old Time Plan Service, P.O. Box 3113, San Jose, California 95156. Also, there are at least two sources that I know of for semi-kits of some of the Old Timers. By semi-kits, I mean kits that furnish only the wing ribs, and fuselage formers (if any), and sometimes curved wing and stab tips. These sources are: Schmidt Custom Kits, 11948 Franklin Blvd., Elk Grove, California 95624, and P & W Model Service, P.O. Box 925, Monrovia, California 91016. Write to either, or both, of these companies for their price lists. If you haven't tried an Old Timer, you don't know the fun that you are missing.

★

It's a strange thing that now, when balsa wood prices are at an all time high, and will probably go higher, interest seems to be rapidly increasing with respect to the larger models. Come to think about it, this may be the next really big interest area we mentioned. Bud Nosen has his stable of extra large aircraft and, certainly, most of the Old Timers are pretty large, with some fantastically big. Ed Morgan, out in Las Vegas, is pushing for a Quarter Scale class, and many modelers all over the country are beginning to see the fun in building the larger size models. Of course, the principle reason for this movement is the fantastic reliability of today's radios. This reliability has been growing for the past several years, where today you can be pretty confident that the radio you purchase will fly your aircraft for a long time to come. Another boost for the larger models, are the extremely powerful engines that are available to yank them into the sky. I have long felt that some of the thrill of flying RC aircraft began to diminish when the size of the model tended toward the size of U-control aircraft. Although I have long been an advocate of the smaller size aircraft, I have always liked the large ones. The Senior Telemaster, I believe, really started the move towards larger aircraft, and proved that you don't need to go 1500 miles an hour to have fun!

All of this just points out that this is an ever changing hobby, and one that can mean just about anything to anyone who has the courage and guts to survive the few crashes that it takes to get started. This is probably the reason that so many great people are in this sport. It really isn't all that simple to get started - - - it's much harder than picking up a golf club or a tennis racket - - - but when you have graduated to having your own wings, you have proved that you're a pretty good human being, and have learned to take the hard knocks as well as the successes.

★

I received a letter the other day that points up a common area of trouble, so here goes . . .

I just finished your article 'RC Design Made Easy Part II', and your experience with the high sided Aeronca Champion seems to explain what happened to my BD-6, built from Fred Reese's plans (RCM Aug '75). On take-off, despite full right aileron, the bugger fell off to the left. Everyone agreed that it was built true, without noticeable warps or misalignment.

My question is: Will larger ailerons, with more throw help? Or is this doomed to be a three channel airplane? My basic trainer was an H-Ray, and I wanted to try a plane with ailerons.

Another problem I had was with the taxiing. It was quite sensitive to the nose

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Soaring

AL KINDRICK

● Nothing we could say, this month, could be more worthwhile than this account, by Ed Munger, of Broadview Heights, Ohio, entitled 'Enter A Contest? Not Me!' I hope you'll all read it . . . then give it a try. If you don't, you'll never know how much you're missing.

•

It was back in October of 1974 . . . and I have a vivid memory of the events. My fellow club member who taught me to fly sailplanes asked me to join him and two other members of our RC club to enter a glider contest in West Virginia.

I told him he was crazy. I told him I appreciated him teaching me to fly sailplanes all the previous Spring and Summer. I reminded him how I totaled (twice) my first plane, a Windfree. I reminded him about my building a second Windfree from scratch, and made it so strong we never could get it trimmed out and flying.

By the Summer I moved up to an ASW17 and began to do a little flying, almost on my own. However, I was still lucky to bring it down within 800 feet of our field. Usually each flying session ended up back home in the basement repairing a wing, the fuselage, a stab or rudder. I had to admire my Kraft equipment — it continued to work in spite of my landings.

Me? Enter a contest? You're crazy. I can't fly good enough. I'd be embarrassed.

The day before the contest we were practicing at our field. I had put up several good flights. And what ended up being my last flight and approach of the day, for reasons known only to that great sailplane pilot in the sky, I cartwheeled it into the weeds. The result was that the entire outer 1/3 of the right wing was demolished.

On the outside I was berating my dumbness. On the inside I was smiling because I knew now there was no way they could talk me into entering the contest the next day. I couldn't fly with one wing! You see, I had a business dinner meeting that night and wouldn't have time to repair the damage. Good!

My friend took the damaged wing home with him and said he'd see if he could fix it. I went to the party relaxed in the knowledge that I could sleep the next day. He called me at 12:30 or 1:00 AM and said the wing was fixed and we were ready to go. Rat's! Now I couldn't go to sleep!

At 5:30 the next morning the four of us were on our way to the contest. In the last city we passed through on the way to the field, we stopped for breakfast. I couldn't eat. I tried to drink a cup of coffee. There were my three friends, eating like there was no tomorrow, laughing it up and having fun. I think I went to the bathroom four times. Me nervous? You bet!

We arrived at the field. I was praying my plane had gotten crushed somehow on the trip and I couldn't fly. No way!

I remember assembling the wings on my ASW17. I was so nervous I could hardly get the rubber bands doubled and through the fuselage. I'm sure I ruptured one of the rubber bands in my haste to get the plane assembled. (Remember that small point, dear reader.)

So, off we went to register. The only familiar faces were my three friends. I reminded them that when it came my turn to fly, I needed one of them to launch me, because I hadn't learned that trick yet. They assured me they'd be there when I needed them. That helped my nerves a little.

"Number fourteen, get your timer."

"Number fourteen, you're up."

Oh hell, that's me. I grabbed my plane and my box. I looked around for one of my friends. They were nowhere in sight! My heart jumped up in my throat. I couldn't swallow. I could hardly talk. I couldn't think of a way to get out of flying my turn. (It was much later I learned about sandbagging!)

Then I saw a friendly looking guy and asked if he would time me. He said he'd be happy to. Walking to the line I confessed this was my first contest, my first flight, and I couldn't launch the airplane. He replied, "No problem!" And he called his friend to the high-start.

They gave me a good toss. My two new-found friends coached me up through a snagged line and up to a good height for a 2-minute Precision. They encouraged me all the way. Because of the windy conditiions, I had a little trouble getting down on time. But Wow! My approach was almost perfect, and I almost made the circle! They congratu-

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Radio Spectrum

JIM ODDINO

● Last month we attempted to describe a basic control system without discussing electronics or looking at schematics. We compared the directing of an automobile backing out of a driveway, using hand signals, to controlling a model airplane with radio control. It was established that we needed a transmitter which puts out a carrier, whether it be visible light or RF energy, and a receiver that can detect the presence of the carrier. We learned that information was sent by modulating or modifying the carrier. Two RC systems we described used low frequency sub-carriers or audio tones and one achieved proportional control by varying the frequency of the tone. Those systems have become obsolete in RC circuits where the accepted technology is the so-called digital proportional. I say "so-called digital" because it is actually analog, i.e., the pulse position is analogous (proportional) to the control stick position. Digital gets its name from the fact it uses digital (full-on, full-off) techniques in the encoder, decoder, and servo amplifiers. But that is getting ahead of ourselves.

How can we send four to six channels of proportional information by simply turning the transmitter on and off with no sub-carriers? It is easy to see how we could have a different sub-carrier for each channel in the system we described last month, just as we could transmit two channels of information with hand signals if we used the left hand for one channel and the right hand for the other.

What we must do is send the information sequentially, that is, one channel at a time and when we finish all channels we start over again. If we do this fast enough, the information appears to be continuous to a servo.

Let's go back to our car backing out of the driveway and assume we wanted to control the direction and speed of the car with hand signal techniques similar to digital proportional. You're going to hold your hand up and drop it for short, fixed durations, periodically, and your wife is going to respond to this information, assuming she has a perfect sense of time. Let's say you tell her that you're going to send a "get ready" signal by allowing five seconds between the first two times you drop your hand. That tells her that the next interval will command steering and she knows that the next interval after steering commands speed. Let's say you had agreed that if the second interval (steering channel) was 1.5 seconds long, she would drive straight ahead. If it were 2.0 seconds long, she would turn the wheel all the way to the right as far as it would go. Anything between 1.5 and 2.0 seconds would give some lesser degree of right turn. If the interval was between 1.0 and 1.5 seconds, it would call for a left turn. Likewise the third interval (speed channel) would have a scale factor that would relate speed to the time of the interval. One and a half seconds could be a stop command with 2.0 seconds being full speed forward and 1.0 second corresponding to full speed in reverse. At the end of this interval, you would again send a fixed five second interval to tell her to get ready for the next set of information. Each time you send a set, the "get ready" (synchronizing) and channel information, you are sending one "frame." To put these 1000 words into a picture, look at Figure 1.

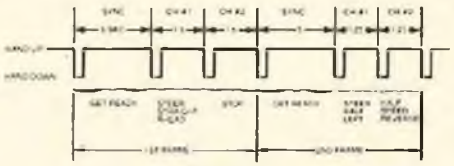

FIGURE 1

If we substituted an RF carrier for the hand up signal and turned the carrier off to simulate the hand down signal and divided the time by 1000, the straight ahead command would be .0015 seconds or 1.5 milliseconds; we would have described a two channel RC system. To add more channels is a simple matter of adding more pulses before repeating the synchronizing interval.

You would probably find this technique unsatisfactory for directing your wife even if you both had a perfect sense of time because each frame is too long. If you had commanded a left turn with a magnitude of half of full left, chances are she would have run into a bush or a tree in the seven and a half seconds before you updated the information. However, this problem goes away with the miracle of electronics which can send the information 1000 times faster. Notice that if the sync is a fixed time, the frame has a variable time depending on what commands are being sent. This results in a shorter average frame which means the fastest possible updating of information. Next month we'll look at how these pulse trains are generated in the portion of our transmitter called the encoder.

• • •

Before I do anything else, I've got to print a rebuttal to an article that appeared in the October 1976 issue of RCM. It was entitled, "Pat Your Head . . . Rub Your Belly". The author, Stu Richmond, makes a strong case for selecting the so-called Mode I transmitter configuration. With a Mode I transmitter, the pitch control (elevator) and yaw control (rudder) are placed on the left hand stick and the roll control (ailerons) and throttle are placed on the right hand stick. In the early days of proportional radio, Mode I was very popular because many of the flyers had previously flown reed systems, which always placed elevator under the left thumb. When switching to proportional, the transition to a left hand control stick was natural. In recent years the trend appears to be changing as Stu indicated in his article. I'm not sure why it is changing but I'll give you some reasons why it should.

I will agree with Stu that a beginner will learn to fly better faster if he chooses Mode I, but I think he will reach a plateau at a lower level and, therefore, fewer Mode I flyers will become world class. Now this doesn't mean a Mode I flyer won't be world champion, in fact I think Matt does fly Mode I, but it means that more guys in a sample of 100 Mode II flyers will rise higher than a like number of Mode I flyers.

Human factors tests have been run that show you can control two functions better if you use two hands. When you are starting out, you really only need to control two functions, most of the time. However, an airplane has three axes of control, and if you want to be the best pilot you better be able to control all three during maneuvers, and still be able to throw landing gear, flap, rate switches, etc., while flying into position for the following maneuver, and controll-

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RADIO SPECTRUM

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ing the throttle and maybe mixture control while all of this is going on.

The Slow Roll, Four Point, and Eight Point require precise coordination of rudder application which means one hand is going to have to control a minimum of two axes at one time. As most people are right handed, it sure makes sense that most of them would choose to do the difficult two axes control job, with their right hand. If the Mode I were set up with aileron and throttle on the left hand, and the rudder and elevator on the right, it might make more sense because then you would be using your strong hand for the two channel coordination required for those maneuvers. However, you would find that you wouldn't like aileron and throttle on the same side either. Clarence Lee, one of those old reed and, therefore, Mode I flyers, pins the gimbal on the right stick so it only performs the aileron function. He puts throttle on a separate lever. I guess you'd call him a three stick flyer. Phil Kraft, another reed graduate, puts stops on his throttle travel because he has better control of his aileron, with less travel on the throttle.

Anyway, it is my contention that Mode I flyers have a more difficult time performing maneuvers that require simultaneous, coordinated rudder inputs. I think the recent Nats data backs me up. In Novice, we see three of the top five and six of the top ten used Mode I with the rest using Mode II. No single sticks. In Advanced, two Mode I's made the top five and three in the top ten. No single sticks. In Expert, we're down to two Mode I's in the top ten, but we see three single sticks in the top five. I think this shows that, as the task gets tougher, you see fewer Mode I flyers up on top. The Masters class had three Mode I's in the top ten, but there is still an influence of the reed set up on some of these "old" Masters.

Don't get me wrong — to fly well you need to use both hands and it would probably help to use your feet too. But once again, I think the more you do with your right hand, the better off you will be.

• • •

I received a note from Ken Kern of Bedford, Indiana, the other day with Ken's guess as to what might be causing some of the interferences on six meters, particularly in the Ohio area. Ken sent along a list of amateur radio FM repeaters which included the following:

Location	Area	Call	Input	Output
Cincinnati	SW	W8QID	52.92	53.05
Cleveland	NE	WR8ACP	53.15	52.79
		WR8ABL	53.25	52.6
Willowick	NE	K8NPY	53.7	53.46
Columbus	Cent.	W8TQA	52.76	52.525

There were a number of repeaters listed in the Dayton area, but most were

on two meters with one on 443.75 MHz. If you're having problems on six meters, it would be wise to check to see if there are any ham repeaters in your area.

• • •

We've talked about various autopilots and stabilization systems for models before and I guess a number of people have successfully flown some of these systems over the past few years. However, until yesterday I hadn't actually seen, much less flown, a stabilized model. Now I can tell you it does work. The model belongs to Jack Hertenstein, former ace pylon racer, who earns his living working for a company called Developmental Sciences, Inc. This company is well-known in the RPV industry. Jack's system will (1) keep the wings level, (2) hold its altitude or some constant rate of climb, and (3) hold a magnetic heading. When I saw the Mode I transmitter I thought I was in trouble, and I guess it did give me a little problem, because every time I started to turn I wanted to pull back on the throttle, and no matter how good your stabilization system is, you must have airspeed. The best testimonial to how well the system works, was the confidence Jack showed when he handed the transmitter to a friend of mine who had never flown an RC model. He had less problems than I did because he wasn't trying to hold the nose up in the turns.

One interesting thing, from a pattern flyer or judge's standpoint, is the fact that the plane appears to climb as it comes toward you and dive as it flies away. Therefore, the good flyer is probably compensating for this effect to make the maneuver look level to the judges. I don't know if the judge downgrades a maneuver that looks level or one that is level and appears to arch. 'Tis a problem. At first glance it would seem to be an excellent system to learn to fly with because the airplane maintains altitude. Jack can fly around behind himself just listening to the engine or put the airplane in a bank and set the transmitter down. However, the system is not easy for a beginner to set up because it must be adjusted for your servos, airplane, etc.

Jack plans to put it in a sailplane and do some out of sight flying.

Although he didn't give away the technical details of how the system works, it appeared to be simple and capable of being produced in a small package at a reasonable price.

It basically is like having an altimeter on each wing tip. A tranducer senses which one is higher and sends the appropriate command to the aileron servo. Jack thought the whole thing could be placed in a package the size of a servo. Let us know if there is any interest out there and maybe we'll encourage Jack to continue his work and make it available to the modeling public.

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KOUGAR/KOMANDER KONTEST

Larry Austin of Fremont, Nebraska flew this Super Tigre .46 Kougar with the prototype color scheme. He uses a 2" scale Wm. Bros. pilot instead of the usual 1-1/2" scale.

Here are part of the multi-colored Kougars and Komanders that flew at the '76 meet. Contestants picked the winners in the two beauty events by ballot.

FALL FUN FLY - SEPTEMBER 26, 1976
COUNCIL BLUFFS COBRA'S FLYING FIELD

Despite area-wide bad weather the day before and a worse forecast for Sunday, a large entry of Kougars and Komanders flew in the 3rd annual Fun Fly. Organized by Bud Kilnoski of Bud's Hobby Stores of Omaha and Council Bluffs, it had been exclusively for Sig Komanders in 1974 and 1975. The addition of Kougars for 1976 proved popular and there were a few more of them than Komanders. As it turned out, the rain that had been predicted didn't materialize and though the sky was heavily overcast, with some fog, the flying conditions were pleasant. In fact it was so calm that a scheduled new event called "Kill The Kite" had to be called off because no-one could keep the kites in the air.

Event winners were: Egg Drop, Faye Andrew, Dean Copeland and Don Sproul. Limbo, Dean Hines, Clayton Frief and Dean Kobus. Pattern, Will Hicks, Bill Schmidt and Steve Peck. Kougar Beauty, Bill Dewey, Wayne Nenninger and Larry Skiles. Komander Beauty, Marv Bosch, Dean Copeland and Doug Hutcheson.

Ron Woods of Omaha, Nebraska fuels up his Komander in the pit area. Placed in the Limbo event. He and the model have flown in the previous '74 and '75 contests.

Several methods were used to drop the eggs. Loops and rolls were common, but several used a lob-bombing flip to throw it out. This is Doug Hutcheson's Komander.

Left: No, No, Dummy! Get the egg and the airplane in the picture. (Nikon FTN, 1/1,000 sec., 400 mm. telephoto, f 5.6, TRI-X film.)

Dean Copeland made this twin-boomed design by sawing off a stock Komander just behind the wing and using the remaining wood for the unusual tail. It flew fine.

Larry Skiles used a camouflage color scheme to give a distinctive touch to his Kougar. Placed in Kougar Beauty & Egg Drop events.

This striking psychedelic color scheme, done on a purple base color with interlocking patterns of various shades, is the artistic work of Wayne Nenninger. 2nd in Beauty.

Gene Jones of Hazelwood, Missouri flew a sleek Kougar fitted with Kraft retract gear units. Powered by a K & B .40 equipped with a Perry Pump, it was a fast and smooth flying model. The Kougar has a thick wing section that will take several kinds of retracts.

Frank Trouba releases his Kougar, which placed in the Short Pattern event. Frank said he was very pleased with the performance and flying characteristics of the model.

Lyle Larson of Mitchell, South Dakota zooms his Kougar under the top ribbon in the Limbo event, while a Komander banks to go around for another pass rather than cause a traffic jam between the poles.

PICK A WINNER - RC-35 KOUGAR $42.95 - RC-32 KOMANDER $39.95

See your dealer first. To order direct add $1.00 postage in the U.S. $1.50 in Canada. No C.O.D. orders.

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RADIO SPECTRUM

from page 19/16

• • •

I've mentioned the Signetics NE 544 Servo Amplifier a couple of times before, without going into much detail. This month I thought I would describe one of its unique features that makes it a good candidate for a high performance servo.

Some time ago we mentioned that the Kraft Signature Series Encoder had made a stride forward by replacing the non-linear (exponential) pulse width generator with a linear ramp generator. This solved the problem in the transmitter but the system was still slightly non-linear due to the exponential reference generator in the servo. The NE 544 overcomes this problem.

Operation of the circuit can best be described by refering to Figure 1.

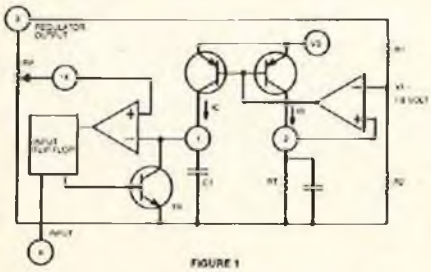

FIGURE 1

The reset transistor TR is normally on, thereby discharging capacitor CT. The timing cycle starts after the input pulse sets the input flip-flop and releases the reset transistor. This allows current IC to charge up capacitor CT in a linear fashion. It is linear because IC is constant and matched to IR. The OP amp serves as a voltage to current converter with the currents IR and IC equal to the voltage (VI) at the inverting input divided by RT. Typical values are 1.8 volts and 18K resulting in a current of .1 milliamp (ma).

The timing period is complete when the voltage ramp at Pin 1 reaches the threshold at Pin 14 set by the servo feedback pot. The time is given by

$$T = \frac{CT\ V14}{IT}$$

With CT equal to .1 microfarad and V14 equal to 1.5 volts

$$T = \frac{(.1 \times 10^{-6}F)\ (1.5\ volts)}{.1 \times 10^{-3}\ Amps}$$

T = 1.5 Milliseconds.

When the internal one shot has timed out, the input Flip Flop is reset. The reset transistor TR is clamped to ground as soon as the input pulse goes to zero. Figure 2 shows the relationship of the input pulse, the internal one shot pulse, the ramp at pin 1 and the error pulse for a condition where the input pulse is longer than the internal pulse.

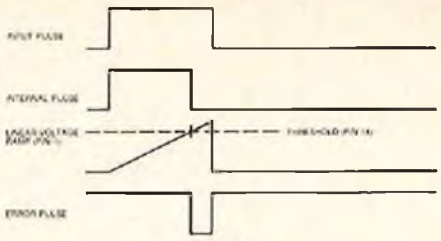

FIGURE 2
TIMING DIAGRAM

In contrast to most conventional designs, the total value of the feedback pot RP is no longer important, since it serves only as a voltage divider. A reasonable lower limit is 1.5KΩ to keep power consumption low and to prevent loading of the voltage regulator. In the typical application a 5K pot is used.

Adjustment of Servo Travel. The amount of angular rotation of the feedback pot R (or of the Servo Control surface) can be changed by simply changing the charging current. Figure 3 shows a plot of the servo travel as a function of input pulse width for 3 different values of current setting resistors RT.

It should be noted that the center position of the wiper (1.5 ms) will also shift when the amount of travel is changed. This shift may be compensated by mechanical wiper adjustment or by the

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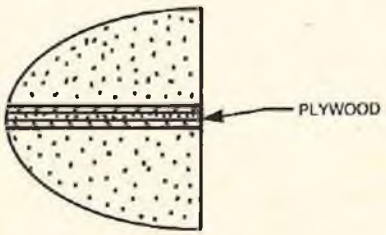
A BETTER WAY . . . .

BY ROGER CLAUDE

● A metal E string from a guitar can be used in place of braided or twisted cable and will do the job better and cheaper. Guitar shops will usually give you all the broken strings you need.

If a leading edge is made in layers, use a layer of plywood as the center. The glue and plywood add a great deal of strength and sanding to shape is simple since the plywood forms a hard leading point from which the rest of the edge will sand easily and true.

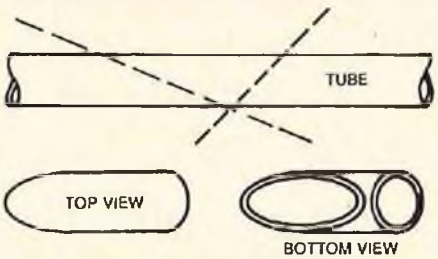


Since fuel seems to seep into, and soak, the wood around unprotected openings on a plane, such problem areas as holes for switches, charging jacks, and fuel lines can be fuel proofed with Zap. Zap does not fill the gap, it only fuel-proofs the area around the hole.

Often the part of the landing gear that goes through the wheel becomes bent. A long bolt, or rat-tailed file, stuck through the coil will permit the torque produced by the pliers, or a tube slipped over the bent section, to be absorbed by the other hand. Straightening can usually be done without removing the gear from the plane.

To sand a high area without sanding into a lower adjacent area, put masking tape over the low section. Sand down to the level of the tape. Pull the tape and feather carefully to blend.

Air scoops may be a necessity to cool batteries on electric powered planes and may be desirable for radio dependability in the summer. Scoops of various sizes can be made from aluminum tubing cut

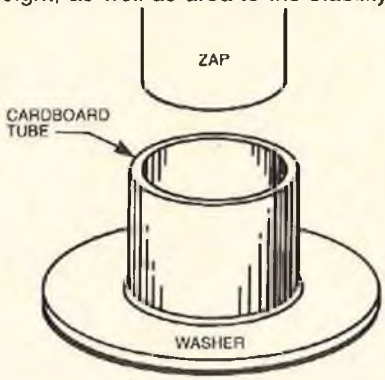


as shown in the drawings. The small end of a magic marker can be cut off, the ink wick pulled, and you have a large bore aluminum tube.

Short pieces of inner NyRod can be connected by using a threaded wire or a section of 2-56 bolt.

Army surplus outlets and automotive specialities houses often carry small squirrel cage blowers that can be easily adapted for cooling batteries in electric powered planes. Extension cord leads from the car's battery supply power to the blower. With proper ducting, a set of flight batteries can be completely cooled during charging. The inlet hole may be in the form of a scoop so as to cool during flight. A neat air exit can be made by using the metal or plastic framed screen from a kitchen faucet. They can be bought from plumbing supply stores in several sizes. Just cut a hole in the side of the plane, insert the screen, and Zap in place.

Since Zap containers upset easily, the problem can be avoided by talking your friendly hobby dealer into giving you the top from a tube piano wire comes in. Cut it to about an inch long and glue the metal end to a two inch square of 1/8 balsa or some other suitable base. I prefer a two inch washer because it adds weight, as well as area to the stability.



By putting two rubber bands around your two epoxy containers, they will always be together. You can not use one without the other anyway. I usually leave mine inverted for instant use.

When making an odd shaped piece to fit an opening, the shape can be easily transferred by laying waxed paper over the opening and rubbing gently around the edges with a hard smooth object. The shape imprints on the wax paper which can then be cut to an exact template.

By using an old rotisserie motor and mounting it as shown, a plane rotating paint stand can be made that will reduce

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MURPHY'S LAWS . . . AND RC

BY JIM KITCHEN

Just who is, or was Murphy?

No one can really answer that question, but we do know that Murphy is a modern-day folk hero. His fame has even surpassed that of the legendary Kilroy. Kilroy's specialty was travel. Murphy's is philosophy. Murphy is generally considered to have cut his teeth in the military. Whether he was a citizen soldier or a careerist is uncertain, but one finds vestiges of military as well as everyday life in the philosophical sayings that he has given us. These sayings are commonly referred to as "Murphy's Laws".

If anything can go wrong it will: This is probably Murphy's most famous and oft-quoted law. In recognition of its status it is called Murphy's First Law. Dedicated to flyers who have stood by helplessly and watched their model spiral in from interference or radio system failure; to those who have watched their fuselage in a wingless descent with all or part of the wing fluttering in its wake; and to those who have had a take-off terminated because of a reverse aileron hook-up.

Nothing is as simple as it seems: To modelers who do repair work on their own R/C systems, and to power flyers about to take up silent flight.

Everything always costs more than you have: To the new $750.00 radio systems, and to would-be R/C modelers as they look at the advertisements in this magazine.

Everything takes longer than you expected: To that half-finished model that permanently resides in the closet of every modeler, and to RC'ers who have just sent their system off to be serviced.

If you fool around with something long enough it will eventually break: To that old faithful model that seems to keep on flying forever, until - - -

If you try to please everybody, somebody is not going to like it: To the Academy of Model Aeronautics, and to those hard-working Model Contest Directors.

It is a fundamental law of nature that nothing ever quite works out: To that model, built with loving care, whose flight performance never lived up to your expectations; and to the weather on that contest date picked out six months in advance.

Whatever you want to do, you have to

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Sunday Flier

KEN WILLARD

Heave!

● With each passing year, the sport of R/C flying takes on more and more of the aspects of other sports, in that an event, once staged successfully, and then followed a year later by the "2nd Annual Bash" of the same sort, gradually becomes a "classic."

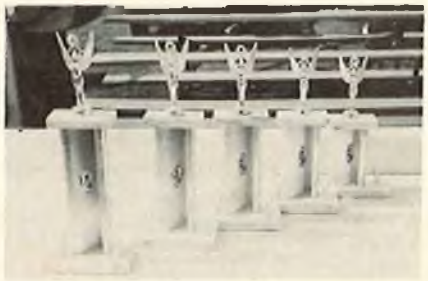
Such an event occurs almost in every part of the world. I don't mean the National Championships, or the Internats, or the other biggies that we all follow, even if we don't compete. I mean the semi-specialized events, started by a club and then growing into a position of national interest even though it really is local when it comes to entries. Well, maybe not local, but at least regional.

The RCM Slope Soaring Racing Championships are a good example; so is the DCRC Oktoberfest, Rhinebeck, and the Winternats. You could name an event for almost any part of the country.

Sometimes the very nature of the event creates strong differences of opinion as to just how it should be conducted. And probably one of the events in which opinions differ most widely is that of 1/2A racing. As Formula I, then 1/4 Midget,

Dale Metzler and winning Quicksilver.

Quickie 500, and Quickie 200 gained in popularity, the experts, as always, became the names in the winning column. So the idea of 1/2A racing, with controls limited to two, was supposed to change all that. It would be a relatively cheap — change that to inexpensive — event. Uh-huh. It is. But not in the amount of time spent in tweaking up those balky engines, shaving and balancing those props, increasing the nitro content to 50 to 60%, and anything else to get a higher



RCM trophies to fifth place.

speed. There just isn't any way, it seems, to keep a determined enthusiast from finding some way to get a slight advantage. And maybe that's the way it should be.

Last year, the first annual RCM 1/2A Trophy Race was held at the old Pioneers' Stewart Field in Sunnyvale. Not an ideal site, to be sure, but adequate. Seventeen entries showed

Gary and John Acord with a Wild Turkey.

up — not bad for a first effort, particularly when you consider that the rules weren't universally approved by the contestants. But the enthusiasm to race outweighed the gripes, and the races went off quite

Jim Boswell in the classic pylon judge position.

well, and everybody had a good time.

This year, on September 19th, the second Annual RCM 1/2A Trophy Races were held at the Pioneers/Santa Clara Police Activities League's new R/C Model Airport — one of the finest facilities of its type ever designed. Sure, it doesn't compare with something like an abandoned air base, such as Oxnard or Mile Square, but, as a facility specifically designed for R/C, by R/C fliers, it is first class, with provisions for sport flying, pattern, fun fly-ins, and, of course, racing.

So what happens? Only twelve entries showed up. To say the least, a very disapointing number. However, those who did come were among the top racing pilots in the 1/2A field — as evidenced by the fact that the times were, in many cases, under 1:30 for ten laps of the RCM 1/2A course, with the fastest at 1:25.4. Of course, that was with hand launched starts — which I consider a travesty when there is a beautiful asphalt runway available.

And you should see those hand launches! You'd think they were trying out for the javelin throw in the Olympics. Why, just the momentum from the launch would nearly carry the model to the scatter pylon. Take a look at those heaves in the photo of the start of one of the heats.

At the pilot's meeting, in accordance with the RCM rules, a vote was taken, and the hand launchers won. In the discussion prior to the vote, the argument was put forth that take-offs were dangerous because the ground control was virtually non-existent with only aileron and elevator control. True — but

not if you had rudder and elevator control. But then the air control isn't as good. And that gets us right back to why we have the two control limit in the first place. Cost, they say. Maybe so — but most of the contestants flew three or four control systems anyway, but just using two servos. Personally, I believe that the two control limitation is a vestigial appendix with today's R/C systems, and should be eliminated. And, at the same time, when a suitable runway is available, take-offs should be required. But I guess I'm in the minority. As least I would be if I went down to Los Angeles. Maybe, as 1/2A racing increases in popularity — assuming that it will — it'll come to the two class system which I suggested a couple of years back — Unlimited and Sportsman. The Unlimited class to be whatever the modeler can design that will hold together under the stresses of 1/2A racing, and the Sportsman class to be strictly rudder and elevator control, with standard props and fuel, and engine claiming for the winners if there is any question. Thus, if a contestant has souped up his engine, it could be claimed by another contestant for the standard purchase price. That way a modeler would tend to be discouraged from spending a lot of time working on his engine, only to have it claimed if he wins too consistently.

However, as it always seems to be in 1/2A racing, the name of the game is to get your engine running in the specified start time, and finish each heat you are in each round. Even if you don't win all first places, you'll come pretty close to taking home the hardware. One failed start, and a zero for that heat, is worse than getting two third places. Lee Helzel was looking like the man to beat — until he conked out in one heat.

Last month I reported the winners — Dale Metzler with his Quicksilver; Ron Clem with his Tigercat; John Acord and his dad, Gary, third and fourth with their Wild Turkeys; and Lee Helzel with his modified version of the Upstart.

It always makes me feel good to see a father and son team like Gary and John Acord battling each other and, at the same time, helping each other. And their Wild Turkey design turned in the fastest

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Fred Weaver, LSF Level V, with an original design 12½foot span thermal soarer.

REPUBLIC SEABEE

BY TOM MOUNTJOY

Tom Mountjoy is a prime example of a pre-World War II free-flight scale buff (FFSB) who, several years ago, was bitten by the R/C bug. He designed and built his original Seabee in 1945, during which time the Republic Aviation Company was tooling up for the production aircraft with the dream of a Seabee in every hangar and/or boat dock. The fly-away price of the Seabee was first advertised at $4,500, although later the price was increased to a staggering $7,000. Republic built over one thousand Seabees before production was halted for good in 1947, due to a declining market.

The Seabee was a fine idea with a strong attraction to almost anyone interested in the ultimate airplane. The design has a certain amount of sex appeal not found in the average airplane. There was an old rumor that the Seabee was underpowered and it can now be told that, indeed, it was too much airplane for the size engine available at the time. Today, the original 210hp Franklin has, more than likely, been replaced with engines varying from 265hp up to 350hp. The Bee would true out at around 90mph low cruise, 115 at high; this, and patience, would get you anywhere!

It has been the author's experience that most model builders are constantly on the lookout for a challenge. Let me assure you, before going any further, that the Seabee R/C has all the basic requirements necessary to make it a prime candidate for anyone on a challenge search. It is a true marriage of the airplane and the boat, known as an amphibian. All of this pushed ahead with a power plant located behind the C.G. and therein lies the real challenge. The two problems most associated with an R/C configuration of the Seabee type are: (1) tail heaviness, and; (2) cooling the engine on a pusher installation.

Cooling is no problem in the air, but on the ground you will want to hold engine runs to a minimum (particularly on a hot day). This is not an unbearable situation; it's just one you must be aware of and exercise the necessary caution.

Fuselage Construction:

The fuselage construction is unique. As you can see by studying the plans, it is quite different from the normal. Remember that you are building an amphibian so there are some unusual curves involved. As in all boat construction, the keel is laid first. Make the forward section of the keel from 1/8" plywood sheet (no warp allowed) and the aft sections from 1/8" hard balsa. To keep the tail light, lightening holes are recommended as shown on the plans. I used an X-Acto hole cutter in my hand drill motor which does a neat job if the blade is sharp. Practice on a piece of scrap first.

Once the keel sections are secure, you are ready to add the bulkheads in the usual manner. The cabin floor and inside panels are added next in order to form a neat box construction. Be certain that all internal parts, stringers and even the control surface NyRods are glued in their proper places before covering the fuselage with 1/16" top grade balsa sheet. Note the 1/16" balsa "V" panel directly under the engine for catching fuel oil drippings.

Do not try to cover more fuselage with balsa sheet than you can conveniently

handle. Small sections accurately done give a much neater job than trying to cover too much area with one sheet. In building the Seabee, the fin is an intricate part of the fuselage and, therefore, should be assembled and covered right along with the rest of the fuselage.

You will note that the cabin floor has a rectangular hole for mounting the servo tray for the rudder and elevator only. Because of the engine location, the throttle servo is not a member of this group. Be certain to match the servo cut-out with your servos, using the drawing as a guide only. Control servos are mounted as low as practical in order to insure a direct route for the NyRod travel to the tail surfaces. Fill in the area under the servos with a solid amount of foam rubber for protection.

Follow the plans in constructing the top cabin structure. Use hardwood, or hard balsa, so that it will be strong in case of a flip-over landing. The skylight window is removable in order to gain access to the servos and radio gear. A little more weight for additional strength ahead of the C.G. is recommended with this particular design.

There are two fuselage window modifications I have made in the plans, not identifiable in the Seabee pictured in this article. The original, or first, Seabee did not have the racy slant to the forward window post and the windows were somewhat larger. In order to establish accuracy, I have corrected this situation on the plans. The smaller windows will make the addition of the Kavan window mounting channel more difficult to apply but not impossible. The problem will be in making the curves at each corner. It will probably be necessary to stop and start the channel in each corner, then trim the outside edge of the corner radius in order to give a curved appearance. Miter the opposing edges 45° at time of installation. The actual production Seabee as it left the factory did not have channel rubber window mounting. Therefore, if you decide to forego it, you will be that much more true to scale.

The landing gear is made in two separate sections, namely a right and left assembly. Using 3/32" wire, bend as shown on the plan and solder each of the two pieces after wrapping with fine brass or copper wire. Also, solder a small brass lug to each leg at the fuselage in order to secure the gear and yet make is easily removable. By turning the gear upside down and switching sides, it can be retracted for seaplane operation. The real Seabee carried the wheels in a similar manner on the outside when fully retracted.

Center Section:

As you can see on the plan, the wings are made in two panels and join at the center section which is a part of the fuselage. While I do not advocate this type of wing installation, it is a necessity because of the unconventional location of the engine and fuel tank. (By using the new pumper engine, the fuel tank might conceivably be located under the center section, thereby allowing for a one piece wing complete with aileron servo.)

In addition to the wing stubs, the center section contains the engine and mount, the fuel tank (Kraft 4 oz.), and the aileron servo. Locating and mounting the servo is a delicate situation because of the limited space. In order to facilitate a direct push-pull line to the ailerons, the servo is situated under the fuel tank. Since the tank is clearly accessible and easily removable, this is really not too bad a layout. A careful installation will insure against surplus fuel getting into the servo area.

The aileron push-pull rods are connected to the servo disc with the tank raised out of the way. I found that by drilling a Kwik Link hole on either side of the regular hole in the servo disc, adequate aileron travel could be obtained. Just enough clearance must be left between the opposing Kwik Links to allow freedom of movement.

The center section spars are made from 3/16" balsa, bonded to a slightly wider piece of 1/16" plywood. Note that the plywood extends down below the bottom edge of the balsa spar. This allows you to securely glue the spar assembly to the mating bulkhead. The 3/32 diameter wire pins for receiving the outer panels are thread wrapped and epoxied to each spar. The locknut arrangement for holding the outer panels must be installed before covering the entire center section with 1/16" sheet balsa. Blend the lower surface of the center section into the fuselage side with a good filler material.

Right here you have to say to yourself that mounting the wings and the aileron servo connection sounds like a lot of hookup work at the flying field. Actually, the Seabee is not a big model. It can be easily transported in most cars without disassembly. In other words, once you get it together, you can leave it together.

Tail Surface Construction:

The stabilizer is constructed in the normal manner and covered with 1/16" balsa sheet. Make the main spar from spruce or basswood as it must be strong. Insert the stabilizer through the fin so that the rear fin post is flush with the main spar of the stabilizer as shown on the plans.

The rudder and elevator are not covered with sheet balsa in order to preserve lightness. If you prefer to cover with sheet balsa, use 1/32" or sand the 1/16" to a maximum. Remember to keep the aft section as light as possible without sacrificing strength.

Engine Cowl:

The engine cowl can be carved from one hunk of balsa if you like to whittle. I made mine by framing with a front, center, and rear bulkhead, then filling in-between with 1/2" square soft balsa blocks. Use good quality balsa and you will have no problem carving to the desired shape.

The front grill is made from soft 1/16" wire, glued or soldered permanently in place. Paint the grill silver for a sharp appearance.

Wing Construction:

The wings of the Seabee are the only part that is not unusual. Believe it or not, the prototype Bee had a tapered wing which was attractive but too expensive to manufacture. I have stuck to standard wing construction for the right and left panels. If you have no objection to three controls, the ailerons can be deleted. Since my Bee has ailerons, I cannot vouch for the performance. However, it would save a lot of work including elimination of the servo installation in the

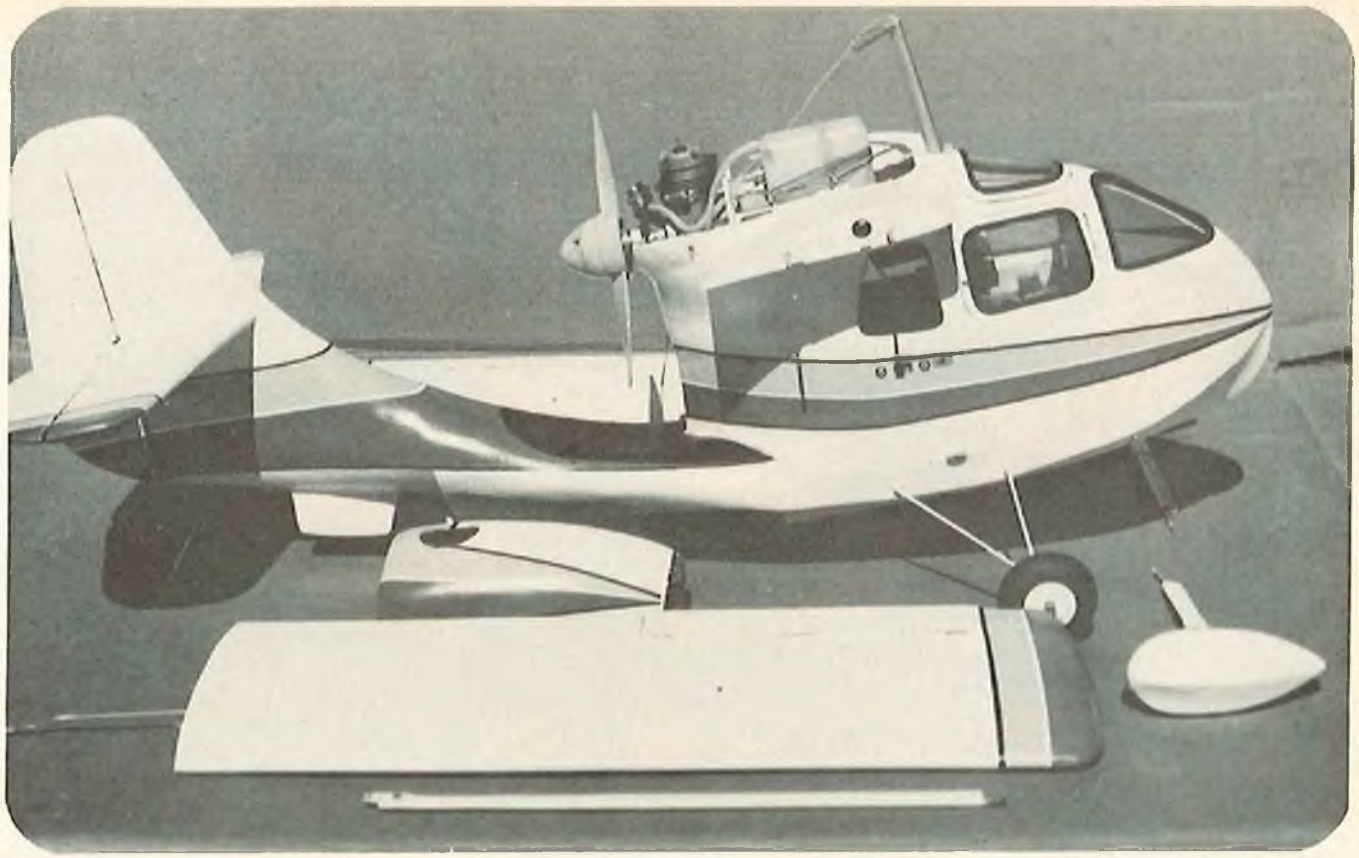
SEABEE AMPHIBIAN

Designed By: Tom Mountjoy

TYPE AIRCRAFT
Stand-Off Scale
WINGSPAN
51 Inches
WING CHORD
6.5 Inches
TOTAL WING AREA
331.5 Square Inches
WING LOCATION
High Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1 Inch
O.A. FUSELAGE LENGTH
34 Inches
RADIO COMPARTMENT AREA
(L) 7" X (W) 4" X (H) 3"
STABILIZER SPAN
18 Inches
STABILIZER CHORD (Incl. elev.)
5.125" Average
STABILIZER AREA
92 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Way on Fin
VERTICAL FIN HEIGHT
9 Inches
VERTICAL FIN WIDTH (Incl. rudder)
5.125" Average
REC. ENGINE SIZE
.23—.35 Cu. In.
FUEL TANK SIZE
4 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
Four
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa and Spruce
Weight Ready-To-Fly	56—72 oz.
Wing Loading	24—31 oz./sq. ft.



center section. Wing strut and pontoon fittings etc., are securely mounted and checked for alignment before final covering.

Pontoons & Wing Struts:

The pontoons are carved from lightweight balsa block and the strut is made from spruce. The mounting fitting is designed to hold the strut securely to the wing and yet be quickly removable. You will not wish to install the pontoons when flying off of land because of their vulnerability to damage. The wing struts are streamlined spruce with end fittings as shown on the plans.

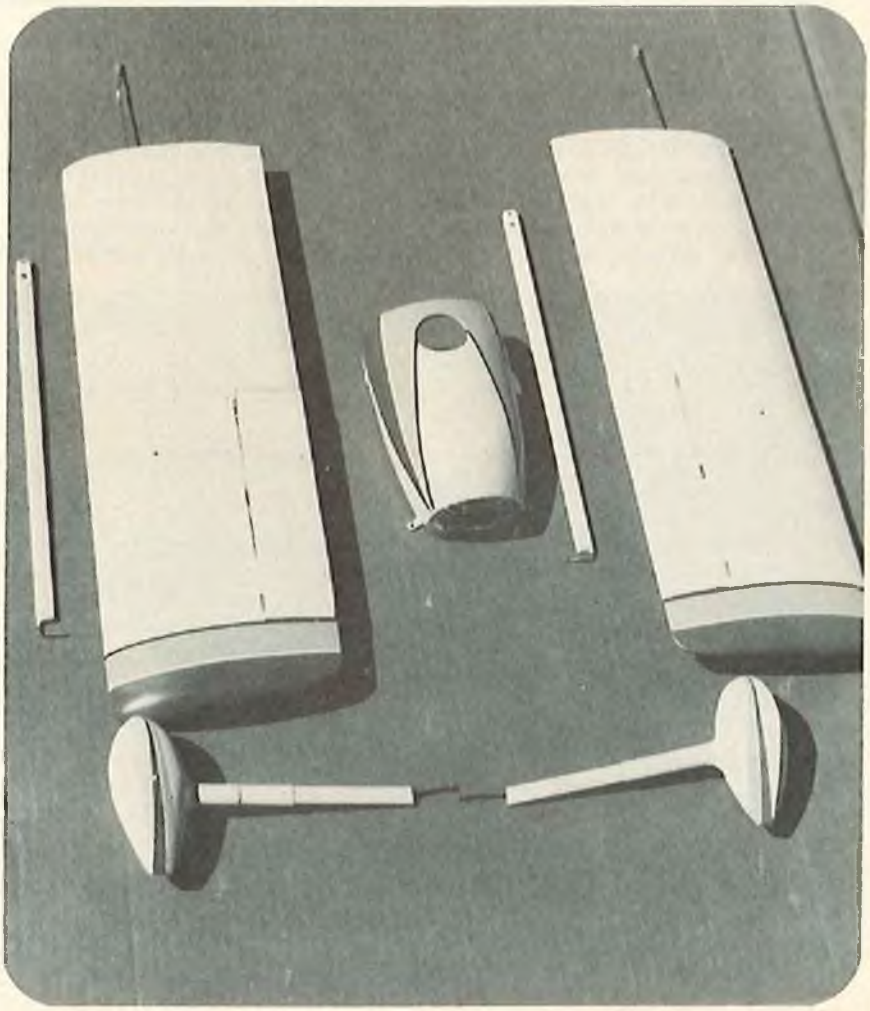
Covering & Finish:

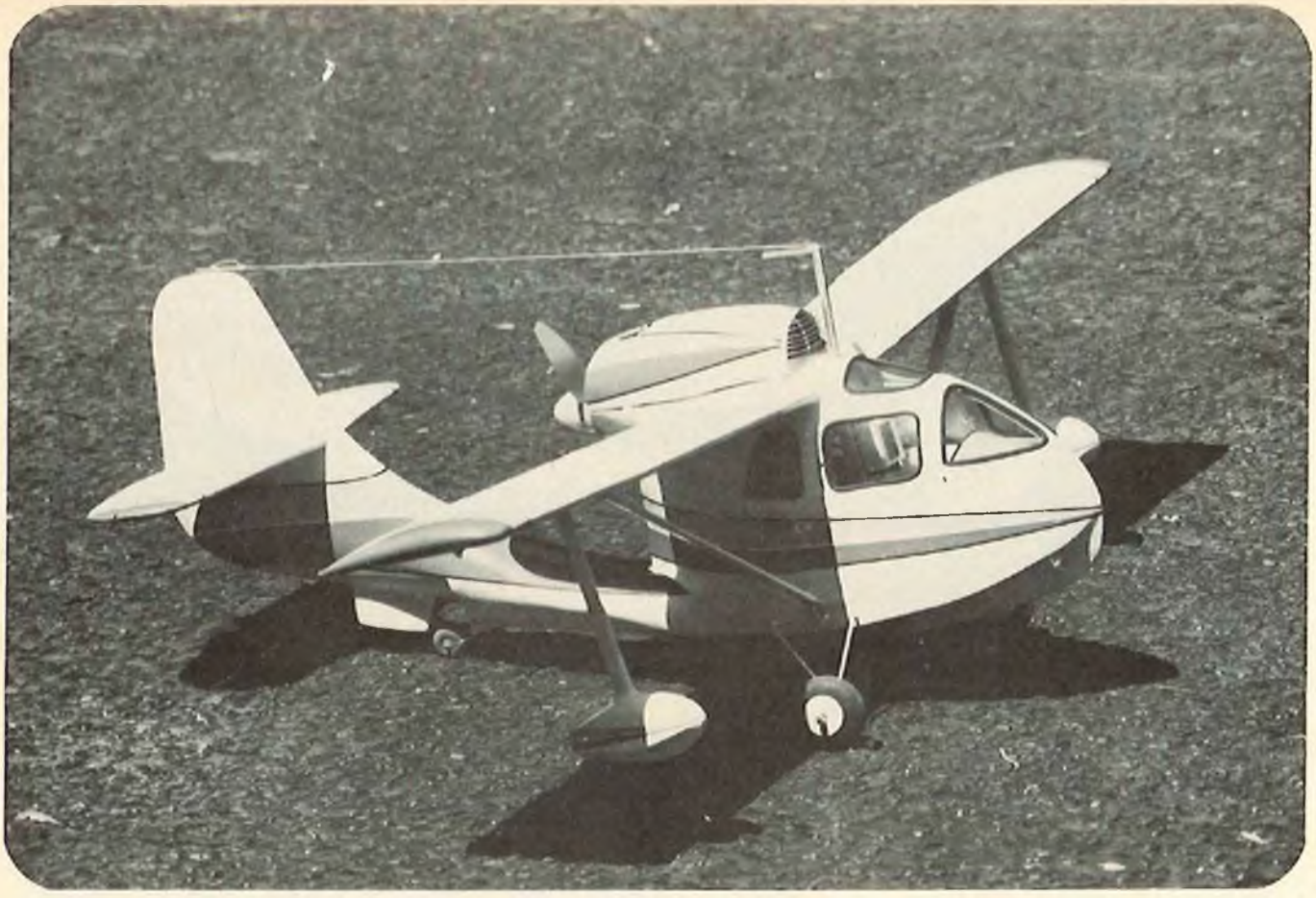
Cover the entire model, including all balsa surfaces, with a material of your choice. The real Seabee is all metal with corrugated aluminum on the wings and tail surfaces. I used the new lightweight Coverite throughout and finished off with white K & B epoxy spray paint prior to adding the trim. The orange and bright yellow trim is accented with a thin black strip on the outer edges with a white strip between the orange and yellow. Because of the unusual shape of the Bee fuselage, the striping can be a point at the front and very wide at the rear. This would make a conventional airplane appear to be backing up, but with the Seabee, it gives a most attractive appearance.

Adjusting & Flying:

The first thing before flying is to balance your plane 1/3 back of the leading edge of the wing. If you have watched your tail weight from the beginning, this will be easy. A trap door in the nose is

Photos above and below show the Seabee with the wings, nacelle cover, struts, and floats removed.



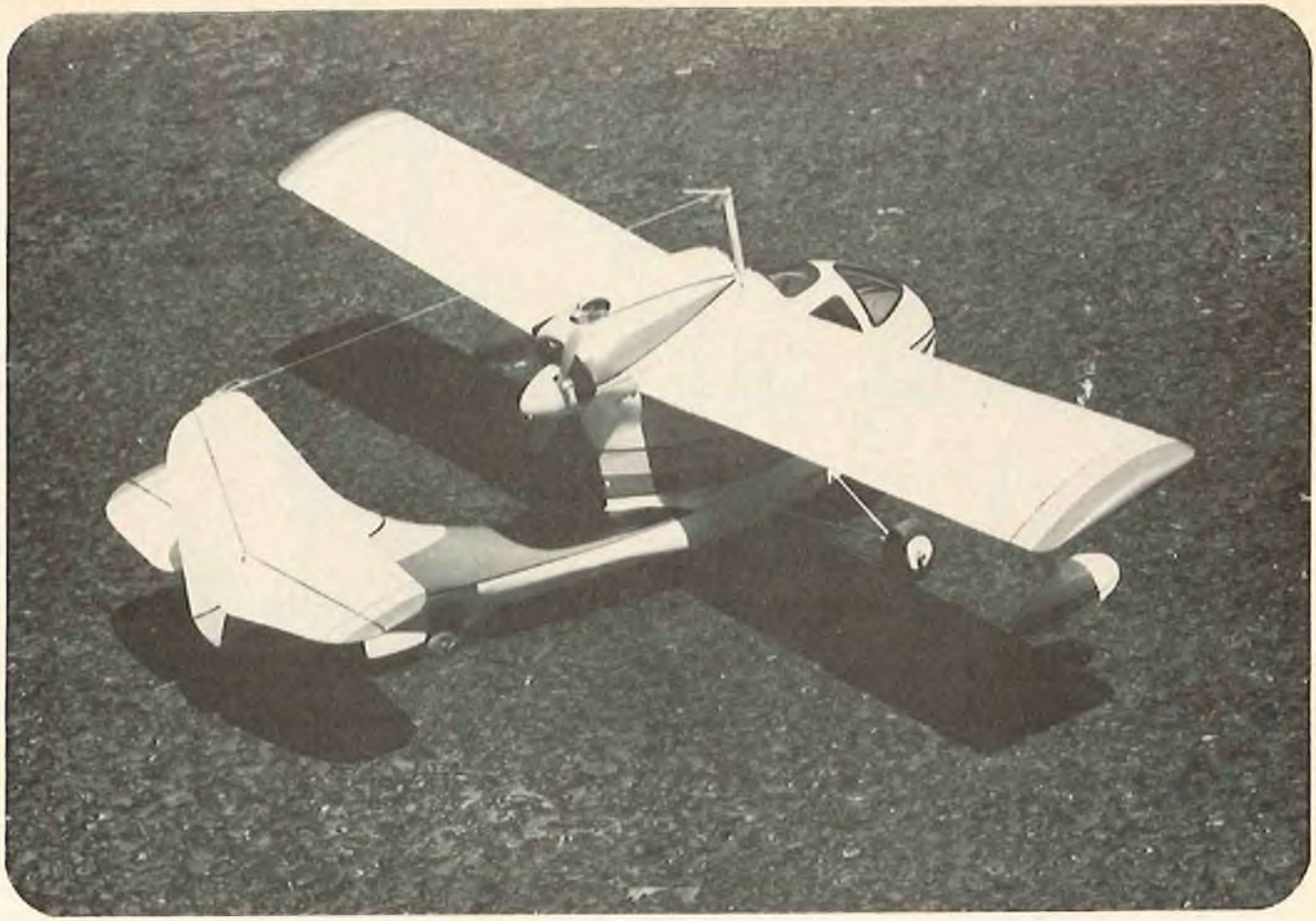


designed to hold any additional weight required. Since there is no propeller on the front end, weight can be added to a boom or probe extension made from a 3/16" dowel rod. This moves the weight well forward and cuts down on the amount needed and, therefore, the overall weight of the plane. Actually, the probe is rather attractive and gives the plane an experimental look found in most flight test aircraft.

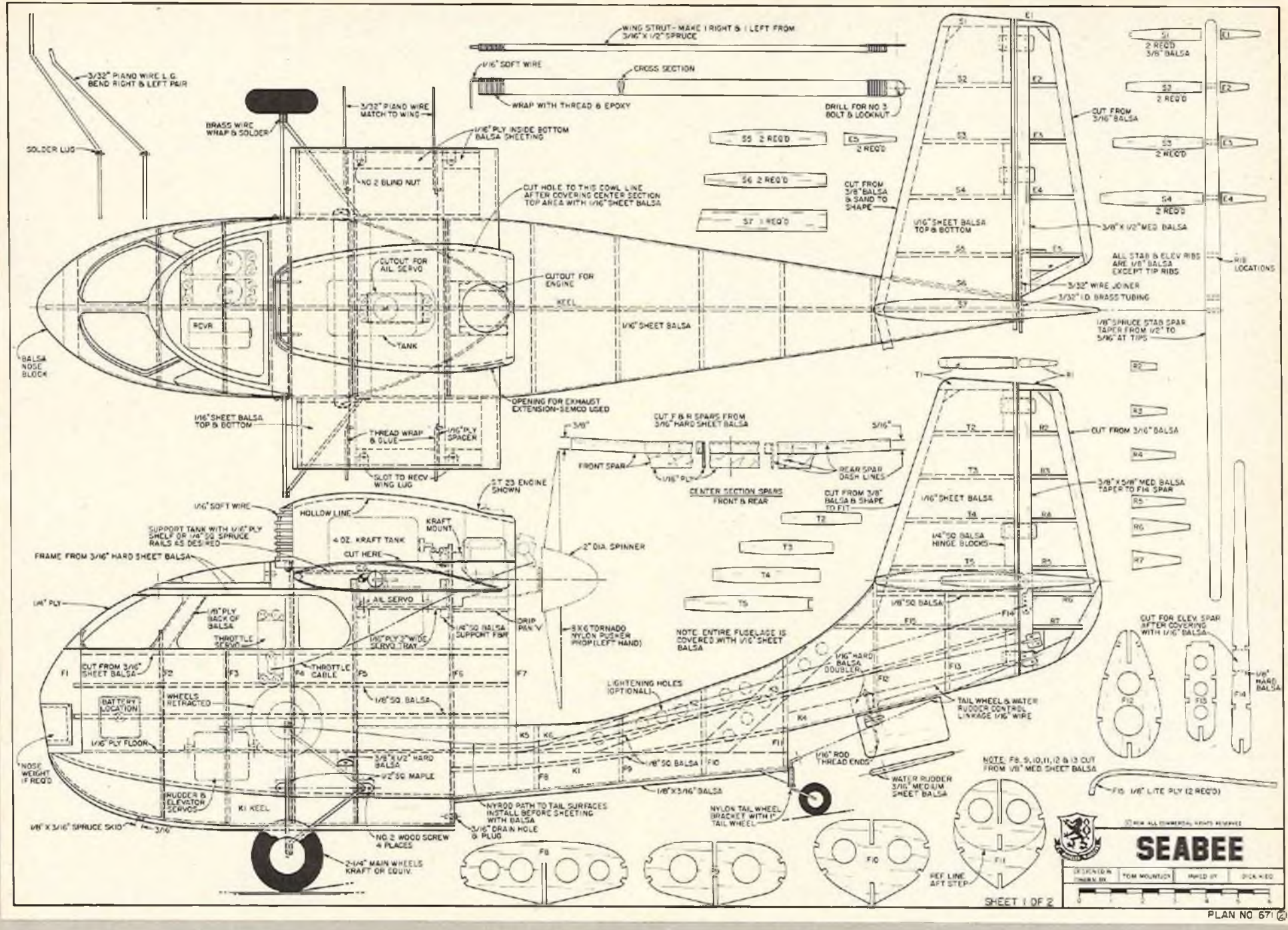
In flying off the water, all adjustments remain the same except, don't forget to retract your landing gear and add you wing pontoons. If you plan to fly from the water, make certain from the beginning that your model is as watertight as possible. Drain holes are shown on the plans just in case.

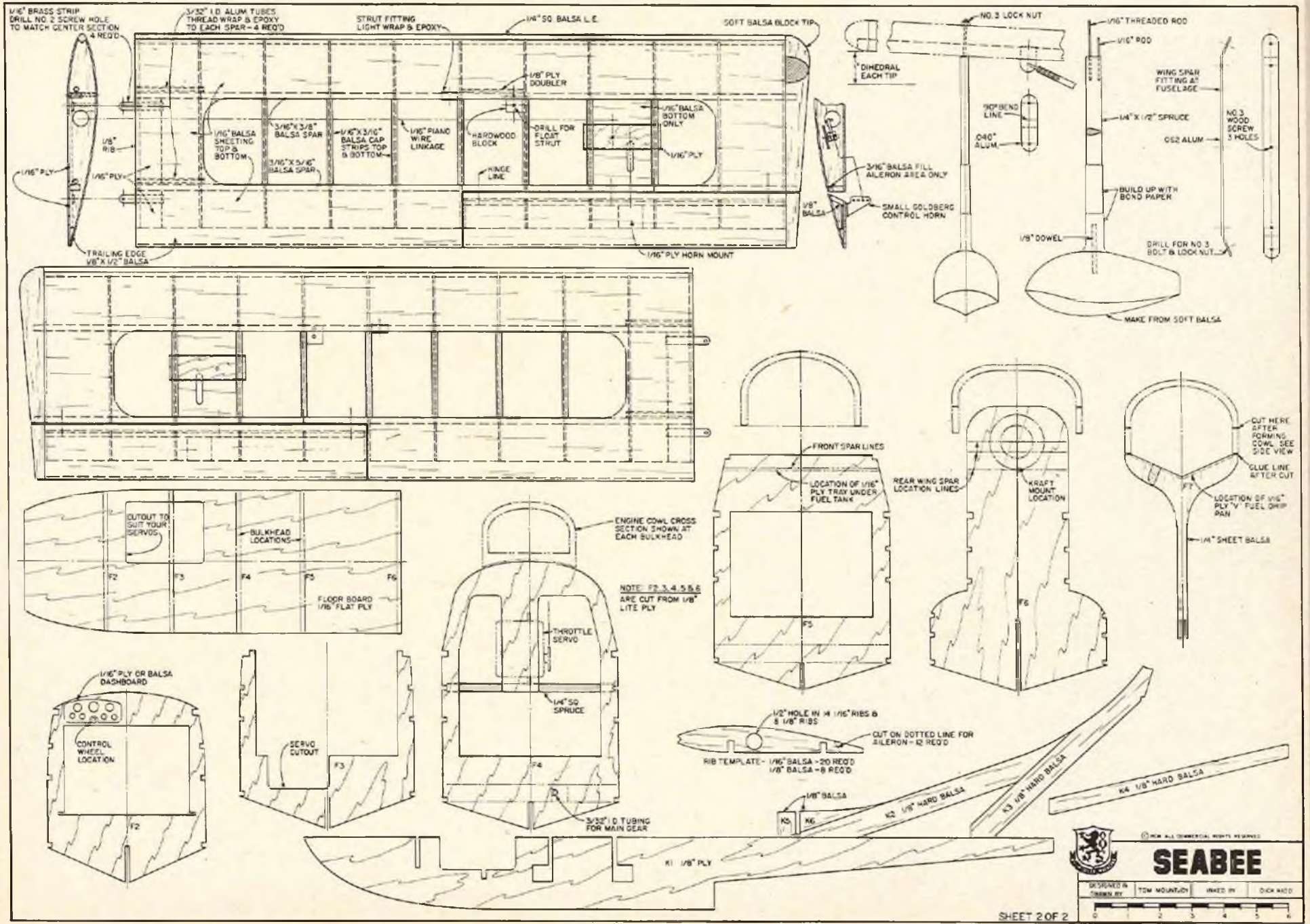
Author's note: By now you have met the challenge on earth. Now see if you can meet it in the sky. Of the hundreds of models I have built, the Seabee has been the most rewarding. It's a cute little beast with a mind of its own which seems to say, "Fly me you devil; you ain't seen nothing yet!" □

The full size Republic Seabee which RCM's Technical Editor, Dick Kidd, piloted for Chelan Air Service in the late '40's and early '50's.



FULL SIZE PLANS AVAILABLE — SEE PAGE 190




1/16" BRASS STRIP DRILL NO. 2 SCREW HOLE TO MATCH CENTER SECTION 4 REQ'D
3/32" I.D. ALUM TUBES THREAD WRAP & EPOXY TO EACH SPAR - 4 REQ'D
STRUT FITTING LIGHT WRAP & EPOXY
1/4" SQ. BALSA L.E.
SOFT BALSA BLOCK TIP
1/8" PLY DOUBLER
1/16" BALSA BOTTOM ONLY
1/16" PLY
1/16" BALSA SHEETING TOP & BOTTOM
3/16" X 3/8" BALSA SPAR
1/16" X 3/16" BALSA CAP STRIPS TOP & BOTTOM
1/16" PIANO WIRE LINKAGE
HARDWOOD BLOCK
DRILL FOR FLOAT STRUT
HINGE LINE
1/8" RIB
1/16" PLY
TRAILING EDGE 1/8" X 1/2" BALSA
1/16" PLY HORN MOUNT
3/16" BALSA FILL AILERON AREA ONLY
1/8" BALSA
SMALL GOLDBERG CONTROL HORN
DIHEDRAL EACH TIP
NO. 3 LOCK NUT
1/16" THREADED ROD
1/16" ROD
WING SPAR FITTING AT FUSELAGE
90° BEND LINE
.040" ALUM
1/4" X 1/2" SPRUCE
.032 ALUM
NO. 3 WOOD SCREW 3 HOLES
BUILD UP WITH BOND PAPER
1/8" DOWEL
DRILL FOR NO. 3 BOLT & LOCK NUT
MAKE FROM SOFT BALSA
CUTOUT TO SUIT YOUR SERVOS
BULKHEAD LOCATIONS
F2
F3
F4
F5
F6
FLOOR BOARD 1/16" FLAT PLY
ENGINE COWL CROSS SECTION SHOWN AT EACH BULKHEAD
NOTE: F2,3,4,5&6 ARE CUT FROM 1/8" LITE PLY
FRONT SPAR LINES
LOCATION OF 1/16" PLY TRAY UNDER FUEL TANK
REAR WING SPAR LOCATION LINES
KRAFT MOUNT LOCATION
CUT HERE AFTER FORMING COWL SEE SIDE VIEW
GLUE LINE AFTER CUT
LOCATION OF 1/16" PLY "V" FUEL DRIP PAN
1/4" SHEET BALSA
1/16" PLY OR BALSA DASHBOARD
CONTROL WHEEL LOCATION
SERVO CUTOUT
THROTTLE SERVO
1/4" SQ. SPRUCE
3/32" I.D. TUBING FOR MAIN GEAR
1/2" HOLE IN 14 1/16" RIBS & 1/8" RIBS
CUT ON DOTTED LINE FOR AILERON - 12 REQ'D
RIB TEMPLATE - 1/16" BALSA - 20 REQ'D 1/8" BALSA - 8 REQ'D
1/8" BALSA
K5
K6
K1 1/8" PLY
K2 1/8" HARD BALSA
K3 1/8" HARD BALSA
K4 1/8" HARD BALSA
SEABEE
SHEET 2 OF 2
PLAN NO. 671

A Three Channel .15 Size Home-Built Type Parasol Wing Sport Ship. **BY GEORGE F. JENNINGS.**

SMALL WONDER

● Small Wonder is a fun airplane! You can relax, have a ball, and fly as much as you like on a minimum investment with this airplane! I have always had a soft spot in my heart for parasol airplanes. (My wife says the soft spot is in my head!) Anyway, some of my fondest memories of R/C flying go back some ten years to when I built and flew my first parasol, called the Petite Parasol. It was a Fox .07 powered job, guided by a Min-X radio and a Rand Galloping Ghost actuator. Those brand names bring tears to the eyes of us old timers and stares of puzzlement to the newcomers. Anyway, the Petite Parasol was a good flyer and gave me my first taste of true success in the form of consistent flight performance. But as the saying goes, according to Don Dewey, "A fool and his airplane are soon parted!"

Small Wonder is an effort to duplicate that fun and relaxed flying I had with the Petite Parasol, except this time a modern home-built flair has been added. Stolp Starlet, Baby Ace, and Pober Pixie are examples of modern day parasol designs that have become popular with the EAA (Experimental Aircraft Association) members everywhere. Small Wonder is a scale-like ship that could very easily have a full-size counterpart hiding in some EAA'ers garage this very minute!

With 320 sq. in. of wing area, three channel radio, O.S. 15 R/C engine and a healthy epoxy paint finish, the flying weight is 2½ pounds. This results in a wing loading of 18 oz. per sq. ft. and is right in the ballpark. If you want a real floater, use an .09 engine, and cover with Solarfilm and it should weigh in at 2¼ pounds or less!

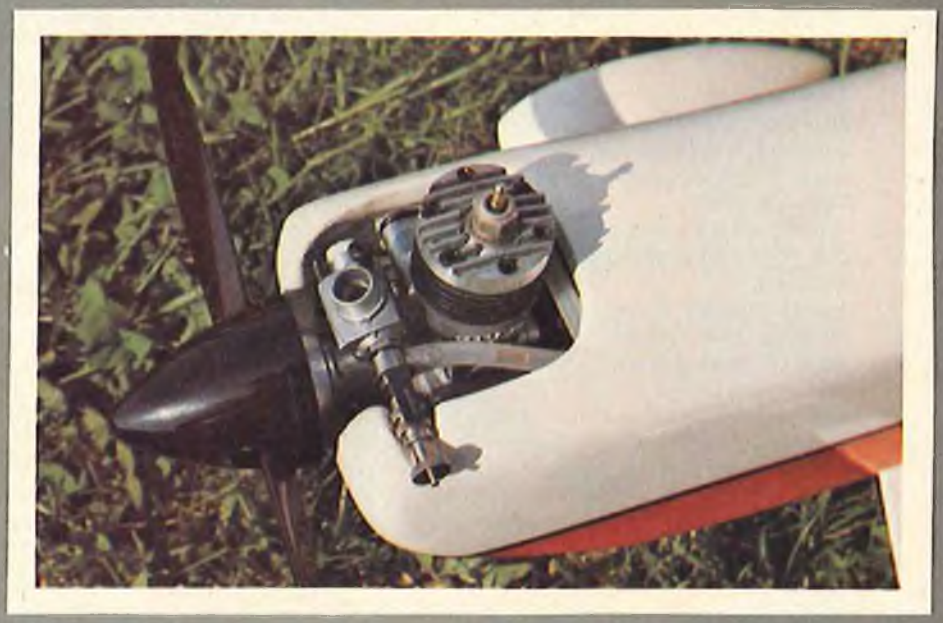
In the flying department, Small Wonder excels. Take-offs are effortless and requires very little rudder correction. Lift-off is smooth with no zoom and, once airborne, the ship is rock solid and goes where you point it. With an .09 engine in the nose, flight is slow and relaxed; however, a .15 provides enough zing to really tear up the sky. You may even be able to invent some aerobatic maneuvers of your own! Landings are easy with good control all the way in and, once back on the ground, you will be delighted with the ground handling. Construction is easy, quick and economical. Don't let the curved fuselage top and cabane struts throw you. Uncle George has engineered out the hard part. Just follow the steps in the test and in a few evenings you too will have a parasol that will occupy a soft spot in your heart (head?). It's truly a Small Wonder!

Wing

(Note) All balsa in the wing should be medium weight wood. *Do not* use soft mushy wood as most airplanes fly better when the wing is in one piece!

- ☐ Build the left wing panel directly over your wax paper covered plan by pinning down the 1/16" bottom leading and trailing edge sheeting, as well as the 1/16" x 1/4" capstrips and center section sheeting. Touch each joint with a drop of Hot Stuff instant glue.
- ☐ Using yellow glue such as Hobby Shack Kwik Tak, add the 1/2" x 1/2" leading edge and the 3/16" bottom spar.
- ☐ Cut the ribs from 1/16" sheet and glue in place all except the center rib.
- ☐ Add the 3/16" top spar. When thoroughly dry, block up the outboard end of the wing panel so there is 1½" measured from your building board to the bottom of the

Close-up of cockpit area and cabane struts. Easy to build, the Small Wonder returns a maximum of fun for a minimum investment.



An .09 to .15 engine and a four ounce tank provides ample flying time with a fuel bill that's hard to beat.

The wheel pants add a finishing touch to this home-built type parasol wing. Remove the pants when flying from rough fields.

SMALL WONDER

Designed By: George F. Jennings

TYPE AIRCRAFT
Sport
WINGSPAN
46 Inches
WING CHORD
7 Inches
TOTAL WING AREA
322 Square Inches
WING LOCATION
Parasol Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1.5 Inches
O.A. FUSELAGE LENGTH
28 Inches
RADIO COMPARTMENT AREA
(L) 7" X (W) 2.5" X (H) 2.5"
STABILIZER SPAN
15.75 Inches
STABILIZER CHORD (Incl. elev.)
4.375"
STABILIZER AREA
65.5 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5 Inches
VERTICAL FIN WIDTH (Incl. rudder)
3.75" Average
REC. ENGINE SIZE
.09 — .15 Cu. In.
FUEL TANK SIZE
4 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
Three
CONTROL FUNCTIONS
Rudder, Elevator & Throttle
BASIC MATERIALS USED IN CONSTRUCTION

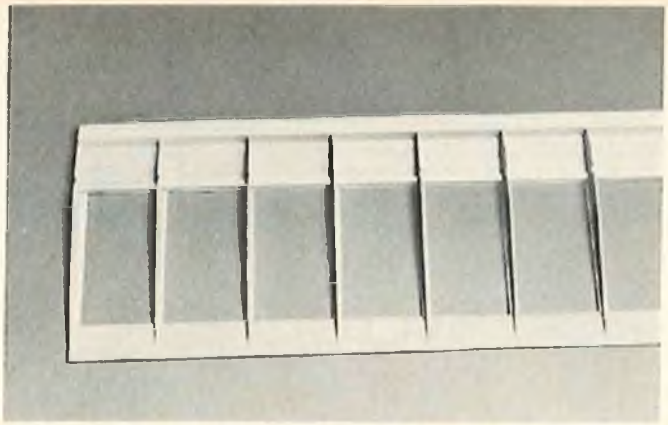
Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa
Weight Ready-To-Fly	36 — 40 oz.
Wing Loading	16 — 18 oz./sq. ft.

lower spar at the end rib.

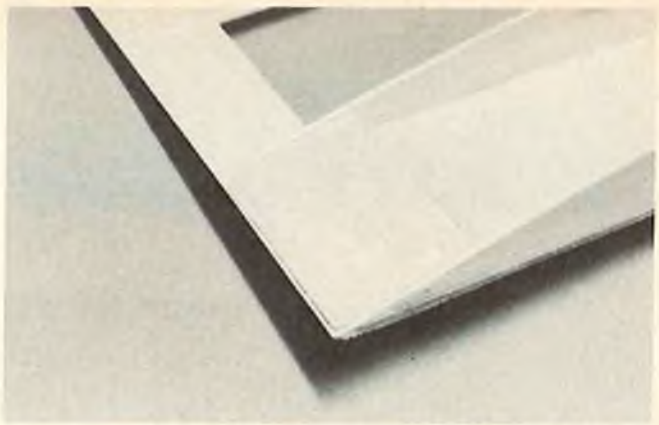
- ☐ Now glue the center rib in place using a square to set the rib at exactly 90° from your building board.
- ☐ Trim the top spar and leading edge to match your center rib angle. Also bevel the leading edge to match the front of the ribs where the top leading edge sheeting will attach.
- ☐ Add the center section balsa filler block at the trailing edge.
- ☐ Repeat the last 7 steps and build the right wing panel.
- ☐ Join the wing panels as follows: Pin down the left panel flat to the building board and block the right panel up 3" and glue together with Kwik Tak.
- ☐ When the glue dries, cut out 1/16" notches in the center ribs both in front of and in back of the main spars. Slip the 1/16" plywood dihedral braces in place after liberally coating with Kwik Tak. Clamp the braces securely to the spars with spring-type clothespins until the glue sets.
- ☐ Next add the 1/16" leading edge sheeting, trailing edge sheeting, capstrips, and center section sheeting to the pinned down panel. Use Kwik Tak glue.
- ☐ When the left panel is dry, pin down the right panel and add the top sheeting.
- ☐ Using a sharp X-Acto knife and sanding block, shape the leading edge of the wing to correspond with that shown on the plans.
- ☐ Cut out the curved portion of the trailing edge of the wing center section as shown on the plans.
- ☐ Add the 1" triangular wing tip blocks and, when the glue is dry, carve the tips to the contour of the airfoil and the tip shape will form automatically.
- ☐ Sand the entire wing lightly and wrap the center section with Celastic soaked in dope thinner or wrap with Carl Goldberg nylon tape and saturate with Kwik Tak. *Do not* eliminate this step, since a great deal of wing strength comes from the center section wrap!

Fuselage & Tail Surfaces

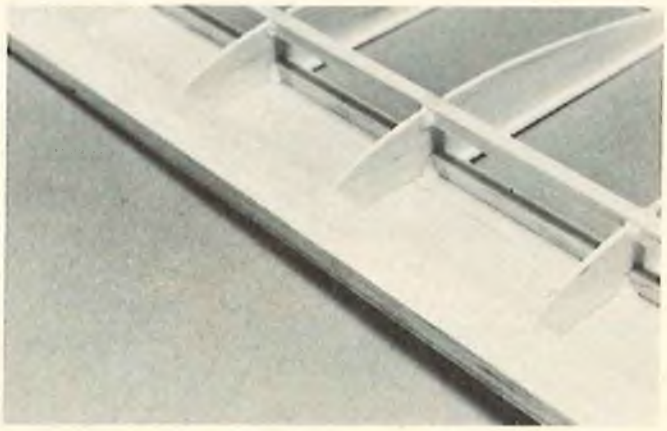
- ☐ Cut two fuselage sides from 1/8" x 3" x 36" medium balsa. Add a 3/16" square spruce strip flush with the bottom of the fuselage as shown on the plans. This will later become the framing for the radio access panel.
- ☐ Next, pin down the right fuselage side over the plan and glue the 1/8" x 3/8" plywood upright cabane struts in place on the inside of the fuselage side. Be sure that the strut position matches the plan perfectly.
- ☐ Using contact cement, add the vertical grain 1/16" balsa doublers, carefully fitting them around the struts. The doublers run from the rear of the firewall to the front of former F2.
- ☐ Add the 3/8" triangular firewall braces, as well as the upright 3/16" square balsa braces at the aft end of the fuselage and then the 3/16" square balsa tank floor brace. The tank floor height on the plans is positioned for a Sullivan SS 4 four ounce tank. If you use a different tank, adjust the tank floor braces accordingly.
- ☐ Complete the left fuselage side in the same manner as the right, making sure you end up with a *right* and *left* side! Use the right side as a guide in making sure the cabane struts are positioned identically on both.
- ☐ Cut out F1 from 3/16" plywood and all other formers from 1/8" balsa.
- ☐ Mark and drill the radial engine mount on the firewall and install the 4-40 blind nuts. (A Kraft-Hayes mount was used on the original.) Grind or file the mount for about 1½ to 2° of right and down thrust.
- ☐ Pin down the right fuselage side and use 5 minute epoxy to secure F1 and F2 in place. Use a square to make sure they are 90° perpendicular to the fuselage side.
- ☐ Epoxy the left side in place, making sure everything is absolutely square.
- ☐ Epoxy the 1/16" plywood forward fuselage bottom in place which runs from the front of the firewall to the front of the radio access panel.
- ☐ Bevel the fuselage sides at the tail. Mark the center of F1 and F2 and set the fuselage over the centerline on the plan and pull the tail together so that the marks on F1 and F2 and the rear of the fuselage are centered on the line. Add Kwik Tak and use a spring clamp clothespin(s) to hold until dry.
- ☐ Add the 3/16" square balsa cross braces in the rear of the fuselage, as well as the 3/16" square spruce cross braces at the front and rear of the radio access panel.
- ☐ The radio access panel hatch can now be cut from 1/16" plywood and installed using six No. 2 x 3/8" round head wood screws. Drill small pilot holes through the hatch into the spruce before adding the screws.
- ☐ Install the 1/8" balsa tank floor and drill holes for the fuel lines. Fuelproof the inside of the tank compartment with polyurethane varnish or surfacing resin. (If you fail to do this and your tank springs a leak, you may get to see how your airplane flies without an engine and front end!)
- ☐ Sheet the front fuselage top by first installing formers F1A and F1B with Hot Stuff, as well as the 3/16" square balsa top stringer. Cut out



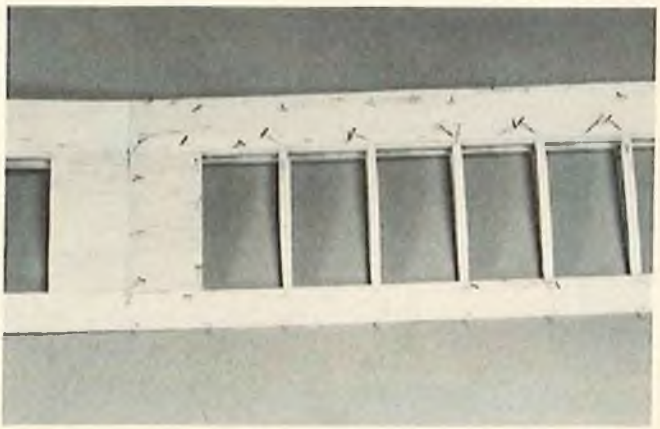
Pin down the 1/16" bottom sheeting as well as the 1/16" capstrips. Add 1/2" x 1/2" leading edge and the 3/16" bottom spar. Next add ribs and then top 3/16" spar.



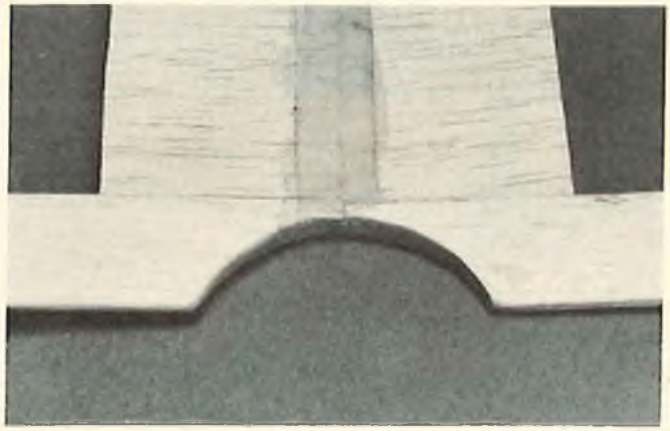
Add a soft balsa block at the trailing edge of the center section and shape to the contour of the wing ribs.



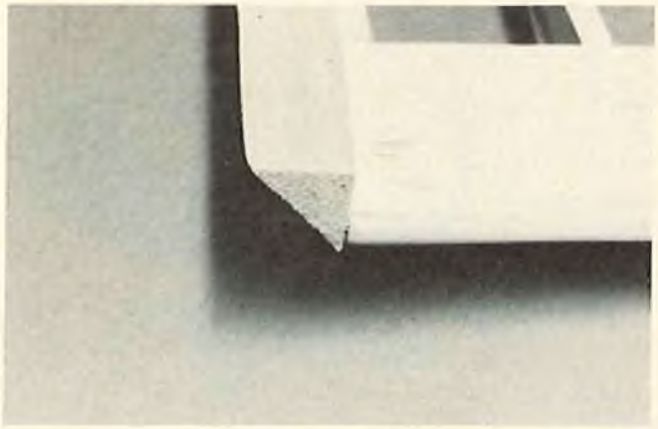
Taper the leading edge stock to match the front of the ribs in preparation for sheeting the top of the wing.



After wing panels are joined, pin wing panels flat to the building board and glue 1/16" top sheeting and capstrips in place.



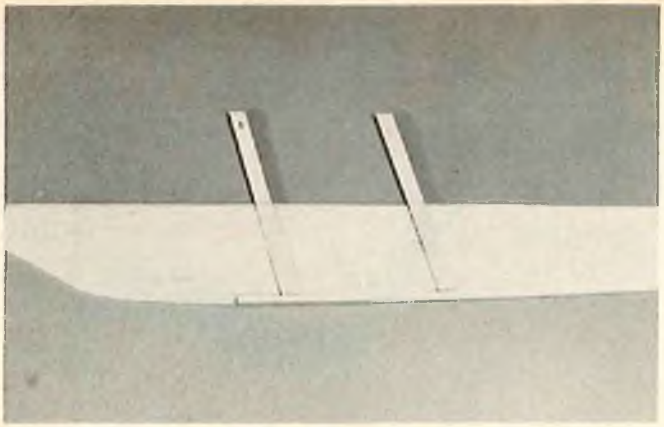
Trailing edge center section showing wing cut-out.



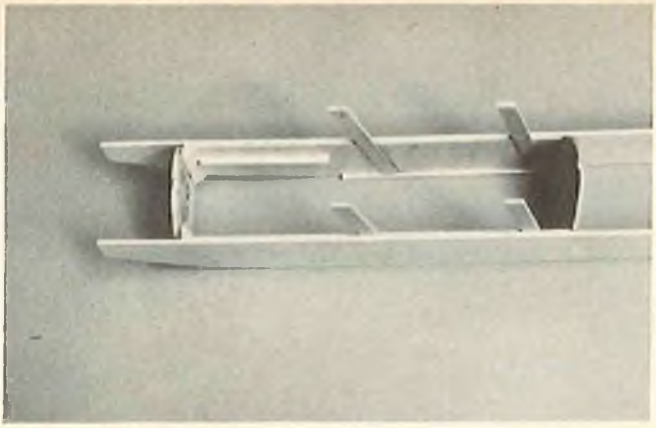
Wing tip is 1" triangular stock glued in place and carved to shape.

two sheeting pieces using the pattern on the plan from 1/8" soft balsa. Wet the outside of one piece and glue in place with Kwik Tak and hold in position with pins and masking tape until dry. Cover the other side with the second piece.

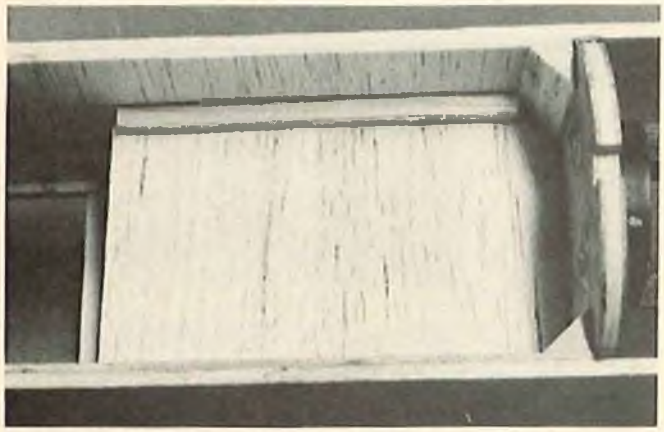
- ☐ Install the 1/8" balsa cockpit floor as shown on the plans.
- ☐ Cut out the 1/8" sheet balsa tail surfaces and epoxy the stab in place by applying the epoxy and pinning the stab in place. Then, before the glue sets-up, turn the fuselage over and sit it on the cabane struts and measure the stab to be sure there is an equal distance from your building board to the trailing edge of the stab on both sides.
- ☐ Glue F3, the fin mounting plate, in position in front of the stab as shown on the plan.
- ☐ Glue the fin in place, making sure it is located squarely.
- ☐ Add the rear fuselage top sheeting by first adding formers F2A and F2B, as well as the 3/16" square balsa top stringer. Again using the pattern on the plan, make two covering pieces from soft 1/8" balsa and glue in place in the same manner as the forward sheeting.
- ☐ Add 3/4" soft balsa blocks to each side of the fin and carve and sand so as to blend them into the fuselage and tail.



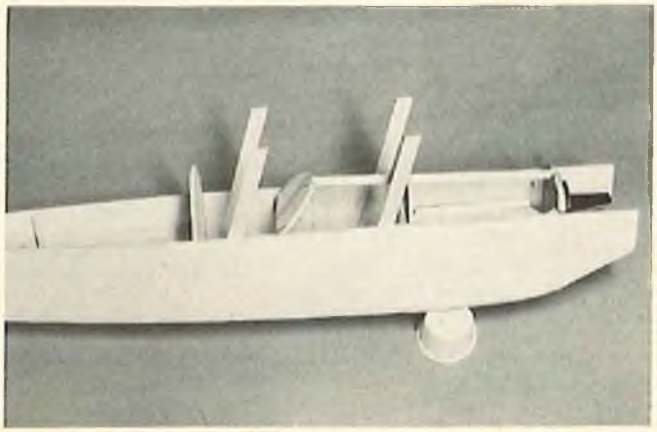
Right fuselage side showing 3/16" spruce strip and 1/8" by 3/8" plywood cabane struts glued in place.



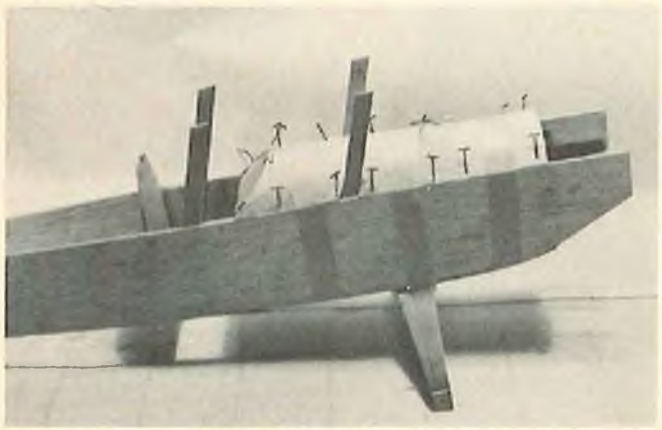
After fuselage doublers, tank floor braces, and 3/8" triangular firewall back-up braces are added; fuselage sides are joined using F1 and F2.



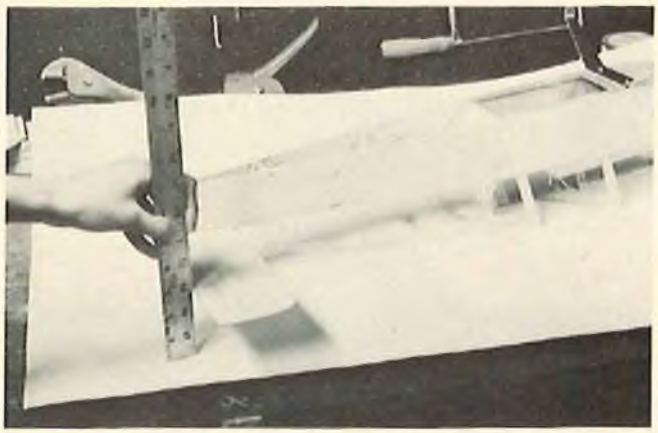
Tank floor is made from 1/18" balsa. Be sure to fuel proof inside of tank and engine compartment.



Instrument panel, F1A and 3/16" stringer are glued in place in preparation for sheeting of front top fuselage.

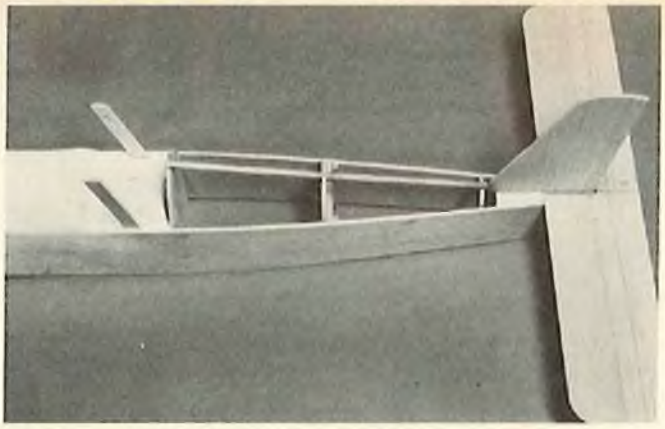


Wet the 1/8" soft balsa sheeting on the outside, glue in place and hold with masking tape and pins.



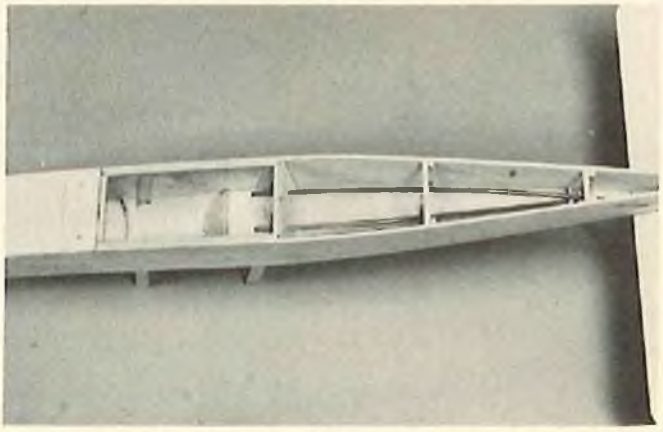
Stabilizer is epoxied in place with 5-minute epoxy. To insure correct alignment, place fuselage upside down on cabane struts and measure both sides of the stab to be sure of equal distance from your work table.

- ☐ Install the 1/16" plywood tail piece at the rear of the fuselage — drill a 1/16" hole at the location shown on the plan.
- ☐ Make up 6 control surface hinges from strip nylon hinge material as detailed on the plan. Using a sharp X-Acto knife, make slots in the tail surfaces for the rudder and elevator. Temporarily hinge the surfaces to be sure they function properly.
- ☐ Taking 1/16" music wire for the tail, bend a 90° angle and drill a 1/16" hole into the rudder at the location shown on the plans.
- ☐ Carefully poke the wire down through, and out, the 1/16" hole in the plywood tailpiece on the bottom of the fuselage. Bend the wire to accept the tail wheel.
- ☐ Temporarily re-install the rudder with hinges and plug the wire into the rudder. When adjusted for easy movement, solder a small washer to the wire at the bottom of the fuselage. A soldered washer takes the strain from the rudder. The rudder control horn straddles the wire plugged into the rudder for strength in this area.
- ☐ Solder the tail wheel in place. You now have a steerable tail wheel.
- ☐ Plan your servo installation but don't install them yet. Install the outer pushrod cases by drilling 3/16" holes through F2 and out the

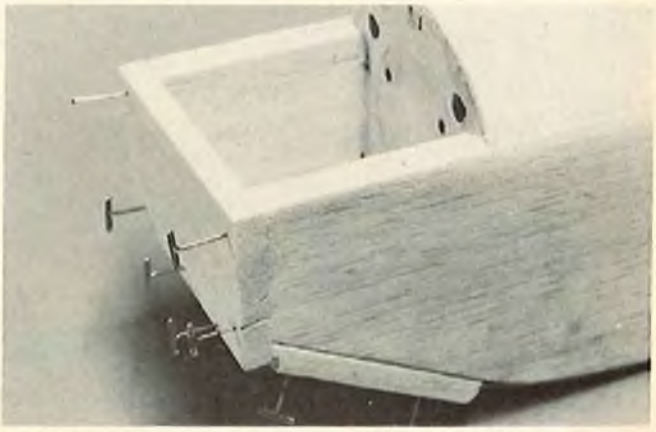


Rear top fuselage sheeting is installed in the same manner as the front top sheeting.

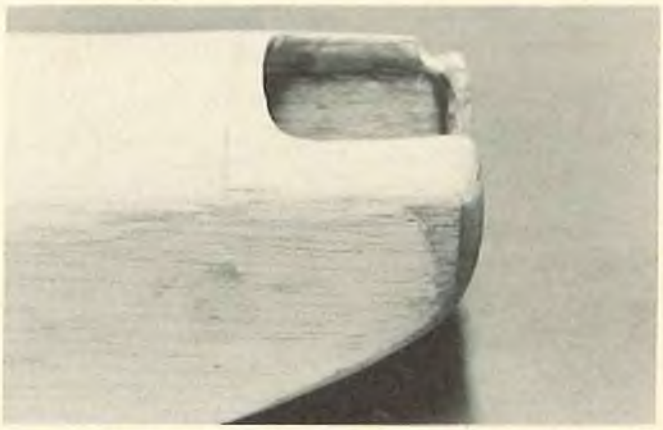
Add 3/4" soft blocks to each side of the fin and carve and sand to blend into the fuselage.



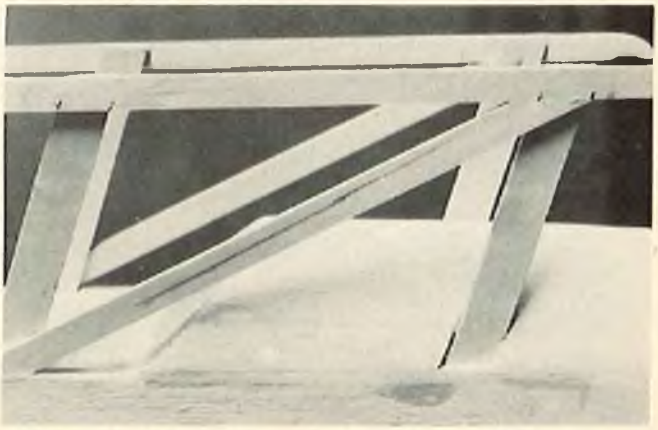
Sullivan pushrods are installed before bottom of fuselage is sheeted.



Soft 1/4" balsa blocks are installed at the nose for easy carving and shaping.



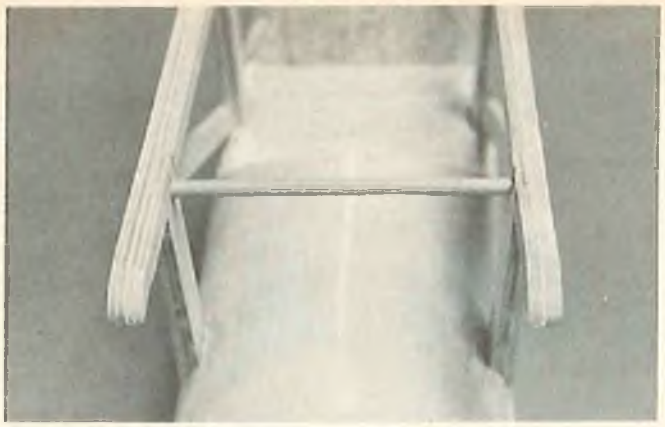
The 3/4" top nose block has been added and the nose has been carved and sanded to shape.



1/8" plywood wing saddles and diagonal braces are shown glued in place.

rear of the fuselage at the appropriate locations. Taking coarse sandpaper, rough up the pushrod cases where they go through former F2 and fuselage rear and epoxy at both ends. Bevel the pushrod cases where they exit the fuselage at the tail so that they are flush with the fuselage.

- ☐ Now install the 1/16" balsa bottom fuselage sheeting from the radio access panel on the back. Make sure this is installed crossgrain.
- ☐ Add the 1/4" soft balsa noseblocks as shown on the plans and carve to a pleasing well-rounded shape.
- ☐ Tack glue the 3/4" soft balsa block in place and carve to blend in with the rest of the nose. Remove and, using coping saw or jig saw, cut out top of block to accommodate engine. When a good fit is achieved, permanently glue in place.
- ☐ Add the 1/8" plywood wing saddles to the outside of the cabane struts using Kwik Tak (see plan).
- ☐ Add the 1/8" plywood diagonal cabane struts.
- ☐ Fill in the outside of the upright struts with 1/8" balsa and, using sandpaper, round the edges. Also add 1/8" plywood fill-in to the wing saddle on the inside (see plan).
- ☐ Drill 1/8" holes through the wing saddles at the location shown on the plan and insert pieces of 1/8"



1/8" dowel cross braces are added to cabane structure.

Small Wonder completely framed up ready for covering.

The finished product.

Son, Doug Jennings, fires up Small Wonder while Ken Sucharski holds.

The Small Wonder looks like an EAA home-built in the air.

A three channel sport ship, the Small Wonder is easy and fun to fly.

dowel.

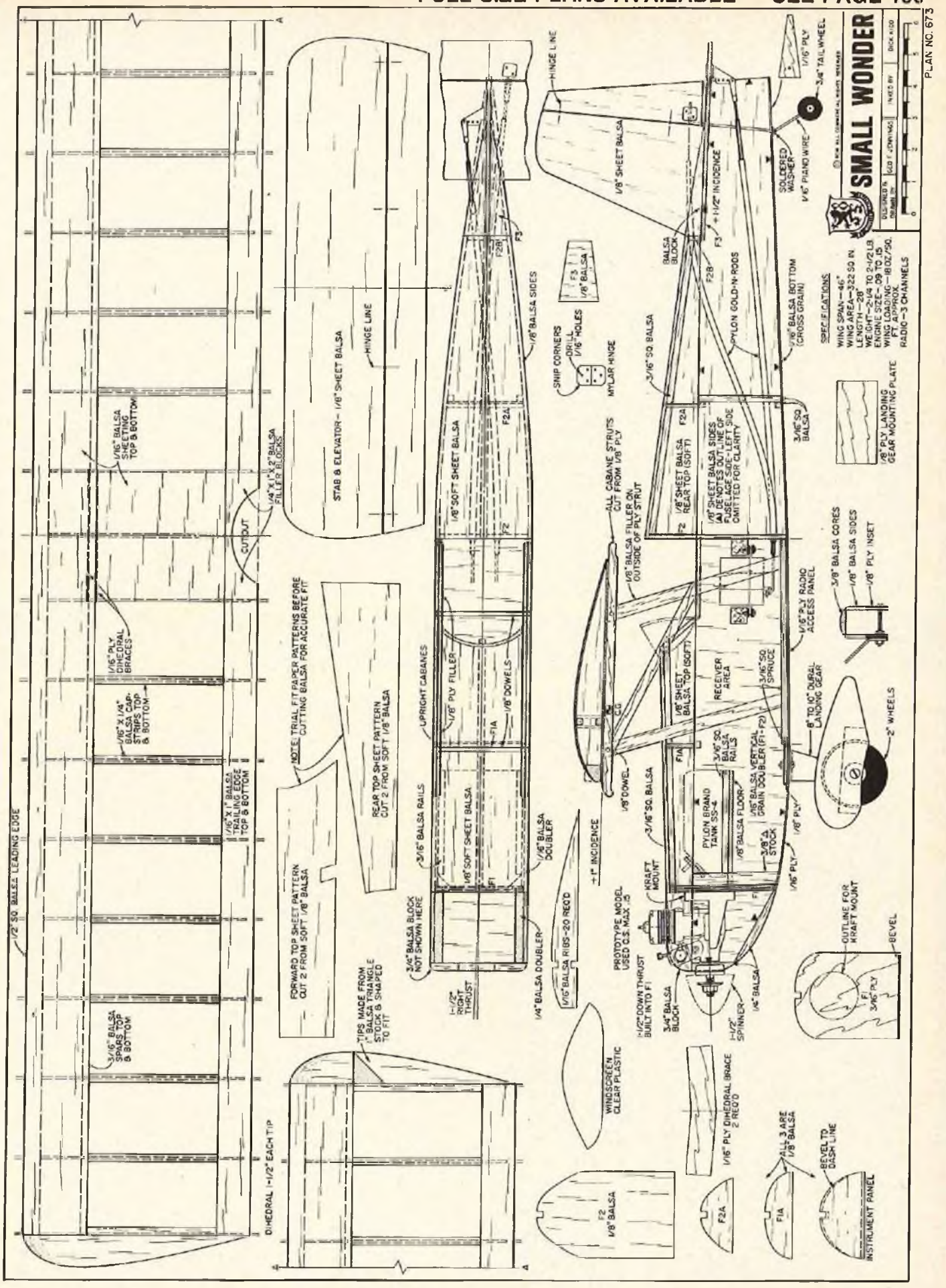
- ☐ Install 8"-10" tread dural landing gear by epoxying the 1/8" plywood landing gear plate in the fuselage as shown on the plan. Drill two 1/8" holes through the gear. Line the gear up so that the wheel axle is in line with the leading edge of the wing. Mark the location on the fuselage and drill 1/8" holes through the fuselage bottom. Install 4-40 blind nuts and bolts, cutting off the excess length of the bolts. (Note: Wheel pants are not recommended if you fly from grass.)

Finishing

- ☐ It is recommended that one of the plastic heat shrink covering materials be used such as Solarfilm or MonoKote; however, the traditional silk and dope method is acceptable on this aircraft. The main thing to remember is that extra weight detracts from good flying performance. Surfacing resin and epoxy paint can be used; however, this method will result in a weight gain of about 4 ounces (on the airplane!). One trick you might try if you cover with Solarfilm is, once the aircraft is covered, mask off trim areas and spray with K & B Superpoxy directly on the Solarfilm. Don't be alarmed if the covering loosens up. When the Superpoxy is cured, gently re-

to page 162

FULL SIZE PLANS AVAILABLE — SEE PAGE 190



ABOVE: The unique lines of the Sinbad Supreme will make it stand out at any flying field.

Two Sinbad Supreme prototypes with the Super Sinbad built from the Sig kit.

SINBAD SUPREME

BY LARRY SWARD

● Model aircraft are becoming more expensive to build with each passing season. This is mainly due to the skyrocketing prices of construction materials. Being a rather active modeler, but not a particularly rich one, I felt that it was about time to reduce the cost of model building. The Sinbad Supreme is a result of this cost reduction effort. By using spruce and balsa laminations and incorporating the no-cost "foam wing rib", the total cost of the sailplane presented here was held to less than $30.00. This price includes the MonoKote, canopy, glue, towhook and other associated hardware (except radio).

The Sinbad Supreme is an outgrowth of the old Super Sinbad sailplane, originally produced by Berkely, but presently available from Sig Manufacturing Company. The wing, fuselage, rudder, and stabilizer have been completely redesigned to be more compatible with today's Standard Class sailplane. The flat bottom airfoil was taken from the Windfree sailplane because of its good, yet forgiving, characteristics and because it simplifies overall construction.

There have been a total of three prototypes built. Each prototype incorporated various design features which I felt were important to a versatile sport sailplane.

The seven major design criteria for the Sinbad Supreme consisted of the following: (1) Simple construction; (2) light structure; (3) repairability; (4) good maneuverability; (5) accept a removable power pod; (6) withstand the loads of a high start; (7) low cost.

The projected weight of the finished model was established to be between 34 and 37 ounces. This would allow the wing loading to be between 7.2 oz./ft.^{2} and 8 oz./ft.^{2}. The three prototypes all weighed less than 35 ounces. All of the aircraft flew right off the board with no undesirable flying characteristics.

The major reasons for choosing the construction materials and techniques employed in the model were cost, strength, and weight. It is quite surprising how strong a laminated keel and stringer fuselage can be. I have landed many times nose first with each of the prototype models, and no damage was ever incurred. Also, laminated keels and stringers provide very nice curves without built-in stresses.

The foam ribs were cut using the hot wire technique. This is a very clean and fast process. I don't know how many have noticed, but the supply of foam ribs is unlimited. All of the ribs for the wing of the Sinbad were cut from "egg carton" tops. This foam is about 1/8" thick and with the 3/16" x 1/16" balsa capstrips, the ribs are extremely strong. In fact, I use "foam ribs" on all my pattern planes and believe me, they can take more punishment than ever would be possible with a balsa rib. Not only that, but the foam doesn't cost anything. I saved over three dollars on the Sinbad by using the foam instead of balsa. Foam rib blanks are stacked between two plywood templates and then cut using a hot wire.

CONSTRUCTION

The construction of the Sinbad Supreme is very straightforward and should present no problems to the intermediate model builder. The model goes together very quickly - - - in fact, I built one of the prototypes at work during six weeks of half-hour lunch breaks. (A little work each day is all it takes to complete any model.) Since this is not a beginner's model, I will only emphasize the important points of construction.

Wing: The wing is started by cutting two 3/32" plywood rib templates. Put these ribs together and sand them to ensure that they are identical. Drill the 7/32" and 1/8" wing rod holes in them at the locations shown on the plans. These ribs not only serve as rib cutting templates, but will be used at the wing center section where the wing tubes are bonded in place. Cut 32 of the foam rib blanks (1/16" balsa may be substituted, if desired) and stack enough rib blanks for half of the wing between the two templates, then cut and shape. Do the same for the other wing half. I cut half of the number of ribs required each time since it makes handling easier.

Once the ribs are cut, the construction of the wing can begin. Be sure to use an aliphatic resin glue if foam ribs are used. The center section is built as one piece with the 3/16" ID and 3/32" ID brass tubes epoxied in before sheeting the leading edge. Be sure to mark the center of the wing section when the center section is built. Cut it in half at these center marks and then install the left and right panels, reinforcing the dihedral joints with the 1/32" plywood doublers. This method ensures a perfect alignment of the wing rods without the normal "fuss and muss" associated with other wing alignment procedures. Two final points should be brought out about the wing. First, the spars of the outer panels are balsa. This helps to eliminate excess weight. The center section spars are spruce since this section must withstand higher stresses than the outer panels. The second point is the use of a spruce leading edge. The spruce is heavier than balsa, but it resists nicks and dings better. The slight weight penalty is more than compensated for by the increased durability of the wing.

Rudder and Stabilizer: The rudder and stabilizer build up very fast, especially if Hot Stuff is used. The rudder and stabilizer are all-flying which simplifies construction. Be sure to choose uniform, medium weight balsa to reduce any warping tendency. It should be noted that the stabilizer has a slight lifting section. This helps to reduce nose weight that may be required for balancing and

ABOUT THE AUTHOR

Larry Sward has been an active modeler for the last 18 years. Radio control sailplanes have been his major interest for the last 9 years. The Sinbad Supreme is the 15th model sailplane designed by Larry and he considers it as one of his best.

Mr. Sward has a Bachelors Degree in Mechanical Engineering and a Masters Degree in Industrial Engineering. He has been on active duty with the Air Force for the last three years. Larry is currently working towards a Commercial Pilots Certificate. Radio controlled model aircraft have not only provided a challenging hobby for Larry but they have also contributed to his professional background.

thus reduces the overall weight of the model. To help ensure correct alignment of the stabilizer, build the halves before installing the 3/32" OD and 3/16" OD brass tubing. When the halves are completed, lay both of them flat on the work table and epoxy the tubes in place using the 1/16" piano wire connecting rod and the 5/32" OD brass connecting tube to maintain proper positioning.

Fuselage: The fuselage is begun by laminating the side keels of the fuselage directly over the top view of the fuselage on the plans. An aliphatic resin glue was used for the lamination of all fuselage keels and stringers. All cross pieces are installed in the fuselage after the side keels are laminated. After the side keels are laminiated and the cross pieces are installed, build the formers from the materials indicated on the plans. Install the bottom formers on to the side keels while it is still on the plans. When the formers are secured, laminate the bottom keel and bottom stringers directly on to the fuselage. Laminate only one layer at a time. Don't try to laminate all three layers of either the keels or stringers at once since this is too much to handle. The lamination construction may sound like a lot of work, but it is very simple and fast if care is taken and if a large number of clothespins are used for clamping.

When the bottom half of the fuselage is dry, remove it from the building board and install the top formers. Then, laminate the top keel and stringers in place. Once again, take care during the lamination process and don't be afraid to use all the clothespins that are needed. When the laminations are dry, install the rudder wing pylon support, hardwood tow hook mounting block, nose and cockpit blocks, associated sheeting, filler blocks, and other hardware as indicated on the plans. Sand and shape to the outlines shown. After shaping, the canopy can be installed. The canopy shown is cut from the rear section of a 13" Sig bubble canopy. To add a little color, tint the plastic by putting it in a bucket of medium warm water containing 3/4 package of Rit dye. Leave it in for about 1½ hours to obtain a medium strength tint. The tint intensity can be varied by adjusting the length of time the canopy is left in the dye. It is important that the surface be completely free from dirt and oil before dyeing. If it is not clean, the tint will end up blotchy.

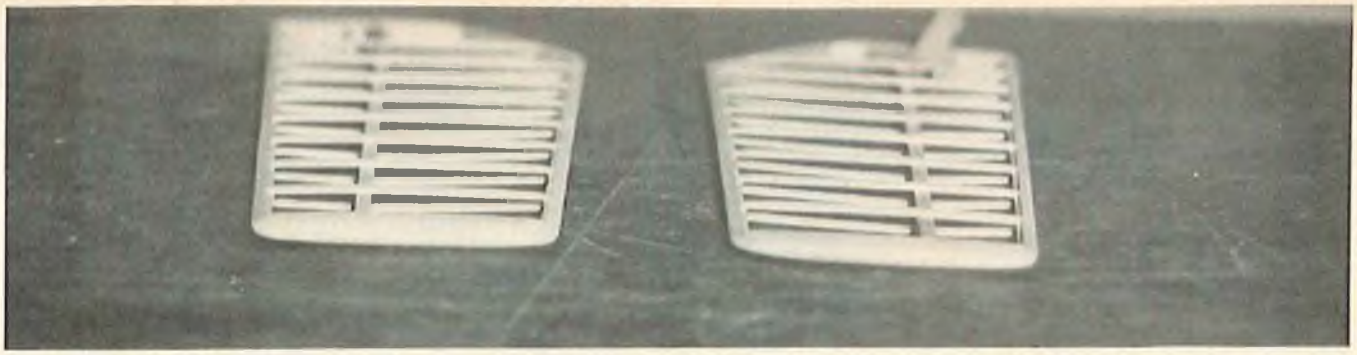
Radio Installation: The two channel radio installation should present no problems and is left up to the discretion of the individual builder. The main thing to watch for is complete freedom of movement of all controls. The radio is installed before covering since this makes threading the pushrods much easier. The Sinbad Supreme was designed around the Heathkit radio using the KPS-11 servos and square 500 mah battery pack. Minor modifications to former locations are all that would be required for installing a

BILL OF MATERIALS

Qty	Size	Use
	Fuselage	
3	1/16 x 1/4 x 36 spruce	Bottom keel
1	1/16 x 1/4 x 36 balsa	Bottom keel
6	1/16 x 3/16 x 36 spruce	Side & top keel
3	1/16 x 3/16 x 36 balsa	Side & top keel
16	1/16 x 1/8 x 36 spruce	Stringers
8	1/16 x 1/8 x 36 balsa	Stringers
1	1 x 3 x 18 balsa	Hatch & nose block
1	1/4 x 1/2 x 3 maple	Tow hook mount
3	3/16 sq. x 36 hard balsa	Formers
1	3/16 dowel	Wing hold-downs
1	3/32 x 3 x 36 balsa	Formers & pylon support
1	1/32 x 6 x 12 plywood	Doublers
1	13" Sig Canopy	Canopy
1	1/16 x 6 x 12 plywood	Wing pylon
	Stabilizer and Rudder	
10	3/16 x 1/16 x 36 balsa	Ribs
2	1/4 sq. x 36 balsa	Rudder & stab tips
1	3/16 sq. x 36 hd. balsa	Spars
2	1/4 x 1/16 x 36 balsa	L.E. & T.E.
1	3/16 OD brass tubing	Stab connectors
1	5/32 OD brass tubing	Stab connectors
1	3/32 OD brass tubing	Stab connectors
1	1/16 Piano wire	Stab conn. & rud. hinge
1	3/32 x 6 x 12 plywood	Rudder support
1	1/4 x 1/8 x 36 balsa	Rudder ribs
1	Scrap 1/4" sht. balsa	Filler blocks
	Wing	
3	3/4 T.E. stock balsa	Trailing edge
5	1/16 x 3/36 balsa	Wing ribs & L.E. Sht.
12	1/16 x 3/16 x 36 balsa	Rib caps
3	1/8 x 1/4 x 36 balsa	L.E. back
3	1/8 x 3/8 x 36 spruce	L.E.
10	3/32 sq. x 36 balsa	Diag. & spacer
1	1/32 x 6 x 12 plywood	Face ribs, dih. doubl.
2	1/8 x 1/4 x 36 spruce	Main spars
4	1/8 x 1/4 x 36 balsa	Main spars
2	1/16 x 3/16 x 36 spruce	Drag spars
1	3/32 I.D. br. tub.	Wing sockets
1	3/16 I.D. br. tub.	Wing sockets
1	3/16 piano wire	Wing rod
1	3/32 piano wire	Wing rod
2	1½ x 1 x 7½ bal. blk.	Tips

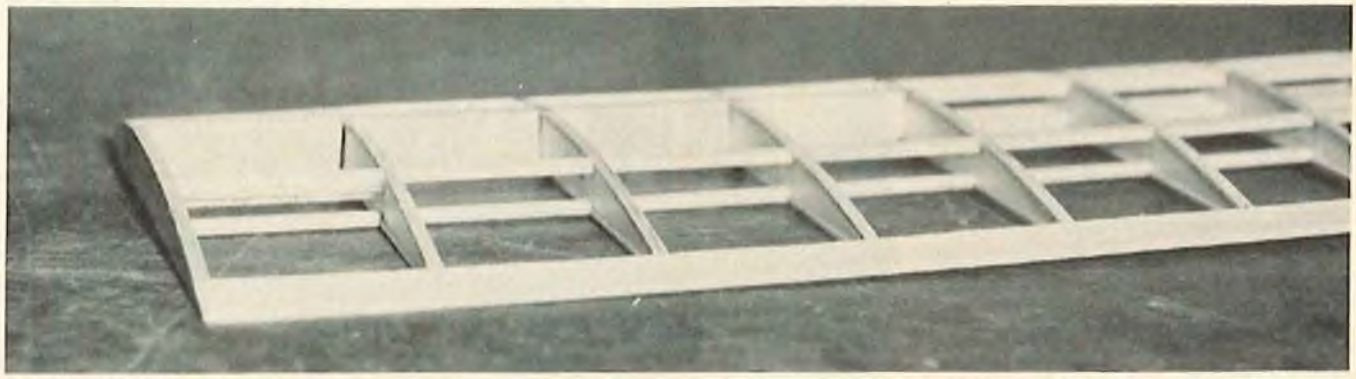
SINBAD SUPREME
Designed By: Larry Sward

TYPE AIRCRAFT
Standard Class Sailplane
WINGSPAN
94 Inches
WING CHORD
7 Inches
TOTAL WING AREA
660 Square Inches
WING LOCATION
High Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
4 Inches
O.A. FUSELAGE LENGTH
42.75 Inches
RADIO COMPARTMENT AREA
(L) 9" x (W) 2¾" x (H) 2"
STABILIZER SPAN
23.5 Inches
STABILIZER CHORD (incl. elev.)
4.75" Average
STABILIZER AREA
100 Square Inches
STAB AIRFOIL SECTION
Flat Bottom
STABILIZER LOCATION
Mid-Way on Fin
VERTICAL FIN HEIGHT
9 Inches
VERTICAL FIN WIDTH (incl. rudder)
5.75" Average
REC. ENGINE SIZE
NA
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
Two
CONTROL FUNCTIONS
Rudder and Elevator
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply & Spruce
Wing ..... Balsa, Ply, Spruce & Foam
Empennage ..... Balsa and Ply
Weight Ready-To-Fly ..... 34 Oz. (min.)
Wing Loading ..... 7.2 Oz/Sq. Ft.

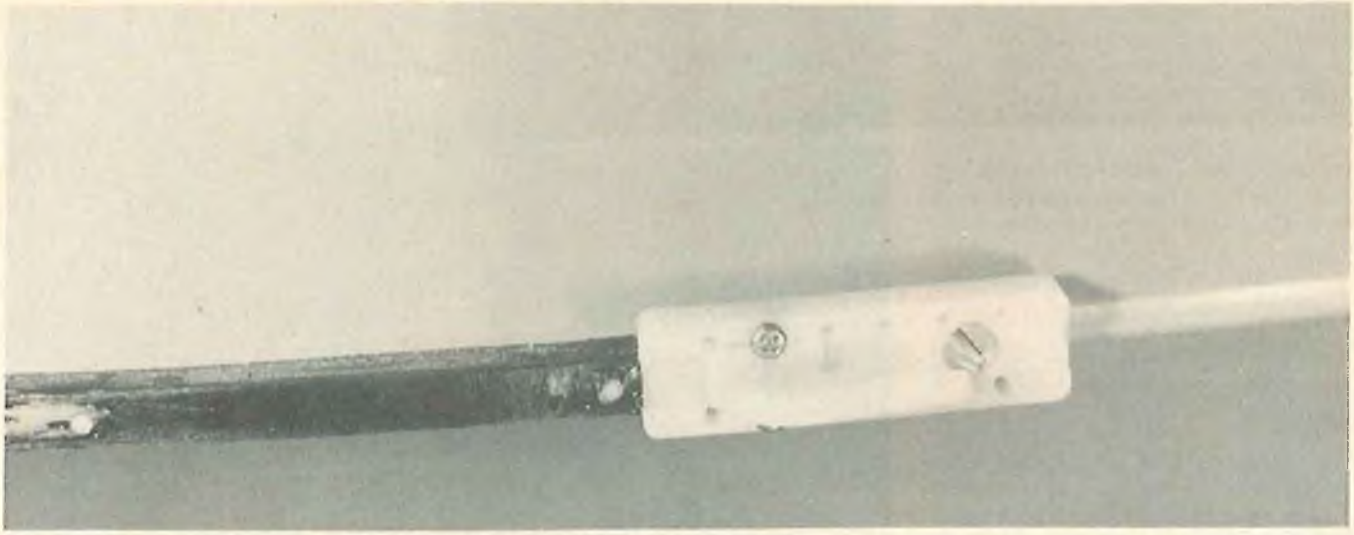


A view of the method of constructing the stabilizer ribs using capstrips over and under the spar. This structure is light and strong and has been used ever since the early days of gas models.

Proper alignment of the connections used in the stabilizer is important. Use 1/16" piano wire for the connector rod and 7/32" diameter brass tubing for the connector tube.



A view of one wing panel. The shear web only extends for four rib bays beginning at the root. This method helps eliminate excess weights while maintaining structural integrity.



Tow hook and skid detail. The EK-logictrol tow hook is mounted with wood screws rather than using the nut plate that is provided with the tow hook hardware package.

The all flying tail surfaces provide excellent control. Center photo illustrates how even the largest radio will fit. The plywood wing pylon, shown below, provides good wing support and is attached after the fuselage is covered.

"brick" type radio.

Covering and Finishing: As far as I am concerned, the plastic covering materials are the only way to finish the Sinbad Supreme. Not only are they light, durable, easy to repair and beautiful, but the transparent types provide the maximum in visibility. Since sailplanes can reach rather healthy altitudes, visibility is vital, and I have found transparent orange to be excellent in this respect. The only notes concerning covering are to ensure that 3/8" washout is put into the outer wing panels while shrinking the covering, and install the 1/16" plywood wing pylon after the fuselage is covered. Be sure to remove the covering from the top of the 3/32" balsa pylon support to ensure a good bond.

FLYING

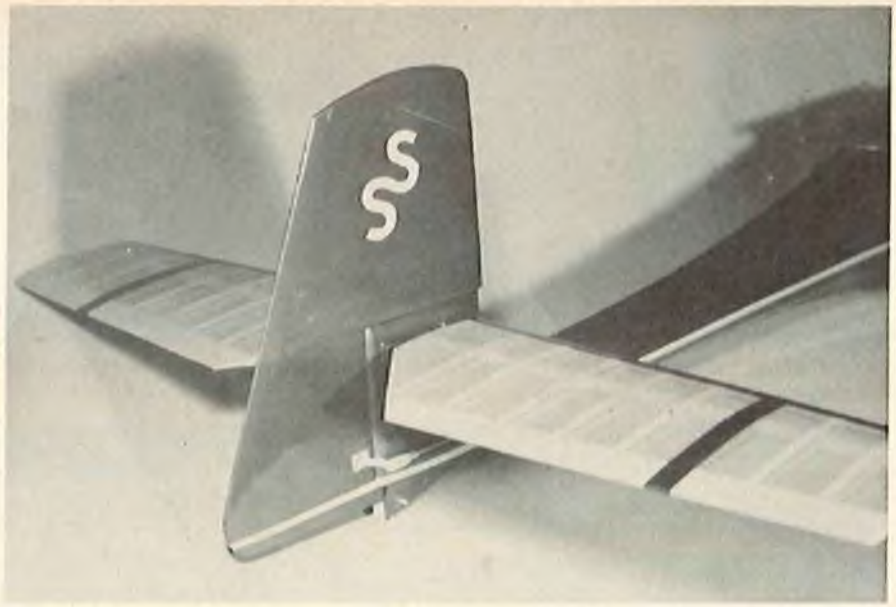
Make certain that all surfaces are true and warp free. Also, ensure that the same amount of washout is put in both wings. One addition that I also feel helps is to put on two layers of 1/8" trim tape 1" back from the leading edge on the upper surface of the outer panels of the wing. These act as "turbulators" which delay stalling of the outer portion of the wing. This, then, allows the Sinbad to turn very tightly without any tendency to snap roll.

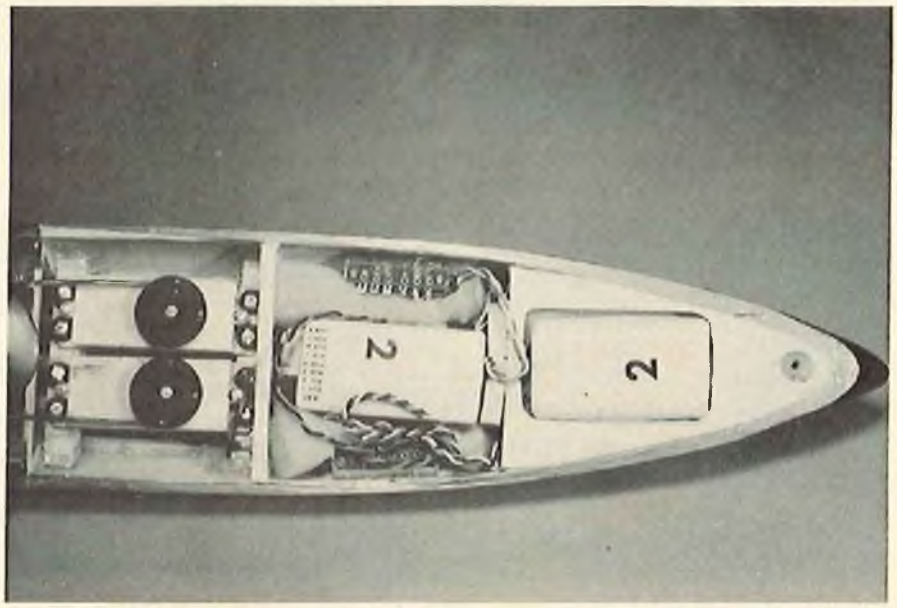
Check the Center of Gravity carefully. If the airplane was built according to the plans, no weight should have to be added to the nose. All the prototypes required no nose weight for balancing.

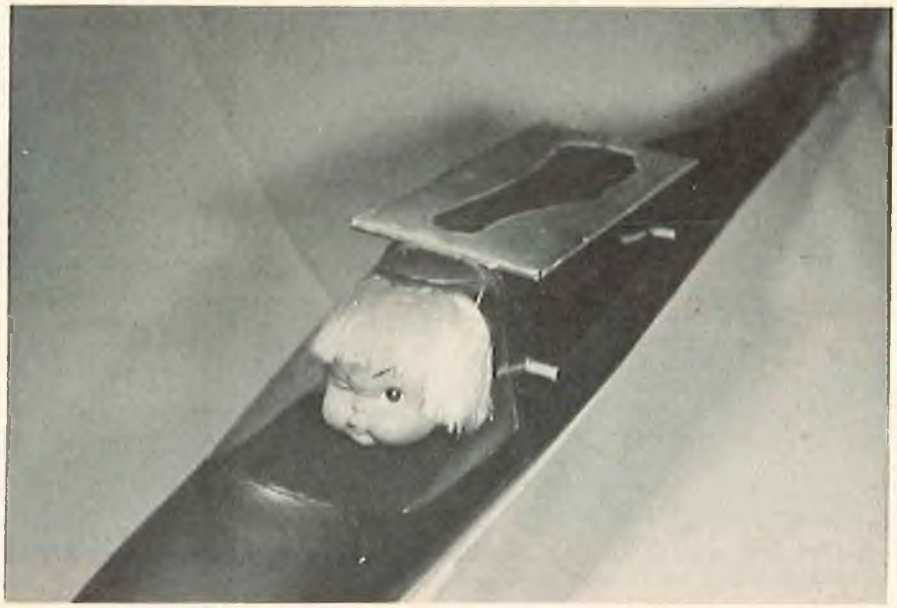
Set the control movement to the least sensitive positions for the first few flights. Once you become familiar with Sinbad Supreme, the controls can be set to a more sensitive position for very snappy response. My Sinbads have been flown thermal, slope, hi-start, power pod, and aerobatically. No bad tendencies were ever encountered. One point should be made about the hi-start launch, however. The nose of the plane should be pointed up at about a 30° to 40° angle. This may sound quite steep, but I have found this to give the optimum height on launch. Also, use a heavy duty hi-start. The lighter hi-starts just don't give the Sinbad Supreme the necessary "zing" to make it climb.

CONCLUSION

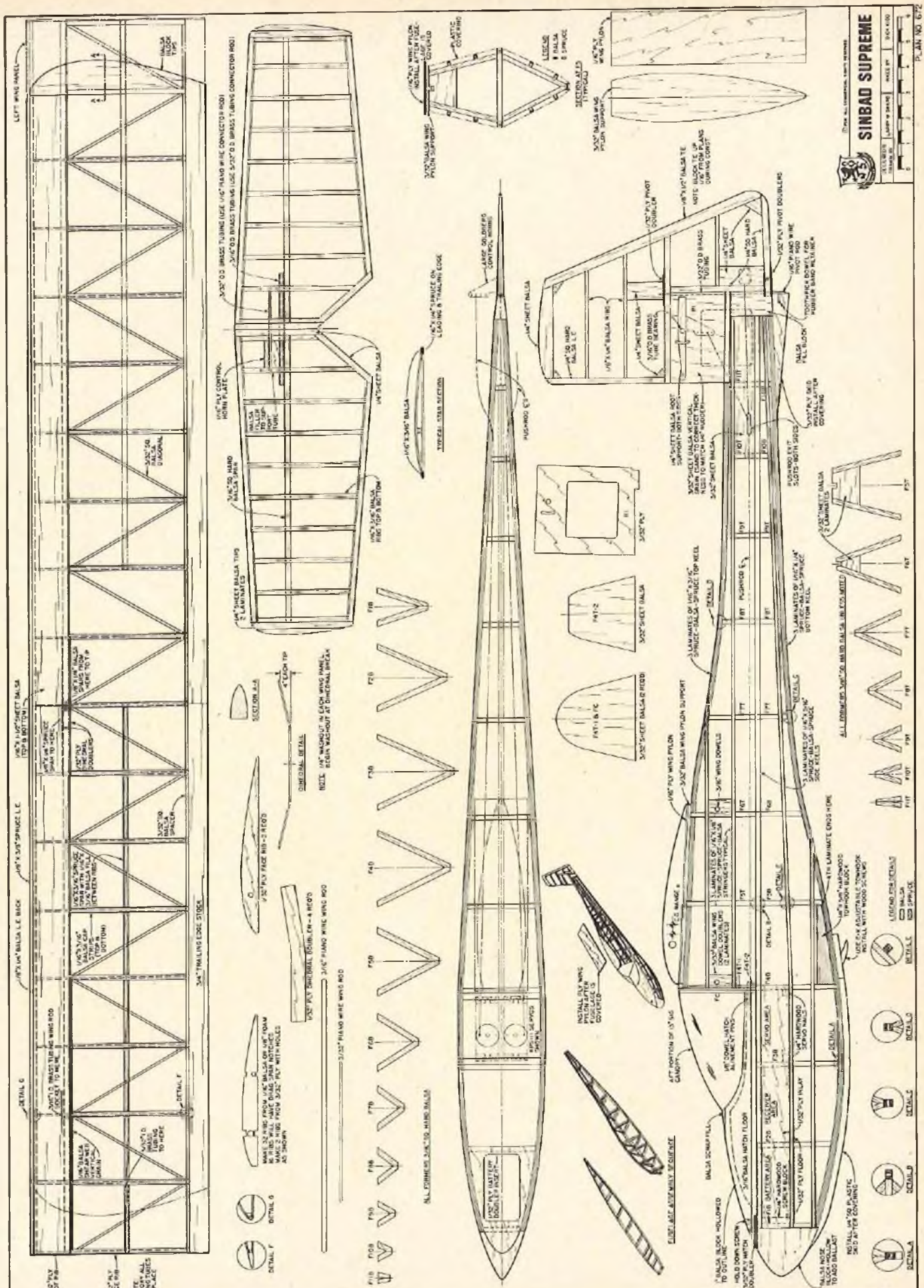
As far as I'm concerned, the "foam rib" and spruce laminate concept is superb. It is cheap, fast to build and very durable. If anyone has questions, my address is: 96 North 1st East, Bountiful, Utah 84010. I am sure anyone who builds the Sinbad Supreme will be very pleased with its interesting construction techniques and pleasing performance.







FULL SIZE PLANS AVAILABLE — SEE PAGE 190



THE OPERATIONAL AMPLIFIER

BY DOUG SPRENG

PROLOGUE

I understand that there has been some head-scratching concerning the "East Side Bowery Boys." The "Boys" are, in fact, a legend in their own time. It started "way back when" RCM was very young. Some of us fearless people, at that time, were performing miraculous feats of daring with (and without) "toy airplanes." We always referred to models as toy airplanes. We never took the hobby too seriously at that time because to do so resulted in that particularly insidious type of insanity called "Frustrationitis." Radios only sometimes worked. The ones who kept them working won and the ones who couldn't didn't really care. We were all a very closely knit group at that time. Dewey was the chief rabble rouser and glove flinger. In his spare time, or when he ran out of gloves and rabble, he tried his (best?) to start a magazine called Radio Control Modeler. If this monologue sounds like ancient history it's because it truly is. The "Bowery Boys" were the core around which the sport, as we now know it, grew and flourished. Many feats of daring and foolishness were perpetrated.

It is this writer's wish to get together with some of the "Boys" and tell the infamous tales of bravado that ensued during these formative years of radio control. So, all you newcomers, stand by and ye shall hear of the days of old as told by the participants in future issue of RCM, so be sure and renew your subscription.

Harold Goldclank! Are you listening? Let us hear from you, oh cracker barrel philosopher of R/C. We beseech and implore you to lay some words on us as one of the original "East Side Bowery Boys." Your rhetoric on the subject would amaze, amuse, confuse and absolutely delight every reader of this infamous publication.

Now I have run out of gloves.

SPECIFICATIONS FOR THE LM 324

ELECTRICAL CHARACTERISTICS (V^+ = +5 V_{DC} and T_A = 25°C unless otherwise noted)

PARAMETER	CONDITIONS	LM 324			UNITS
		MIN	TYP	MAX	
Input Offset Voltage	R_S = 0Ω		2	7	mV_{DC}
Input Bias Current (Note 3)	$I_{IN(+)}$ or $I_{IN(-)}$		45	500	nA_{DC}
Input Offset Current	$I_{IN(+)} - I_{IN(-)}$		±5	±50	nA_{DC}
Input Common-Mode Voltage Range (Note 4)		0		V^+-1.5	V_{DC}
Supply Current	R_L = ∞ On All Op Amps		0.8	2	mA_{DC}
Large Signal Voltage Gain	$R_L \geq 2$ kΩ		100		V/mV
Output Voltage Swing	R_L = 2 kΩ	0		V^+-1.5	V_{DC}
Common Mode Rejection Ratio	DC		85		dB
Power Supply Rejection Ratio	DC		100		dB
Amplifier-to-Amplifier Coupling	f = 1 kHz to 20 kHz (Input Referred)		-120		dB
Output Current Source	V_{IN}^+ = +1 V_{DC}, V_{IN}^- = 0 V_{DC}	20	40		mA_{DC}
Output Current Sink	V_{IN}^- = +1 V_{DC}, V_{IN}^+ = 0 V_{DC}	10	20		mA_{DC}

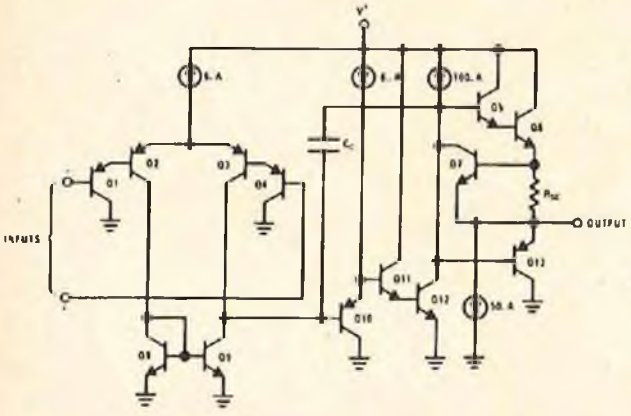
Note 1: For operating at high temperatures, the 276-1711 must be derated based on a +125°C maximum junction temperature and a thermal resistance of 175°C/W which applies for the device soldered in a printed circuit board, operating in a still air ambient.

Note 2: Short circuits from the output to V^+ can cause excessive heating and eventual destruction. The maximum output current is approximately 40 mA independent of the magnitude of V^+. At values of supply voltage in excess of +15V DC, continuous short-circuits can exceed the power dissipation ratings and cause eventual destruction.

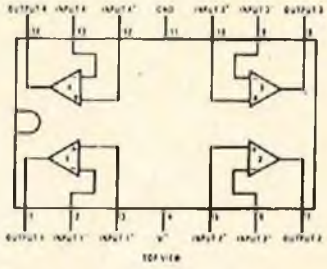
Note 3: The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the input so no loading change exists on the input lines.

Note 4: The input common-mode voltage or either input voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V^+ — 1.5V, but either or both inputs can go to +30V DC without damage.

SCHEMATIC AND CONNECTION DIAGRAMS



Dual-In-Line Package



General Theory of Operation

The Operational Amplifier (Op-Amp), has been around many years, but only recently have integrated circuit op-amps been offered that meet the price and low voltage operating constraints common in R/C circuits. For the purpose of this discussion, I shall refer to the LM 324, which is a quad op-amp in a 14 pin dual in-line plastic package. This device was used in last month's Servo Tester. I shall first explain the fundamental operation of the op-amp and then proceed to define its use in the Servo Tester.

The schematic representation of an op-amp is illustrated in Figure 1. As you

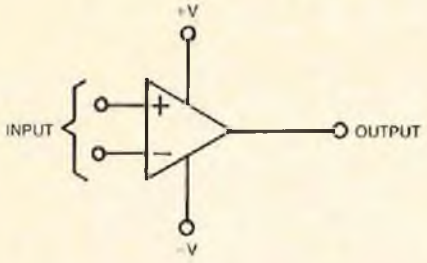


FIGURE 1
SCHEMATIC REPRESENTATION OF AN OPERATIONAL AMPLIFIER (OP-AMP)

see it has both a positive and negative input. This is referred to as a "differential" input because the input voltage that

will cause a change in output voltage is the *difference* in voltage between the two inputs and *not* the voltage from the inputs to ground, although ground may be used as a voltage reference for measuring purposes.

The LM 324 has an open loop (no gain controlling feedback) gain of 100db, or an output change of 100v. for 1 millivolt (mv.) of input change. Since the output cannot swing 100v., we may divide both of these figures by 100 which results in an output change of 1v. for a .01 mv. change between the + and − inputs. .01 mv. = 10μv. which is 10 millionths of a volt. As is apparent, these devices are extremely sensitive. The input bias current is typically 45 nano-amp, or .045 millionths of an amp. A milliampere is 1 thousands of an amp, so you see it takes very little bias current to operate; therefore, it presents an extremely high input impedance (approx. 22 megohms at 1v. input). Moreover, this bias current is temperature compensated insuring extremely accurate switching points when the device is used as a pulse generator. This means the pulse width is essentially independent of temperature as long as the external components are also very stable. Figure 2 illustrates the switching

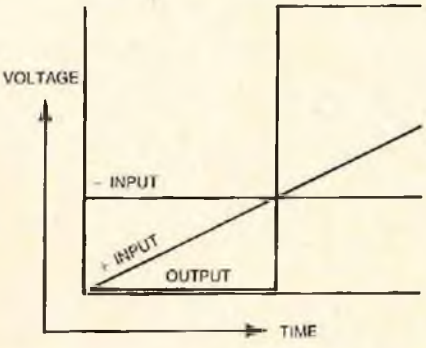


FIGURE 2
TRANSFER FUNCTION OF "OPEN LOOP" OP-AMP

action as a rising voltage on the + input crosses a reference voltage on the − input - - - the output switches from low to high almost instantaneously. The time taken for the output to switch from low to high is dependent upon the rate of change of the + input voltage. If the voltage changes instantaneously, the output will change in about 5 microseconds. If the voltage is changing more slowly, such as in the pulse generator application, the output change takes longer. It takes 15 microseconds to rise and 30 microseconds to fall. The discrepancy is due to the difference in output impedance of the op-amp in the high and low output state. This makes no difference in servo performance since an I.C. servo amp will trigger at a constant input voltage. Notice that if the + input is at a lower potential than the − input, the output will be low. The output state depends on the polarity of the differential inputs. This brings us to Common Mode Rejection Ratio.

Remember, the output is the result of the difference between the + and − inputs and not their relationship to ground. The LM 324 has 85db of common mode rejection. In other words, if there were 0v. difference between + and − inputs, these inputs may be raised from ground to the supply voltage less 1.5v. (Vcc − 1.5v.) and this variation would be 85db less (approx. 17,800 times less) at the output.

When the amplifier is operated in a linear mode, that is, if the output is not saturating, its power supply ripple rejection is 100db. The output will swing from ground to Vcc − 1.5v., or from 0 to 3.5v. with a 5v. supply.

Applications

The most elementary use for an op-amp is as a comparator (Figure 1 and 2). Although an op-amp does a good job as a comparator, the internal frequency compensation slows up the switching. The LM 339 is a high speed comparator with no frequency compensation but makes a poor op-amp because it is difficult to stabilize. Normally, the 324 will switch fast enough for our needs.

The next application deals with controlling gain by means of adding feedback from the output to the − input. The gain of the amplifier will now be Rf/Ri. If Rf is 10K and Ri is 1K, the gain will be 10. In this case, the output will be 180° out of phase with the input; in other words, if the input was −.3v. below the + input (Vref.) the output would be +3v. above Vref.

The major point to remember is that in closed loop operation, the inputs are always at the same voltage. The output will go to any voltage necessary to make the differential input voltages indentical. Now, when I say identical, I mean within ±2 to 5mv. This is the input offset voltage and is normal and insignificant compared to the voltages we are dealing with. The input impedance of the Figure 3 amplifier is equal to Ri (1K) in this case.

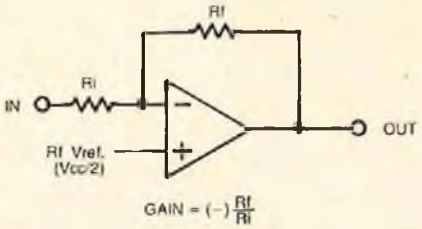


FIGURE 3
CLOSED LOOP INVERTING AMPLIFIER

This means it should be driven by a low impedance source for the gain to be accurate. (If the source impedance was 1K, the gain would drop from 10 to 5.) To illustrate how the gain is determined by the resistor ratio, imagine the amplifier is driven by a zero impedance source. Remembering the fact that the output will attempt to make the inputs equal, apply 2.6v. to the input. Vref. is one half the supply voltage or 2.5v. If the − input was not connected, the output would also be at 2.5v. Since Vref. is 2.5v. and 2.6 is 0.1v. greater, this unbalanced the + and − inputs in the positive direction; therefore, the output must supply voltage in the negative direction to rebalance the inputs. Since the feedback resistor is 10 times the input resistor and the difference is 0.1v., the output will go 1 volt negative to offset the 0.1v. positive input difference.

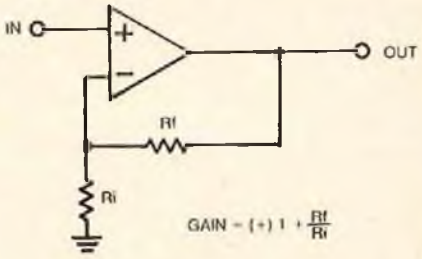


FIGURE 4
CLOSED LOOP NON-INVERTING AMPLIFIER

Figure 4 illustrates a non-inverting amplifier. In this case, the signal is fed into the + input and the gain determining resistors are connected to the − input. For negative feedback, the feedback resistors are always connected to the − input. For positive feedback such as used for a Schmidt Trigger or oscillator, the feedback resistors will go to the + input. The gain of this amplifier is determined by the formula: Gain = 1 + Rf/Ri. As can be seen by this formula, it is impossible to achieve a gain of less than unity because of the "1+". In the case of the amplifier of Figure 3, gains of less than unity are readily achievable (.5, .1, .01, or whatever). The main advantage of this amplifier is its extremely high input impedance, which is on the order of 20 megohms, whereas the input impedance of the amplifier of Figure 3 is equal to Ri.

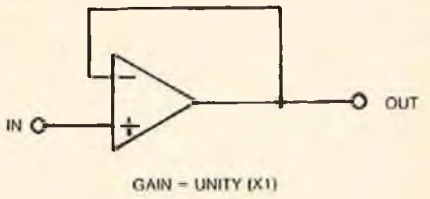


FIGURE 5
VOLTAGE FOLLOWER

Figure 5 is a unity gain "voltage follower." All this means is that everything is fed back to the − input; therefore, the output very accurately follows the input. Again, this amplifier exhibits an extremely high input impedance and a very low output impedance. It is sometimes referred to as an "impedance transformer."

Figure 6 shows a positive feedback application, a Schmidt Trigger. Refer-

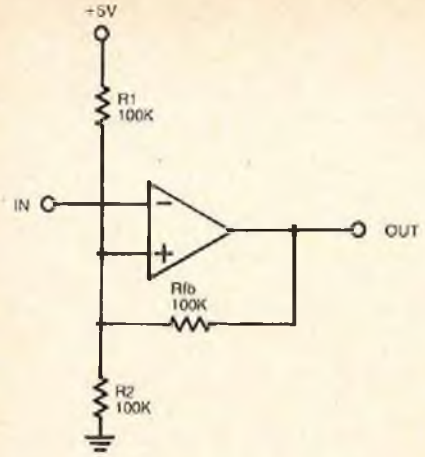


FIGURE 6
SCHMIDT TRIGGER

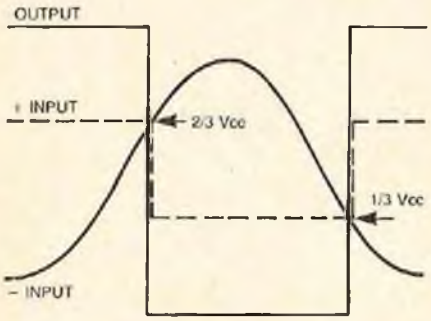


FIGURE 7
WAVEFORMS FROM CIRCUIT OF FIG. 6

ring to Figure 7, notice that the + input is high because the output is high; therefore, the 100K feedback resistor is in parallel with R_1 thereby raising the + input to 2/3 Vcc. The sine wave input is applied to the – input (high impedance). When the – input crosses the upper trip level at 2/3Vcc, the output switches to the low state, thereby paralleling Rfb and R_2 and lowering the trip level to 1/3 Vcc. Now as the – input voltage passes the lower trip level, the output will go high and stay until the applied voltage on the – input reaches the upper trip level. The value of Rfb determines the amount of hysterysis. The higher the value, the less the hysterysis. In other words, the trip levels get closer together as Rfb is raised.

Figure 8 illustrates how to use the preceeding Schmidt Trigger to make an oscillator that will produce square and saw-

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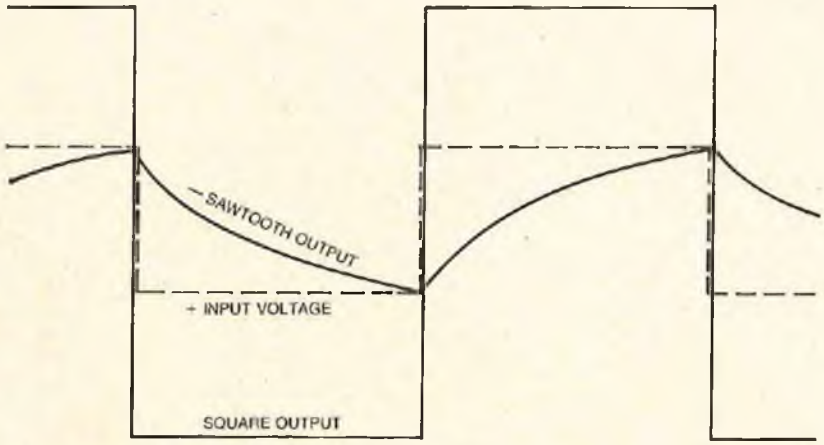


FIGURE 9
OSCILLATOR WAVEFORMS

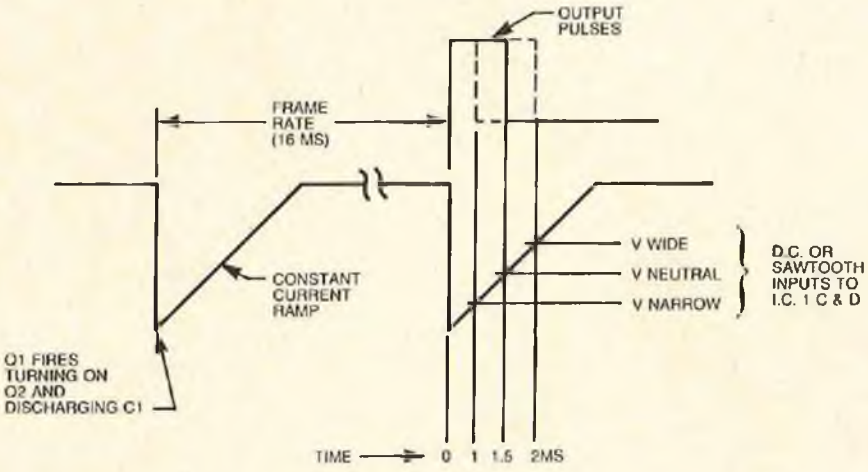
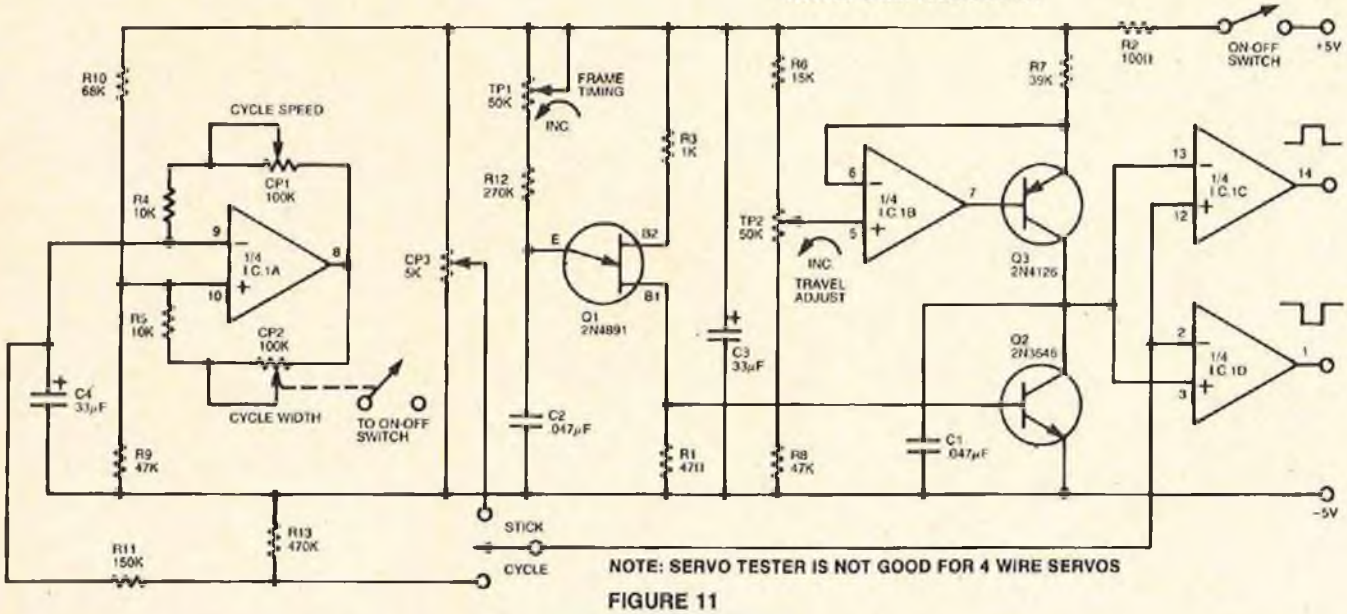


FIGURE 10
WAVEFORM ACROSS C1

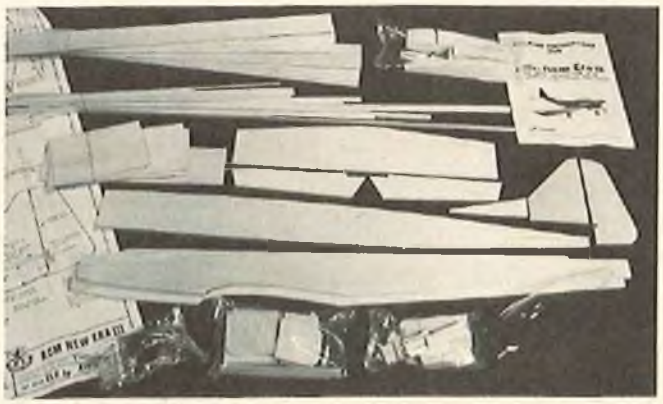


NOTE: SERVO TESTER IS NOT GOOD FOR 4 WIRE SERVOS

FIGURE 11
SERVO TESTER SCHEMATIC

RCM PRODUCT TEST

AIRTRONICS NEW ERA III



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

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

● The New Era III is a general sport aircraft capable of the entire competition pattern and designed for engines in the .19 to .25 cubic inch displacement range. Designed by Don Dewey, and first appearing as a construction article in R/C Modeler Magazine, the New Era III has been kitted by Cox Hobbies (Airtronics), 1525 E. Warner Ave., Santa Ana, California 92702. The wing span is 44½" with a total wing area of 400 square inches. A modified NACA 2415 airfoil is used on the constant chord wing. A tricycle geared aircraft, 4 channels of control are used.

The kit is of conventional construction using balsa and plywood in the fuselage, balsa, spruce and plywood in the wing and balsa tail surfaces. Hardware included in the kit consists of hinges, control horns, bellcranks, clevises, wing hold-down screws, main and nose landing gear, engine mount, steering arm, and landing gear retainers. There is one plan sheet measuring 34" x 48" with an 8 page instruction manual, with construction photos included in the latter.

The kit features excellent machined parts and a perfectly aligned hole for the wing dowel in former #2 and a slot in the wing center rib which line up perfectly. Our prototype weighed 52 ounces ready to fly for a wing loading of 18.7 oz./sq. ft. MonoKote and B & E Quik Stripe was used for finishing. A Cox Conquest .15 R/C engine with muffler was used for power, while a Cox/Sanwa 4 channel radio provided guidance control.

There simply aren't enough superlatives to describe the high quality of this kit. It is excellent in every respect and one of the finest kits we have seen from an engineering standpoint as well as that of production of each and every item in the kit. With regards to the flight performance, the New Era III is very stable and easy to fly yet will fly the complete AMA pattern. Due to its stability, we would also recommend this aircraft as an excellent intermediate trainer for the flyer ready to step up to a higher performance aircraft. This kit is an excellent buy at $44.95. □

SPECIFICATIONS

Name	New Era III
Aircraft Type	Sport-Pattern
Manufactured By	Cox Hobbies (Airtronics) 1525 E. Warner Avenue Santa Ana, California 92702
Mfg. Suggested Retail Price	$44.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Advanced Trainer, General Sport
Wing Span	44½ Inches
Wing Chord	9⅛ Inches
Total Wing Area	400 Square Inches
Fuselage Length	39 Inches
Radio Compartment Dimensions	(L) 8⅛" x (W) 2½" x (H) 3"
Wing Location	Low Wing
Airfoil	NACA 2415 Mod.
Wing Planform	Constant Chord
Dihedral	1/2 Inch
Stabilizer Span	19 Inches
Stabilizer Chord (Incl. elev.)	5.3" (Avg.)
Total Stab Area	100 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	5½ Inches
Vertical Fin Width (Incl. rud.)	7" (Max.)
Mfg. Rec. Engine Range	19-25
Recommended Fuel Tank Size	4 Oz.
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, Spruce & Ply
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	34" x 48" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (8 pages)
Construction Photos	Yes
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	48-54 Ounces
Wing loading based on rec. flying wt.	18 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	52 Ounces
Wing Loading	18.7 oz./sq. ft.
Covering & finishing materials used	MonoKote, K & B, B & E
Engine Make & Disp.	Cox Conquest .15 RC
Muffler Used	Yes
Radio Used	Cox/Sanwa
Tank Size Used	4 Ounce

NRCHA

DON DEWEY (N1A)

Micro Mold Lark

For those of you who have purchased the .19 to .25 Micro Mold Lark, manufactured in Great Britain, and previously reviewed in RCM, and have experienced difficulty in obtaining enough power for lift-off, we'd like to present the following information by Harry Curtis reprinted from *Model Aviation Canada*, the newsletter of the Model Aeronautics Association of Canada:

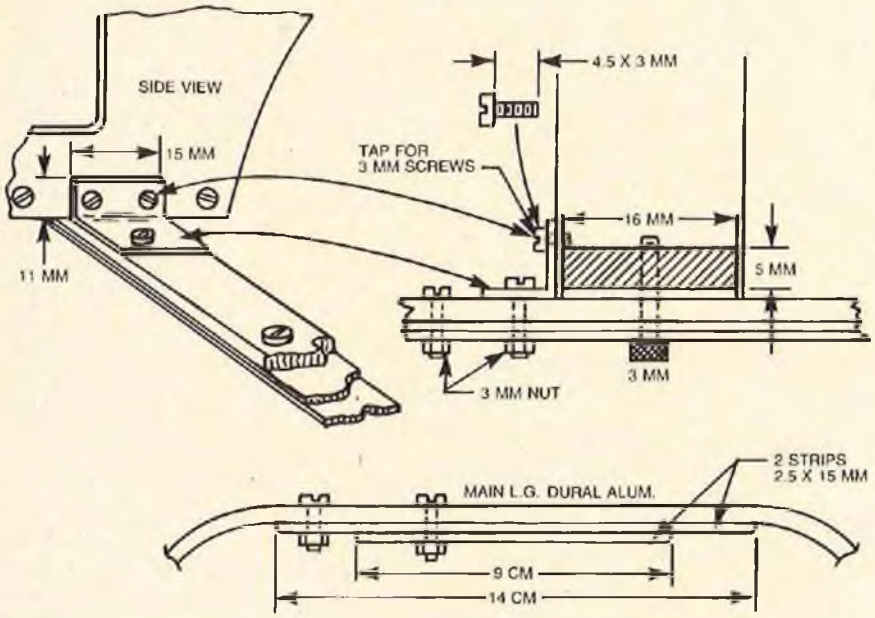
It is my understanding from talking to other model helicopter enthusiasts that there are a number of Micro Mold Lark Helicopters which will not lift off at full throttle. Having built a Lark, only to find it wouldn't fly, working with it for the past several months to get it to the point where it performs as it should, I would like to pass on my findings to others who may be experiencing problems.

My Lark was first equipped with an O.S. .25 and the first problem to be found was an improperly operating clutch. Upon dismantling of the clutch, it was realized that the clutch shoes were too tight on the pins. To check this, remove the spring and rotate the flywheel around. The shoes should fall freely about. If this is not happening, remove the shoe from the pin and polish the holes in the shoe until it does rotate freely on the pin. Having made this correction, the Lark was again taken out for a test flight only to find slippage still remained. Again the clutch was dismantled, this time to find that the spring was burnishing a groove in the aluminum housing, therefore, not allowing the shoes to throw out and grip on the liner. This groove was then filled with epoxy to provide a smooth hard surface for the spring to ride against. Again, flight was attempted but still to no avail. At this point, a letter to Micro Mold regarding the problem, prompted a reply with an enclosure of a new clutch spring which is much softer than the original. This was then installed in the Lark and reduced the slippage considerably, but it was still present at high rpm. A trip to a local leather shop produced many scrap pieces of leather which were substituted for the cork liner until the correct combination to eliminate the slippage was found. The leather is very soft, the same thickness as the cork when compressed, and placed smooth surface toward the shoes. I have a limited supply left and would be happy to send a sample to anyone who writes including a self addressed stamped envelope. The problem of a slipping clutch was now cured as could be witnessed by my tachometer readings.

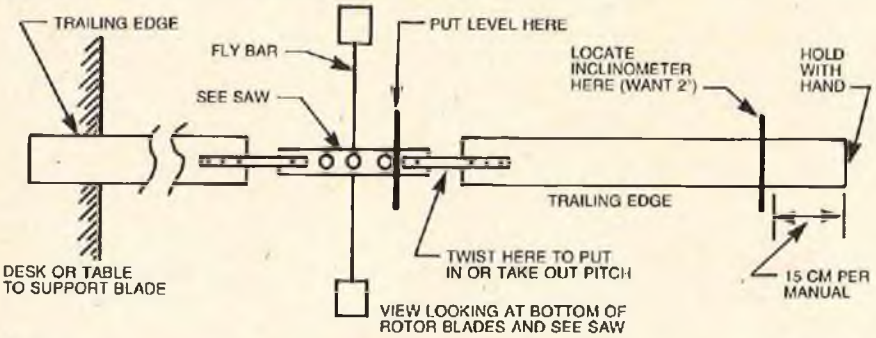
Still unable to lift off, the engine was now substituted for an O.S. .40 — it still did not lift off. A letter to Micro Mold prompted a reply that the O.S. .40 should be removed as it was not designed for this size of engine unless the rotor blade size was changed. They went on to recommend checking the freedom of the gear train and I quote "a test for the correct amount of freedom of rotation is to disconnect the drive belt and spin the main rotors by hand, from a gentle push it should be possible to obtain at least three or four complete rotations of the blades."

This check was then done to find that everything was in order. Not wanting to give up, I had installed a Super Tigre .19 engine on the helicopter. It was with this engine that the first flight took place, but not without help from nature, that is a 15 to 25 mph wind which is the equivalent of forward speed to the helicopter. Under these conditions, it lifted off at full power but flew at just one notch above idle;(I was lucky to have Don Dow for my test pilot and instructor in these conditions).

What do do now? Another letter was sent to Micro Mold including all the data (i.e. weight, rpm, weather conditions, etc.). A Veco .19 engine was now in-



R.G. Palmer's modifications to the stock Heli-Baby skids.



Richard Hanners method of adjusting the pitch on his Heli-Baby.

stalled — still no improvement.

While awaiting a reply, I was looking over a set of plans for a scratch-built MK2C Helicopter when the ultimate solution was found. A foot long note on the plans read "higher lift blades for less powerful engines may be made by building up the blade thickness with 1/32" or even 1/16" balsa on the undersurface."

I then laminated a 3/32" piece of balsa sheet on the undersurface of the blades (greedy for lots of lift). My blades now measure 11/32" at the thickest spot of the chord.

Three days following my successful test flight, a reply was received from Micro Mold containing more information which I shall pass on as well as info from previous letters.

1. "Anything over 7 degrees pitch in the main rotor blade creates more drag than additional lift."

2. "Unfortunately a tracing error on the original instructions showed an incorrect angle on the pitch gauge, please check this out fairly carefully" (6 degrees).

3. "At about this time we also had a batch of kits in which the rotor blades were too thin, they should be 1/4" thick after sanding."

4. "Again on the rotors, the balsa trailing edges of the blades could be slightly too soft, causing the blade to feather, which of course would be destroying your lift."

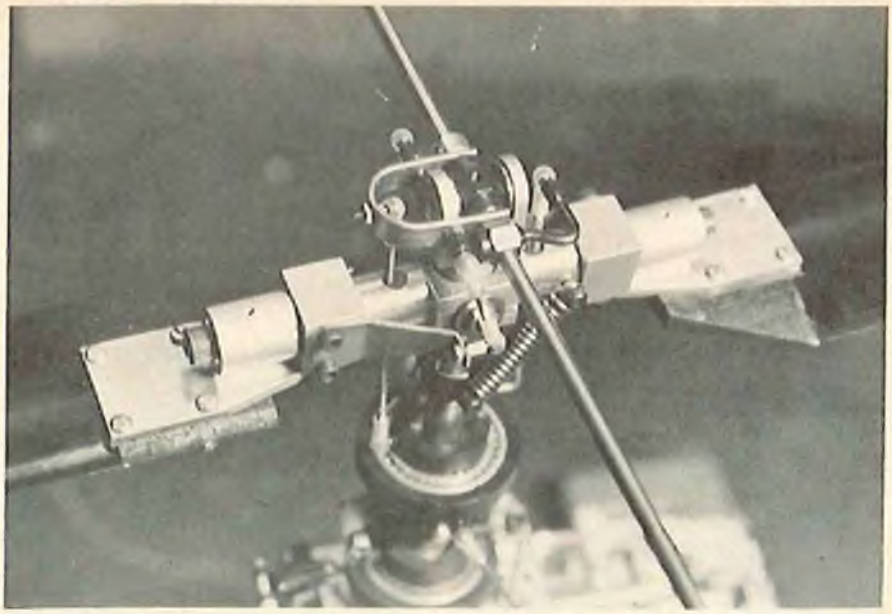
5. "With the advent of the new design engines, especially for helicopters, and in particular the HB 25, we have found a considerable improvement in performance of all small helicopters and we do feel that it may be to your advantage to re-engine your Lark with this particular model which we have tried fairly extensively in our own models and have found a tremendous improvement in performance."

It appears that the HB 25 Micro Mold regularly achieves lift-off at half throttle as compared to 3/4 throttle with an average .19 motor.

My Lark now lifts off at 1/2 throttle with floats and 6 degrees pitch. It is now flying successfully, but at sometime in the future, I shall install an HB 25 and return the original blades to compare the performance.

Hints & Kinks For The Heli-Baby

R.G. Palmer of New Zealand, learned to fly his Heli-Baby without benefit of training gear and, as a consequence, his skids received a great deal of abuse. As a result, Palmer found the following modifications shown in the sketch sufficient to beef up the stock landing gear in order to absorb the shocks of hard landings. The sketch, itself, should be self-explanatory. In addition to beefing up the landing gear struts themselves, it also prevents the struts from pivoting. The same modifications could be used on the American R/C Helicopter's popular Rev-olution.



A photo of one of the prototypes of the new collective pitch head soon to be introduced by Du-Bro Products for their Shark .60. The by-pass of the swash plate to the collective head swash plate will allow use on any helicopter without disturbing the present servo-to-control set-up. New unit features rugged construction that is very hard to damage even when the chopper is tipped over.

■ ■

Richard A. Hanners of State College, Pennsylvania, writes that the instructions included with the Heli-Baby kit, state exactly how to set the 2 degrees of pitch in the main rotor blades and these, Dick feels, leave much to be desired. In fact, he found that the pitch gauge was accurately cut to 2 degrees but, while holding it under the blade and trying to make the bottom straight, plus the fact that the see-saw can move all over the place, turned out to be frustrating. Dick found an easier way to do it. Simply attach both of the blades to the see-saw and remove the head from the main rotor shaft. Turn the main rotor upside down and support one of the blades on the desk or any flat surface that is convenient. Put a level on the part of the see-saw nearest the rotor blade you are holding. Any level will suffice, but the one Dick used was from his Kavan Jet Ranger kit since it is small and you don't

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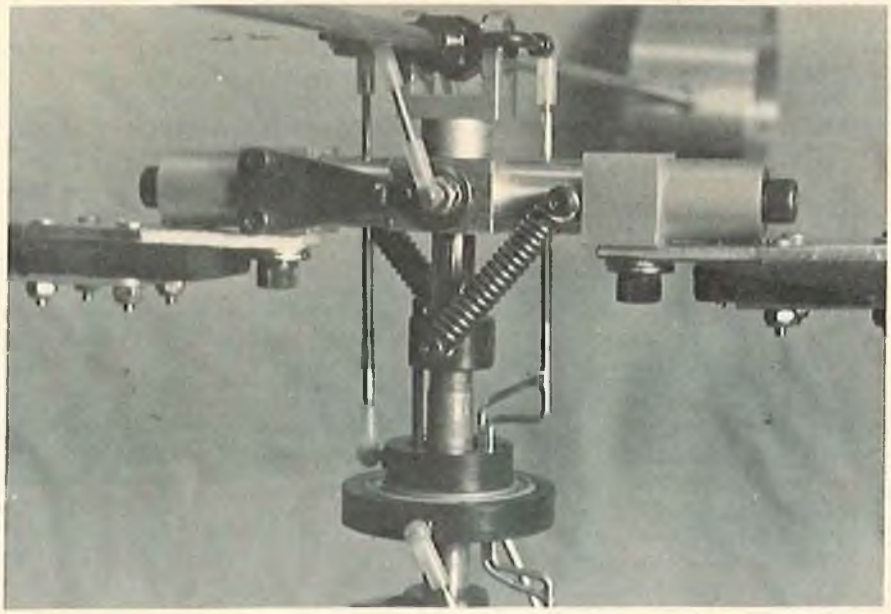
The Shark Expert Collective Head is easy to assemble and set up. Using the standard high lift Shark blades, a regular .60 engine can be used instead of a high priced Schneurle. American made with parts and service available, the price, including blades and all control linkages, is projected to be $125.00.



Racing At Random

FRED REESE & DON DOMBROWSKI

Some of the action at Legg Lake on Labor Day Weekend. 228 boats entered!

The winners, left to right: Gene Weaver, 2nd Place; Bob Mikko, 1st Place; and Daryl Chesire, 3rd Place.

Launching for flying start. That's Oregon's Ralph Cooney on left and Dave Katagiri on right.

● This past Labor Day weekend we attended the District IX R/C Boat Racing Championships at Legg Lake in Whittier, California. R/C boating is increasing in popularity at a tremendous rate and this was evident when we arrived. There were 228 boats entered and tons of people along with them. We roamed around asking various questions about classes, procedures, requirements, etc. We found that the R/C boat people are very well organized and have been around for quite a while.

There are two organizations in boating: NAMBA International and The I.M.B.A. This event was NAMBA sanctioned and 10 different classes of boats were being run over the three day weekend. The classes were A. B. C. Hydro, Sport 40, Scale Hydro, 40 Deep Vee and 60 Deep Vee. All of that gets a little confusing especially when you're a neophite to boating and Polish besides. So, we did the next best thing, we wrote to these organizations and requested information. The 26 cents spent in stamps was worth it. We got membership forms, a list of District Officers, race schedules and all kinds of goodies. At the present time we are taking the varying class requirements as far as engine size and boat design and compiling the information together so that in our next article we can show a picture of a typical boat used in each class and give an outline of the rules for that class. In the meantime, if you would like to spend 26 cents, drop a note to the following organizations: N.A.M.B.A. International, Myrtle B. Coad, Secretary, Rt. A, Box 19, Lower Lake, California 95457, or I.M.P.B.A. Office, 24310 Prairie Lane, Warren, Michigan 48089.

★

The following is a race report by Vince Caluori with photos by Brad Gong.

The first 1/2A Chapmionship Race went into the books this last Memorial Day weekend as an unqualified success. The race, co-sponsored by RCM, the Boeing Hawks, and the PROPS, drew twenty entrants primarily from Oregon and Washington with Southern California represented by Ron Clem of TigerCat fame.

Fifty, four plane heats, divided into five rounds on Saturday and five rounds on Sunday, were planned. Saturday turned into a typical rainy Seattle day (that's why we built a domed stadium), but thanks to the goodwill and fortitude of the helpers, four of the five rounds were run off. Sunday's schedule was expanded to six rounds and, fortunately, the weather turned to mediocre and allowed a full schedule.

Saturday's weather produced more than a few strange sights as water soaked flyers splashed to the starting area with trains of plastic sheet dragging behind. More importantly, the weather caused more than a few problems when it came to sorting out fuels, etc. There were an awful lot of D.Q.'s due to double cutting which resulted from the combination of rain-slowed airplanes and the tight competition. It got so bad that a

Gene Weaver on the line with his starting box on wheels.

Winner Bob Mikko on the starting line. Do you think he's got enough nicad power!

Single grudge match heat. 1st Row: B. Hunt, V. Caluori, R. Clem, 2nd Row: S. Arstead, B. Mikko, J. Holcomb, D. Katagiri and N. Eddy.

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RCM PRODUCT TEST

Astro Flight PARTENAVIA VICTOR

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 Partenavia Victor is a scale electric twin aircraft manufactured by Astro Flight Inc., 13377 Beach Avenue, Venice, California 90291. Designed by Bob Boucher, the Partenavia first appeared as a construction article in R/C Modeler Magazine. The price of the kit is $49.95 and is available direct from the manufacturer and retail outlets. The wing span is 48½" with a wing chord of 8" for a total wing area of 388 square inches. An Eppler 387 constant chord airfoil is used. The ship is designed for twin Astro 05 electric engines, and 4 channels of operation. The kit is of conventional construction using balsa, plywood, and hardwood in the fuselage and balsa in the wing and tail surfaces. The kit includes a complete landing gear assembly including wheels, steering arm, hinges, horns, threaded control rods, and aileron linkage. The plan size is 36" x 50" with building instructions included on the plan sheet in addition to the 4 page instruction manual. All parts are die-cut and shaped. Unusual features of the kit include the twin electric motors, full flying stabilizer, and unique two speed motor control which does not rob rpm from the top end of the motors. The wing is bolted on for clean lines. The weight of our prototype ready to fly was 64 ounces for a wing loading of 23.8 oz./sq. ft. Our model was finished with white Quik Cote, black Solarfilm windows, and Pro Stripe trim. The radio used was an Ace 4 channel system.

In the construction of the kit, when joining the wing halves together, be sure to install the plywood in the trailing edge sheeting so the wing hold-down bolts will have a firm attach point. We found that the brass tubes for the elevator hinge are 1/8" OD x 2" while the stabilizer is of 3/16" thick balsa. The 3/32" diameter music wire that supports the whole stabilizer has a tendency to flutter slightly in flight. After 4 flights on our test model, cracks were evident along the brass tube glue line in the stabilizer. We elected to glue on 1/16" ply doublers measuring 1" x 2½" over the brass tubes. This corrected the weakness on subsequent flights and no further cracking oc-

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SPECIFICATIONS

Name	Partenavia Victor
Aircraft Type	Scale Elec. Twin
Manufactured By	Astro Flight 13377 Beach Avenue Venice, California 90291
Mfg. Suggested Retail Price	$49.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Sport, Stand-Off Scale
Wing Span	48.5 Inches
Wing Chord	8 Inches
Total Wing Area	388 Square Inches
Fuselage Length	37.5 Inches
Radio Compartment Dimensions	(L) 8" x (W) 3.2" x (H) 3.5"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	1/2 Inch
Stabilizer Span	20.5 Inches
Stabilizer Chord (incl. elev.)	4"
Total Stab Area	82 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Mid Fuselage
Vertical Fin Height	7 Inches
Vertical Fin Width (incl. rud.)	4.5"
Mfg. Rec. Engine Range	Twin Astro 05
Mfg. Rec. Fuel Tank Size	NA
Landing Gear	Tricycle
Recommended No. Of Channels	4
Recommended Control Functions	Rud., Elev. Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Hdwood
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	36" x 50" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (4 pages)
Construction Photos	Yes
Kit Includes	Die-Cut & Shaped Parts
Mfg. Rec. Flying Weight	56 Ounces
Wing loading based on rec. flying wt.	20.7 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	64 Ounces
Wing Loading	23.8 oz./sq. ft.
Covering & finishing materials used	QuikKote, Solarfilm
Engine Make & Disp.	Astro 05 Twin
Muffler Used	No
Radio Used	Ace
Tank Size Used	NA

For Old Time's Sake

RANDY CARMAN

Looks like Don Hartman is trying to assist his Standby!

● Having just returned from an unexpected extended business trip to merry olde England, this month's column will be a little on the short side.

By the way, I saw some gorgeous, green (yes, the drought was ending while yours truly was there) fields that would make ideal flying sites. Sorry to say, though, we didn't have a chance to "ring up" any of the British enthusiasts while there. However, talking with non-fliers about the hobby was most interesting — they were very much aware of the sport! Their reaction to model aircraft is very positive — not considered "child's play" at all. They even seemed to know of the international competitions. Apparently the hobby is discussed in the daily papers and is treated with an intellectual attitude. No looking down their noses, these British! The American press and populace could learn a few things about treating modeling with a little respect.

☆

Many thanks to Chuck Cunningham (where have we seen that name before?) for the following contest report.

A stable of big birds at the SAM Champs, owned and operated by George Haley. MG in the back, Ehling's Gas Job in front.

"The Texas Pride Tournament was the brain child of the one and only Helmer Johnson and was designed to provide a great contest for both sailplanes and old timer aircraft, and it was highly successful. Helmer borrowed the idea of using beer cans as part of the trophies, and conned the Texas Pride Beer Company into providing a bit of the pale brew for prizes and refreshment. All in all, H.J. constructed 34 trophies, for this contest, and they were beautiful. The main thing was not the trophies, but the very successful blending of sailplanes and old timers into one contest. They did not fly against each other, but both groups flew the LSF Task II contest, which is a three flight add-em-up 15 minute total duration with a spot landing worth 25 points on each flight. Engine run for the powered aircraft was limited to 35 seconds. All other aspects of the SAM rules as to engine size and aircraft were adhered to.

Gene Crim displays his Robotaire. Can you guess what engine he's using?

"The soaring competition was not divided into standard and open, but was divided into categories of expert and novice. This worked out very well. Sixteen fliers were entered in Expert Sailplane, 14 in Novice Sailplane, and 16 in Old Timer. All three groups also flew a 'Chicken' event, which is fun to fly, though a bit hard on the aircraft if the wind is blowing, and it did, and I did with my glider, let it get too far down wind that is. For those of you who don't know, the 'Chicken' event is very simple. The aircraft is climbed to altitude, either by tow launch or power, then you are given 10 seconds to set up the glide pattern, then you must set the transmitter on the ground and not touch it again. When you get too 'chicken' and have to pick up the transmitter your time stops, and you have made an official flight, provided that you are able to fly the aircraft back to the field, and land on the field. I think that a spot landing should be included as well but we didn't do this for this contest.

Don Lamkin's Cloud Cruiser makes a gentle take-off at Lakehurst, N.J.

"The old timers took to the 15 minute add-em-up just like a duck to water and made for interesting flying. The quality of the fliers and flying was excellent. Entries in this event included Bruce Norman of SAM Nationals fame, Bob Elliott, President of EK-logictrol, Ted White, noted pattern flier, Helmer Johnson, Chuck Cunningham, and a bunch of other fine fliers. When the day ended, Bruce Norman and Chuck Cunningham tied for first in the 15 minute add-em-up, and Bruce took first in the 'Chicken' event with Chuck taking second. Helmer grabbed off third place in 15 minute, and C.B. Horton from Waco, Texas, took third in the 'Chicken'.

"Since this is an old timer report I won't go into who won what in the sailplane events, but when the smoke had

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A good argument for RC assist! You Taft fliers have it made! This is one of the Central Jersey RC Club's fields - - - the best one!

RCM BUILDS THE

BY GRADY HOWARD

KAVAN ALOUETTE 2

● Kavan has introduced their latest helicopter kit to the USA with the release of the Alouette 2. This is a semi-scale model of the full sized French helicopter used throughout Europe. The model is basically plastic with only the fuselage side pieces and the cabin floor made of plywood. Also, the main rotor blades are wood. The kit comes with a full size plan sheet with line drawings on one side and step-by-step photos on the other side. The instructions are printed in a 21 page booklet along with a parts list.

On the first page of the instruction book is written, "First of all we wished to create a reasonably priced and luggage compartment sized model, *(this they did)* which opens the way to the beginning helicopter pilot, *(this they did not do)* and is still an ideal second model for the *experienced* owner of the Kavan Jet Ranger." I have emphasized "experienced" in the statement as this is definitely what it takes to fly the Alouette 2.

The controls on the model are extremely sensitive and react with much speed and positiveness. I am a very experienced helicopter pilot and I found that I was in for a handful of helicopter. The Alouette 2 is definitely for the advanced expert. The expert flyer can really put the Alouette through its paces and its capabilities but, for the novice, I feel that the Alouette is a "no-no".

The construction is quite simple with many of the assemblies pre-assembled, such as the tail rotor gear box, the main rotor head the tail boom along with the clutch assembly, to name a few.

The hardest part of the whole building process was trying to put the canopy together. I spent approximately 2 hours on this chore alone. Trying to put the second half of the canopy into the thin jointing plastic piece is "pert-near" impossible. I finally cleaned out the glue and started over using Zap, gluing and

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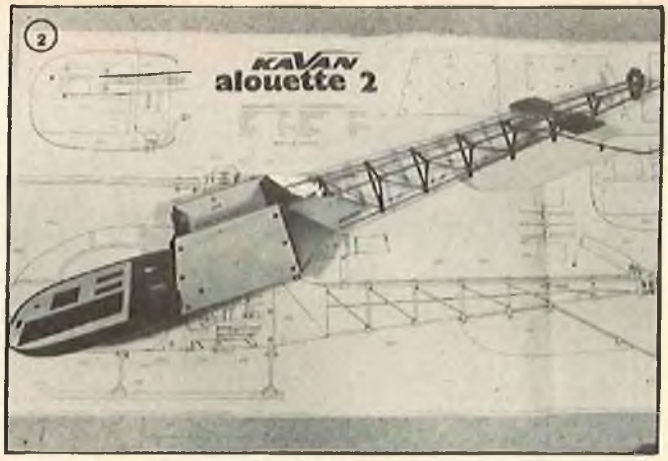
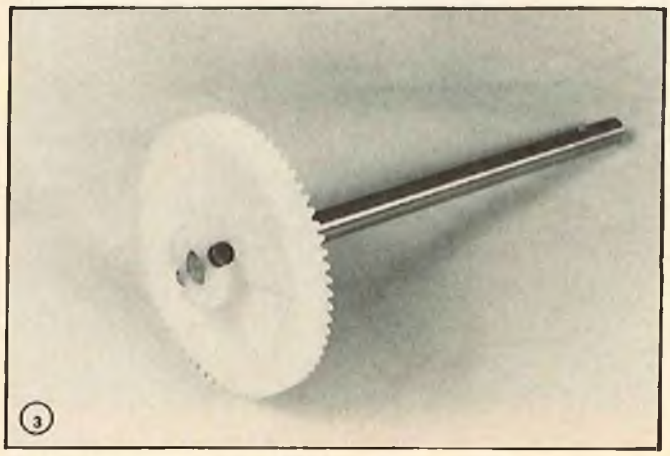
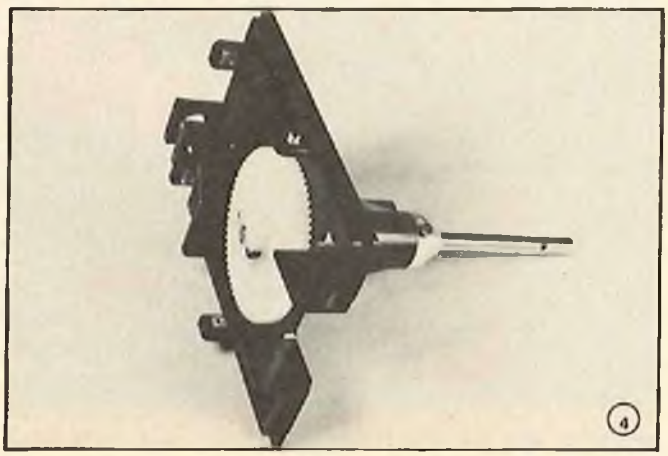
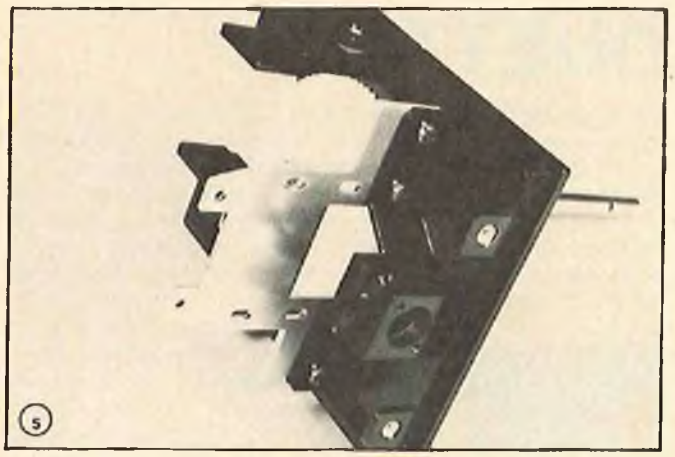
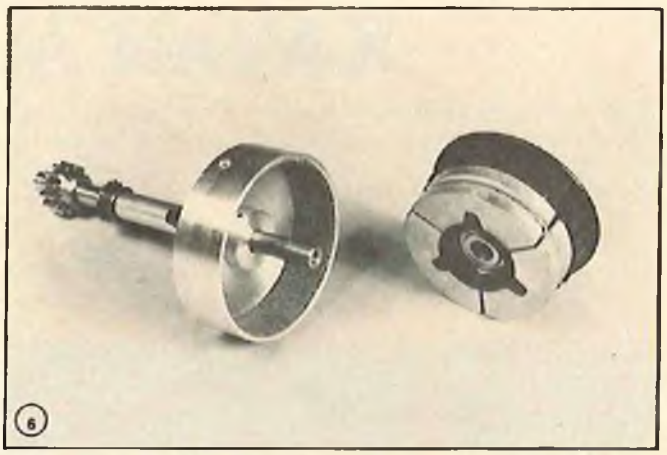
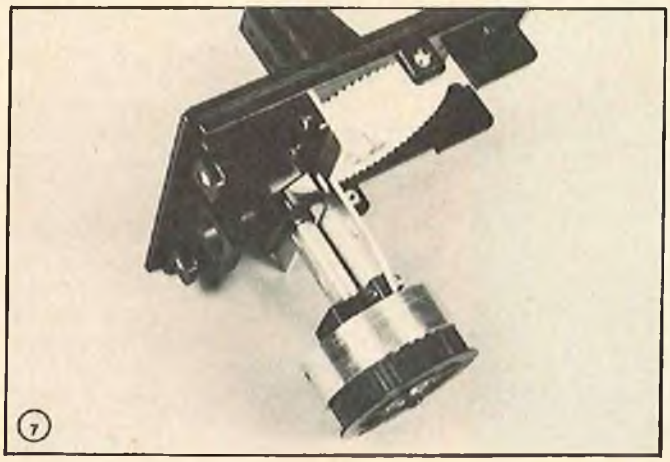






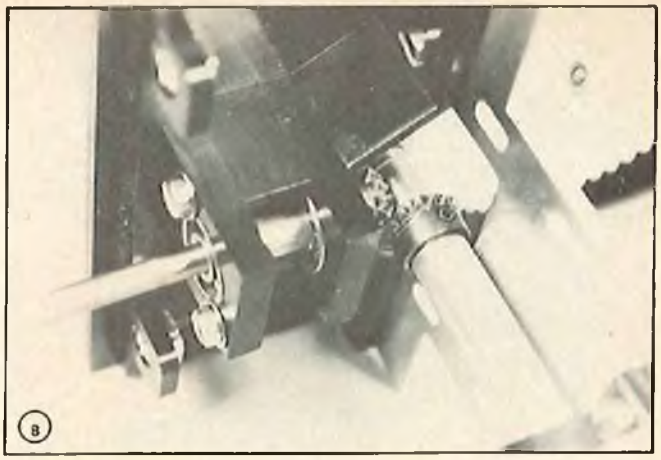


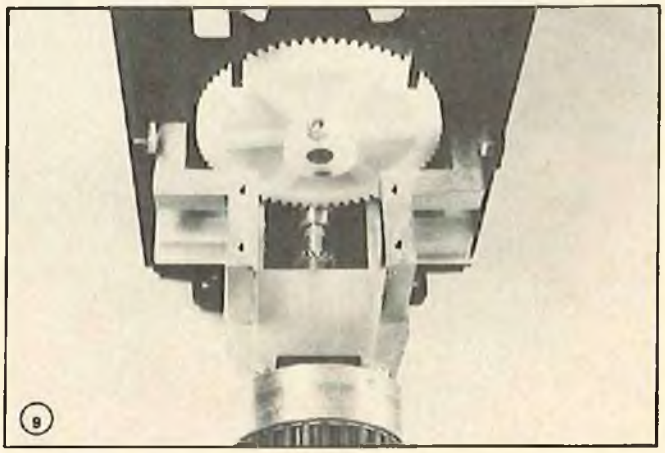


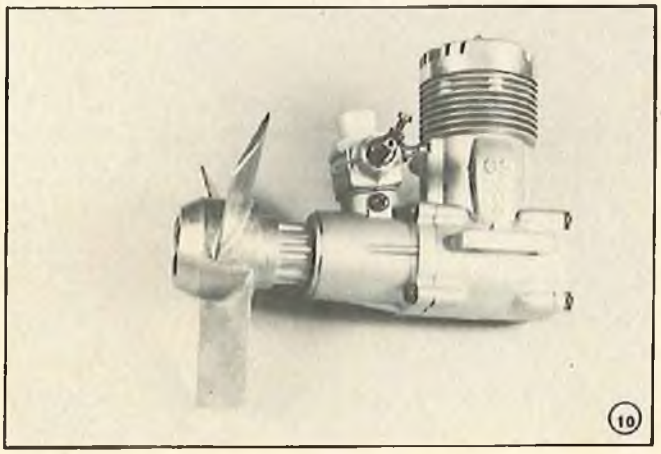


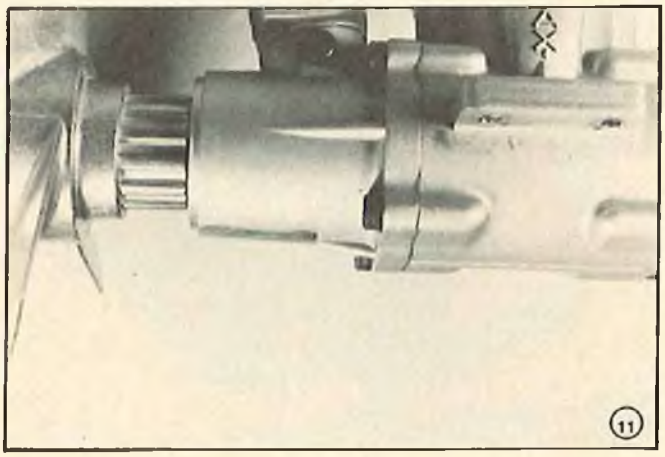
(1) Assembled tail boom and front body with servo tray and front bulkhead. (2) Tail boom, fuselage sides and front body all joined together. Be sure to fuel proof the plywood sides. (3) Plastic spur gear mounted on the main rotor shaft. (4) Main shaft slipped into the transmission plate and held in place by the cone shaped aluminum retainer. (5) Aluminum mounting plate attached to transmission plate. (6) Pre-assembled clutch, clutch bell and jack shaft as they come in the kit. (7) Clutch and jack shaft mounted to the transmission plate.

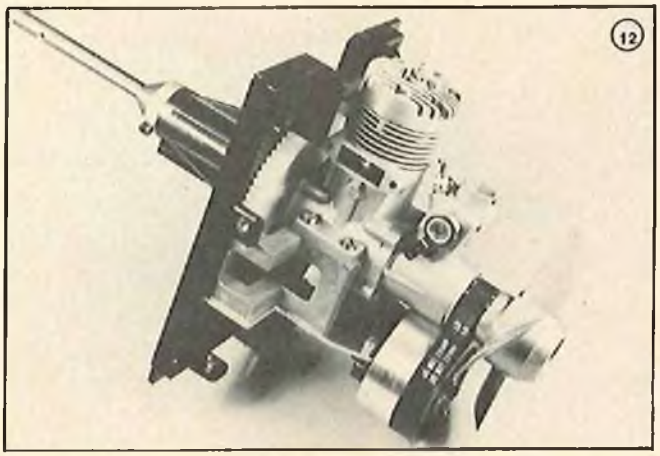
(8) Tail rotor drive shaft and bevel gear inserted into plastic mounts that are part of the transmission plate. (9) Engine mount castings in place on aluminum plate. (10) Cooling fan and pulley assembly are mounted to the engine. (11) Part of fin on bottom of the engine must be filed away to allow clutch clearance. This is on the OS40FSR. (12) Completed power and transmission unit. (13) OS Max muffler completes the unit ready for installing into the fuselage. (14) View of fan after power unit is installed but before fan shroud is installed. Note cut-out curve in front body to allow shroud to be centered when installed.

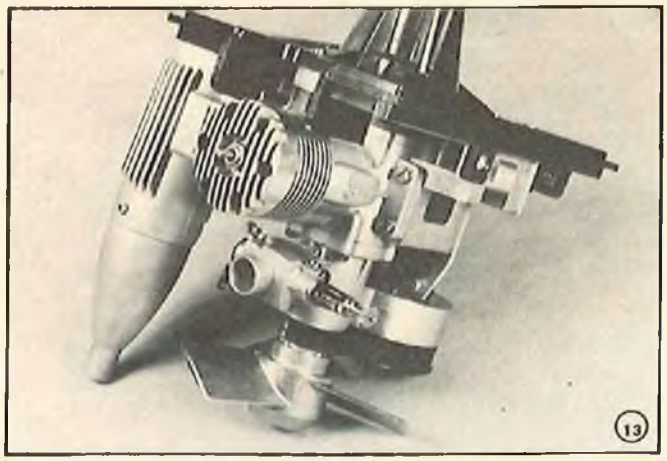


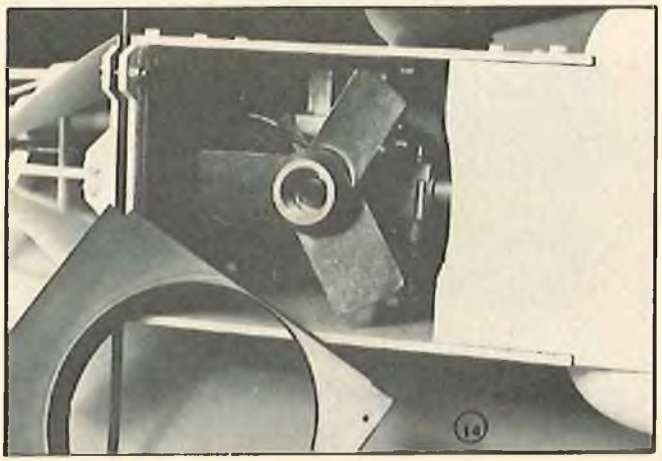


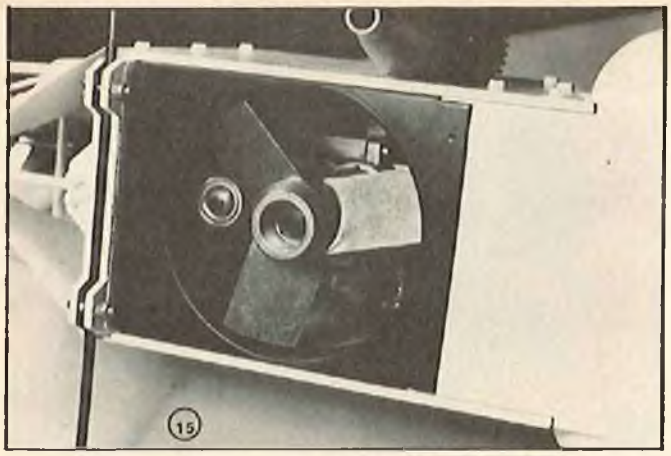


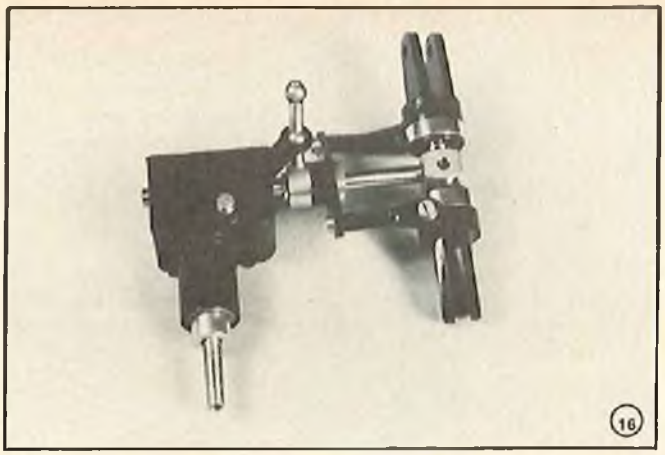




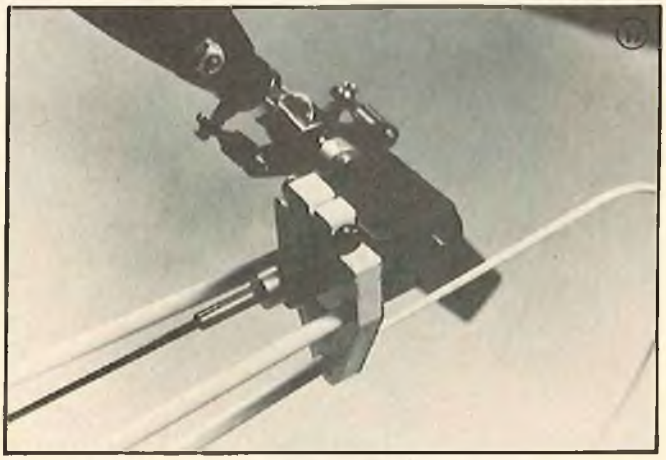


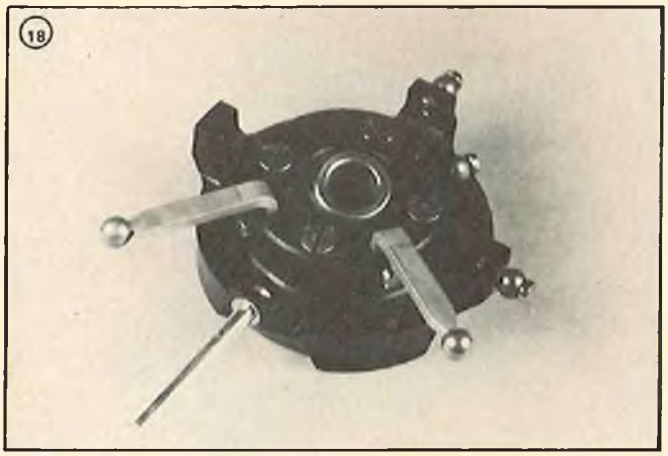


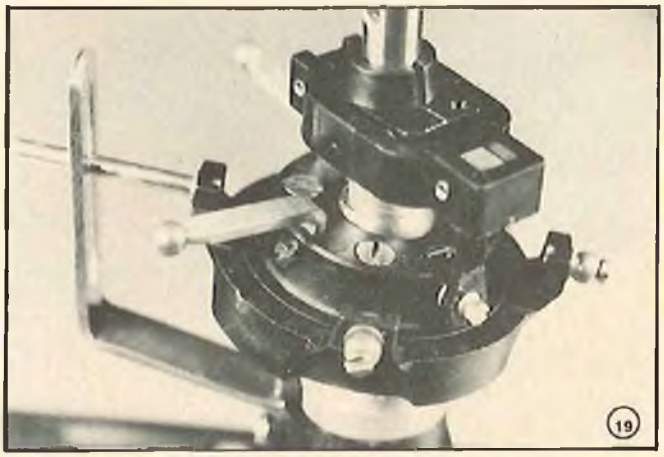


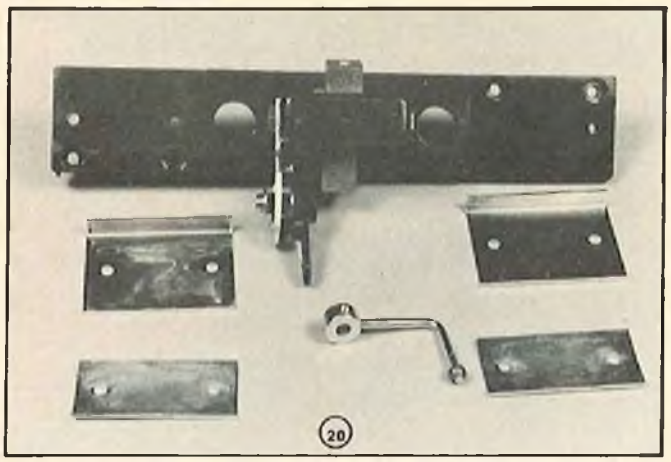


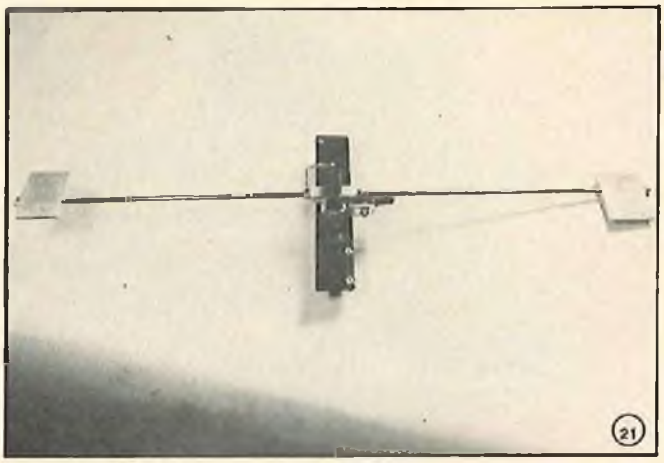
(15) Fan shroud installed and will be held in place with 2 sheet metal screws. (16) Tail rotor gear box and blade holders as they come in the kit, already assembled. (17) Tail rotor gear box installed into tail boom. Held in place by tightening the bolt on top of the tail boom. (18) Swash plate ready to be put on main shaft. Arms and balls must be put on swash plate. (19) Swash plate and driver installed on main shaft. (20) Rotor head parts as they come in kit. Fly bar bearing and control links already installed. (21) Fly bar installed into rotor head.

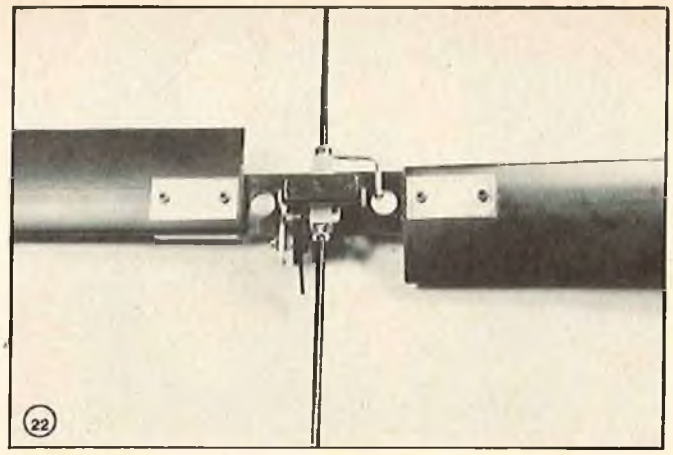


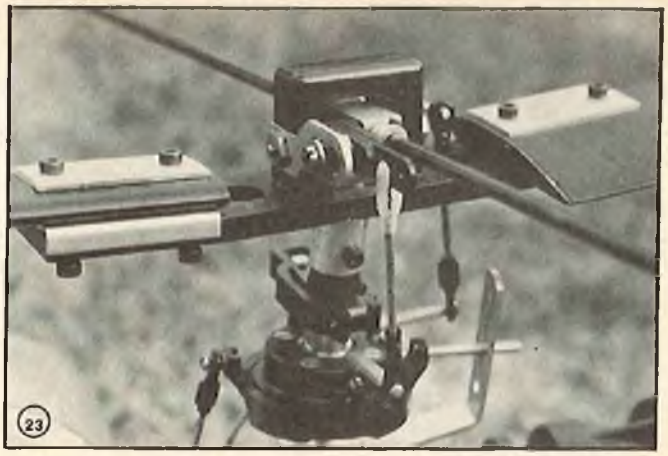


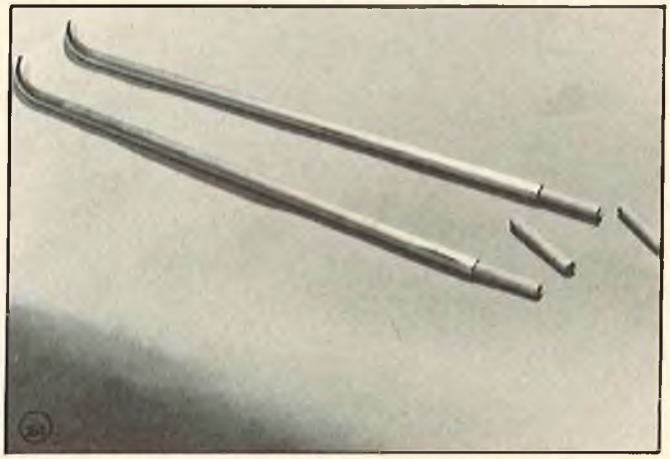


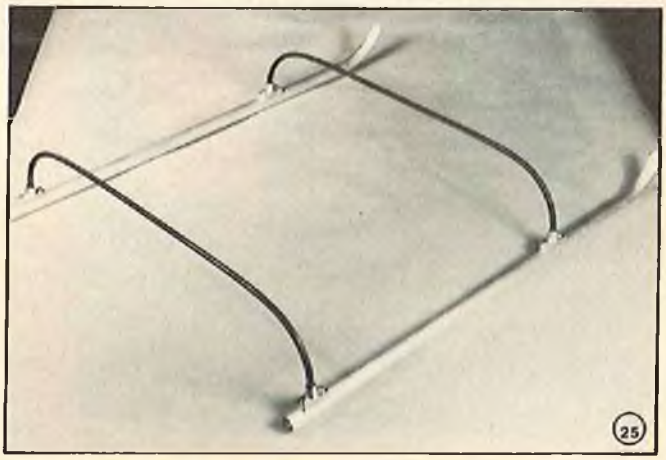


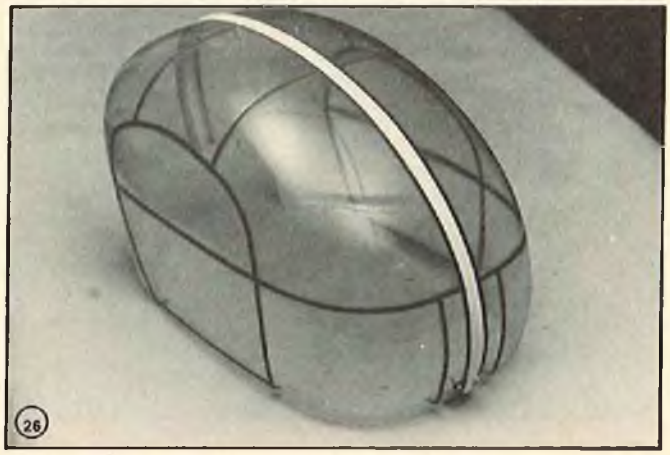


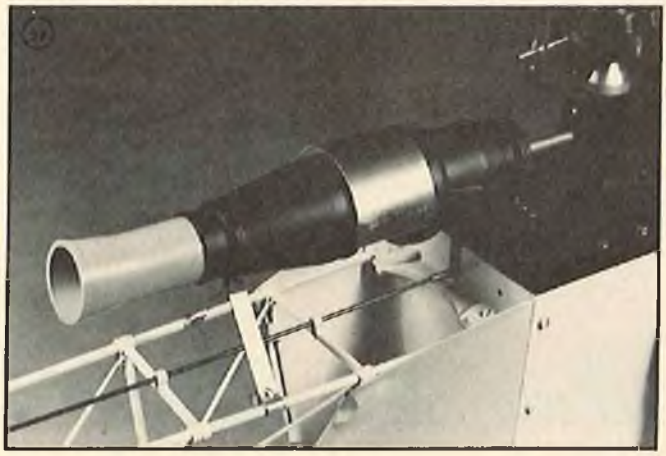


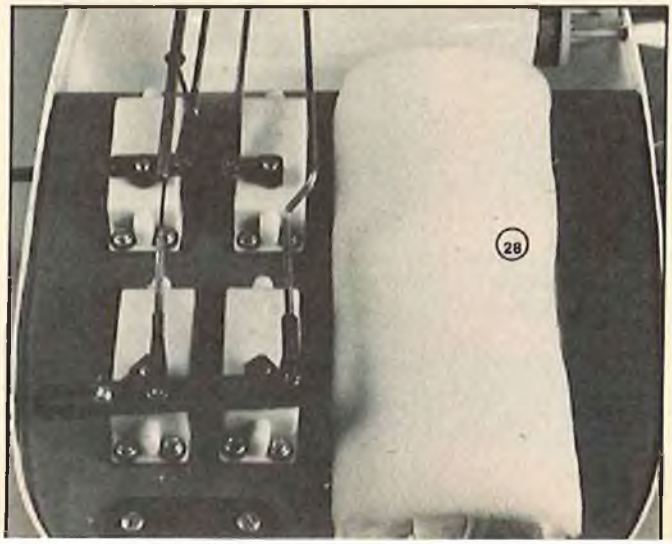




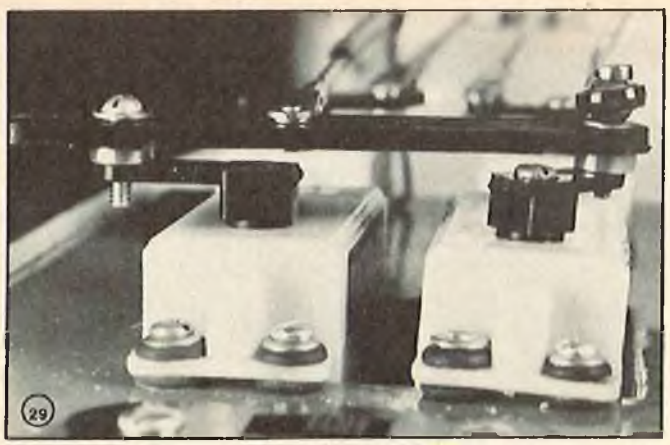


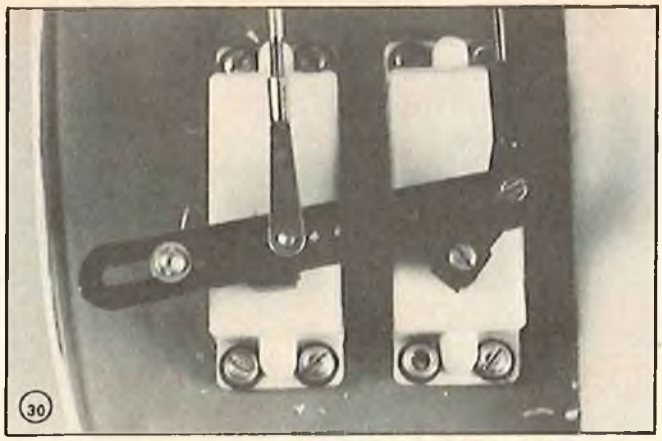


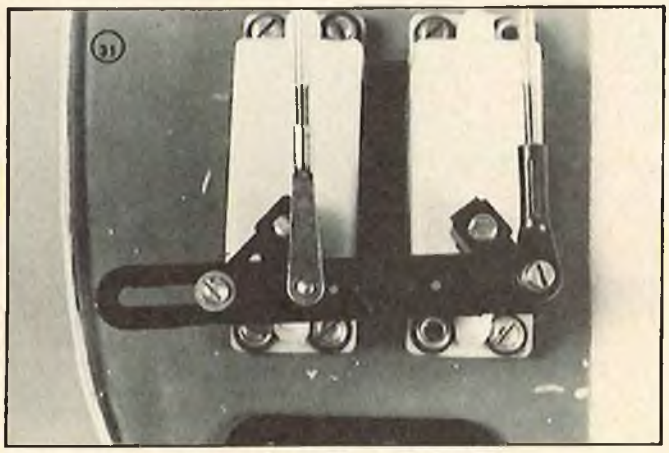


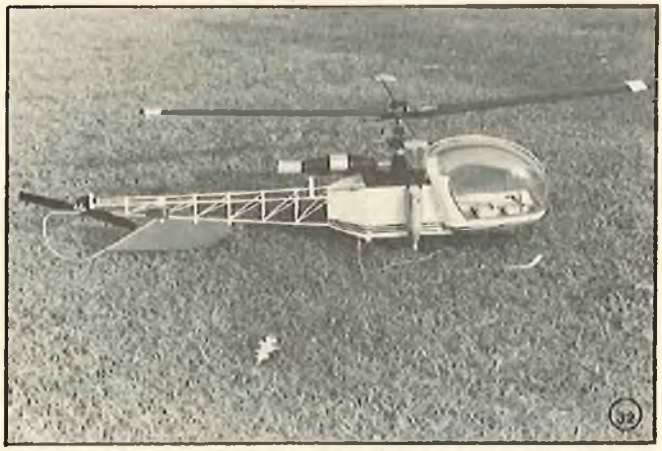


(22) Completed rotor head with blades attached. (23) Rotor head installed on main shaft showing control linkage. (24) Dowels cut to length and inserted into skids. (25) Completed landing gear ready to put on to fuselage. (26) Completed canopy ready to install. Panel lines are made with DJ's Tape. (27) A nice finishing touch is the dummy Jet Engine mounted on the top of the tail boom. (28) World Engines S10 servos fit nicely and offer plenty of power to move the controls.









(29) Close-up of tail rotor mixing bar that ties tail rotor to throttle for compensation of torque when throttle is applied. (30) Top view showing low throttle and neutral tail rotor. (31) Top view at high throttle and full tail rotor control. (32) All finished and awaiting its first flight. (33) Up, up, and away . . . first test flight of RCM's Alouette II.

inserting about 1" of canopy at a time. This, then, worked pretty well with somewhat satisfactory results.

I used R & S Perfect Paint to finish my model and this proved to be a good finish for the plastic and metal parts, but first use #320 grit sandpaper on the front bottom body to give better adhesion. Trim colors were DJ's Tape along with the canopy panel colors.

After approximately 10 tanks of fuel through the OS Max 40FSR, I noticed that the molded landing gear brackets had cracked. I had not made any hard landings so I contacted Bill Curtis, a Kavan representative, and he said this was a weak point in the fuselage and suggested that I grind the lugs completely off and use landing gear straps like those used on airplanes. This I did with no ill effects. I also noticed that the tail rotor blades were not tracking 90° to the tail boom. After examining the screws in the end of the tail boom, I discovered them to be loose even after I had used Loctite on them. By torquing to the right, the twisting had also loosened several of the truss struts.

I re-tightened the two rear screws and used Zap to lock them and the struts in place. I have had no further problems in this area.

Flying the Alouette 2, as I stated earlier, is very exciting, especially the first couple of flights. After the initial shock of the control response is over, then flying is a pleasure. The Alouette is capable of loops and I'm sure that with a little more nerve I could get a roll out of it. In a hover you can rock the Alouette back and forth with as much as a 45° tilt and never move from over one spot. This goes back to that fantastic control response.

Along with the photos here and the instruction booklet, I feel that there should not be any problem with anyone building the Alouette 2. The only problem with *anyone* building the Alouette is that the novice can't handle the flying. This is definitely an expert's helicopter and an expert can have a ball with the Alouette 2.

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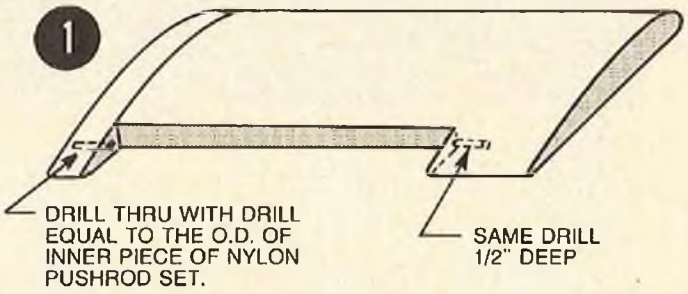
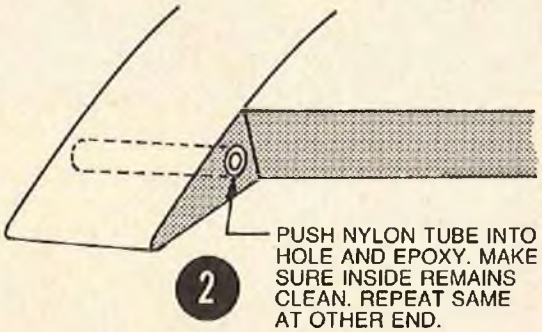
HOW TO

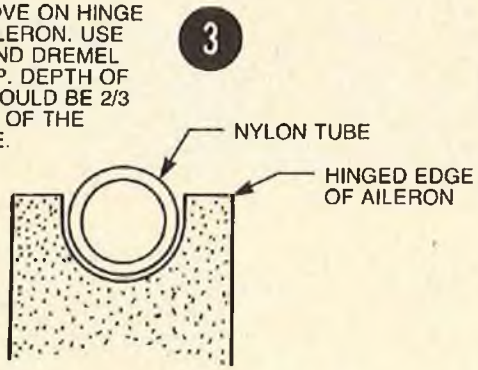
BY J. DEL CASTILLO

HINGE YOUR AILERONS

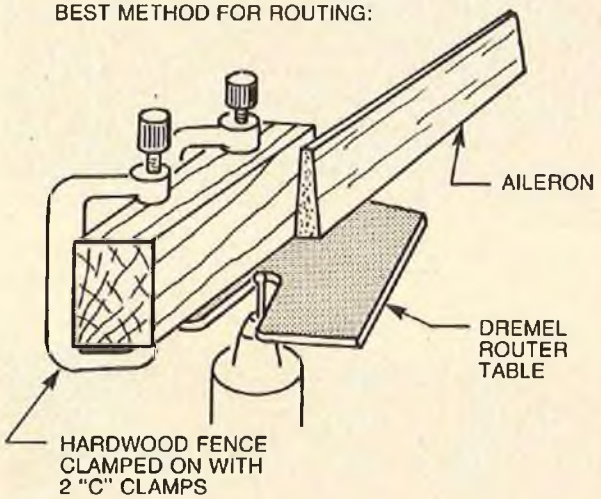


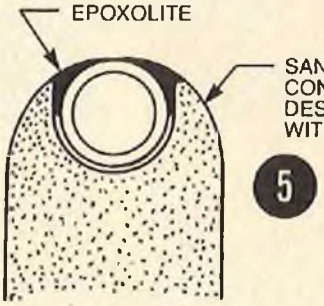


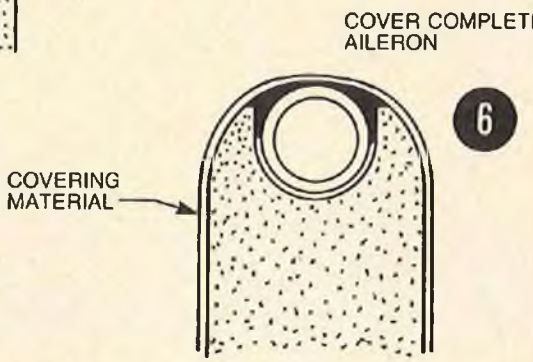
ROUT GROOVE ON HINGE EDGE OF AILERON. USE SMALL ROUND DREMEL ROUTING TIP. DEPTH OF GROOVE SHOULD BE 2/3 OF THE O.D. OF THE NYLON TUBE.

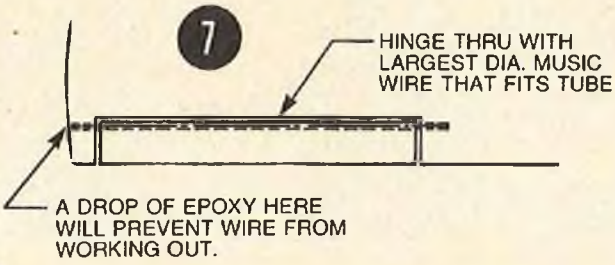


BEST METHOD FOR ROUTING:









Spectators take a close-up look at the Lear before take-off.

Jim Perrault starts the engine, while John Quero and Salvatore Paolucci look on.

A TV cameraman takes a static shot for the local news broadcast.

The Lear is out on the runway and rolling for a take-off.

The nose gear lifts off followed by the main gear.

The Lear Liner is airborne on its maiden flight.

Quero handles the controls as he makes a fly-by.

Bringing the Lear back after the first flight.

THE MAIDEN FLIGHT OF A

BY LORELEI SNYDER

LEAR JET LINER

● By 9 a.m. on Memorial Day, the low cloud cover had burned off and for the first time in several days, the sun bore down on the crowd of nearly 100 who had come to watch Salvatore Paolucci's third attempt to get his one-inch-to-the-foot Lear Jetliner into the air. Pilot John Quero of Brockton, Mass., a site instructor with the South Shore Radio Control Club, ran a lawn mower up and down the already manicured field, lowering a special take-off strip, while Sal, from Quincy, Mass., who built the model, and Jim Perrault, Brockton, Massachusetts., his engine mechanic, tested out the two .60 pusher engines they hoped would get the mammoth Stand-Off Scale off the ground.

Twice before it had failed to make the air, first when the fuel line broke because of a rotted line, and the second time when the landing gear collapsed on take-off. All systems appeared to be go this time. John put away the mower and took up the five channel 1974 single stick Kraft transmitter. The plane responded well, and he guided it down to the strip.

The crowd quieted while the engines raced. Then John gave full throttle and the behemoth began to move down the field gathering speed. At about 100 feet, the nose gear lifted off and led the rest of the plane into the air at a 30 degree angle. By the time it passed over the end of the 180 foot runway, it was well above the heads of the cheering crowd. A slow left turn brought it back around the field as it climbed over the tree tops while cameras snapped. There were Instamatics and Polaroids and a professional telephoto used by the *Boston Globe* reporter and the TV camera from WCVB-TV.

"My brother-in-law told me not to fly it without telling the papers first," Sal laughed. Local radio stations announced the flight as well, and the *Brockton Enterprise* and the *Quincy Patriot Ledger* also carried stories.

John leveled the flight off at about 1,000 feet. A peculiar sensation held the crowd, that of seeing a full scale jet in the air instead of this 16½ pound, 11', 2" long balsa and Hobbypoxy version with a 9' wing span, built from R/C Modeler Magazine plans.

It had taken two years to arrive at this flying field behind the Massachusetts Correctional Institution at Bridgewater, but the story really began four or five years before that when Sal first bought the plans.

More a builder than a flyer, Sal studied the plans while he built his first R/C model, a Williams Brothers LaJollita pylon racer. He sold it, and if flew well. Now he was ready to begin the Lear.

"To me it was a challenge," he explained, and all that study paid off. "You have to study it carefully before you begin. Then you know what you're doing."

During this time he also built six or seven smaller models, including an S-Ray which he began to fly himself with the help of John Quero.

"I had over 100 flights out of that before I plowed it 10" into the ground last fall. Now I'm working on my second trainer, a Senior Falcon," he said. Right now he has no intentions of taking the controls of the huge Lear.

John doesn't share Sal's reticence.

"I think he could handle it. The controls are slower on a plane this size. You have more time to think. It's easier than the small planes once it's trimmed properly," he said.

Trim was indeed a problem on that first flight. It required John to hold full right aileron to keep the plane level, and right turns were out of the question. But

TOP, RIGHT: It takes a group effort to turn the long fuselage over in order to detach the wings. CENTER: Sal Paolucci and a friend gently ease the big plane into the station wagon. BOTTOM: The 11 foot, 2 inch fuselage takes up all of the inside of a standard size station wagon.

the soft, slow bank to the left was a beautiful sight, and only experts noticed the problem in the air.

"It really looked like the real thing up there," Sal marveled.

The original plans called for a finished weight of 25 pounds, but Sal wanted to get it lighter. He covered both the fuselage and the wings with 3/32" balsa, then coated the whole thing with sealer and one coat of white Hobbypoxy. He used a 32 ounce shampoo bottle for a fuel tank, and the two Enya .60's without mufflers.

"There wasn't room and we wanted to reduce the heat," explained Jim Perrault who set the engines for Sal. He adjusted for maximum power and didn't bother with an idle.

"For this flight we were more interested in getting it off the ground than in landing," he said.

"I learned everything about building from magazines," said Sal, 46, a bricklayer by trade, and this is where he got the idea to reinforce the landing gear with plywood, after the first collapse.

"Nothing on the plans indicated the need for reinforcement," he said.

It took over 2,000 hours to build this model, Sal estimated, and he will probably sell it for somewhere in the neighborhood of $3,000.

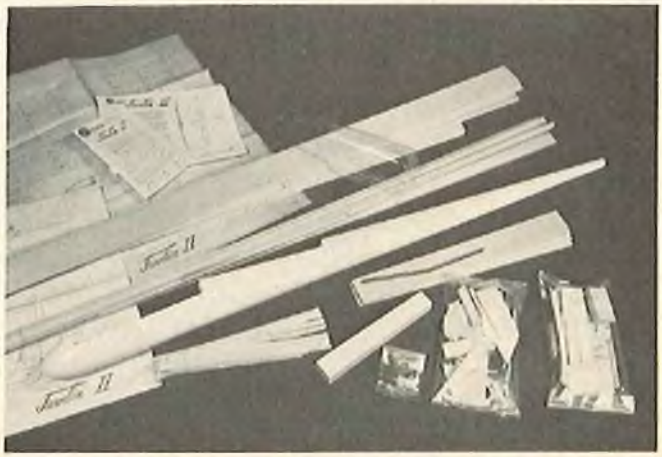
Other South Shore Radio Control Club members share Sal's penchant for large scale planes. Joe Purpura was flying a Bud Nosen 1/2 scale Cessna 10 that day, and Linda and Eino Narju are doubling Nosen's plans for an Aeronca Champ.

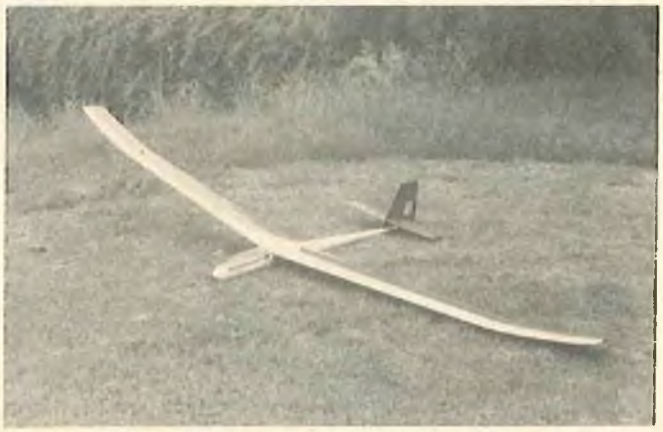
The big Lear had been in the air about 10 minutes when John decided to bring it in. After one last low pass to please the crowd, he circled the field and dropped onto the ground near the beginning of the landing strip. The plane rolled all the way across the field and came to a stop in the tall grass at the far end. The crowd cheered and applauded as Sal and Jim ran out to retrieve the plane and carry it triumphantly back to the pit area. The only damage was some bent balsa on the trailing edge of the wing where it attaches to the fuselage.

It had been a very satisfying flight, but John refused to give an encore until the trim was corrected. He saw no point in trying his luck! □

RCM PRODUCT TEST

JP MODELS JAVELIN II





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

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

● The Javelin II is a high performance sailplane manufactured by J.P. Models, 26557 Mazur Drive, Rancho Palos Verdes, California 90274. Priced at $69.00, it is available direct from the manufacturer and is a sport and competition sailplane designed for Open Class activities. The wing span is 134" with a total wing area of 1,005 square inches. Two channels are required to operate rudder and elevator.

The basic materials used in the construction are plywood and fiberglass in the fuselage, balsa and plywood in the wing, and built-up balsa tail surfaces. The kit includes a rolled plywood fuselage which is factory pre-painted, hinges, control horn, pivot wires and brass tube bearings, molded canopy, fiberglass tubes for the wing rod, pre-bent dihedral rod, control tubes and cables, and wing retaining wire. There are 2 sheets of plans, one of which measures 6' x 2', and the other 5' x 1½'. Building instructions are included on the plan sheets and there is a 7 page instruction manual in addition to the plans.

All parts are die-cut and shaped. Unusual features of the kit include a balanced rudder with full flying stabilizer, pre-cut wing webbing, and the unique J.P. Models pre-finished rolled plywood fuselage. If the builder is going to take the option of curved or elliptical wing tips, extra time must be spent on building a wing board with the proper curvature. This option is pictorially shown in the building instructions. The aspect ratio of the Javelin II is 18:1.

Our prototype, ready-to-fly, weighed 52 ounces for a wing loading of 7.45 oz./sq. ft. The wings and tail surfaces were covered with MonoKote while the fuselage is factory pre-painted with white epoxy paint. We used Rit dye to tint the canopy to match the wing and tail surface covering material

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SPECIFICATIONS

Name	Javelin II
Aircraft Type	Sailplane
Manufactured By	JP Models 26557 Mazur Drive Palos Verdes, California 90274
Mfg. Suggested Retail Price	$69.00
Available From	Manufacturer
Mfg. Recommended Usage	Sport & Competition
Wing Span	134 Inches
Wing Chord	7½ (Avg.)
Total Wing Area	1005 Square Inches
Fuselage Length	48 Inches
Radio Compartment Dimensions	(L) 10" x (W) 2" x (H) 2"
Wing Location	Shoulder Wing
Airfoil	Flat Bottom
Wing Planform	Swept T.E.
Dihedral	7.5 Degrees
Stabilizer Span	23 Inches
Stabilizer Chord (incl. elev.)	5 Inches
Total Stab Area	115 Square Inches
Stab Airfoil Section	Symmetrical
Stabilizer Location	1/2 Above Fuselage
Vertical Fin Height	9 Inches
Vertical Fin Width (incl. rud.)	7" (Ave.)
Mfg. Rec. Engine Range	NA
Recommended Fuel Tank Size	NA
Landing Gear	NA
Recommended No. Of Channels	2
Recommended Control Functions	Rudder & Elevator
Basic Materials Used In Construction:	
Fuselage	Ply & Fiberglass
Wing	Balsa & Ply
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	6' x 2' — 5' x 1½' (2 sheets)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (7 pages)
Construction Photos	No
Kit Includes	Shaped & Die-Cut Parts
Mfg. Rec. Flying Weight	50 Ounces
Wing loading based on rec. flying wt.	7.2 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	52 Ounces
Wing Loading	7.45 oz./sq. ft.
Covering & finishing materials used	MonoKote, White Epoxy Paint
Engine Make & Disp.	NA
Muffler Used	NA
Radio Used	EK Logictrol
Tank Size Used	NA

HERE'S HOW

FEATURED THIS MONTH ARE A NIFTY SET OF SIMPLE CLAMPS THAT CAN BE BUILT IN A VERY SHORT TIME. AND, THE BEST PART IS, THEY CAN BE BUILT USING THE LITTLE SCRAPS OF WOOD YOU NORMALLY THROW AWAY. A QUICK LOOK UNDER YOUR WORKBENCH AND YOU'LL SEE WHAT I MEAN.

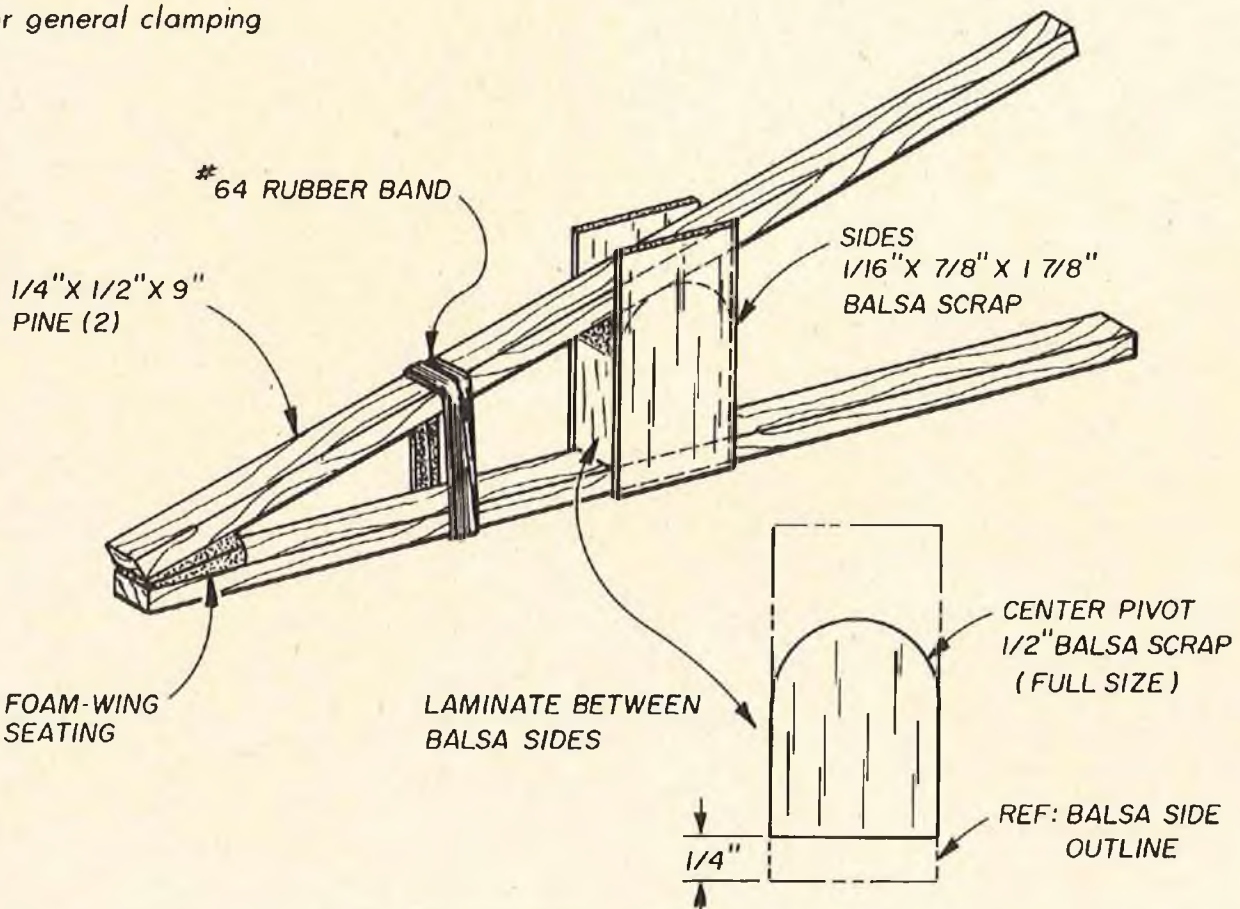
THERE ARE THREE TYPES OF CLAMPS SHOWN. EACH CLAMP HAS A SPECIFIC USE, DEPENDING ON YOUR PARTICULAR NEEDS HOWEVER, YOU WILL FIND THEM ALL MIGHTY HANDY WHEN IT COMES TO CLAMPING. THE BASIC CLAMP WILL PROBABLY FILL MOST OF YOUR CLAMPING REQUIREMENTS BUT, THERE ARE TIMES WHEN A SPECIAL CLAMP IS REQUIRED FOR A PARTICULAR HOLDING JOB. IN THIS CASE YOU MIGHT CONSIDER BUILDING THE ANGLE OR UNIVERSAL JAW CLAMP. ALTHOUGH SOMEWHAT MORE DIFFICULT TO BUILD, THESE SPECIAL CLAMPS ARE ESPECIALLY SUITABLE FOR ANGULAR AND UNPARALLEL SURFACES. THE WIDE FLAT JAWS PROVIDE A GOOD GRIPPING SURFACE AND WILL ADJUST QUITE READILY TO MOST CLAMPING SITUATIONS

ANOTHER NOTEABLE FEATURE IS THE ADJUSTABLE CLAMPING TENSION. BY ADDING MORE OR LESS LOOPS OF RUBBER BANDS CLAMPING POWER IS INCREASED OR DECREASED. ALSO TAKE NOTE OF THE PIVOT ARRANGEMENT ON EACH CLAMP. TAKE YOUR CHOICE WHEN BUILDING.

THESE NOVEL AND UNIQUE CLAMPS WERE DESIGNED BY GEORGE WALTERS OF LA CRESCENTA, CA. YOU WILL FIND THEM EXTREMELY USEFUL IN YOUR WORKSHOP AND THANK GEORGE MANY TIMES FOR SHARING HIS IDEA WITH YOU!

BASIC CLAMP

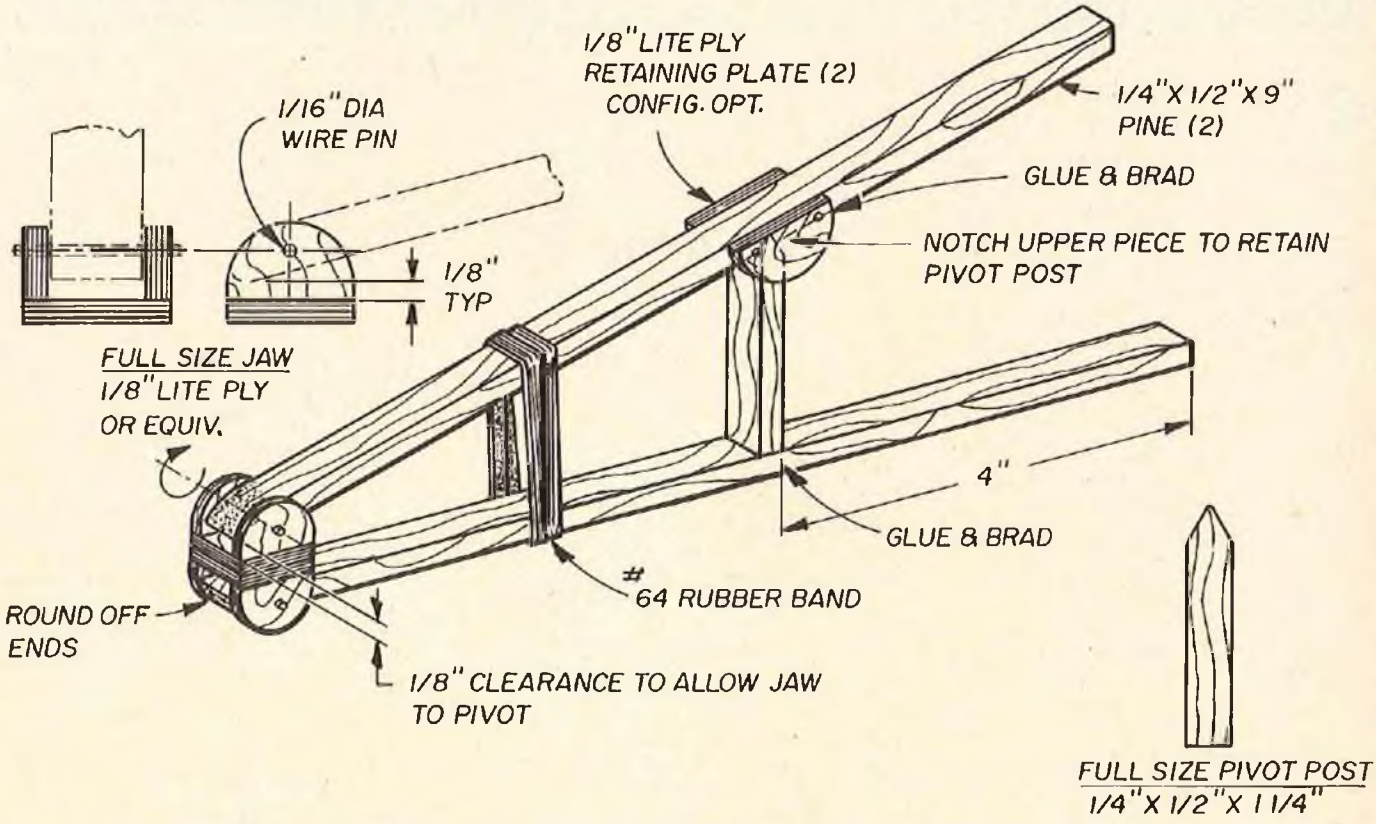
For general clamping



NOTE: The basic clamp can be built with most any scrap material. A good way to use all those small pieces!

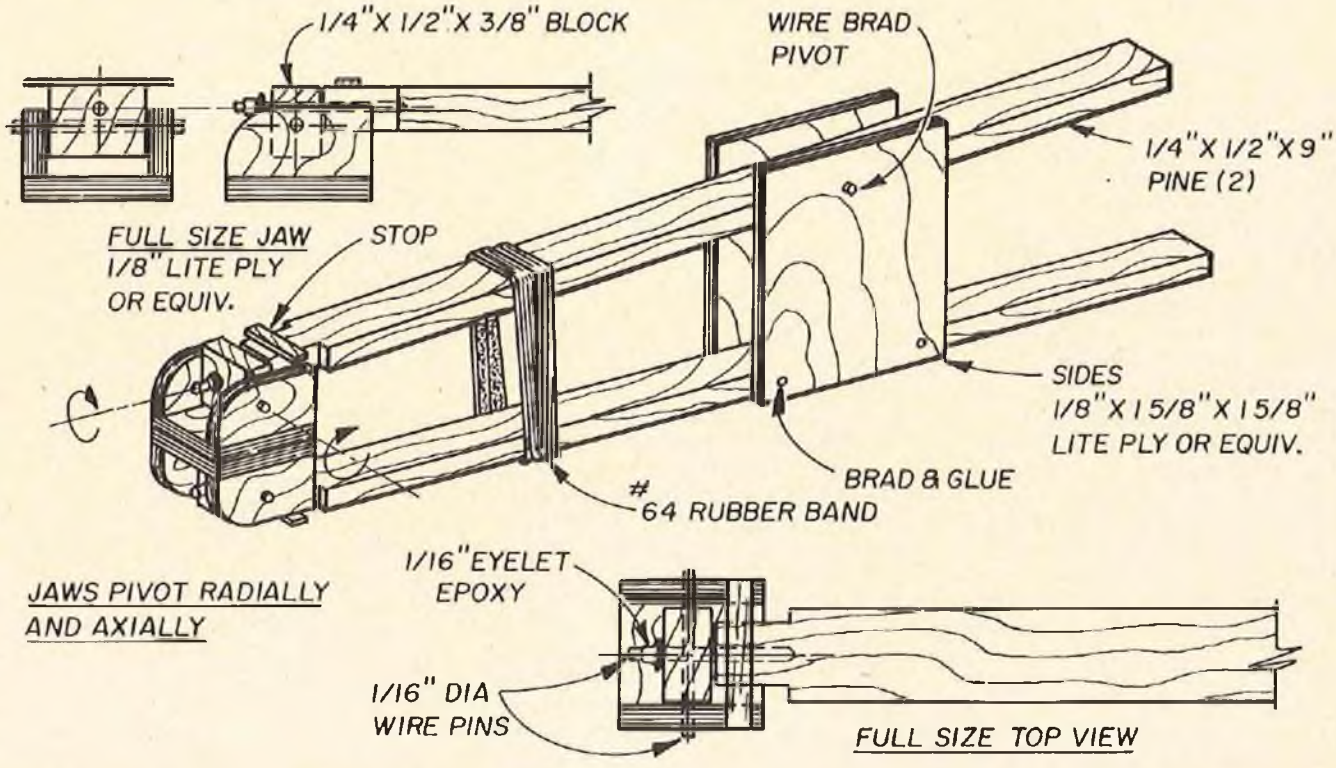
ANGLE JAW CLAMP

Especially suitable for clamping trailing edge sheeting and any surfaces not parallel in one plane.



UNIVERSAL JAW CLAMP

Especially suitable for clamping any surfaces not parallel in two planes.



USING ELEVONS, AILERATORS, FLAPERONS, OR RUDDERVATORS? THEN YOU'LL NEED A

CONTROL MIXER

BY JACK HEADLEY

Before we actually begin might I say that I've always been amazed that anyone could solve the aileron/elevator problem at all, not to mention coming up with several different solutions. However, I could never understand how a stunt tank worked when I was a Ukie flyer, so the answer could simply be my own ignorance of things mechanical.

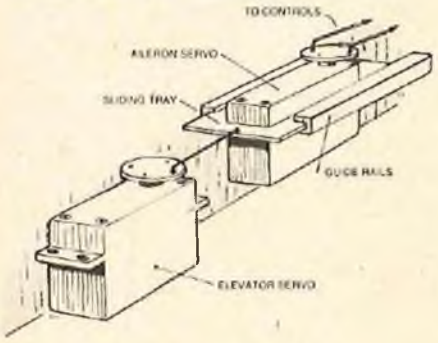


FIGURE 1: THE SLIDING SERVO MARK 1

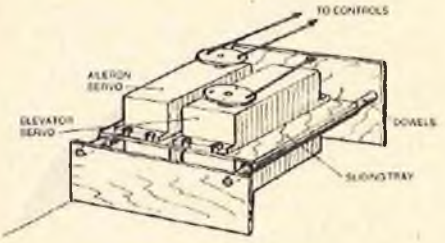


FIGURE 1A: THE SLIDING SERVO MARK 2

The first, and as far as I've been able to determine, the original solution, is the "one-servo-pushing-the-other" approach. Here the elevator servo is fixed in the model, and its sole function is to push the aileron servo backwards and forwards. The aileron servo is the only one connected to the controls and, in normal operation, causes the aileron deflections. Pushing this servo produces the elevator effect. A small modification of this system is to have both servos on the sliding tray. Of these two types I prefer the former, as this puts the least inertia load on the pushing servos gears (that's a polite way of saying it's more "crashproof"). Figure 1 shows both of these schemes. You should make sure that the slide is friction-free but not too sloppy, otherwise it may twist and bind up, causing all those little plastic teeth to fall from the servo gears.

The good features of this system is that it requires little extra work than the normal installation, and the servos can either be mounted in series or in parallel.

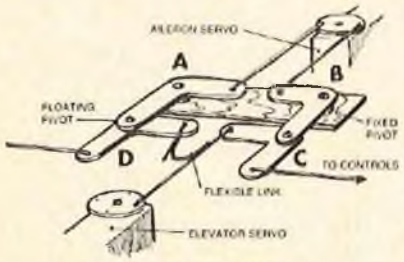


FIGURE 2: THE FOUR BELLCRANKS

Figure 2 illustrates a home-built unit that's strictly for flying wings, and consists mainly of four right angle bellcranks which, for clarity, we've labelled A, B, C, and D, in our sketch. The aileron servo is connected directly to the A and B pair of cranks, which are mounted solidly into the model. Pivoted on the aft ends of these levers are the C and D bellcranks, and the elevator servo is connected directly to the C lever, and indirectly to D via a U-shaped wire, which flexes to take care of the varying dimensions between the inboard ends of C and D.

Connections to the aerodynamic controls run outboard from the aft ends of bellcranks C and D, which is why, in the first paragraph, we labelled this unit strictly for flying wings.

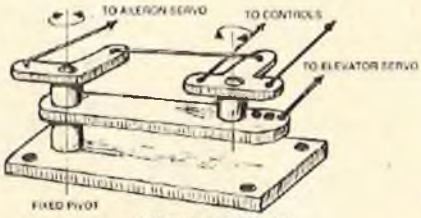


FIGURE 3: EK DCM7 UNIT

Figures 3 and 4 show two variations of the same idea, which is basically a bellcrank mounted on a lever arm. The first scheme is the EK DCM7 unit, and this consists of a long lever pivoted at one end on which is mounted a bellcrank. This bellcrank is connected to the elevons. A further bellcrank is mounted on the lever concentric with the main pivot point, and the aileron servo is coupled to this latter crank. The elevator servo is connected to the long lever, and translates the control bellcrank, to give a true elevator effect.

Figure 4 shows a home-made version of this idea, and this unit eliminates the auxiliary bellcrank, and uses the aileron servo to drive the main crank directly. The elevator servo moves the long lever

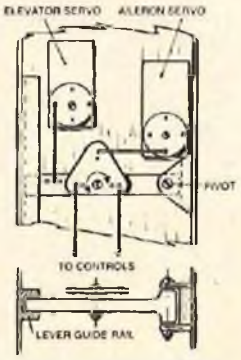


FIGURE 4: SWINGING LEVER UNIT

as before. One possible problem with this unit is that unless the aileron servo and the main lever pivot point are in the same fore and aft line a true parallelogram linkage is not formed, and some roll may be introduced along with the elevator motion.

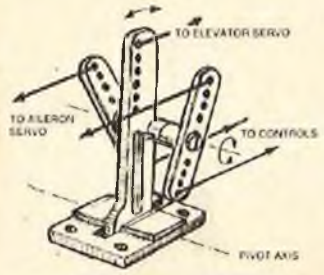


FIGURE 5: VECTOR DIRECTOR

Figures 5 and 6 show what is probably the most popular type of mixer. Both of these units are essentially the same, differing only in construction detail. Let's start with Figure 5, which is the well known Airtronics Vector Director. Here a central lever pivoted at its base carries a pair of smaller control arms, which are, in turn, connected to the aerodynamic surfaces. The elevator servo controls the position of this central lever, and the aileron servo controls the positions of both the smaller levers.

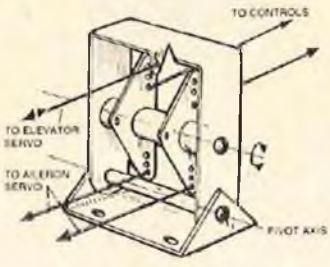


FIGURE 6: SWINGING FRAME UNIT

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Ernie Huber, Beverly, Mass., used his Kavan Jet Ranger to win 1st Place in Expert at the NRCHA Nationals.

1976 NRCHA

BY GRADY HOWARD

NATIONAL HELICOPTER CHAMPIONSHIPS

● Again this year, Bill Curtis CD'ed the largest R/C Helicopter Contest ever held in the USA. The site was the Greenville, Pennsylvania Municipal Airport. The contest courses were well laid out and reflected many hours of planning.

This year's contest weather was beautiful, but with this clear sky came quite strong winds at 15 to 25 mph. These winds played havoc with some of the Expert and Intermediate flyers. The Novices were not bothered so much by the wind as they flew inside a hangar.

View of just some of the eight helicopters that were at the largest helicopter contest ever held in the USA.

The contest began about 11 a.m. on Saturday, which was a little late because of the new system of rotating flyers and contestant-judges. After many delays on the first round, it was determined that this system was fine on paper but was not working too well in reality. So the system was dropped and flying began to move smoothly. The delay in the first round, plus the large number of entrants, caused only 3 rounds to be flown. There were some complaints about this from some of the entrants. Only two of the 3 rounds were used for official scores, so that each contestant had one "throw-away" score.

This years competition drew some 30 Novice flyers and there were lots of young kids flying in this class. It's good to see these youngsters taking an active part in this challenging and rewarding part of R/C flying. The Intermediate class had 18 entrants with the Expert class boasting only 14 contestants. However the total was well in excess of 60 entrants with 88 helicopters counted.

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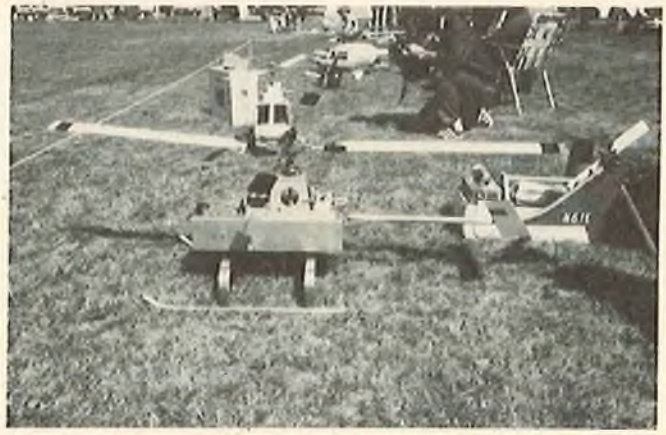
1ST ROW: (L) Graupner 212 by Don Nuss, Williamsport, Penn., used World Engines radio, OS60FSR engine, and a home-made electronic governor. (R) Gazelle by Bill Lyons, Eldridge, Iowa, with R-S radio, ST60 engine and polyurethane paint. 2ND ROW: (L) Larry Bingham from Salt Lake City, Utah, extends his Kavan Jet Ranger 3⅜" to create the Long Ranger. Uses Kraft radio and Webra engine. Acrylic enamel paint. (R) Wendell Hostetler and son Ray had this pair of Jet Rangers and used them to place Ray 1st and Wendell 4th in the Intermediate class. Used Pro-Line radio and Webra engines. 3RD ROW: (L) Brian Crisp came from Guelph, Ontario, Canada, with this beautiful Cobra. Uses Heathkit radio and Veco .61 engine. (R) Beautiful red Jet Ranger by Dwayne Stevens of Akron, Ohio, uses Kraft radio and Webra engine and took Dwayne to a 3rd place in Intermediate class. The "TNT" on the side means "T'aint Necessarily True." 4TH ROW: (L) Ron Weinsch, Dayton, Ohio, had his Du-Bro Tri-Star with the Enstrom fuselage, along with his Shark .60. (R) Bell 205 was home-built of plywood and fibreglass by Elmer Nowak, Toronto, Canada. Used Kalt collective head and Schluter mechanics.

1ST ROW: (L) Fran Wojcik, Cheshire, Mass., used his Kavan Jet Ranger to finish 1st in Novice class. Kraft radio and Webra engine. (R) Al Delanio, Williamsport, Penn., had two of the new Rev-olutions, powered by OS40SR and guided by Heathkit radio. 2ND ROW: (L) Horace Hagan, Red Bank, New Jersey, flew this Kavan Jet Ranger with Pro-Line radio and Webra engine. (R) Thomas Coate, Covington, Ohio, had this Graupner Bell G-47 powered by HP-25 engine. 3RD ROW: (L) Bill Jensen, Beacon Fall, Conn., powered his Du-Bro Shark .60 with OS60 engine and Kraft radio. (R) Here we have yours truly's Du-Bro Hughes 300 with 60 conversion and my Du-Bro Shark .60. The Shark met an untimely end when I pulled too much back stick in a stall turn. When they get on their back, there's not much you can do but watch them hit the ground. Oh well, back to repairing. 4TH ROW: (L) Ron Weinsch with his Du-Bro Shark .60, World Engines radio and OS60FSR engine. (R) John Molnar, Toronto, Ohio, had this Hell-Baby powered by OS40FSR and World Engine's Las Vegas radio, R-S Perfect Paint.



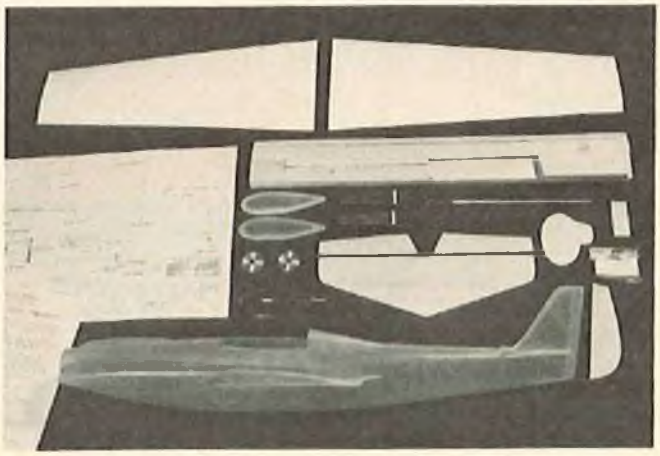



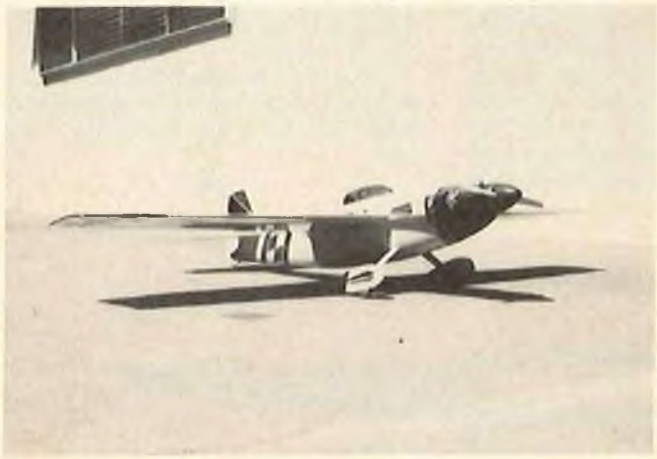


1ST ROW: (L) Don Chapman from Tallmadge, Ohio, had a pair of identical Kavan Jet Rangers that took him to a 2nd Place finish in Expert Class. Uses Kraft radio and Webra engines. (R) R. Bee 310 is homebuilt design by Robert Benson, Cedar Grove, New Jersey, has no clutch and is direct drive. Uses World Engines radio and Webra .40 engine. 2ND ROW: (L) John Burkum had this huge helicopter there on display. He and Gene Rock are building this together. Has eleven foot rotor blades and powered by McCullough MC101B engine. Uses bicycle chain and sprocket for drive. A 1/2" aluminum tube drives the tail rotor. Weight is 56 lbs. empty. (R) "Das Haben Box" by Al Irvin used Royal radio and governor and Webra engine. 3RD ROW: (L) Brian Crisp from Canada watches a flight with Bill Curtis, the C.D. (R) Dwayne Stevens on his way to a 3rd Place in Intermediate. 4th ROW: (L) Jim Cline flys his Du-Bro Shark 60 to 5th Place in Novice. (R) Harvey Dorfman carries the cargo block to a 5th Place win in Intermediate.

RCM PRODUCT TEST

D & S MODELS RICKEY RAT





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			NA								

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

● The Rickey Rat is a competition Quarter Midget racing aircraft manufactured by D & S Models, 4080 Orange Ave., San Diego, California 92105 and priced at $59.95. It is available both from the manufacturer and at your local hobby shop. The wing span is 42" with a wing chord of 7.25 inches for a total wing area of 300 square inches. The airfoil is symmetrical and 4 channels of control are required. The kit includes a polyester resin fiberglass fuselage with molded cheek cowl fillet, wing and tail fillets, canopy fillet, and fin. Also included is a polyester fiberglass cheek cowl along with polyester fiberglass joined wheel pants which are only 5/16" thick. Slim racing aluminum wheels are included in the kit and measure 1/8" x 1¼" diameter, weighing only 1/4 ounce each. Axle and locking nuts are included. The balsa tail surfaces are pre-cut as is the 3/16" plywood firewall. A dural aluminum landing gear, landing gear block, foam wing cores, wing skins, torque rods, and canopy are included in the Rickey Rat kit. Plan size is 12" x 17" with a 6 page instruction manual.

RCM's prototype of the Rickey Rat weighed 40 ounces for a wing loading of 19.2 oz./sq. ft. MonoKote and K & B Superpoxy were used for finishing and the ship was powered by a Super Tigre X15 with Super Tigre muffler. An R.S. Systems 4 channel radio was used. The kit is of extremely high quality and results in an excellent racer that is light in weight and enjoyable to build in a minimum of time. We found no modifications to the kit to be necessary. The aircraft tracks well, is extremely smooth during flight, and lands quite easily at low speeds. An excellent competition ship for the Quarter Midget flyer as well as one of the easier-to-fly racers, making it possible for the sport flyer to learn to fly the Quarter Midget circuit. □

SPECIFICATIONS

Name	Rickey Rat
Aircraft Type	1/4 Midget
Manufactured By	D & S Models 4080 Orange San Diego, California 92105
Mfg. Suggested Retail Price	$59.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Competition
Wing Span	42 Inches
Wing Chord	7.25 Inches
Total Wing Area	300 Square Inches
Fuselage Length	30 Inches
Radio Compartment Dimensions	(L) 6" x (W) 2½" x (H) 3"
Wing Location	Mid Wing
Airfoil	Semi-Symmetrical
Wing Planform	Double Taper
Dihedral	1¾ Inch
Stabilizer Span	13 Inches
Stabilizer Chord (Incl. elev.)	5¼"
Total Stab Area	54 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	6 Inches
Vertical Fin Width (Incl. rud.)	4"
Mfg. Rec. Engine Range	.15
Recommended Fuel Tank Size	4 Oz.
Landing Gear	Conventional
Recommended No. Of Channels	4
Recommended Control Functions	Rud., Elev. Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Fiberglass
Wing	Foam/Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	12" x 17" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (6 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	40 Ounces
Wing loading based on rec. flying wt.	19.2 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	40 Ounces
Wing Loading	19.2 oz./sq. ft.
Covering & finishing materials used	MonoKote, K & B Superpoxy
Engine Make & Disp.	Super Tigre X15
Muffler Used	Yes
Radio Used	RS Systems
Tank Size Used	4 Ounce

FORMICA SKIIS FOR RC

YOU CAN ENJOY THE FUN OF WINTER FLYING WITH THESE RUGGED SKIIS THAT HAVE LESS DRAG THAN ALUMINUM UNITS AND NEED NO WAXING, AS IN THE CASE OF WOODEN SKIIS.

BY GENE DE COOK

As an active RC enthusiast for the past 12 years, I have seen and tried various materials and designs for skiis for use during winter flying. The sketches accompanying this article show the design that I have used for the past 3 winters on a Sig Piper J-3 and an Andrews Aeromaster.

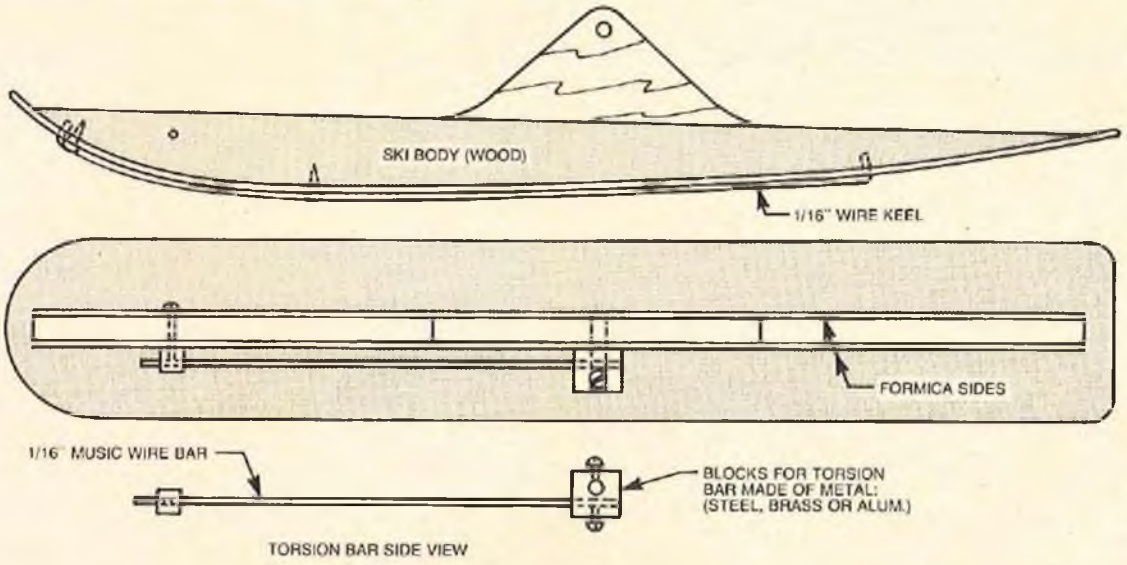
Using Formica for the ski, I have found there is less drag than aluminum and no need for waxing as in the case of plywood skiis.

The first thought that occured to several members in our club here in New York was that the Formica, when subjected to the cold, would become brittle and break on a bad landing. Unintentionally, one day, they were put to the test. While flying the Aeromaster on a low pass at half throttle, the skiis hit a clump of dirt at the end of the field. The plane flipped over on its back and, when everything was checked over, not one crack was found in the plane or the skiis, and I was able to continue flying the rest of the day.

Although they take a little longer to construct than skiis fabricated from aluminum or plywood, these units are quite rugged and do have a somewhat Stand-Off Scale appearance. In the area of construction, a Bernz-Cutter is quite useful for cutting the Formica while a file is used to smooth up the edges. The Titebond glue was used for laminating with epoxy used at the body-to-ski joint. After the ski has been completed, a thin coat of 5-minute epoxy is applied to the top of the ski and the exposed wood of the body. The 1/16" wire keel works very well even on hard crusted snow.

The suspension of the skiis was changed from the usual cable-and-spring method to the torsion bar method used by Guy R. Gianino as presented in the March 1975 issue of RCM. This type of suspension also helped save my Aeromaster by allowing the skiis to rotate on the axle.

Study the drawings and, if you live in a snow bound part of the United States, try these skiis for some real winter flying fun.

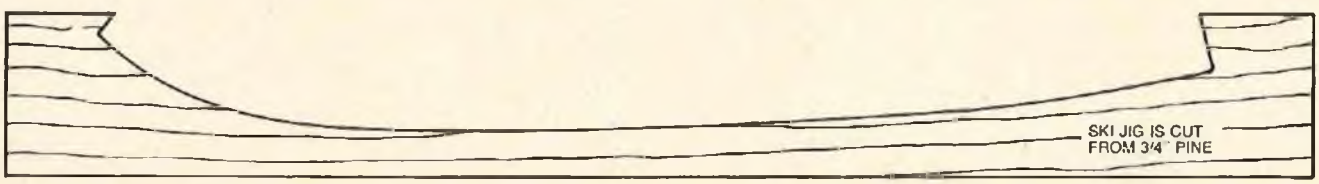


BUILDING SEQUENCE

1. CUT ONE LEFT AND ONE RIGHT SKI SIDE FROM FORMICA.
2. SKI BODY MAY BE MADE FROM 1/4" PLY OR 1/4" PINE.
3. LAMINATE BODY BETWEEN SIDES WITH TITEBOND AND LET DRY.
4. SKI IS CUT FROM FORMICA 2" WIDE BY 12¼" LONG.
5. EPOXY BODY TO SKI USING JIG AND "C" CLAMPS.
6. AFTER EPOXY HAS CURED, DRILL HOLES FOR SCREWS AND WIRE KEEL.
7. INSTALL SCREWS SO SLOTS ARE PARALLEL WITH SKI. PRE-BEND KEEL WIRE, EPOXY IN PLACE AND SOLDER TO SCREW SLOTS. THIS COMPLETES THE SKI CONST.

TORSION BAR

DRILL HOLES FOR AXLE & BAR IN BLOCK PERPENDICULAR TO EACH OTHER, THEN DRILL AND TAP HOLES FOR 4-40 SET SCREWS. FRONT BLOCK MUST HAVE SLIGHTLY LOOSE FIT FOR BAR TO ALLOW FOR FLEXING OF SKI.



LET'S HELP THE INSTRUCTOR

BY DICK RADCLIFFE

● In the past, there have been many "How-To Fly" articles directed to the beginner. This article is directed to the instructor. Hopefully, it will stimulate further ideas to bring more methods of teaching to the instructor.

Observing many RC flying clubs over the years has revealed that most instructors do not trim a trainer plane properly. A plane that is out of trim will require an excessive number of controls to try to stabilize its erratic flight. The plane that is properly trimmed will require only a minimum of control to maintain smooth flight. This is our aim.

The most abused design factor is CG. The most important and most overlooked is wing loading. As an experienced flier, and you are, the very first time you handle any plane is always by grabbing it somewhere around its CG. A plane, to any experienced flier, is like any fine crafted "piece", we can tell by hefting it if its balance is in the ball park or not. Take time to weigh the plane and calculate the wing loading. Sixteen oz. per sq. ft. is ideal. When it gets over 20 oz. per sq. ft. it will not be a good trainer.

Hopefully, when the beginner drops his plane into your lap, it will be a trainer. It will have a high wing, adequate power, throttle control, proper dihedral, rudder (not aileron), and elevator. A rudder dihedral control is very forgiving and requires minimal corrections. Hands-off it will always seek level flight. The aileron arrangement must be signaled to level flight. This means the beginners signal to correct to level flight could be a 50/50 chance of being correct. The rudder dihedral set up, hands-off, will be 100% correct. This affords more learning time to the beginner.

Rather than argue rudder-vs-aileron, or any other mode, let me suggest this: Choose a chairman for an Instructor Program. Collect data on all types of trainer craft as they show up. Measure the weights and angles and record same. The trainers that exhibit the best flying capabilities can be duplicated or recommended. Most important to the program is to have the beginner bring his plane in before he starts on it and to bring it during construction to every meeting possible. It is too late to make major corrections to a plane that is completely finished. During construction everybody is learning and data can easily be added to the Program.

For now let's go to the field. This is where it is usually dumped in your lap. Check that wing loading. Run through the normal check off procedures and establish whether you fly or go back to the work bench. If it is fly, then let's check a little further. Establish a mean line along the length of the fuselage parallel to the stab. (Convert older type designs that have a positive stab and zero engine downthrust to this set-up.) This will give a zero stab. The wing should set positive to the mean line and the engine negative to the same line. How much? For now set the wing two degrees positive and the engine negative by the same amount. In the air, you will find out exactly how much. A word about the positive angle of incidence. The angle is measured between the chord line of the wing and the line on the fuselage. As an instructor you should be familiar with this chord line. Engine side thrust can be slightly right or zero but not left. Set all control surfaces neutral and minimal. Set the wheels to track straight. Get a reliable idle and smooth transition from low to high. We should now be ready for take-off.

On take-off, determine how much side thrust is in the plane. After a little flying around, start the first check which will be the glide path. Reduce the engine to idle speed and observe the angle of flight. With a full tank, the glide should be slightly nose down. Land the plane and empty the fuel tank to 1/4 capacity. Take-off again and cut the engine and watch the glide path. It should be flat. If not, land the plane and adjust the wing incidence to obtain the flat glide just described. Do not change the CG!

The next step is to fly at full bore with a full tank. Don't forget to keep that elevator zero during these checks. Okay, at full throttle and with a full tank the plane should have a slight climb with no wind prevailing. If the plane climbs excessively, then more downthrust is needed. If the plane does not climb, then there is too much downthrust. Adjust all engine thrust at this time. There must be adequate power to take off from a grass field. The plane should take off briskly at full bore. The fact that the plane can take-off from a paved surface is not a proper test. What we are looking for is, when the student is practicing fly-by's, and he goes from low motor to high motor, the plane will have adequate climbing power so that the student only has lateral control to contend with. A reminder again - - - let the plane do the work! Don't jam all those multi controls at the student all at once. This procedure may seem drawn out to you but when you see the results, it will be time well spent.

Okay, back to power. At two-thirds throttle, the plane should fly level. It will climb at full bore and glide at idle or dead stick. At this time we have a plane that is an excellent trainer craft. Now to teaching techniques. In a real plane the horizon stretches endless in front of us. With our model plane there is a boundary. We must turn or fly out of sight. Turning is the most difficult part of learning to fly. Lefts and rights become a problem when the plane is coming at you. There are methods suggested such as pushing the down wing up with the control stick when the plane is coming at you. There is very little time to think which wing is down and which way you must push the stick to make the proper correction. The fastest way to learn turning is to make more and more turns until it is part of you and your plane. The method to teach is the one we experienced fliers use and do not recognize. Every once in awhile we all lose perspective. What do we do? We cut the engine and immediately execute a quick lateral blip. The corresponding movement of the plane tells us which way to go. So let's use this method as our primary tool. Have the student move the stick quickly to one side (left or right) and let the stick return to neutral. The plane with this signal will turn sharply but only slightly. It will tell you that it is the direction you want or do not want. Usually, the student holds the stick over and then applies full up which screws the plane into the ground before you can wrench the box out of his clutch. In the early instruction period we will use

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STUDENT LOG

C = Current P = Practice A = Achieved

	C	P	A
Instructor calling signals			
Turn one way			
Turn both ways			
Holds altitude			
Stays close to flight line			
Flies at all throttle settings			
Flies thru sun			
Flies flight line up & down			
Take-off with help			
Take-off unassisted			
Stay upwind on windy days			
Talked to a landing			
Land with a little help			
Land unassisted left or right			
Force land			
Solo			

NOTES:

RC MODEL JATO

BY LT. COL. BOB MORRIS & CHRIS MORRIS

PHOTOS BY BOYD BELCHER

● Two thought blips slowly merged on my grey matter screen. One had appeared after reading Chuck Cunningham's request for air show ideas in the January 1976 issue of RCM. I had thought that we should write a note relating how successfully model rockets had been used as a part of the RC air shows our club puts on. Model rockets broaden spectator appeal and, on one occasion, a rather rapid launch rate had kept the show's pace moving when an epidemic of balky engines had struck.

A second blip blossomed when son Chris pointed to a history book picture of a fighter performing a jet assisted take-off (JATO).

"Why can't we do that with an RC aircraft using a model rocket engine?" said the imaginative sixteen-year-old.

I couldn't think of any technical reason for an RC model Jato not working. I recalled the JATO maneuvers I had performed back in the late 1950's flying a F-84G. The actual take-off and initial climb wasn't all that spectacular with the "Lead Sled" at full gross weight, but everyone watched!

The blips merged — a novel RC project, technically easy, with sure-fire spectator appeal. It seemed just the thing for air shows. By blending about five years of model rocket experience with our novice level RC capabilities, we found it simple to build a JATO system that produced gratifying results.

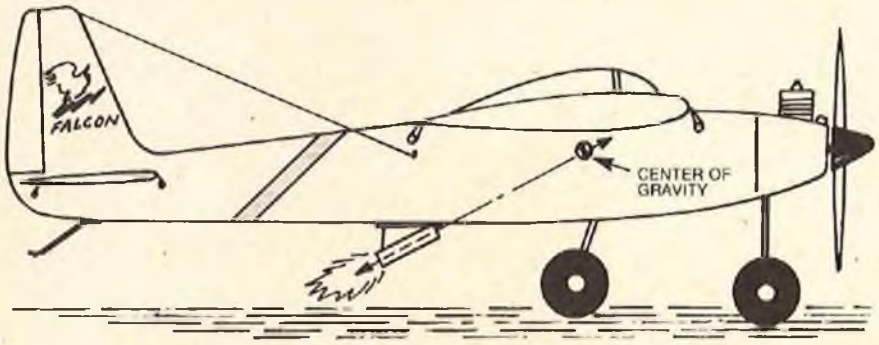

FIGURE 1

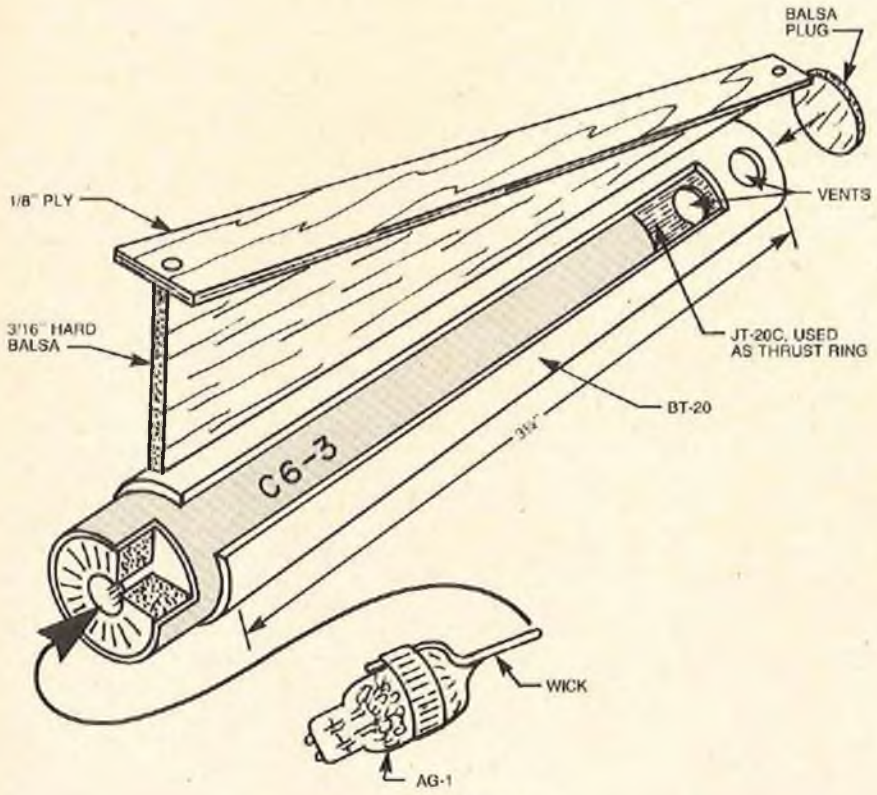

FIGURE 2

The selection of an aircraft for the experiment was easy; the only thing we had flyable was a sturdy Falcon 56 powered by an over-the-hill .25 engine. A C6-3 rocket engine (ten Newton-second total impulse) was chosen because its dimensions looked right, it is easily obtainable and economical, and its time-thrust curve promised an observable jump in take-off performance.

The next step was to determine the actual Center of Gravity (not to be confused with the balance point) of the aircraft. This is essential so that the thrust line of the rocket engine can be aligned with the C.G., thus avoiding pitch changes while the engine is thrusting. If, for example, one were to mount a JATO unit underneath, and parallel to, the fuselage, one would predict a serious pitch-up problem. Of course, mounting a unit in the tail could eliminate that problem. But the aircraft would probably be ridiculously tail heavy. In our particular installation, the forward end of the JATO unit is aligned below the trailing edge of the wing and the unit is mounted at a 27° angle with the bottom of the fuselage (Figure 1). Spruce hardpoints are inlet into the fuselage bottom sheeting to accept JATO mounting wood screws. This was the only structural modification to the airframe.

Normally, model rocket engines are remotely ignited by connecting a lantern or a car battery across a short length of fine Nichrome wire which is in contact with some plasticized powder (to act as a heat amplifier). The powder, in turn, contacts the propellant grain. Of course, we had no intention of carrying a big battery load in the Falcon; a simple lightweight ignition system had already been developed by model rocketeers. What these fliers were after was a highly reliable way of igniting clusters of rocket engines. *(See "Flashbulb Cluster Ignition", John Langford, Model Rocketeer, May 1974, Vol. XVI, No. 4, page 5.)* The heat amplifier in this case is the Centuri wick (Catalog No. IG-12), a 1/2" length of copper wire coated with powder. The wick is taped to an AG-1 flash bulb (Figure 2) which provides plenty of heat to set it off. Now, all that is needed is enough battery power to flash the AG-1. We took the two AAA size pen cells from the family camera and installed them, and a servo activated micro switch, in the Falcon. Wires were led out the bottom of the fuselage, terminating in micro clips for easy flash bulb connection and we were all set to test.

Ray Roberts, the founder of the Gulf Coast LARCS, and our chief tester of new aircraft, instantly agreed to do the first time flights. After firing two lower thrust rocket engines and a C6-3 at a safe altitude, Ray was convinced the system would work on take-offs. So, about 6:00 P.M. on July 30, 1976, he performed the first ever (as far as we know) RC JATO. What a grand sight! At about 75% of normal take-off roll, Ray hit the retract switch, the flash bulb flashed, and the old Falcon jumped off and climbed at a 70° angle (an otherwise ridiculous angle for this particular ship)! The sound of the rocket engine was clearly audible and a satisfying trail of white smoke traced the flight path. At 1.7 seconds and about 30 feet, the rocket engine burned out and Ray dropped the nose to the normal climb angle. It looked just like the real thing. Ray reported that there were no changes in the handling of the aircraft, and that we could perform the maneuver ourselves, which we did — about 10 times so far with uniformly good results.

By way of answering the common questions fired at us — yes, a variety of model rocket engines are available from as small as to be of no value for this application up to a whopping 57 Newton-second engine. A "D" size motor (20 Newton-second) or perhaps even an "E" (40 Newton-second) might very well do the trick on an "Ugly Stick". A JATO mount to accommodate a cluster of two engines would be no problem; it would just cost you twice as many flash bulbs.

The −3 (or −5 or −7) portion of the rocket motor designation refers to the time delay between motor burn-out and ejection charge operation. The ejection charge (a solid propellant gas generator) is designed to pressurize a model rocket body tube and eject a chute or other recovery device. In RC JATO application, the system is defeated by providing vent holes in the JATO mount. A sufficient source of information on model rocket engines, including time thrust curves is in the AVI catalog. *(AVI Astroport Mail Order Catalog, Mineral Point, Wisconsin 53565. $2.00.)* With it you can easily identify an engine suitable for your application.

Since we are safety conscious fliers, we want to be sure that JATO users are aware of the few hazards involved. To reduce the chances of inadvertant rocket firing, first assemble the motor, wick and flash bulbs at the flying field. When assembled, shunt the flash bulb contact wires to prevent the possibility of static electricity, or RF signals from firing the flash bulb. Before installing the motor in its mount, turn your transmitter and receiver on and double check that the transmitter function switch is "off". We are using the retract switch and quickly

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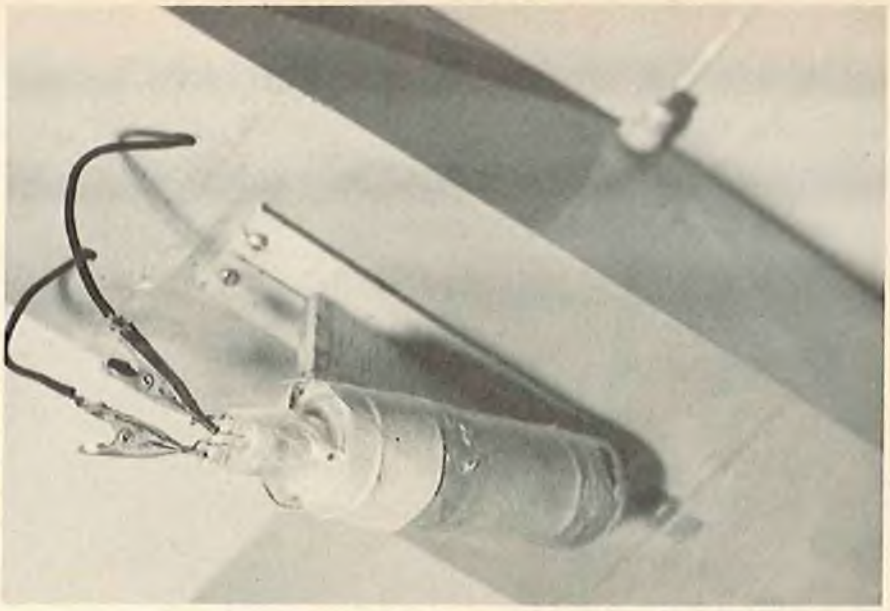
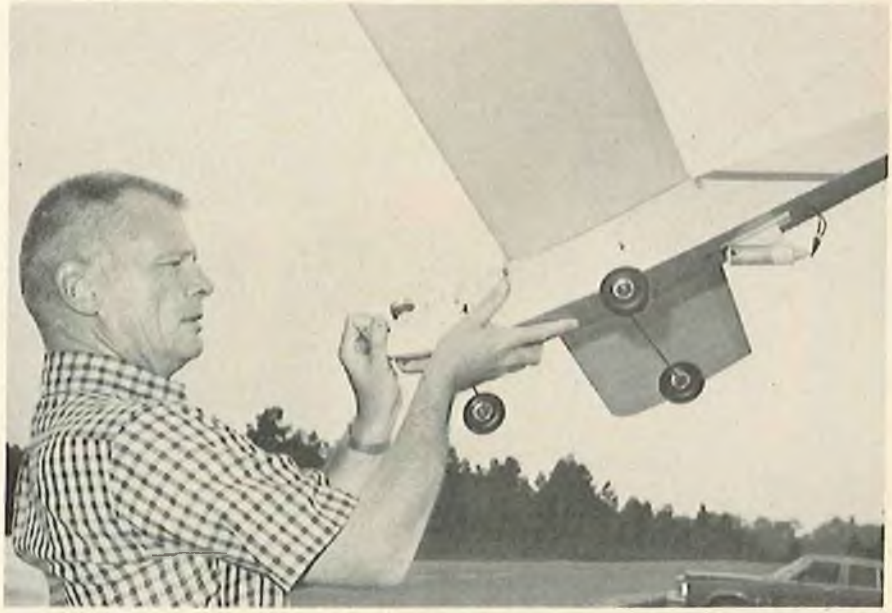


Typical configuration of single rocket engine JATO. Lots of tape used to secure flashbulb to engine. Vibration proof electrical connections required.



Rocket exhaust temperatures and scant ground clearance restrict this JATO configuration to paved runways.

An easily controlled, spectacular boost into the air. JATO is fired at approximately 75% of normal take-off roll.

Dr. Joe Bruzzese and his record breaking OPS .60 powered Wing modified by Hap Williams.

1976 NAMBA DISTRICT IX CHAMPIONSHIPS

BY DICK TICHENOR

Dr. Joe Bruzzese Sets A New National Class C Hydro Record As 230 Boats Compete During Three Day Meet.

● The Prop Nuts Model Boat Club in Southern California was host for the 1976 NAMBA District IX Championship races. The races were held on Legg Lake at Whittier Narrows close to Los Angeles, California.

The official count showed 230 boats that raced. There were 190 races during the three day meet. The degree of sophistication and attention to details of all the boats was most impressive and was necessary to obtain the performance that they attained.

The highlight of the meet was a new national NAMBA record for Class C Hydroplanes that was set by Dr. Joe Bruzzese. His time for the 5 lap course (.9 mile) was 1:28.1. His machine was an OPS .60 powered Octura Wing Ding modified by Hap Williams. The finely tuned craft expertly driven by Doc Bruzzese did the job.

Any contest with this many entrants requires top notch management. The Prop Nuts officiers, President Jim Ricco, Vice-President Larry Reynolds, and Contest Director Dennis Coleman had it well organized to the extent of a 16 page schedule of each heat in each event. We have never seen a more smoothly run contest than these races.

For those who haven't seen modern power boat racing, we suggest that you make an effort to attend a race. You will experience the excitement unique only to model boating. Our congratulations to NAMBA District IX members for a job well done. □

OFFICIAL RESULTS

A MONO

(1) Glen Myrberg, (2) Doug Hole, (3) Gary Johnson, (4) Ed Windfeldt, (5) Bill Schaeffer.

B MONO

(1) Rodger Hooks, (2) Glen Myrberg, (3) Bruce Wren, (4) David Lindsey, (5) Bob Atchley.

C MONO

(1) Jim Whitlatch, (2) Sally Stewart, (3) Judy Prigley, (4) G & P Racing Team, (5) Ira McKay.

A HYDRO

(1) Bob Atchley, (2) Ralph Henry, (3) Leonard Feeback, (4) Marshall Mizobe, (5) Glen Paykoff.

B HYDRO

(1) Frank Farm, (2) Gene Adams, (3) Glen Paykoff, (4) Joe Bruzzese, (5) Marshall Mizobe.

C HYDRO

(1) Jim Whitlatch, (2) Joe Bruzzese, (3) Dannie Jones, (4) Glen Paykoff, (5) Jeff Schmidt.

SCALE HYDRO

(1) G & P Racing Team, (2) Leonard Feeback, (3) Pal Jennings, (4) B & K Racing Team, (5) Charles Fondacaro.

SPORT 40

(1) Ralph Henry, (2) Steve Muck, (3) Tom DiLeo, (4) Ken Freeland III, (5) Ken Freeland.

40 DEEP V

(1) Dick Aubert, (2) James Love, (3) Larry Reynolds, (4) Shige Oshiro, (5) Robert Tom.

60 DEEP V

(1) Judy Prigley, (2) Douglas Nystrom, (3) Don Reutlinger, (4) G & P Racing Team, (5) Al Godding.

Jim Whitlatch, OPS .60 Octura Wing Ding.

John Brodbeck (center) was a contestant in a hydro.

Sally Steward competed in C-Mono and B-Hydro.

Leonard Feeback with his scale hydro.

Mae and Don Dees prepare Don's scale hydro.

Art Hammond, Super Manu-Kai, A-Mono.

Jack Garcia assists Bobby Tom with his B-Mono.

Dick Norsikian, B-Mono, Norco Eagle.

Steve Muck, B-Mono, Dumas Ski Vee 40.

Ed Windfeldt, Northwind B-Mono, ST .40.

Steve Hopkins (325); Dave Shikany (207), Northwind B-Mono's.

Tom Steele, Northwind B-Mono, OPS .40.

Irene Brooks, Dumas Deep Vee B Mono.

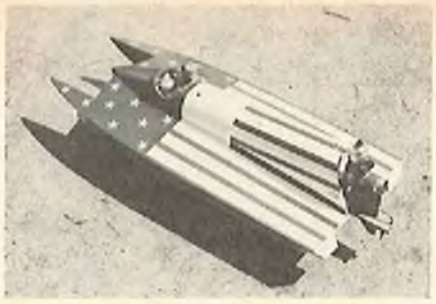
John De Long, Mike Shelhart, Gary Granger, Competition Ski C-Mono's.

Mae Dees, Surveyor 16 C-Mono.

Jeff Schmidt, JVS 60 and 20 Claim Jumpers.

Stormi and Glen Payloff (both are drivers) C-Hydro, A-Mono.

Glen Spickler's K & B outboard a hydro driven by Russ Kominitsky.



A hydro with K & B outboard by George Campbell.

Allan Hammond, Octura Wing Ding, A-Hydro.

Howard Hole (Hawaii), original A-Hydro.

Scale Hydro by Don Reutlinger.

Shige Oshiro, Paula Farm, Elaine Mazobe, from Hawaii.

John Beach, Scale Hydro from RCM plans.

Gary Johnson, Scale Hydro.

U-2 Scale Hydro by Bob Brackett.

Joe Monohan, 40 Dee Vee.

Don Ast, JVS Hull, 60 Deep Vee.

Doug Hole (Hawaii), 60 Deep Vee.

Charlie and Pat Pottol.

Doug Nystrom and Rosie, John Holland and AVIS, JVS Deep Vee's.

John Holland's JVS Deep Vee on the ready line.

Frank Hu came from Hawaii to race.

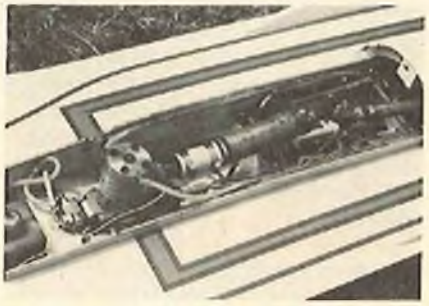
Darrell Lindley displayed his electric Harbor Tug.

The fiberglass model wasn't even scratched.

This is where the races were directed and timed.

Sophisticated details of Judy Prigley's Surveyor 60.

Launching handle keeps Ernie Bob's fingers out of Hustler prop.



Interior of John Beach's U-95.

And the start of the action at the Championship Races.

ANATOMY OF A BOUNCE

BY WILL D. MITCHELL

● The sleek little ship flies superbly. Rolls are perfectly axial, loops are symmetrical, and it spins in either direction and stops on a dime. You're the envy of the field, except for one thing. Every landing is a series of bounces that elicit humorous scathing comments. Every now and then a long dragged-in approach ends with a smooth touchdown, after the landing flare has consumed three-quarters of the runway, but it is impossible to put the plane down inside 100 feet. Sound familiar? More often than not, here is why.

Most of us land with plenty of flying speed left; it's safer that way. Not having an airspeed indicator handy, it is better

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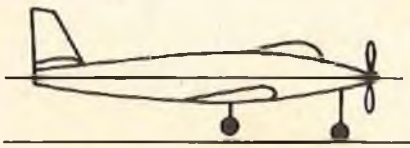
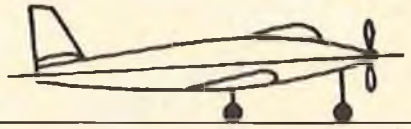
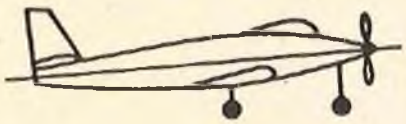


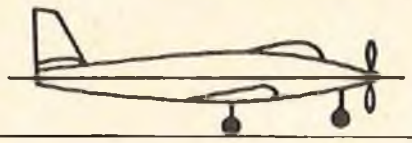
NOSE WHEEL FIRST



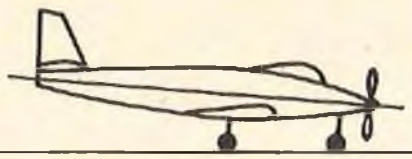
ANGLE OF ATTACK INCREASES



AIRPLANE BOUNCES INTO THE AIR

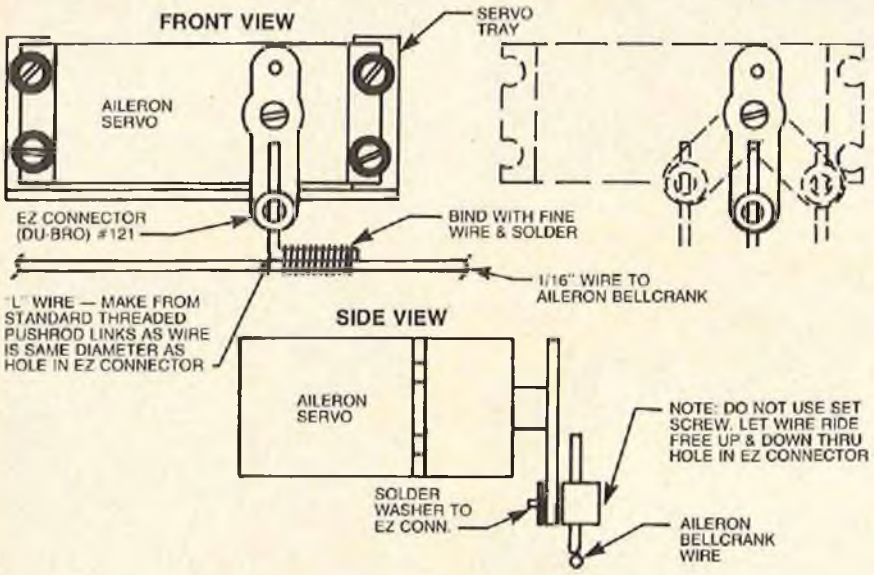


MAIN WHEELS FIRST

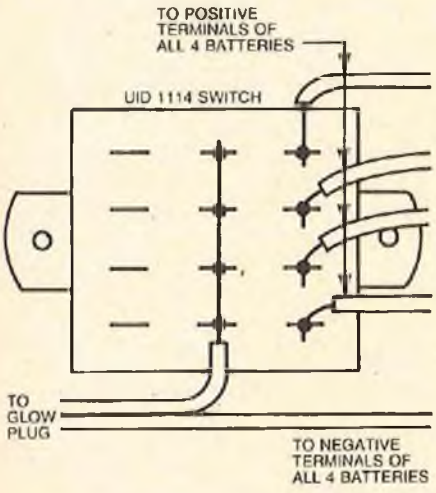


NOSE PITCHES DOWN, AIRPLANE STICKS

FOR WHAT IT'S WORTH

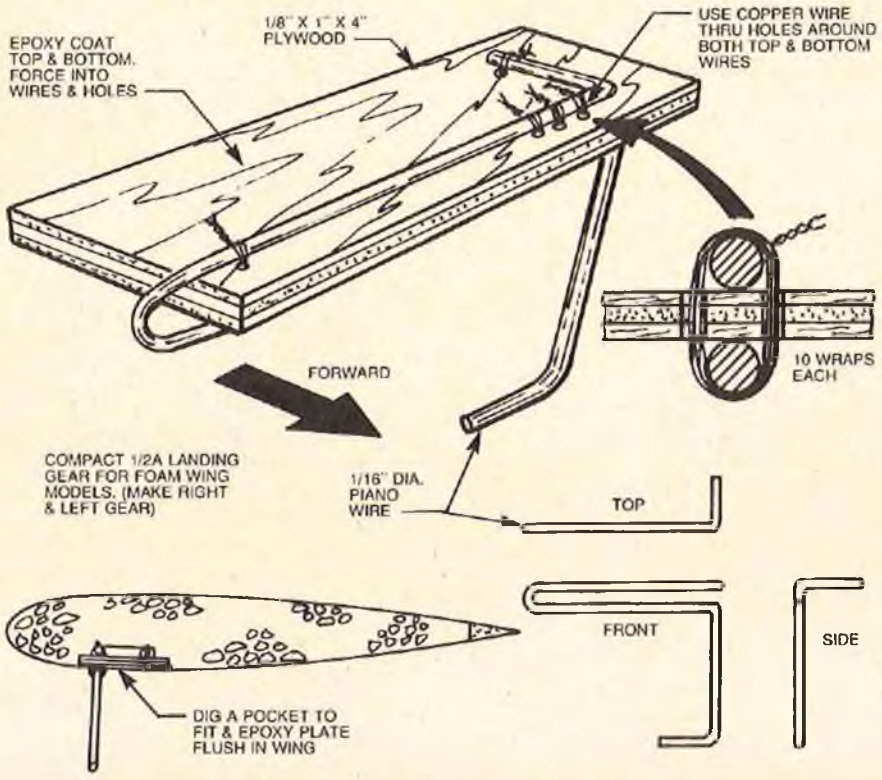


Charles Beck of Villa Park, Illinois, submitted the following sketches for a scale biplane no-bind "barn door aileron" servo connector. The basic idea is to let the EZ Connector rotate on the servo arm and let the L-wire on the aileron bellcrank rod ride up and down through the hole in the EZ Connector as the servo arm traverses its arc. The result is a no-bind linkage which has been tested on several planes and provides excellent operation. If the aileron action is reversed, move the servo arm 180 degrees and use a longer L-wire. Best results are obtained when the EZ Connector is nearest to the bellcrank wire.



Using ordinary D-cell bettaries for starting glow engines work very well and can be very inexpensive. Four cells are quite comparable with a 1½ volt lantern type battery. However, when D-cells are wired in parallel, the strongest cells will slowly discharge until all the cells wired together are equal in strength (voltage). To avoid this, wire four cells to a 4-pole switch and they will be separate until the switch is turned on. The use of a switch can also minimize the time the glow plug is drawing current, extending the life of your batteries. One switch which works very well is contained in some of the switch assortments sold by Radio Shack. Simply wire your batteries and switch as shown, making sure to use heavy gauge wire. This idea was submitted by David Carlson of Nova Scotia, Canada.

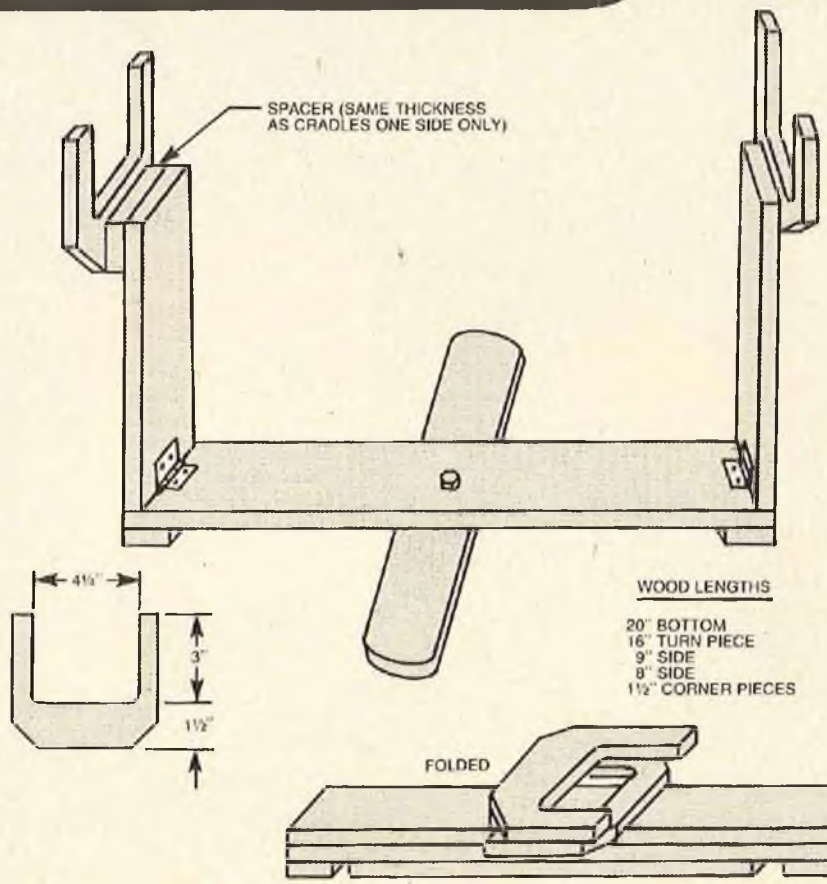
The accompaning sketch, submitted by Larry Renger of Costa Mesa, California, shows a simple and compact way of mounting landing gear in 1/2A models utilizing foam wings. As you can see, no groove or trunion blocks are required, just a piece of flat plywood and bit of wire. The landing wire is torsion sprung and retained by the upper wire to keep it from tearing the plywood on hard landings.



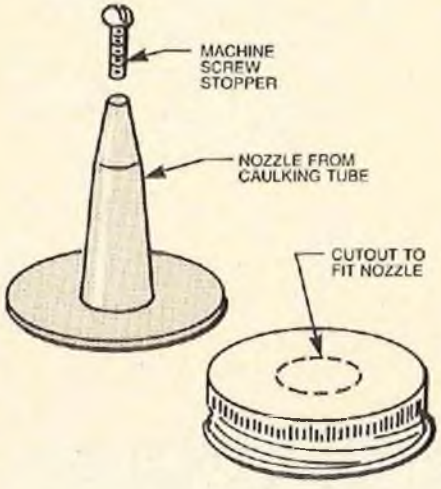
John J. Bruner of San Diego, California, writes that a very good, and nearly perfect, sander for undercambered wings can easily be made. Just glue a piece of 320 grit sandpaper to a sponge wax applicator. The applicator has a slit around its edges that's seemingly made for a rubber band (to achieve the necessary curve). The slit also makes an ideal place for your fingers while sanding.

If you have had to sheet a wing with 3/32" balsa skins, you know that the sheets are going to have to be soaked in water to allow for bending. When clamped in place to give the proper shape, it is necessary to wait for hours for the wood to dry. Wayne D. Griffiths of Victoria, B.C. Canada, applied Hot Stuff to see what would happen. It displaced the water, both in the balsa and in the 1/4" spruce leading edge, and provided an excellent bond. It also bonded the wet balsa to the balsa ribs. Later, Wayne put a small bead of Wilhold Aliphatic Resin to ensure the joints although this was probably not necessary. Wayne found that hardwoods like pine and spruce glue more readily with Hot Stuff when wet since the wood becomes more porous when it is damp. The Hot Stuff displaces water when it is applied.

FOR WHAT IT'S WORTH



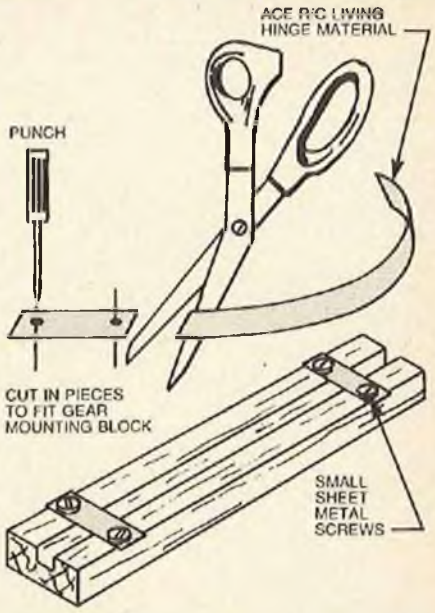
Here is a stand for people like Steven R. Harris, D.M.D., of West Palm Beach, Florida, who owns a small, two-seater sports car. This stand will fold to a 20" x 3" x 3" dimension. It was cut from 60" x 3" x 1" piece of wood — the cradles from scrap plywood. A single bolted piece turns to stabilize the stand. Foam is cemented inside the cradles to prevent damage to your aircraft. With stiff hinges, no latches are needed to hold the sides up. Total cost for this stand is $1.59.



You say that you don't buy glue in the money saving quarts or gallons because you waste half of it in the pouring anyway? Fret no more. Here is How E.M. Turner of Seattle, Washington, uses the larger containers and wastes not a drop from the gallon to the glue gun. First, find a nylon nozzle from a tube of caulking compound, clean it, and trim the base to exactly fit the inside diameter of the lid to your large glue container. Cut a hole in the lid to fit the nozzle and smooth up the cut with a stone in your Dremel tool, or by using a rat tail file. You then have a two-piece screw-on glue nozzle - - - the lid holds the nozzle on the can. Trim the nozzle to suit your glue gun and use an appropriate size machine screw for a stopper. The sketch is self-explanatory.

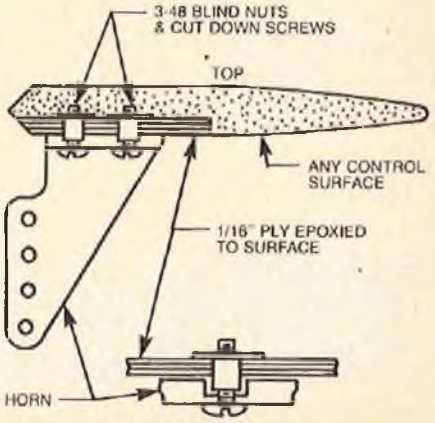
Here is an idea reprinted from the "Fly Paper," newsletter of the Greater Pittsburgh Aero Radio Control Society. On certain surfaces, Hot Stuff is reluctant to set-up as quickly as it should. To get it to "kick", prepare the surface by coating it with a light, thin coating of common baking soda. This changes the PH of the surface and allows the Hot Stuff to work in the normal manner.

Bob Brown of Kent, Washington, writes that a good and inexpensive supply of landing gear retaining strap material can be obtained from buying some Ace R/C Living Hinge material (Stock #40L216-LH20). One small pack will make a great supply of straps. The prime advantages of these, over the conventional metal retainer, is that they (1) don't generate any radio noise, (2) in a very rough landing, these will shear and save your landing gear trunion blocks, while the metal retainers will take a lot of the wood with them. The sketch shows an illustration of how to do it.



B.W. Houk of Hanford, California, writes that cardboard tubes that gift wrapping paper is rolled on can be used to make wheel wells. Simply cut off the desired depth and glue to the lower wing surfaces. These tubes come in various diameters and you will be able to find one that matches your wheel size requirements.

Donald Serafin of Northvale, New Jersey, has found, like many other modelers, that the nylon nut plates used on control horns as retainers do nothing for the appearance of a model. What Don has been doing to alleviate this is to use 3-48 blind nuts and 1/16" plywood on the under surface, leaving the top clean and neat. The sketch should be self-explanatory. Note that the blind nut extends past the 1/16" plywood so that the horn is drilled out 1/16" deep with a 1/8" drill bit.



The launch of the Sunrise on its maiden flight at Nellis Range 63.

PROJECT SUNRISE

THE WORLD'S FIRST SOLAR POWERED AIRCRAFT

"I believe that the first flight of Sunrise will prove to be just as important an event in the history of aviation as was the first powered flight at Kitty Hawk."
- - - Robert J. Boucher

● We as modelers can be especially proud of this historic achievement. It was only made possible by combining the skills of the Nordic and Wakefield free flighter, in aerodynamics and structures, the R/C modeling technology for lightweight command and control, the electric flight technology for propulsion, and aerospace solar cell technology for power. Since three out of four of the required technologies are found in the modeling industry, it should not be suprising that a small dedicated group of modelers achieved what the aerospace industry thought was impossible.

The concept of Sunrise, a solar powered vehicle of extended range and altitude (patents pending) was a natural extension of the pioneering work done by Astro Flight in the field of electric powered fixed wing aircraft. The use of solar power, although heavy in terms of watts-per-pound, and expensive in terms of watts-per-dollar, has one singular feature — the energy source is inexhaustible. Since the solar flux at sea level is sometimes obscured by clouds, the solar powered vehicle is designed to operate in the clear regions of the upper atmosphere where it can bask in the unattenuated sun, free from high winds and atmospheric turbulence. Yes, the behavior and attributes are quite different from other present day air vehicles. It may prove quite useful in many ways yet undreamed of.

The Flight Demonstration Program

The objectives of the Sunrise flight demonstration program were to verify the feasibility of achieving the weight, power, and performance needed as a basis to judge the desirability of proceeding to the tactical model.

Many specific objectives were satisfied during this flight demonstration program. More specifically these were:

(1) The ability to build a complete airframe weighing 2 ounces per square foot of wing area.

(2) The ability to assemble large arrays of solar cells having a specific power greater than 100 watts-per-pound.

(3) The ability to convert electrical power to thrust horsepower with a propulsion system weighing about three pounds per horsepower.

(4) The ability to achieve sink rates during glide of one foot per second.

(5) The ability to climb to high altitudes on solar power.

(6) The ability to navigate with a sun compass.

These are no small achievements for the world's first Solar Powered Vehicle.

Sunrise Is A Vehicle

The vehicle Astro Flight model 7404 solar powered remotely piloted vehicle is shown in the photographs and drawings. The vehicle weighed 22.5 pounds gross weight and was powered by a single .6 hp permanent magnet motor with a speed reducer and a wooden fixed pitch propeller. The power for the electric motor was generated by a bank of four solar arrays affixed to the upper wing surface and capable of generating 570 watts of electrical power (air mass zero normal solar incidence). The vehicle was positively stable on all axis and flew hands-off for extended periods. Model 7404 was controlled by rudder and elevator during take-off and landing and navigated by rudder command when out of sight. Sun sensing was used for heading reference and this proved itself when, during the flight tests, the vehicle was lost to ground tracking stations for an extended period of time, yet the operator was able to navigate the

vehicle back into the vicinity of the take-off location and ground tracking was re-established.

THE AIR VEHICLE

The Air Vehicle is shown in the 3 views. It is a high wing monoplane propelled by a .6 hp motor driving a 30" fixed pitch propeller. No ailerons are provided, rather the design utilizes 6 degrees of dihedral coupled to a balanced rudder. Pitch control is effected by a rather small elevator attached to a normal stabilizer. The single wheel undercarriage with tail skid and outrigger wires proved adequate in every landing. Take-off was assisted by utilizing the stored energy in a stretched 50 meter length of bungee cord attached with a drop-away hook attached to the landing gear bulkhead.

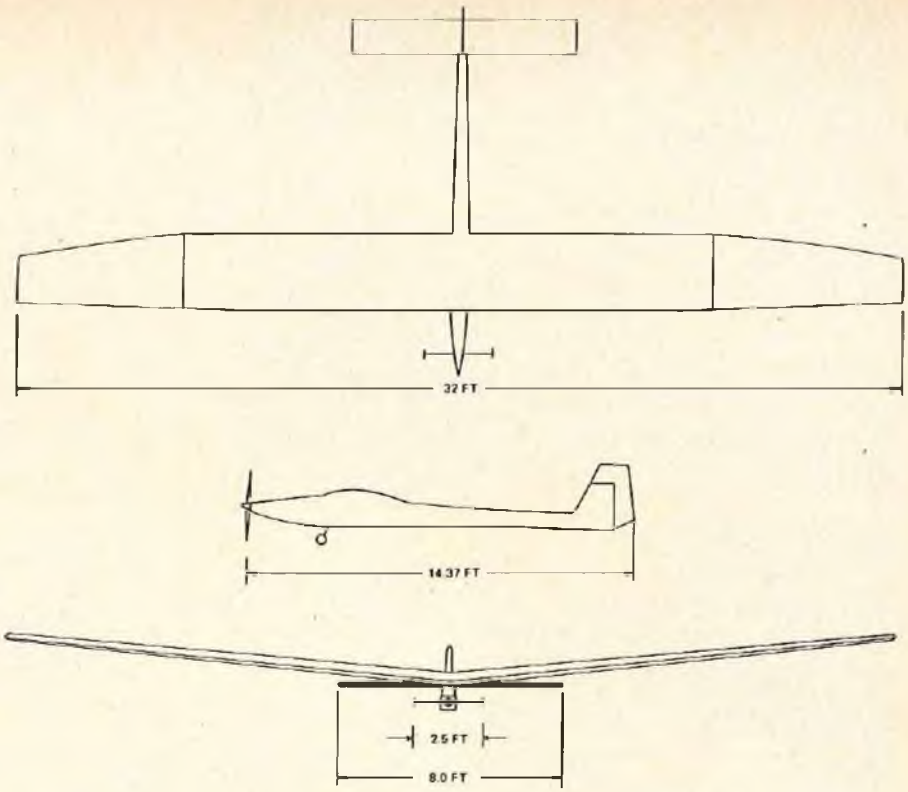
The air vehicle has a stall speed of 14 feet per second and a cruise speed of 20 to 30 feet per second at sea level. The climb rate is rather modest compared to other fixed wing aircraft and varies from 100 to 400 feet per minute depending on altitude and sun angle. At operational altitude, the speed is considerably higher and approaches 100 feet per second.

The power-off glide is considerably better than any known high performance sailplane and is approximately 1 foot per second.

Air Frame

The air vehicle Astro Flight model 7404 is a high wing monoplane propelled by a single tractor propeller. The configuration is orthodox and the areas and moments resemble a powered sailplane. Construction of the wing utilizes a box spar with spruce caps and balsa webs, to take bending loads and a balsa sheeted D tube leading edge to withstand torsion and fore-aft loads. The outer wing panels are removable by, and are secured with, a single 1/4" steel bolt at the main spar. The fuselage utilizes a Warren truss made of Douglas fir with ash blocks to take single point loads such as landing gear, wing, and tail attachment points. The entire framework is covered with mylar sheet attached with industrial adhesive and shrunk in place by the application of heat.

The wing span is 32', length 14.37', height 3', wing area is 90 square feet, and the gross weight is 22.8 pounds. The structure accounts for slightly more than half of the gross weight of the vehicle. Propulsion is provided by a .6 horsepower electric motor driving a 30" fixed pitch wooden propeller through a six to one reduction drive. When fully loaded, the wing loading is four ounces per square foot, which translates into a stall speed of 13.3 feet at sea level and a cruise speed of 81 feet per sec. at 60,000 feet altitude. This extremely light surface loading makes ground operation difficult in even light winds. The vehicle has flown in 25 mph winds, which are



GENERAL ARRANGEMENT – 3 VIEW

almost twice the stall speed, and landed in these winds as well. This is analogous to landing a J-3 Cub in 75 mph winds! Scores of flights were made in these hazardous conditions.

The Command and Control Equipment

The Command and Control Equipment consisted of two basic subsystems. The control system used a top quality 72 mc radio control set driving a 10 watt power amplifier coupled to a vertical whip antenna. The control functions were rudder, elevator, motor on-off, array series/parallel, battery booster in/out, and battery jettison. These six functions were accomplished with five independent channels by combining the on-off and series/parallel functions on a single output cam of the motor control channel. A link analysis indicates that

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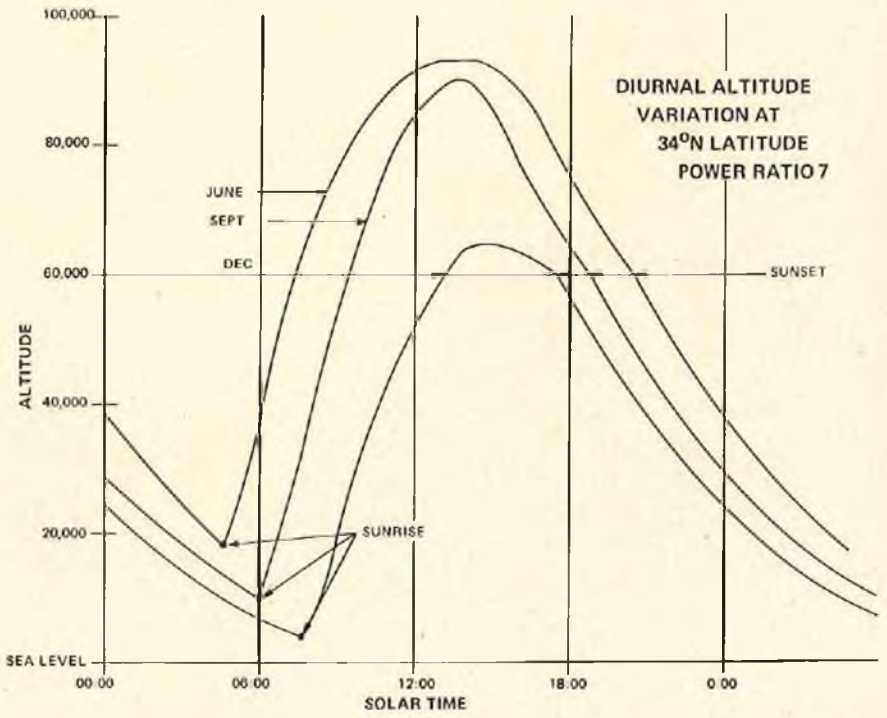
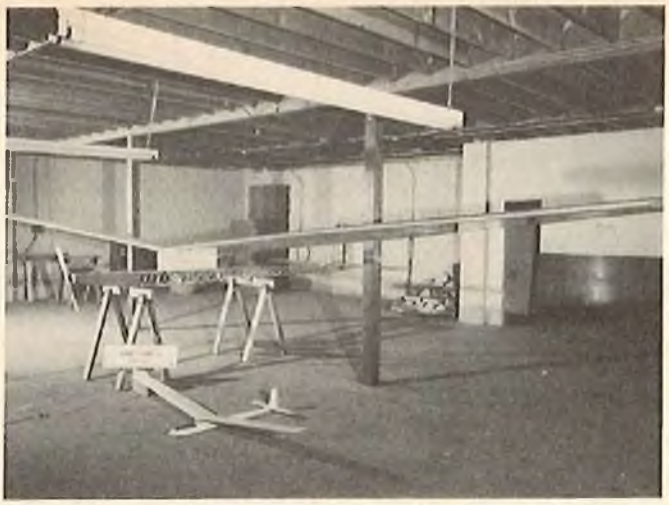
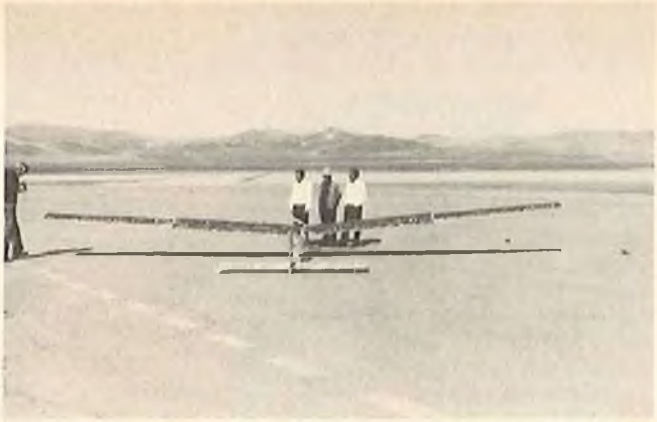
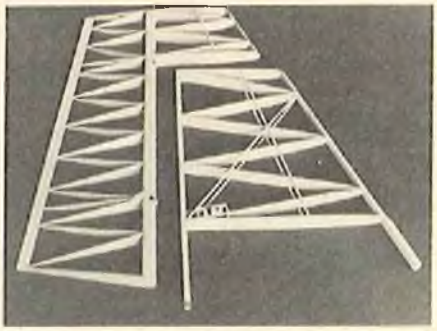


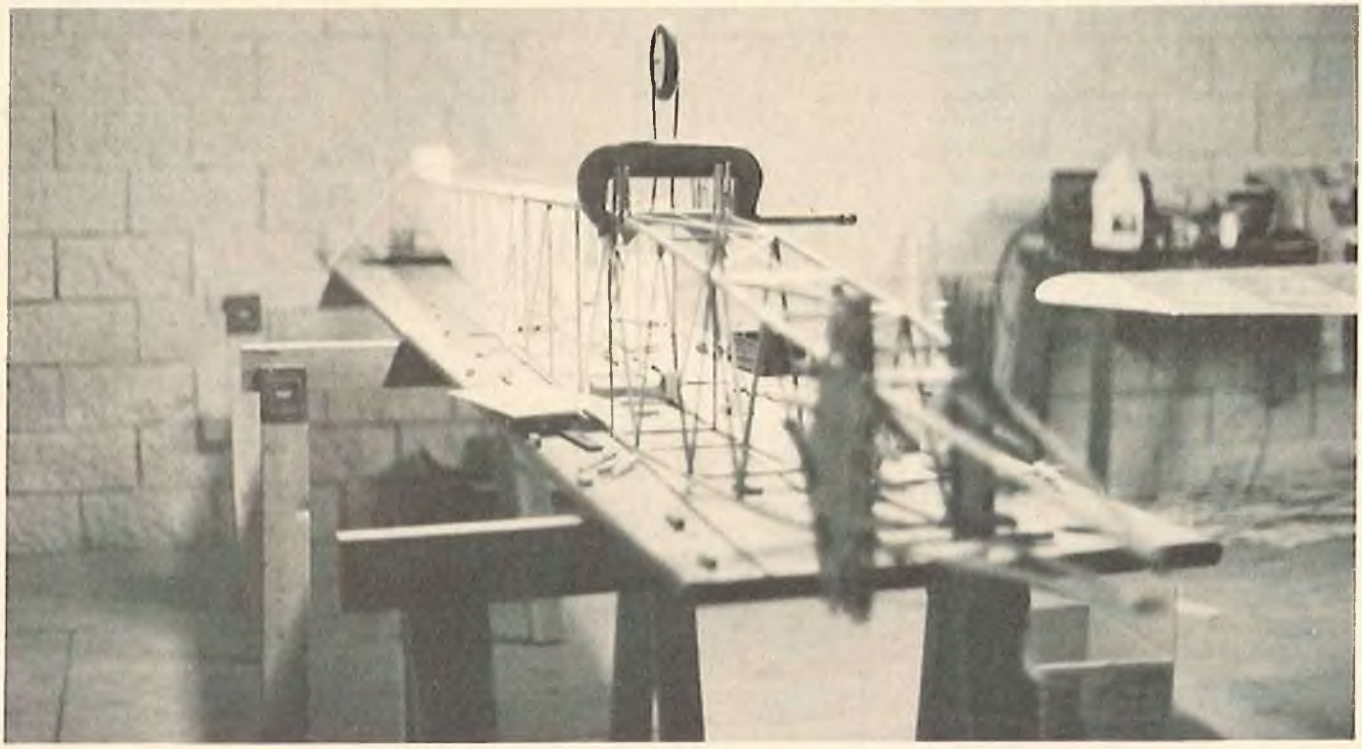


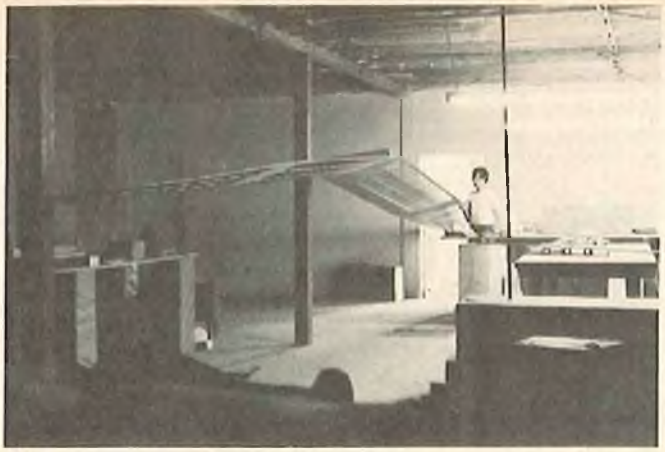


LEFT: An idea of the size of Sunrise next to a conventional RC sailplane. ABOVE: Sunrise at Camp Irwin, Bicycle Lake, California.



LEFT: The horizontal stabilizer for the Sunrise is being constructed. In the photo above, you can see the vertical stabilizer structure which weighs only four ounces! RIGHT: The photo shows mating wing tips. BELOW: Attaching the landing gear bulkheads.

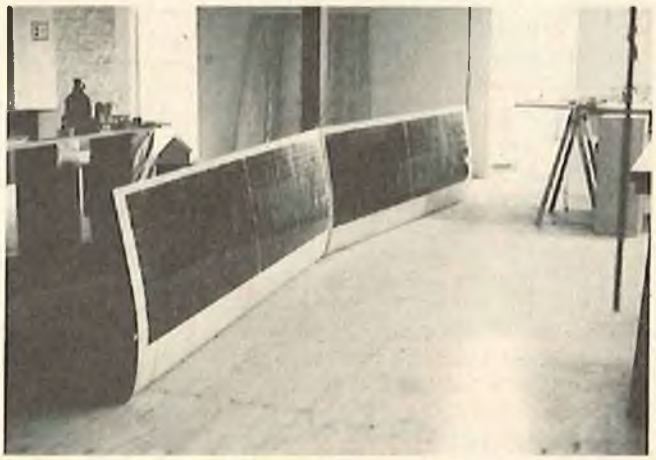




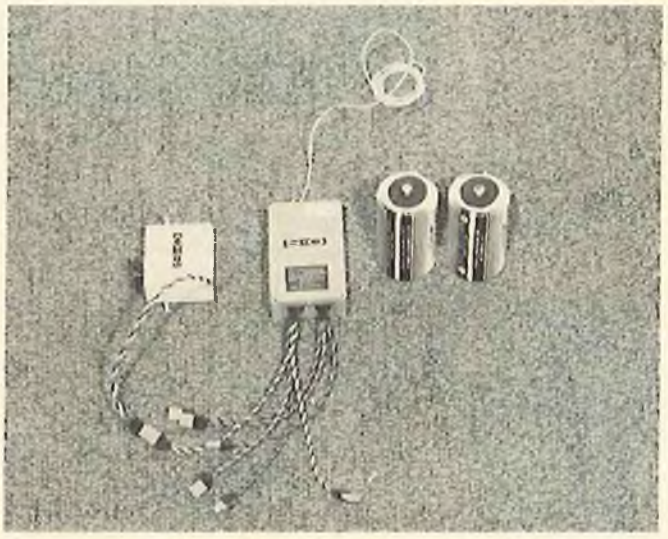
The Sunrise wing ready for static tests.

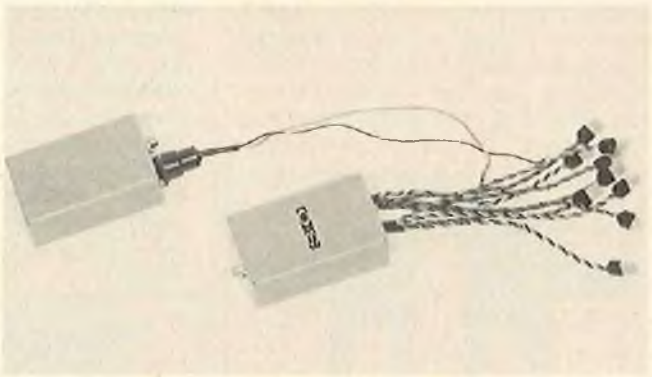
The wing loaded to 5.3 G stress.

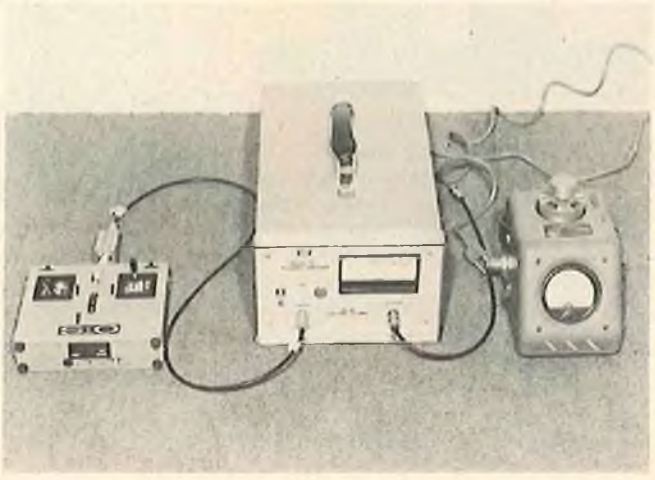
Assymmetrical tail load test.



Solar array affixed to upper wing surface.



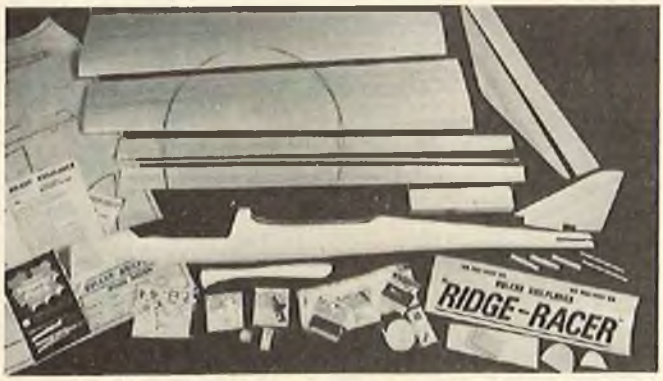




ABOVE: The command receiver, built by Jim Oddino and Paul Gisel. ABOVE, RIGHT: The airborne telemetry encoder and RF transmitter. RIGHT: The S & O command transmitter and power amplifier. Guidance system controlled Sunrise to an altitude of 60,000 feet with higher altitude tests planned.

RCM PRODUCT TEST

SOLENT SAILPLANES RIDGE RACER



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

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

● The Ridge Racer from Solent Sailplanes, Southampton, England, is a truly almost-ready-to-fly sailplane kit. The kit features a beautifully finished white Gelkote fiberglass fuselage that weighs 9½ ounces, tinted canopy, special light density foam wings veneered in obechi plywood, with full width inset ailerons and featuring a larger chord at the tip, giving a very positive control response. All balsa and plywood parts are pre-shaped. A complete hardware and wing joining kit is also included. The Ridge Racer features a 72" span with 650 square inches of wing area and a 42 ounce ready-to-fly weight. These highly pre-fabricated kits are available from Dave's Custom Models at 636 East Colorado Street, Glendale, California 91205, and priced at $115.00 each.

The Ridge Racer is desinged for slope racing and slope aerobatics with two channels of control required for elevator and ailerons. In addition to the previous mentioned items, the kit includes aileron coupler, control horns, all hinges, elevator reducer, threaded couplers, Kwik Links, wing seating tape, servo tape, 5 minute epoxy, resin and catalyst, fiberglass tape, nylon bolts, and blind nuts. There is one plan sheet measuring 33" x 48" with the building instructions included on the plans along with an additional 5 page instruction manual. The beautiful glass fuselage is ready to use as it comes out of the kit box, while the wing cores are ready for joining.

The weight of RCM's prototype was 42 ounces for a wing loading of 9.4 oz./sq. ft. Super MonoKote was used on the wing and tail surfaces while Perfect Paint was used on the wing fairing and DJ's trim tape on all break lines. We used a Proline 3 channel radio for control. We found no modification to be necessary, but the instructions should be followed with regard to the reducer bellcrank for elevator control.

Flight performance of the Ridge Racer is nothing less than spectacular, but you must have a steady slope lift of no less than 12 mph or performance deteriorates rapidly. When flown at Torrey Pines, the entire FAI Pattern became quite simple with the Ridge Racer. At local sites, with only marginal lift, this ship is a handful for even a good pilot. Overall we rate this kit as a very good value for the price. □

SPECIFICATIONS

Name	Ridge Racer
Aircraft Type	Slope Glider
Manufactured By	Solent Sailplanes 7 Carlton PL. Southhampton, England
Mfg. Suggested Retail Price	$115.00
Available From	Dave's Custom Models
Mfg. Recommended Usage	Competition Sailplane
Wing Span	72 Inches
Wing Chord	NA
Total Wing Area	650 Square Inches
Fuselage Length	not given
Radio Compartment Dimensions	(L) 12" x (W) 2½" x (H) 3½"
Wing Location	Shoulder Wing
Airfoil	Semi-Symmetrical
Wing Planform	Swept L.E. & T.E.
Dihedral	1/2 Inch
Stabilizer Span	22 Inches
Stabilizer Chord (incl. elev.)	4.5" (Avg.)
Total Stab Area	99 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Mid Fuselage
Vertical Fin Height	6½ Inches
Vertical Fin Width (incl. rud.)	5"
Mfg. Rec. Engine Range	NA
Recommended Fuel Tank Size	NA
Landing Gear	NA
Recommended No. Of Channels	2
Recommended Control Functions	Ele., Ail.
Basic Materials Used In Construction:	
Fuselage	Fiberglasss
Wing	Foam Core
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	33" x 48" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (5 pages)
Construction Photos	Yes
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	42 Ounces
Wing loading based on rec. flying wt.	9.4 oz./sq. ft.

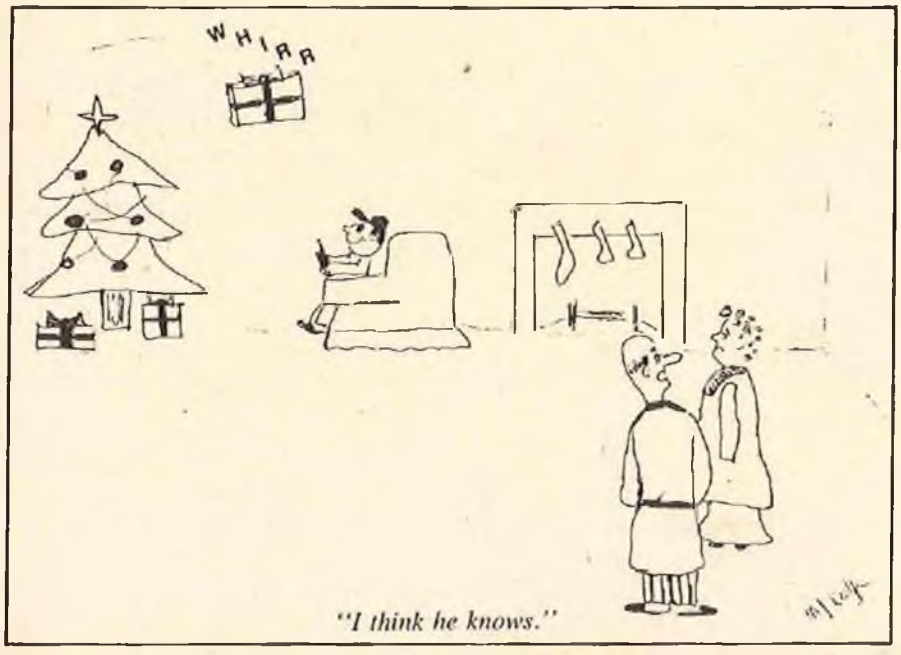
RCM PROTOTYPE

Weight, Ready To Fly	42 Ounces
Wing Loading	9.4 oz./sq. ft.
Covering & finishing materials used	MonoKote, DJ's Trim
Engine Make & Disp.	NA
Muffler Used	NA
Radio Used	Proline
Tank Size Used	NA

LET'S HELP THE INSTRUCTOR

from page 85

command words "left" or "right". These words are directed to the stick *not the plane*. Thereafter it will be words like "go out a little further" or "come in a little closer". So, early in the instruction discussions, teach the quick blip method. You can not expect a beginner to immediately learn to maintain full stick contact time and know where he is on the stick. At the bench he can *see* and then *feel* neutral. When he is in the air he can not.



"I think he knows."

The trim of the plane and the students first controls now weld together. Emphasize now that he will not apply elevator control unless dictated by you. The stick will be moved left or right for a one second count and then gently returned to neutral by its own spring tension. The stick will be held at neutral until the next command is given. This will automatically establish the neutral *feel* and reference point for the next signal. As flying progresses, this stick contact time becomes more continuous rather than intermittent.

Now, back to that one second blip. Let's say a right blip was sent. The plane yaws slightly right then starts to roll right. Gradually it then rolls to level flight again. Adjust the rudder throw and timing so that about 2 or 3 blips will make a 90° turn. During these turns the plane may sink slightly. Wait until the wings are level and instruct the student to apply a small amount of up control and return to neutral via that spring tension. After a few of these flights, have the student give a blip turn signal, return to neutral, and immediately tell him to apply a small amount of up and hold. The turn that was initiated will now be reinforced and held by the elevator. Slowly the student is approaching solid stick contact time and simultaneously coordinating rudder and elevator.

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LET'S HELP THE INSTRUCTOR

from page 106/85

As the student becomes more comfortable with both stick and plane, have him occasionally apply that quick blip for reflex training. Next, get him to cut the engine off and on to where it was - - - level flight. Then work him into cutting the motor, giving a quick blip turn, and then return to power for level flight. This is reflex training.

Now, for take-offs. Instruct the student that, at take-off, he will have his fingers on the throttle and not on the rudder/elevator. He will push the throttle to full high in one quick smooth motion, then hold the box with this hand, and then contact the rudder/elevator stick with the other hand. You are holding the plane. The student nods that he is ready and you release the plane. Do not, at this time, have the student make any lateral ground corrections. Rather, cut the motor and abort the take-off if ground heading is a problem. Concentrate on a good weather-vaning heading so that lateral corrections, on the ground, will not affect take-off and, in fact, not be necessary. With up trim pre-set, the plane should take off smartly. Now help the student with any laterals until the plane reaches adequate altitude. Get a dozen of these take-offs under his belt. During these take-offs have him fly level and tell him to look at the elevator trim and return same to neutral. Have him level his wings again and then have him correct the throttle to proper cruising speed. This is good training to coordinate two hands and to teach him the amount of time the plane will fly level without looking. After these take-offs become comfortable to the student, have him practice some ground control. Guard against over-controlling. When he gains this experience, practice more take-offs but now using throttle control, low to high, without you holding the plane. The idea of holding the plane ear-

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LET'S HELP THE INSTRUCTOR

from page 108/85

lier at full bore and then releasing, was to eliminate the need for ground control signals to offset torque turning during the low to high motor transition. This is a fast sequence and we do not want the student trying to coordinate two sticks simultaneously. He is getting take-off experience. More and more take-offs and the two sticks will blend together as did the rudder/elevator function.

And now to landings. During the time the student became familiar with rudder/elevator turns, you had him practicing while flying at various throttle settings. When he could handle this, you brought him down to about 100 feet altitude with low motor and back up to about 200 feet with high motor. Remember the climb at high motor? This allows the student to only have to concentrate on the lateral controls. Next, you had him fly over the flight line, cut the motor, glide, and climb out with high motor. During these practice runs the student is accumulating just about all the flying functions there are except the actual landing. He is taking-off. He is turning. He is coordinating each hand singly and one with the other. He is learning the fast, as well as the sluggish, responses of the plane as it goes through the power

ranges. He makes corrections without mumbling "left" or "right". He has, by this time, acquired good reflex reactions. He is ready to learn to fly through the sun without losing the plane. When you had him fly level, look at and make trim corrections, you were also conditioning the sun excercise. With the wings level he looks down just before the plane enters the sun, and for about as long as it takes to make a trim correction, then he looks up and picks up the plane as it exits the sun. Caution him not to glance across. It can blind you just long enough to lose the plane. This is a necessary excercise for the time he might fly through the sun without experience or without your being there to bail him out.

Back to landings. The last part of landing for the student to learn is patience and/or anticipating the flare-out, if there is one. If you trim the plane to its fuel load, the flare will hardly be noticed. If the plane does exhibit a definite control to flare landing, instruct the student when that first landing is attempted that the last touch of up-elevator will be held and not increased! The flare is a delayed response because of the slow speed. Most beginners apply too much elevator because a plane does not respond immediately to first commands. The result is usually a snap roll into the ground. The student should be instructed not to make any lateral adjustments once committed to land. Just a gentle touch of elevator.

Even if the plane veers as much as 45° to the wind direction, a safer landing can still be had compared to panicking and giving an improper signal. Remember all that trim work? The plane lands itself — we help it a little.

After about six of these landings you can start to have the student set up his own landing approaches. Keep adjusting elevator trim so that he can concentrate now on lateral adjustments and less on the elevator. Put that plane to work! Spend a lot of time with him on the approach. This is 99% of the actual landing. At this time the student is exercising all functions of flying. It is being done while he is taking off, turning and landing. Keep at this exercise. Nothing is learned at 400 feet just flying around.

As soon as he can handle landings, start to toss in that forced landing. Allow good altitude but get in that element of surprise. You can tell well in advance of any problem by his first reaction. This is also required training when his engine quits and he has never had this situation when alone. It is worthless to solo him without this experience. The element of surprise also teaches him of the loss of sound of the motor and the sluggish response to the controls when *not* over the flight line. We have already practiced flying through the sun, practiced forced landings, and need now only to teach him to stay upwind on breezy flying days. This is a hard one to illustrate — and that is, when the motor quits far downwind, how do you get the plane back to a safe visual landing? Keep it upwind!

When you solo a flier, give him another instruction — no acrobatics without the proper instructor. Impress upon him that if he wants to add to that great balsa forest, acrobatics without help will do it! Even that simple loop!

Advise the new soloist to practice many hours of flying straight up and down the flight line. Avoid flying helter skelter all over the sky. This is simply a case of the plane flying you and not you it! Flying the flight line with the wings level, and the flight path also level, is the most important aspect of flying. Any maneuver you should want to execute always starts and ends with the level wings and in level flight. This practice will aid any flier — pattern or sport.

Now for some final last notes. Notice how beginners, when learning landing approaches, are about 400 feet out? Early in the training period, teach the student to fly the plane directly at himself, at a safe altitude and, when close to the flight line, have him turn into the flight line. Practice this from both ends of the field to familarize him with all the field's backgrounds. As his experience grows he is learning the depth of the field with a moving object.

The blip. The blip method suggested is not new. It was the method used on

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LET'S HELP THE INSTRUCTOR

from page 112/85

those old rudder only planes. (I bite my tongue for saying old — they are still a ball to fly.) This type of flying requires a very well trimmed plane. As we have progressed into today's almost foolproof multi proportional systems, we have become lazy. We are using the trim controls to trim the plane that should have been trimmed at the bench.

Start that Instructor Committee Program. Collect flying data on students and their planes. Get the beginner's plane to the meetings before he builds *out* the trim. Print up a log progress form for the student to carry with himself and his plane. The log will be a reminder to the student where he is and it will aid the next instructor to pick up accurately exactly where the student is with regards to his level of proficiency. Every time I get a new student and question his progress, he says he can shoot down the Red Baron blindfolded! He usually comes close to shooting himself down. I have added a rough copy of what a log form may include. Tailor yours to fit the program.

Real flying entails a pilot log - - - I think our flying should too. □

RC MODEL JATO

from page 87/86

found that *one must label* the switch "On" or "Off" to eliminate confusion. Install the rocket motor on the runway with the aircraft sitting on the ground. If the flash bulb goes off when you attach the micro clips, you have just enough time to get your hand out of the way, but not your head. During or after flight, return your JATO firing function switch to "Off".

If the ejection charge is not vented, the rocket motor will squirt out the back of the JATO mount. The mount tube might rupture (no big thing) but one can think of a number of situations when a hot casing falling to the ground would be most inappropriate. To prevent the rocket engine from vibrating out after engine start, wrap it with enough tape to provide a finger press fit into the mounting tube.

The National Association of Rocketry (a sister organization to the AMA) has been successful in convincing the public that model rocketeers are not a bunch of basement bombers. They "safety certify" commercially available model rocket engines and have established a proper set of safety rules. Users of model rocket engines should never modify them in any way. And, please folks, don't ever try to roll your own engines!

We found the design, construction, installation, and safe operation of the JATO system both simple and spectacular. Try it - - - it's a blast! □

PROJECT SUNRISE

from page 99/98

the command range was reliable to 50 miles.

A second sub-system consisted of the airborne telemetry sub-system and the ground telemetry reception and data display sub-system. Seven quantities were measured by the aircraft on-board sensors. These were air speed, propeller RPM, motor voltage, motor current, electronics compartment temperature, and two null indications of sun position that is sun left-right and sun to-from. These latter quantities were used to navigate the vehicle when out of visual range of the operator. No direct measurement of pitch was used, but rather, airspeed was used to indicate pitch trim and the elevator trim adjusted to obtain desired airspeed for best climb. The vehicle was well damped in pitch and responded smoothly and rapidly to pitch trim changes. The navigation proved itself when the vehicle was lost to ground tracking for 20 minutes while the sun navigation system was successfully used to navigate the vehicle from last known position back to the launch location.

Acknowledgements

I would like to acknowledge the important contribution made by the following modelers on this program which the aerospace industry thought was impossible.

Roland Boucher, inventor of the concept and program manager on vehicle; Dave Halluer, Phil Bernhardt, and Bill Warner who helped build the airframe; co-pilots Col. Bob Thacker and Bob Imrisek; Jim Oddino and Paul Gisel who built the Command and Control Equipment; Lynn Jones, Stan Hall, and Dan Lott of Lockheed who provided consul-

to page 122

PROJECT SUNRISE

from page 118/98

tation, assistance and flight test support. Last of all, but most importantly, to Mr. Ken Perko of Defense Advanced Project Agency and Mr. Bill Elsner of WPAFB who kept the faith through many difficult times and provided the funds to make this program possible. □

ANATOMY OF A BOUNCE

from page 93

to be fast than to chance a stall/spin accident at ten feet of altitude. It is a fine and highly recommended procedure.

But if the nose wheel hits first, the strut immediately forces the nose up a few degrees. There is plenty of flying speed left, the wing's lift increases dramatically with the change in angle of attack and the bird seems to bounce 20 feet in the air. To prevent a stall, you feed in a little down elevator, and set up for the next bounce, etc., etc., etc., into the weeds. On the other hand, if the plane hits on the main wheels first, the natural tendency is for it to pitch down, killing the lift of the wing. The bird sticks nicely to the asphalt, and tire friction quickly kills its speed.

The solution, now that the cause is known, is to shorten the nosegear strut, use a smaller nose wheel, or use larger main wheels — anything to insure that the main wheels hit first. A plane set up this way is so hard to bounce that a landing that hard usually causes structural damage.

And it's amazing how few modelers know it! □

NRCHA NATIONALS

from page 79

The plaques were hand engraved on glass and were well worth the trip to the contest, even without the tremendous amount of merchandise that went along with the first 5 places in each class.

There were two family entrants that did very well. Don Chapman finished 2nd in Expert and his son, Danny, finished 2nd in Novice. Ray Hostetler finished 1st in Intermediate, while Old Dad Wendel came in 4th in Intermediate. It is, indeed, gratifying to see father and son enjoying, and doing so well, in the same hobby.

Helicopters of all sizes, shapes, and colors were present. Several home designs were there which evidenced considerable ingenuity and many hours of hard work and trial and error on the designers' parts.

The Kavan Jet Rangers outnumbered any other single type of

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NRCHA NATIONALS

from page 122/79

commercial helicopter. The Heli-Baby and the Rev-olution were the most popular in the small machines, along with several Du-Bro Tri-Stars. Two Schulter Gazelles were present and several Graupner 212's. Du-Bro Shark 60's were there and also several of the older Hughes 300's with Du-Bro's new 60 conversion kits installed. Many of the 'copters sported patriotic color schemes of red, white, and blue.

The photo section will tell you the rest of the story about the largest and best radio control helicopter contest ever held in this grand country of ours. I must apologize for the fact that there are no more flying pictures than there are. The reason is simply that I goofed on my camera and one whole 36 exposure roll of film was ruined. This just happened to be the roll that had the flying shots on it. Oh well, maybe I'll learn to use this camera by next year. (No chance . . .! ed.)

That's it for this year's NRCHA National Championships, and I hope to see you next year at an even bigger and expanded NRCHA contest. Again, many thanks should go to Bill Curtis, the CD, and to the many manufacturers and dealers who supported this contest with their contributions. □

CONTROL MIXER

from page 78

The home-made unit shown in Figure 6 operates in exactly the same manner, but the basic construction of the device has been simplified for amateur metal workers like myself, (I'm not too good at drilling accurate pivot type holes in blocks of metal). You can see that the central lever is replaced by an inverted U-shaped frame which, again, is pivoted

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RCM PUZZLE

SCRAMBLERS - - - SCRAMBLERS

In this month's puzzle, you unscramble the word on the right and fill in the blank on the left with the unscrambled word. Then, read down and the circled letter will spell the answer below. We've given a definition to the answer to help you. You must fill in all the blanks correctly to win.

Remember — all correct entries are put into a hopper and drawn at random. There is one name drawn for each sponsor for that month. For this month, we will have 50 winners!
GOOD LUCK — Pat Crews

RCM PUZZLE SPONSORS

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TT Electronics
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Wilhold Glues

Clip along dotted line & send to:
RCM PUZZLE, P.O. BOX 487
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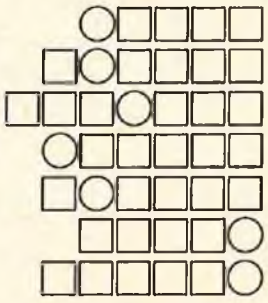
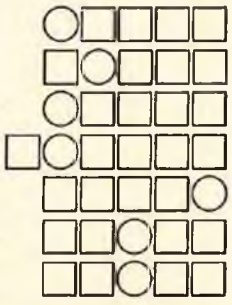


DLOME
YARNUW
RAFIILO
LOSFAT
SLIVEC
LESCA
DERDUR

Used to quiet an engine.

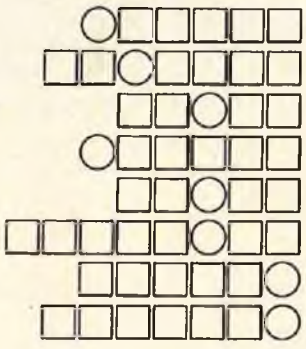
Answer: ☐☐☐☐☐☐☐



CIPHT
LEPSU
TOPRS
HUTSTR
EVHOR
PEYOX
ADROI

Device to connect servo with control surface.

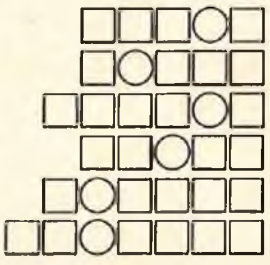
Answer: ☐☐☐☐☐☐☐



LETLIF
NISRENP
ROVES
NEGNEI
LODEW
ARFCARIT
RADLOS
LAHMERT

A plywood bulkhead located directly behind the engine.

Answer: ☐☐☐☐☐☐☐☐



TISCK
SABLA
GIYNLF
HOCDR
CEPSUR
OPDWOYL

A plastic cockpit enclosure.

Answer: ☐☐☐☐☐☐

Name _____

Address _____

City _____ State _____ ZIP _____

Puzzle must be postmarked on or before January 1, 1977.
Void in states where prohibited by law.

from page 125/78

at its base. This frame carries a pair of U-control bellcranks, well supported on a central pivot. Only the upper and lower holes are used on these bellcranks. The elevator servo is connected to the outer frame, preferably centrally as shown, so that no twisting action is applied to the frame. The aileron servo is coupled to both the central levers, which are, themselves, connected to the elevons. Rocking the frame produces diving or looping, and twisting the bellcranks provides the rolling motion.

(In the foregoing we've mainly referred to elevator and ailerons as the two controls, but the same applies if the controls are rudder and elevator, such as on a Vee-tailed model, for example.)

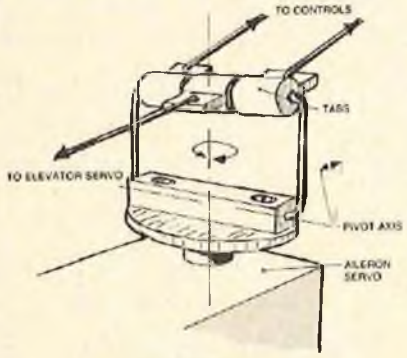


FIGURE 7: ROGERS ROCKER

An ingenious simplification of the sliding servo approach is Mr. Rogers Rocker, which was unveiled in the March 1973 issue of RCM. Our Figure 7 shows the main details of the scheme. A swinging wire frame is built up on top of the aileron servo wheel, and three tabs are fitted onto the top cross member of this frame. Two of these tabs are connected to the elevons, and the other to the elevator servo. Operating this servo rocks the wire frame backwards and forwards, (hence the name), and rotating the frame moves the elevons as ailerons.

All-in-all it's a clever variation of the original idea, and should be quite useful in models with little room for additional mechanisms.

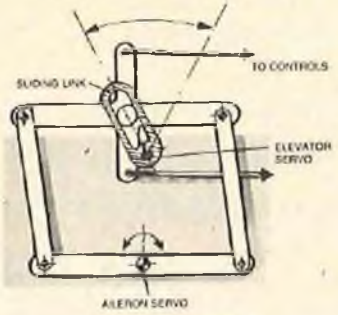


FIGURE 8: KRAFT MIXER

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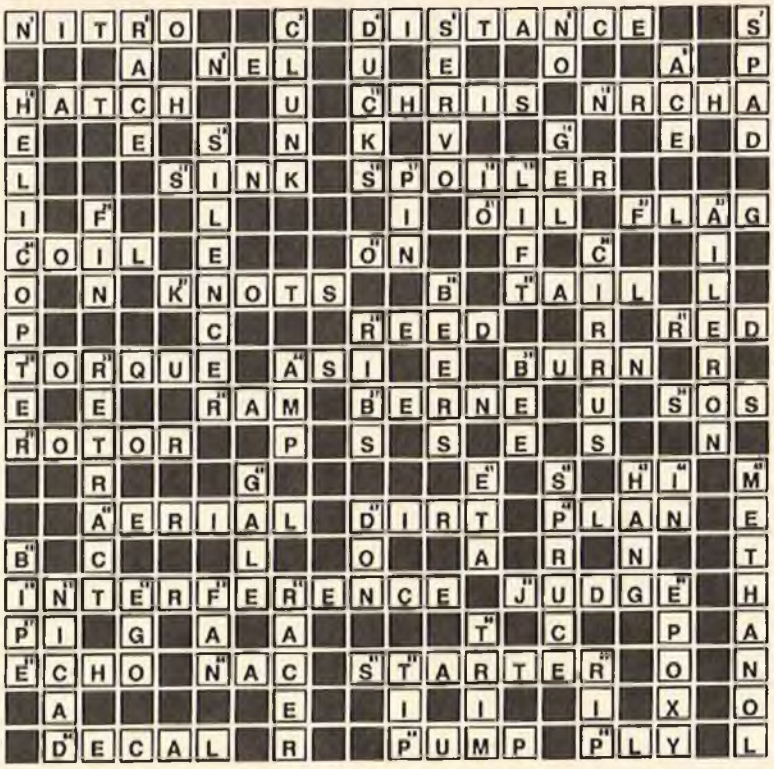
DECEMBER PUZZLE ANSWERS



NOVEMBER PUZZLE WINNERS

Vance Atkinson
Peggy Balmos
John Bartanowitz
A1C William Bowne
Howard Carpenter
Bob Edelberg
Francis Fuge
John Gamer
Rick George
Donald Grove
Harold Hardy Jr.
Ronald Hemphill
Floyd Hipshire Jr.
Rev. Herman Hungwell
Thomas Jacomini
Mel Lindner
Ted Magaletti
Noel Martin
Lloyd McCauley
Ray Meverden
Charles Misicka Sr.
R.C. Monson
Carl Moody
Milo Moon Jr.
Warren Morlan
James Murray
John Nauman
Victor Odquist
Thomas Osborne
Dick Papenguth Jr.
Andrew Parker
Ray Peck
Arnold Peckar
William Pendlebury
Richard Rabe
Richard Sanchez
James Scheetz
Randall Smythe
C.E. Snyder
Jerry Stallings
Joseph Stofan
Bill Thomas
Frank Trouba
Deforest Townsend
Daniel Vincent
Darrain Waters
Michael Wattelet
Don Wilder
Jim Zimmerman

CONTROL MIXER

from page 127/78

Our last mechanism, and a very crafty one indeed, is the Kraft unit. This is available for either mounting directly on the Kraft brick, or with an independent base for use with two separate servos. Again the basic mechanism is a flexible parallelogram with an independent bellcrank attached, but this is the only unit I've discovered that uses a sliding link in the system (all others have fixed pivot points). Our sketch shows the Kraft unit upside-down so that you can see this sliding link action which produces the elevator effect. The aileron motion in this linkage is obtained by the flexible parallelogram action.

So far all the units we've described are part of the receiver end of the system, and require some additional equipment in the model. What then can we do at the transmitter end, if anything? One possibility is to do a little modification of the stick gimbals, i.e., to rotate them 45°. This means drilling a few extra holes in the transmitter case, if you've got round gimbals, then re-position the gimbal. In the model, connect one servo to each elevon, and operate the transmitter normally. Thus, for a dive, pushing the stick up will give an equal signal to both servos, and should move both elevons an equal amount, in the same direction. Pushing the stick down does the same thing in the opposite direction. (All this assumes that you're operating the controls from one stick, Mode II.)

If your transmitter has square sticks then quite a bit of cutting and filing will be needed to rotate the stick gimbal, so it may be better not to bother, and use an airborne mixer. One variation of the above is the English mixer, where the transmitter is simply held at 45° to its normal position. This is not recommended for anyone but lone wolf fliers, as you'll probably end up poking out your flying buddy's eye with the antenna!

Now for the ultimate solution, one in keeping with the times, and this is to do the whole thing electronically. One example of this type is the Christy Mixer, which consists of a small white box which plugs in between the receiver and the servos, each servo then being connected to a single surface. The box sorts out how much of the total transmitted signal goes to each servo to get the correct amount of pitch and roll the flier commands. I was going to try to explain how all this was done inside the box, but fortunately for me, (and you, since I know nothing about electronics), the July issue of R/C Modeler came crash-

to page 136

CONTROL MIXER

from page 132/78

ing through the mailbox and rendered my few words unnecessary. Not only did this issue contain a full discription of the device by the inventor himself, but there were also complete instructions on how to build one, so how lucky can you get!

So that concludes this little survey, and there is now no reason not to tackle the flying wing or Vee-tailed project you've been putting off. □

JAVELIN II

from page 75

. . . . . which added a lot to the overall appearance of the sailplane. An EK-logictrol radio was used for the rudder and elevator.

No modifications were found necessary in any phase of the construction. The packaging of the kit was excellent with all pre-cut parts and hardware items in their individual plastic bags. All planking was rubber banded together. There was no split wood and the die-cutting was clean and sharp with no rib splitting when removing parts from the die-cut sheets.

With regards to the flight performance, attention has been given to the control cables which are supplied in the kit. The link between the servo and the control surfaces is a flexible steel cable inside a nylon tube bearing. This gives a low friction linkage while, at the same time, eliminates the annoying trim problems associated with the plastic type pushrods. Overall, the Javelin II is a

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JAVELIN II

from page 136/75

stable flyer with good maneuverability and is rugged and quite capable of taking rough handling, making it an excellent choice for a sport model. Its low drag and excellent thermalling characteristics will please the serious competitor and contest flyer. With the extremely high penetration ability of the Javelin II, landing speed is a little bit faster than other ships of the same weight and class, so make your approaches flatter and lower. You will find that with a little practice, you'll make the spot everytime. The Javelin II is a proven contest winner. □

FOR OLD TIME'S SAKE

from page 64

cleared away and all of the points were tallied up, the Contest Director managed to tote home the beautiful high point trophy, while Chuck took second, and Bruce Norman took third. Bruce came in third on the strength of his old timer flights alone, with no soaring points to help him.

"The Texas Pride Tournament was an attempt by the Fort Worth Thunderbirds to find if there was a high level of interest in old timer flying in this area, and would a contest similar to a soaring contest be good. It was a very successful meet - - - even if Helmer did take high points - - - wish that I could have snuck it away from him."

Sounds like a good meet with the added interest of sailplanes — lets each group see what the others in the hobby are up to. Nice report, Chuck. By the way, when was it held?

I hope more people will follow Chuck's lead and send us more input — we would really like to hear what's going on out there.

☆

That project we promised you will have to wait for next time. I haven't had a chance to knock heads with the inventor since our return.

☆

Till next time, keep 'em flying and happy landings! □

KAVAN ALOUETTE 2

from page 70/65

SPECIFICATIONS

Weight:	**6 lbs., 14 oz.**
Height:	**13¾ in.**
Rotor Span:	**42⅜ in.**
Tail-rotor Span:	**9 in.**
Width at skids:	**11¾ in.**
Width of Flybar:	**20½ in.**
Fuselage width at canopy:	**7 in.**
Length, Tail skid to canopy:	**42¾ in.**

●

RACING AT RANDOM

from page 60

Zero Club was started and soon counted a whole bunch of the *fast* guys as multiple members.

Bob Mikko wasn't bothered by any of it (except for #2, Gene Weaver) as he displayed some amazing consistency in averaging 1:30.7 for nine heats for First Place and putting in the best time of 1:26.9. Gene, the 1975-1976 Winter season champion, just missed catching Bob and, true to form, posted 2nd best time of 1:27.3. Daryl Chesire flew the pants off of his somewhat slower airplane and, together with the virtue of being the only flyer with 10 finishes to his credit, took 3rd place.

If you look through the tabulated results, you can pick out most of the members of the Zero Club who really went all out to get the *fast* time trophy but couldn't quite make it. There were a total of 12 times turned in under 1:30 by a total of five flyers. This was good racing.

Thoroughly frustrated, the Zero Club organized a grudge match after the regular racing was over and flew a free-for-all heat with a total of eight flyers competing simultaneously! A fitting end to a very good racing weekend. Join us in 1977.

FIRST ANNUAL
1/2 PYLON CHAMPIONSHIPS

Name	Pts	Fast Time
1. Bob Mikko, WA	35	1:26.9
2. Gene Weaver, WA	32	1:27.3
3. Darrel Cheshire, WA	31	1:31.5
4. Stew Arestad, WA	29	1:35.0
5. Ollie Carson, OR	28	1:35.8
6. Brian Dickerson, WA	25	1:45.2
7. Jerry Holcomb, WA	24	1:28.1
8. Jim Fitzsimmons, WA	24	1:39.4
9. Ron Clem, CA	23	1:32.6
10. Vince Caluori, WA	22	1:27.8
11. Ralph Cooney, OR	22	1:35.6
12. Bruce Edwards, WA	22	1:59.6
13. Tom Richards, WA	13	2:02.1
14. Nelson Eddy, WA	12	1:28.9
15. Dave Katagari	11	1:34.6
16. John Erickson, WA	9	2:29.5
17. Bill Brazzle, WA	7	1:54.5
18. Bob Hunt, WA	5	1:43.8
19. C.R. Silver, WA	5	2:38.0
20. Ed Berman, WA	1	2:57.0

★

Here is a short message from George Zink, the NMPRA QM President on the

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RACING AT RANDOM

from page 140/60

QM Championships at Falls of Rough, Kentucky.

Terrific hosts, a magnificent site, a fine place to vacation, great racing, almost perfect weather, and 47 entries, — who could ask for more? There were many close races and with only a 4½ point spread from first to tenth place, there was plenty of pressure and excitement for the racers and spectators as well.

The contest was open to non-NMPRA members this year, but NMPRA had all the heavy weights. All of the top ten finishers were NMPRA people. You can speculate on just what that proves, but it's still a pretty good showing no matter how you look at it.

Next year we plan to limit the Championship Race entries to NMPRA members only. It's not too early to begin looking for a site and if you come up with one let us know right away.

In addition to the prizes given by the State of Kentucky and the Louisville RC Club, trophies were also donated by RCM in the name of NMPRA-QM. We also awarded trophy shirts to the 5 top finishers.

The results were as follows: 1st, Bob Reuther; 2nd, Gail Jacobson; 3rd, Bill Hager; 4th, Tom Moore; 5th, Al Grove; 6th, Greg Doe; 7th, Len Wiederhoeft; 8th, Bob Blouch; 9th, Ben Martin; 10th, Allen Booth.

Fastest time was Bob Blouch's 1:35. Shorty Holsclaw and his boys got together a special "grudge" race from the 9 fastest racers. It boiled down to a 4-plane heat with Bob Reuther, Gail Jacobson, Greg Doe and John Fotiu. Gail Jacobson won this one, but in the qualifying heat Bob Reuther set a 1:34 time, the best of the racing at Rough River. By the way, the top 5 finishers had their engines inspected and no modifications were found, although they did find a bit of rust in one of the engines. Maybe it's time to change it.

★

The 1978 AMA QM Rule Proposals have been sent in and recorded as RC78-28 through 34. I know of at least 15 other QM proposals which are now on the books. Most of them deal with the same general subjects that ours do but approach the problem in a different way.

Right now I'm glad we took the trouble to make all those surveys to find out what QM fliers and CD's want. The AMA has invited us to comment on all the QM rule proposals and, without those surveys, we could only offer our personal opinion. With the surveys we can point to evidence to support our opinions.

One subject we would like to have your opinion on is the use of non-wooden props. There has been quite a lot of advancement in props in the last

few years and several manufacturers are making continuous, tip to tip glass fiber, compression molded props. They are now being used around Chicago off grass fields and seem to work well. We are thinking of asking that this specific type of prop be included in QM. What's your opinion? Send your ideas to NMPRA QM President, George Zink, 80-28 222 St., Jamaica, New York 11427.

★

New Products

We received one of Astro Flights new mini starters. It is especially designed for 1/2A glow engines and features a 12 volt high speed, permanent magnet motor with a ball bearing front end. The drive cup is designed to fit the Cox T.D. prop nut or a small spinner. The cup outer housing is also grouped to accept a marine O-ring, and a rubber boot for flywheel starting of Jerobee cars is also provided. A 12 volt Gel Cell and battery charger are also available. The complete set-up is ideal for 1/2A racing due to its small size, light weight and high rpm. The starter is $15.00, the Gel Cell is $26.66, and the charger is $8.95. For further information contact Astro Flight Inc., 13377 Beach Avenue, Venice, California 90291, or see your local dealer.

Pylon Publications has released a series of books which are a must for the racing enthusiast. They are called Air Racers in 3-Views. There are three books in the series which show the history of Air Racers in 3-view form. The details are excellent and include dimensions, contours, markings, paint schemes and proper colors. The books are $4.95 each or $14.95 per set — this includes a protective holder. For further information, contact Pylon Publications, P.O. Box 2726, Rochester, New York 14626. □

PARTENAVIA VICTOR

from page 61

. . . . . curred. The instructions on the plan, or in the instruction book, do not call out what size hook-up wire to use for wiring the electric motors or switches. Since DC motors draw a lot of current, too small of wire size will prevent the motor from coming up to full speed and the wires will get hot. Conversely, using too large a diameter wire just adds unnecessary weight so we would recommend using 20 gauge stranded wire which seemed to be adequate.

The wood supplied in the kit varied in weight up to 1/2 ounce. Be sure to select your sheeting so that wing halves will balance properly. Also, cut a 2½" diameter hole in former F-2 before gluing the former in place since it makes the installation of the nose gear much easier.

With regards to flight performance, the Astro 05 twin electric motors have a

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PARTENAVIA VICTOR

from page 146/61

surprising amount of thrust. They have no problem pulling this aircraft off the ground with a good rate of climb out. Rolls, loops, and other basic maneuvers can be done with ease. The motors pulled evenly with no evidence of fishtailing or wandering. The mid-range throttle setting would just maintain level flight, and this throttle setting proved to be a good approach speed. Flying under full power, the battery life averages 4½ minutes. The model balanced without any additional ballast by following the placement of battery and equipment shown on the plans. With the wing loading on the high side, keep your approaches fast and flat, since the aircraft will stall very quickly in slow speed flight. The stabilizer is full flying, so keep your movement to a minimum. The aileron throw was 1/4" each side of neutral and proved to be more than adequate.

The manufacturer states that, using a Cox 6/3 or Top Flite 6/4 nylon prop will increase flying time by two more minutes. This is one ship you can fly in your Sunday suit and it makes it very difficult to go back to greasy conventional engines after experiencing the thrill of electric flight □

NRCHA

from page 59/58

have to worry about tipping the see-saw and dropping the level. In any case, once the level is on, all you do is put an inclinometer, 15 centimeters from the end of the blade. Now, rotate the rotor blade until the bubble in the level shows that the see-saw is level and then read the pitch on the inclinometer. Bend in, or take out, the pitch as needed. It sounds complex, but it is really a very simple procedure. This is better than buying a special pitch gauge because the inclinometer can be used for more than

just the pitching of rotor blades and is available at most Sears stores for approximately $8.00.

Dick has used this method at the field with good results having folded back the blades on his Heli-Baby and having to re-pitch them before flying again. In fact, he did find that one of the blades on his Heli-Baby was a bit warped and this showed up at the field when he checked the blade tracking. If after setting the pitch according to this method, and if the blades don't track exactly, Dick always pitches the low blade upward and leaves the blade that was running high alone. When he did this initially, the lower blade ended up being pitched up 1/2 degree more, but this was because it had the warp in it. If the blades have no warp after pitching, they should track true.

■ ■

After a season of flying his Heli-Baby, and having pumped about 3 gallons of 25% nitro fuel through the K & B .40 engine which powered the bird, Lynn Faust of Johnstown, Pennsylvania, found that the accumulated varnish would have to be removed. Following Clarence Lee's tips on cleaning an engine, the point was reached where steel wool, or Brillo Pads were supposed to be used to loosen the gunk. One look into the K & B innards led to the conclusion that there had to be a safer way, and what follows is believed to be a superior substitute for the steel wool.

Readily available through most dealers that handle 3M products is Scotch Brite scouring pads, #96 commercial grade. This is a green colored plastic square which feels like steel wool, but here the similarity ends. Using one of these pads in a conventional solvent, Lynn finished up with a sparkling engine and the following conclusion:

The first and most obvious thing noticed was the absence of the minute scratches steel wool leaves, particularly on the aluminum parts. Secondly, there was absolutely no signs of the pad breaking and getting into the bearings

and parts as steel wool usually does. Thus, there was no danger of particles being left behind even after cleaning. Third, very little effort was required to do a beautiful job. Finally, the small increase in cost is far more than balanced out by a remarkable resistance to wearing out of these plastic pads. All-in-all, an unpleasant cleaning project became a pleasant surprise and Lynn will never return to using steel wool. For what it's worth, some of the danger of harming one of today's fine engines while cleaning need not worry the owner any longer. Lynn suggests that you don't let the lady of the house see these new pads, or you may find your supply dwindling and showing up in areas of the home other than your shop!

■ ■

Training Tips From Indonesia

R.F.C. Ratulangi (N1ID), writes that there are approximately 50 helicopter enthusiasts in Indonesia, all of whom are in the beginning stages of flying. Due to the fact that there are no spare parts available in that section of the world, a basic training method had to be devised to avoid the numerous broken parts experienced by the novice helicopter enthusiast. This is the method that the Indonesian helicopter pilots have used which has proved to be quite successful when learning to fly a helicopter without an instructor, and within an extremely limited space — in this particular case 8 meters by 5 meters.

The helicopter used during these training phases was a Graupner Bell 212 Twin Jet. First, you tie the helicopter at a point which lies in a direct line with the main shaft. In the case of the Bell 212, this is easily accomplished by simply connecting the two strut attaching brackets with a third strut and, exactly beneath the main shaft, you tie a very strong cord. This point must lie directly beneath the Center of Gravity of the helicopter. The other end of the cord is tied

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NRCHA

from page 150/58

to a very strong nail or deep screw eye secured to the ground. The length of the cord is such that, when you lift the helicopter up, it can only rise 8" above the ground. This is extremely important - - - do not make the cord longer than 8". When tied in this manner, the helicopter can make all the maneuvers it is supposed to make. It can tip forward, backward, or sideways but, everytime that a faulty movement is made at the controls, the blades will not touch the ground since the helicopter will be held back by the cord. You have to use floats to prevent damage to your helicopter since the novice is often known to make the wildest movements with his new machine. During this training procedure, you are flying in ground effect which is, in fact, the most difficult area in which to hover a helicopter. However, you will find that, after a few tanks of gas, your reflexes in controlling the helicopter have become automatic, you have broken no parts, and it is time to abandon the cord. From this point on you will find that you will be able to hover the machine in the same area and at the same altitude, gradually increasing your altitude as your proficiency increases. The use of the cord eliminates the restriction of movement of the helicopter encountered with various training poles and tables and, in fact, the helicopter is flying free up to that altitude of 8". This method has proved extremely popular and successful in Indonesia — it might be something you may wish to try with your new machine.

■ ■

New Helicopter Products

American R/C Helicopters, Inc., 23881 Via Fabricante, Suite 516, Mission Viejo, California 92675, has announced the release of a beautiful fiberglass fuselage of the Hughes 500 which is designed to fit over the existing Revolution helicopter frame, transforming it into a beautiful Stand-Off Scale helicopter. No painting is necessary since the lightweight (approximately 16 ounces) fuselage will be available in red, orange, white, or light blue glossy colors. All the modeler needs to do is trim with trim tape for a beautiful helicopter. All necessary hardware is furnished including a 1 piece tinted canopy. Nothing else is required to finish although a scale cockpit may be added if desired. The Hughes 500 Rev-olution flies beautifully with a standard K & B .40 installation and really moves out with an OS Max Schneurle. Retail price of the new 500 fuselage kit is $84.95 and will be available from American R/C Helicopters and their dealers.

Also, the grapevine has it that Ameri-

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from page 154/58

can R/C Helicopters will soon be producing a .60 size Scale helicopter which will be priced right and contain all American produced parts as used in their very popular Rev-olution.

■ ■

The new 228 page "Handbook of Mini-Pitch Drives" from Stock Drive Products, features over 1,100 off-the-shelf inch and metric timing belts and pulleys. They are said to be the smallest pitch ever to go into production. These miniature drives were designed for power transmission synchronization, metering and conveying application wherever space is at a premium.

A highlight of the Handbook is a comprehensive technical reference section which includes 77 pages of computer generated Drive Ratio and Center Distance Tables which make it simple for designers and specifiers to select the proper belts and pulleys at a glance. Many useful general metric conversion tables are also featured.

The product section contains technical specifications and prices for 59 different pitch-lengths of MXL belts which are stocked in 1/8", 3/16", 1/4", 5/16", and 3/8" widths. These 0.080" belts are made of 0.010 gauge spirally wound Fibrex cords embedded in Neoprene. The belt teeth are faced with nylon to eliminate lubrication and increase durability.

The Handbook shows 140 different sizes of metal and plastic-molded 0.080" pulleys and 114 sizes of MXL molded pulleys reinforced with metal inserts known as the Super-Plast series. Also shown is a complete selection of 137 belt lengths plus 563 inch and 361 metric bore 1/5" (5.08mm) pulleys. Aluminum pulley stock and flanges which permit the manufacture of special width MXL and XL pulleys are shown in inch and metric sizes.

The large variety of metric components and reference data contained in the catalog enhances its usefulness for all who are designing, converting to, or interfacing with, metric equipment. The Handbook of Mini-Pitch Timing Belt Drives, Catalog 76, is available at just $2.50 postpaid from Stock Drive Products, Division of Designatronics, Inc., 55 South Denton Avenue, New Hyde Park, New York 11040.

■ ■

Helicopter Side Trip

It is always gratifying to receive a compliment concerning one of RCM's advertisers. For this reason, we'd like to pass the following comments on to you as written by Dennis Saydac of the Winnipeg R/C Club:

I'd like to tell you about a very enjoyable side trip that G. Benoit, G. Dost, P.

Sulkers and I took on our way to the 1976 Toledo Trade Show. We stopped in Elgin, Illinois, which is very close to Chicago, to visit S.C Modeler Hobby Shop. S.C. Modeler regularly advertises in R/C Modeler Magazine that they have built and flown almost every R/C helicopter made.

Upon arrival we discovered, much to our disappointment, that the shop was closed for the day due to inventory and stock taking. Since I am normally a nervy type, I chanced knocking on the door and was greeted by none other than the general manager and resident helicopter expert, Mr. Lloyd Wheeler. I introduced our group and explained that we had just driven 800+ miles just to visit the shop. Lloyd immediately dropped what he was doing and invited us in. The first thing we noticed as we entered the shop was a display of about a dozen R/C helicopters. Many of these had appeared in the R/C Modeler advertisements and several were equipped with a radio and were ready to fly. These included a Kavan Jet Ranger Kalt Hughes 500, Hegi Cobra, Schluter Gazelle, Heli Baby, Graupner Bell Twin Jet and several others.

Since I own a Kavan Jet Ranger and had never seen a model helicopter fly successfully prior to this trip, I had many questions to ask Lloyd. He very patiently answered the questions and provided a lot of extra advice. He then invited us to the local flying field which was located about five miles away for a helicopter flight demonstration. Naturally we accepted.

Lloyd picked up the Hegi Cobra and the Graupner Bell Twin Jet and we were on our way to the field. The Cobra had collective pitch and was equipped with the Royal Electronics Corp. Tachtron unit which governs the main rotor rpm by automatically controlling the throttle servo. This device made the helicopter as easy to handle as your average pattern aircraft. Lloyd demonstrated real expertise in handling the model and we witnessed realistic flight performance and not just a hovering demonstration. The models high speed was about equivalent to an average fixed wing aircraft. Somehow we expected a helicopter to be slower. Several flights were made under real adverse weather conditions as the wind was blowing over 20 mph and it was a very cold spring day. We were soon all chilled to the bone and returned to the hobby shop where we were treated to coffee on the house. The visit to S.C. Modeler was a highlight of our trip which we'll remember for quite some time.

Before we left for Toledo, we asked Lloyd what the "S.C." meant. He said it stood for several things, but above all it stood for Service Centre. Before S.C Modeler sells anyone a helicopter, it has to be proven out by Lloyd with a minimum of 50 hours trouble-free run-

ning on the mechanics.

I'd like to take this opportunity to thank Mr. Wheeler for the generosity and hospitality which he extended to four complete strangers. A finer gentleman, you won't find anywhere. I'd recommend stopping at S.C Modeler anytime you are near Elgin, Illinois.

■ ■

That's it for this month - - - keep them hovering! □

OPERATIONAL AMPLIFIER

from page 56/54

tooth waveforms (Figure 9). Simply by adding time constant R_3, C_1, the Schmidt Trigger is made to self oscillate. When the output is high, R_3 charges C_1 towards the positive supply. As the capacitor voltage reaches the upper trip level, the output lowers to near zero volts. Now the capacitor is discharged toward ground until it reaches the lower trip point. The output then switches to the high state and the process repeats.

Now let us examine how these circuits are applied to last months servo tester project. Figure 10 illustrates how the pulses are generated. Referring to tester schematic which should be shown as Figure 11, I.C. 1b and Q_3 generate a constant current charging current for C_1. I.C. 1b compares the voltage drop across R_7 to the voltage at the wiper of TP_2. The comparator drives the base of Q_3 so as to keep the voltage drop absolutely constant. If the voltage drop is constant, this means that the current flow through Q_3 will also be constant, thereby charging C_1 linearly. C_1 charges up until Q_3 saturates. The voltage then remains constant until Q_2 turns on discharging C_1 and the process repeats generating the waveform of Figure 10. Q_1 is a unijunction transistor which is set to fire every 16 ms. turning on Q_2 for a few microseconds, insuring the complete discharging of C_1. The travel adjust pot, TP_2, adjusts the amount of constant current, thereby controlling the slope of the charging ramp. This ramp is applied to comparators I.C. 1c and I.C. 1d, along with a D.C. voltage from the wiper of the control pot CP_3. The amplitude of this voltage determines how long the pulse lasts as illustrated in Figure 10. Notice that both positive and negative pulses may be generated by merely reversing the inputs of the pulse generator com-

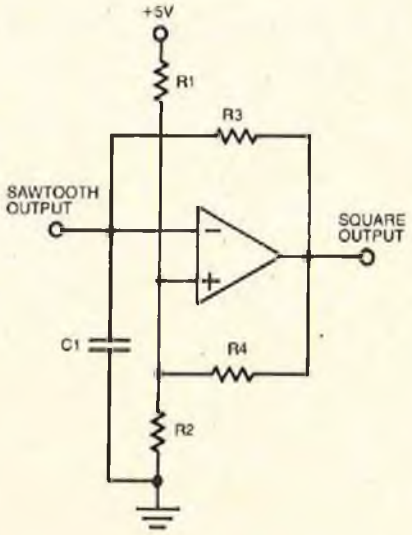

FIGURE 8
OSCILLATOR

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OPERATIONAL AMPLIFIER

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parators. To generate a varying pulse to cycle servos, the cycle-stick switch is switched to the sawtooth output of oscillator I.C. 1a. Figure 9 shows how the sawtooth is generated. The cycle speed control determines the rate of change of the sawtooth by changing the time constant of C_4, R_4 and CP_1. Obviously, the steeper the ramp, the faster the servo will go.

The cycle width control sets the amount of positive feedback which adjusts the trip points; thereby controlling the amplitude of the sawtooth. This then determines how far the servo output wheel will rotate during the cycle. Thusly a controllable sawtooth voltage is applied to the pulse generating comparators causing the output pulse to alternately go narrow and wide to cycle the servo at any speed or amount of travel.

The preceeding shows how operational amplifiers may be applied to R/C circuits. The same project built with the transistors alone would be many times more complex. □

SMALL WONDER

from page 46/40

shrink the covering with your heat gun. It will be necessary to install D.J. stripe tape on the trim line to keep the paint from chipping. Since trying to cover the cabane structure would give you nightmares, it is best to paint this area. Don't forget to fuel proof the inside of the engine compartment and provide an oil drain at the bottom.

- □ Install the windscreen, trim, pilot, and any other finishing touches you care to make.
- □ Permanently install the rudder and elevator by epoxying the hinges in place.
- □ Attach the control horns.

Radio Installation & Flying

- □ Install the engine, muffler, prop, wheels, and tank. Trial fit the battery under the tank, receiver, and servos in the main compartment. Put the radio access panel temporarily in place and attach the wing with rubberbands. Shift the servos and battery forward or back until the correct balance is achieved. The balance point should be in the range of 2¼" to 2⅜" back from the leading edge of the wing and *no further back*! When correctly balanced, the plane hanges slightly nose-down when suspended on the tips of your index fingers placed under the wing on each side of the wing saddle.

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- ☐ When the position of the servos is found for correct balance, epoxy two pieces of 3/8" square hardwood (not balsa) across the fuselage to support the servo tray.
- ☐ Wrap the battery and receiver (loosely) in foam and put in Baggies for fuel proofing.
- ☐ Install the inner pushrods as follows: Cut off the threaded end of a clevis rod and screw into the pushrod at least 1/8". Next, insert in the pushrod case and attach the clevis to the outer hole in the control horn.
- ☐ At the servo end of the pushrod, screw a section of threaded rod into the pushrod at least 1/8". Make a Z-bend in the rod and put in the servo arm. Make all initial adjustments at the servo end by screwing the threaded rod in or out to achieve a neutral condition at the control surfaces.
- ☐ A 1/32" music wire is recommended for throttle pushrod as it is easy to bend and yet rigid enough to actuate the throttle. Be sure the throttle linkage is adjusted accurately so that the throttle servo isn't in a stalled position either at high or low position which can drain your battery pack and damage your radio. Be sure to use a no-noise connector where the wire attaches to the throttle.
- ☐ Set up the throw on the elevators so you get no more than 5/16" in either direction. Set the rudder throw for no more than 3/8" throw in either direction.
- ☐ If this is your first radio installation, get an experienced flyer to check over your work before attempting to fly.
- ☐ Small Wonder is easy to fly. Recheck your balance with an empty tank. Be sure there are no warps in your wing and tail surfaces. Double check to make sure the control surfaces move in the right direction and the throw is the same as specified earlier. Check your radio range both with the engine stopped and running. Be sure to balance your prop — propeller balance is an area commonly overlooked and can be the cause of radio malfunction and failure because of excessive vibration.
- ☐ If you are a rank beginner, get the help of an experienced flyer to help you trim out the plane. Once trimmed out, you will be amazed at the flight characteristics and, when you get her back on the ground and taxi back in, you too will say "It's a Small Wonder." ☐

HAVE YOU DISCOVERED A SHORTCUT OR USEFUL HINT THAT YOU'D LIKE TO SHARE WITH OTHER MODELERS? SEND YOUR IDEAS TO FOR WHAT IT'S WORTH, C/O RCM AND WIN A FREE SUBSCRIPTION.

SUNDAY FLIER

from page 31/30

time of all the races. It's slick!

Next year, the RCM 1/2A Trophy Races will be held in the Los Angeles area — and you can be certain that there will be a lot more entries — every one of them ready to go all out to win. It ought to be a real screamer. I'm planning to be there, and if hand launches are the name of the game, I'm going to get that fastball pitcher of the Angels to launch my job. Start the turn for the scatter pylon just as the plane leaves his hand! Take that!, Crazy Larry!

• •

As exciting as racing is, it still tends to have a somewhat limited appeal for most modelers, simply because they feel they don't have a chance against the experts. And for the most part they're right. So that's why the special event, fun-fly type of action usually draws a pretty good bunch of entries. Also, when it goes off well, and becomes an annual event, the entries get more numerous with each passing year.

Several years ago, watching the success of the annual Rhinebeck affair back East, Monty Groves and some friends concocted the idea of a similar event for the West Coast, and came up with a very appropriate name — the World War I Western Front Jamboree. The event had a relatively inauspicious start, when compared to Rhinebeck, but the participants had such a good time that with each passing year it has grown bigger and bigger. Last year, for example, it was so successful that the entrants were given back their entry fees and the club treasury still received a tidy sum.

This year was the best yet. Twenty-seven enthusiasts entered, and, in addition, there were special exhibitions to entertain the crowd — like Snoopy's Doghouse, and a flight by my peanut scale SE-5, during which I think Ed Sweeney, who hand launched it for me because the grass was too high, ran with it almost as far as it flew after he let go, since the .010 tank only permits about a minute or so of flight.

Every one of the events is designed as a crowd pleaser. Even the scale pattern, which tends to be dull when the planes are of more modern design, drew applause. My personal preference in that event was the flight put in by Ed

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WHEN WRITING TO AN ADVERTISER, LET THEM KNOW YOU SAW THEIR AD IN R/C MODELER MAGAZINE.

SUNDAY FLIER

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Sweeney with his Jenny, built from the Joy kit, which isn't available any more. But the Fokker D-VII's, D-VIII's, Eindeckers, Moraine-Saulniers, BE-2's, Bristols, and all the others were fun to watch too. Then, with the mission event — bomb drop, balloon bust, and spot landing, the crowd really got with it.

Sure, there were winners in each event, and they'll be duly reported elsewhere. To me, the real winner was the Jamboree itself, in that it gave the general public of this area a chance to see how much fun sport R/C can be. And once again, the success was such that the entrants got their entry fee returned, and there's money in the bank to get started towards an even better Jamboree next year.

So, with Rhinebeck in the East, and the Western Front Jamboree on the Pacific Coast, it seems to me there's room for you fellows in the Middle West to get something going along the same lines. How about it?

• •

To close out this month's column, I want to extend congratulations to Fred Weaver of the South Bay Soaring Society, for becoming the third member of the League of Silent Flight to achieve the pinnacle of the Soaring Accomplishment Program — Level V. It's a real accomplishment, and I can see that in the coming year, there will be more. Not that it'll be easier — just that more will be trying.

Include me. □

MURPHY'S LAWS . . . AND RC

from page 28

do something else first: To those household chores that are so necessary to keep peace in the family in order to earn flying time off for good behavior, and to the clean up at the end of a hot summer flying session before you can go home to a cold beer.

It's easier to get into a thing than to get out of it: To the local hobby shop where a visit for a 50 cent item ends up as 10 dollars in purchases, and to RC'ers with more than one thousand dollars invested in their hobby.

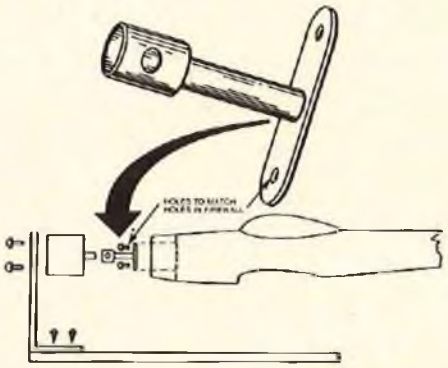
If you explain something so clearly that no one can misunderstand, someone will: To R/C Instructors who have just completed the pre-flight briefing of a new student, and to Don Dewey's Helicopter Flight Training Seminar series.

I have saved my favorite for last. It is especially appropriate for those times when the wife strongly hints that you should do some weekend work around the old homestead — painting, yard work, service the car, etc. — and it's a perfect day for flying. Murphy's Third Law, *If it ain't broke, don't fix it.* This one hit close to home recently when I decided to replace the four-year-old batteries in my R/C system. As an afterthought, I returned the entire system to the manufacturer, telling them to check out all components in addition to replacing the batteries. The COD collect charges of $124.24 were a trifle more than I expected. □

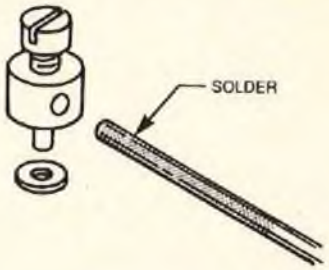
A BETTER WAY

from page 27/26

paint runs and eliminate finger prints. An off-on switch allows the rotation to be stopped at any point that needs special attention. Two engine mount bolts secure the "T" to the firewall.

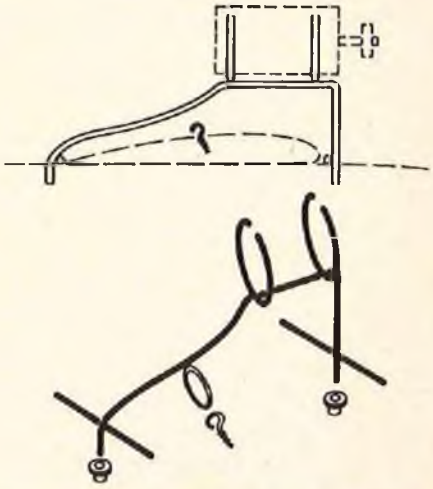


When using the type of connector shown, a smooth wire may slip. By tinning the wire with solder, the holding screw has something soft to sink into.



Scale bullet holes can be made to look very realistic by using aluminum can material. Cut the metal the length into two equal strips and punch appropriate sized holes properly spaced. Glue one strip on each side of the surface to be "shot." Offset the strips to simulate the angle of fire. Fill and feather the edges. By painting silver before the final color is sprayed, you can later pick away the colored paint down to the silver and it appears the bullets chipped the outside paint down to the aluminum going in and out. On thin areas as a sheet rudder, tiny holes can be drilled through to connect the holes.

Here is an inexpensive and easily made adjustable glider power pod for electric motors of the .020 size. 1/16" wire is silver soldered as shown in the drawing. By adding more tension to the rubber band, more positive thrust angle is achieved. Everything is held in place by the wingbands. Brass grommets fore and aft glued into the fuselage produce perfect centering. ☐



RADIO SPECTRUM

from page 22/16

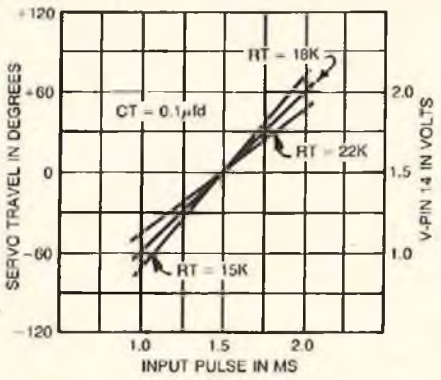


FIGURE 3
SERVO TRAVEL AS A FUNCTION OF INPUT PULSE FOR THREE DIFFERENT CHARGING CURRENTS

addiiton of padding resistors.

All of this may sound complicated but the serious experimentor will see this as a real step forward in servo amplifier design. Now we need a good linear pot in the servo before we can realize the benefits of the expensive linear pots in the transmitter. But hang in there, things are getting better all the time. □

SOARING

from page 15

lated me on my flight and wished me good luck for the rest of the day. I proudly picked up my glider (all in one piece) and headed back to the impound area, walking about ten feet off the ground. What nerves? I was as relaxed as the rest of the guys.

As Round One wore on, I watched the scoreboard . . . and there it was. I actually beat one of my home club friends in the round. He had a zero and I had 55 points!

My turn came for the second round, and one of my new found friends again gave me a hand . . . but I missed the circle completely and ended up with about 90 points. As the 15-minute Cumulative started, the high-start died and we switched to a winch. The winch was something to behold. After watching a few launches, I decided the starter motor was from a Sherman tank and it was powered by four truck batteries lashed in series.

By now all my fears and nerves were gone and I approached the winch for my launch. My club buddy warned me to take it easy on the foot switch. I didn't take him seriously enough when he said

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STATEMENT OF OWNERSHIP MANAGEMENT AND CIRCULATION
(Act of August 12, 1970: Section 3685 Title 39, United States Code)

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A. Total no. copies printed (net press run)	86,229	92,360
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counter sales.	62,000	62,688
2. Mail subscriptions	20,000	24,275
C. Total paid circulation	82,000	86,963
D. Free distribution by mail, carrier or other means, samples complimentary and other free copies.	2,000	2,500
E. Total distribution (sum of C & D)	84,000	89,463
F. Copies not distributed.		
1. Office use, leftover, unaccounted, spoiled after printed.	2,000	2.500
2. Returns from news agents	229	397
G. Total (sum of E and F — should equal net press run shown in A)	86,229	92,360

I certify that the statements made by me above are correct and complete.
Patricia E. Crews

SOARING

from page 176/15

"easy". I watched my plane rising, and the wings developed a terrible dihedral that I didn't build in. (Remember the ruptured rubber band?)

After a hairy flight of about 68 seconds the plane came down in the parking lot. The fuselage was totaled. After putting the pieces in the trunk, I sipped a little of the sauce from the brown bottle and watched as several other models met similar fates. I was completely satisfied with my flying action when one of the members from our club, regarded as the best flyer, landed his sailplane in a tree, about 30 feet off the ground! After about an hour we finally extricated it and I think it lived to fly again.

As the finals were posted and the trophies awarded, I glimpsed the standings. Out of 29 entries, I was 29th. Not bad for my first contest!

As we all prepared to leave, I enjoyed the final bull-session and a chance to join in with the "pros" discussing the events of the day. After all, I wasn't the only one taking my plane home in a box!

It took me a lot of words to get to this point: Sailplane contests are great! Since that first contest in 1974, I've entered 10 or 12 contests. It took me 'til my fourth contest to get out of last place. But I'm moving up. In the last contest I ended up 29th again . . . but this time there were 44 entrants!

I want to make two important points with this story: One, it's fun being in a sailplane contest even if you end up last. There's absolutely no embarrassment and nobody kids you about it. After all, somebody has to come in first and somebody has to come in last.

Second, and most important. Glider Guiders are the greatest people on earth! In my 48 years this is the *only* sport I've been associated with where the competitors help each other to do better, to get more points, to end up higher in the standings. For this reason alone I'm going to continue to go to the contests. After all, with these kind of people to fly with, they might end up encouraging me 'til I win a first place! But even if I never do, the joy of being with those guys is worth every minute of it.

Enter a glider contest? You bet! You're crazy if you don't! □

CUNNINGHAM ON R/C

from page 14

wheel steering. I'm going to reduce the throw, but I was wondering if moving the main gear back a bit would help.

I'm sending a stamped addressed envelope because I'll start building a second wing if you think more aileron

area will help.

Sincerely,
John Zimmerman
Falls Church, Virginia

This really isn't an isolated case. A lot of modelers have tried to take an aircraft that has been designed as a great rudder aircraft and convert it to ailerons with less than overwhelming success. If the aircraft that you are going to convert has low sides, and the wing is relatively close to the centerline of the aircraft, then conversion to ailerons is pretty simple. In John's case, the BD-6 is an aircraft with a very lateral area and sticking ailerons in the wing will not get it to fly like an aileron equipped aircraft. In fact, quite the contrary would be true. When you give the signal for a left turn, the drag of the ailerons will impart an opposite yawing effect to the aircraft, and the result will be that, although you want to turn left, the aircraft is being dragged to the right. If this condition is extremely pronounced, and you are not experienced enough to know what is happening, the model will crash into the ground. And you, the pilot, will believe that you have been the victim of radio failure. There is nothing wrong with the BD-6 as a three channel aircraft, it does its thing really well, but don't try and make something out of something else - - - that simply won't work. In John's experience level, he would have had more success if he had added ailerons to the H-Ray. This aircraft would have accepted them quite nicely. And, while on this subject, you don't have to construct a new wing to add ailerons to your favorite rudder-only aircraft. Just add the ailerons to the trailing edge of the wing, and don't worry about the extra wing area, it won't hurt anything. For most smaller aircraft, the ailerons can be constructed from hard 1/8" sheet. Cover them with plastic film, use any method of hinging, and go about your business. Go back to my series on design to see how large to make the ailerons. When learning to fly with ailerons, don't put in too much movement. 1/8" up and down will be just about all that you will need for a time.

The next problem that John is having is in the nose wheel steering and, again, this usually happens to a modeler on his first trike geared aircraft. Most of the time the average modeler will swing the nose wheel exactly the same as the rudder movement. You don't need much, and small aircraft seem to need much less than larger aircraft. Generally speaking, you hook the rudder pushrod to the outermost hole in the servo arm. You should use a hole half of the distance from the rudder pushrod to the pivot point of the servo arm. If you are using round servo arms with all of the holes on the outer edge, then simply drill a hole half way between. When taxiing your aircraft, you don't need to turn on a dime.!

Moving the landing gear back will not solve the problem. In fact, it may make it worse. By moving the gear back, you make it harder to take the aircraft off, and also increase the sensitivity of the nose wheel by putting more of the aircrafts load on it. An aircraft with the main gear placed too far to the rear must have a lot of elevator applied in order to get the nose to lift off of the ground, and then, when it finally does lift up, you get a violent zoom into the air. It is really a good idea to place the main landing gear so that the wheel axles don't fall much beyond 1" behind the CG of the aircraft. With the fuel tank empty, you should be able to tip the aircraft back onto its tail and it will stay in this position rather than falling forward onto the nose gear. With the wheels in this location, a very smooth rotation can be made on take-off and the aircraft will fly itself into the air.

★

Just this past weekend I got into a discussion with one of my flying friends, Mick Michelson, and the discussion started me thinking that it might not hurt to write about this subject one more time, and that is the problems of taking off with tail dragging aircraft. For the past couple of years, the bipes have been becoming more and more popular, and a lot of modelers have been exposed to

the problem of learning how to take to the air with an aircraft sporting two wheels up front and one in the back. The same holds true for Quarter Midget and Formula I aircraft too, although in a bit lesser way due to the very rapid take-off of most high powered racers.

First, with a properly set up trike geared ship, the take-offs are pretty easy. You can feed in rudder correction and not get much of a violent oscillation. But, this is often not the case with a tail dragger. To begin with, most tail draggers do not have any means of reducing the movement between the rudder and the tail wheel. Generally it is a one-to-one ratio, and almost all fliers use a lot of rudder throw. So to begin with, the tail wheel moves too far in each direction. This is probably the largest source of trouble. But let's back up a bit and take a look at the complete set-up.

It is most important that your aircraft tracks straight and true all by itself. By that I mean that, if you let it roll down a slight incline, it would roll straight ahead and not turn right or left. Make sure that the landing gear is exactly square with the fuselage, and that the wheels are not angled out or one wheel angled out, or in, more than the other. The ideal set-up is for just a slight toe-in effect of the wheels. Next, be sure that the wheels

are free running, and are not binding on the axles. Now, check the tail wheel. Is it square with the fuselage, or does it turn a bit one way or the other? Any of these things can cause a really bad problem in take-off. Now, give a look at almost all of the modern racing aircraft. Normally their landing gear is not too widespread, and is pretty well fixed as to location. Normally, the wheel axles are at, or just a bit behind, the leading edge of the wing. Okay, so far, it's just like your tail dragger.

How about the tail wheel? What tail wheel? They all use a simple wire tail skid so that when a slight correction is fed in at take-off, the tail wheel won't make the correction just that much worse. So, if you are having trouble taking-off your tail dragging aircraft, the first thing to do is to check the landing gear, and then the next thing to do is to remove the tail wheel, and let it ride just on the tail wheel wire. Chances are that this will correct a lot of the troubles. If not, then remove this wire altogether and replace it with a skid that does not move when the rudder moves. Or, if you like a wheel on the aft end, add a non-steering wheel at the tail. The taxiing will be a bit harder, but you may gain your reward with much better take-offs without the problem of the aircraft going ape everytime you try and get it airborne.

Another factor in the flying of tail dragging aircraft is you must get the tail at a flying attitude before take-off. Are you a light plane pilot, or have you ever watched a light plane take-off? Almost the first thing that happens to the aircraft is that the stick is pushed forward to bring the elevator off of the ground to a level attitude (the same relative position that it would assume if it were a trike geared light plane). Then, as flying speed is gained, the wheel is gently pulled back and the climb is begun, but not before flying speed has been reached. Too many modelers try and make their tail draggers take-off with the horizontal stab at the low, or stalled attitude. It simply won't work. You must get your tail flying before the rest of the aircraft will get into the air. (Okay, kick that one around. All you guys with flying tails line up over there.) Now, it is pretty hard to hold in just the correct amount of down elevator to get the tail to rotate to the level position on a model. In fact, it takes a great amount of skill, and may be even a bit harder to accomplish with the smaller models. But, you can do it with trim. You can experiment with a bit of down trim cranked in at the control box to give you this tail lifting condition at normal take-off speed. Frankly, I have never had a bipe that didn't need just a bit of down trim in the elevator all of the time to compensate for the extra amount of lift generated by the top wing. This also seems to hold true for the cabin type of tail dragger, as they normally need a bit of down trim to get them flying straight

and level. You will need to experiment a bit, but if you really want to improve the take-offs of your tail dragger, you can do it. Another method of helping to take the squirrels out of two wheels is to have a rather long tail wheel strut, thus bringing the horizontal stab more in line with its normal position at take-off. A really short coupled aircraft with a high main gear and short tail wheel is a beast to get into the sky.

Another question that has been kicked around is "Why do the old timers get into the air so easily? They are all tail draggers, and look at the position of the main gear. Why not put the landing gear way out in front like they do?"

Well, first of all, the real reason for that landing gear being stuck way out in front on the old timers is to save the prop from damage. Back in the early days, the only way to get a prop was to carve your own, and after all of that trouble, you sure didn't want to break one gliding in for a landing, hence the wheels sticking out in front of the prop. Now, if you have watched an old timer take-off, you realize that the tail comes up right away because it is a lifting section, and it begins to fly at about the same time that the wing does. The roll on the ground is quite brief, and the aircraft is airborne. Also, the wings utilize high lift airfoils, unlike the normal RC aircraft. If we tried to locate the landing gear of our RC aircraft in the same relative position, you would find that, by the time the aircraft got up to flying speed, you would be ground looping all over the runway. If you have ever seen a Telemaster take-off, you will realize what I mean by the tail flying as soon as the wing. With this aircraft and its lifting stab, you can make a take-off in just about two feet. It is a bit strange trying to land one, as the landing attitude is different from any other aircraft that you might fly. When it comes in, the tail is high and the landing is on the main gear. When it has finally slowed down, the tail will settle to the ground, but don't try to drop the tail down with up elevator because the aircraft will lift off and fly again. I have tried and tried to make a three point landing with my Telemaster, and I just can't seem to ease the tail down enough to touch all three wheels at the same time. If I ever get around to designing a big bipe, which I want to do one of these days, I plan to use just a little bit of lifting stab section just for the purpose of making the take-off run that much easier.

If you are having trouble with your two wheeler, or are thinking about building one, give some thought to what I have been telling you about getting the horizontal stab up into the air quickly at take-off. And, especially if you're having a hard time getting your bipe to track straight on take-off, get rid of the tail wheel and see if this won't help a lot.

Until next month, good luck and good flying. □

ENGINE CLINIC

from page 12/10

afraid of the "Mickey" intake timing arrangement that wasn't really that necessary. Advance and retard of the spark timing had more effect on starting ease than the intake timing. All ignition engines (with the exception of racing engines) were started with the spark retarded. This eliminated kickback, etc. Changing the intake timing for starting purposes was of little value - - - a gimmick that didn't pay off as it had no real advantage. The Barkers were made by the Barker Engineering Company in Cleveland, Ohio. I do not know who the actual designer of the engine was or anything of the history of the company. If any of our readers should have some information as to the designer, etc., I would appreciate hearing and passing the information along.

Today the Barkers are all good collector items — especially the pre-WW II engines which, evidently, were made in small quantities. The post-war Man-ul-matic is also a sought after collector item but a bit easier to come by than the pre-

war engines. Finding a Man-ul-matic with a good crankcase is quite difficult. As most of you know, magnesium is extremely corrosive. Corrosion has taken its toll of many old time engines that were made of magnesium — Barkers, Pacemakers, Ardens, Bantams, etc. The exact number of Man-ul-matics manufactured is not known. The serial number on my own engine is #1564. I have seen engines with low three digit numbers but none with serial numbers over 2000 so I would think it safe to assume that something less than 2000 engines were produced.

That about covers what I know about the Barker. Let's get to a few letters.

Dear Mr. Lee:

I'm writing this note in reference to the problem Roger Phillips mentioned in the September issue concerning his O.S. .60 Goldhead.

I had the same difficulty (not being able to richen up the needle valve) with my .60 Blackhead. I tried all of the suggested solutions – replacing fuel lines, clunks, doing pressure tests, even replacing the carb with a new one from O.S., etc., but nothing seemed to help. It wasn't until a month or so ago (after a year of trying) that I finally found the answer.

As you know, with this type of carburetor, there is an adjusting screw for the low speed idle located in the throttle rotor (O.S. calls it their "mixture control valve" – and only says to use it for idle mixture adjustment). Apparently many of these carburetors have been incorrectly set at the factory. I found that by opening this screw 1/2 turn, all of my needle valve problems disappeared. It has a very good range of adjustment, and I could even flood the engine by turning the needle valve too far out! With minor adjustments, the idle was very good. Of course, if the screw is turned too far out, then there is a constant problem with too rich running – if it will run at all.

In talking with my dealer (makes it sound like I'm hooked on "dope", doesn't it?), he says that this is an occasional problem with these engines, but is obviously easily taken care of. I only hope that I haven't cooked my engine too badly before finding this out.

Anyway, thanks for the great column, and keep up the great job! I hope I've been of a little help.

Ted Sander
Minneapolis, Minn.

Many thanks, Ted. Yours is the kind of letter I like to receive as it doesn't take any brain work on my part. Any of you other guys out there who have solved your own problem, don't be bashful! Send in your solutions so we can share them with others.

Dear Mr. Lee:

Having just purchased Volume II of The R/C Engine, I came across an item concerning the use of water cooling on aircraft with tightly cowled engines. You stated that it wouldn't really be too practical since a pump and water tank along with head water jacket and tubing would have to be added. The way you wrote your answer, it sounded to me like the major problem was that of the water pump. Now the question: would the new Perry Pump/Regulator be suitable as the water pump for a "water-cooled" model aircraft engine?

Not being too involved in the scale end of flying, this was simply an idea that I felt might be of use to other fliers who are scale fliers.

If you feel that this idea has any merit then please feel free to print it if you so desire. I might add that your column in RCM has been a great help to me ever since I began flying five years ago.

Sincerely,
Ernest Spinks
N. Las Vegas, Nevada

As far as water cooling a model aircraft engine, the pump is the least of the problem. You have to have a coolant tank and radiator, both of which would add a considerable amount of weight to a model, more than their use would jus-