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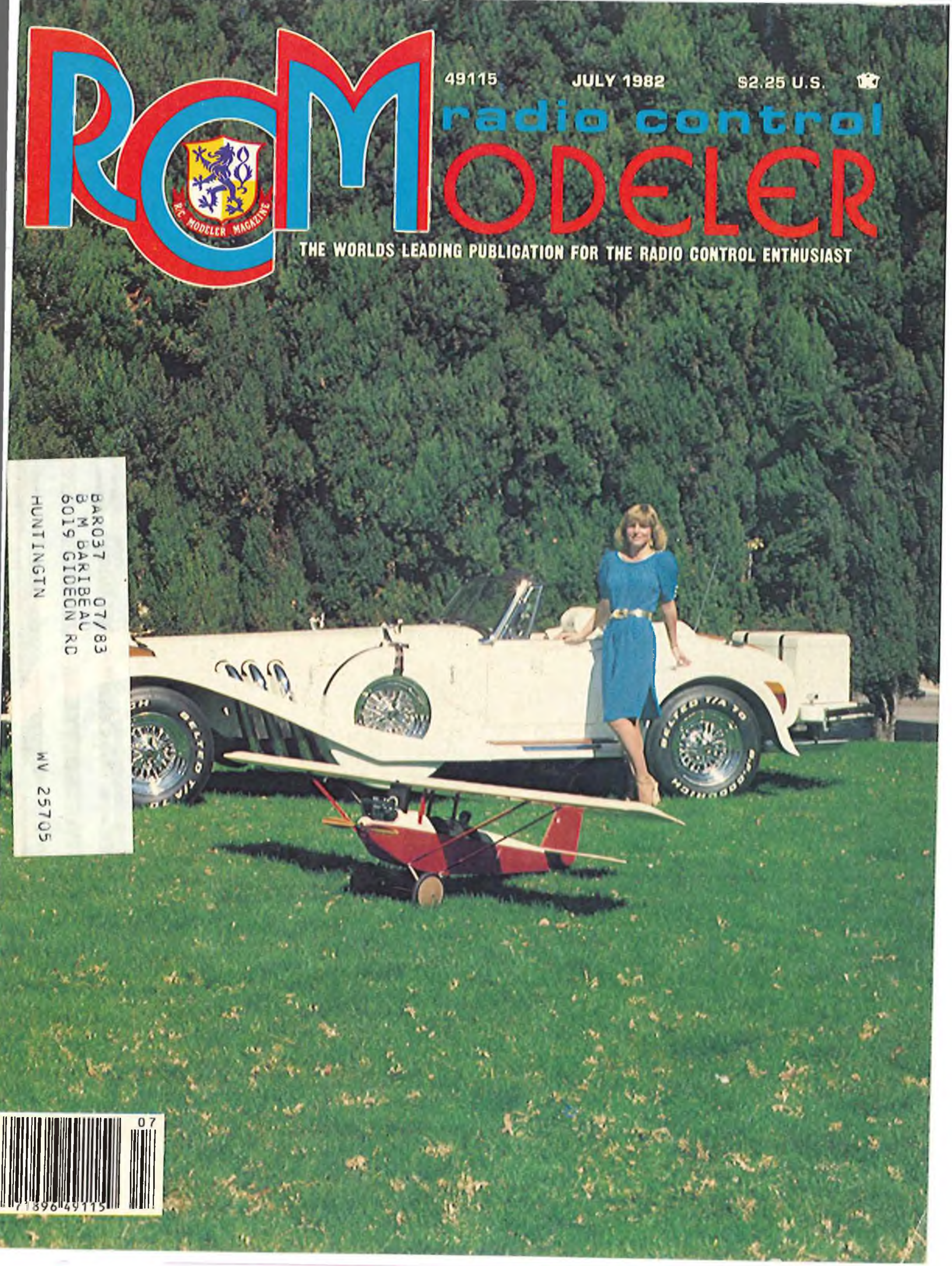

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This Month's Cover
The 1/4 Scale .60 powered Pietenpol Air Camper, designed and built by Gene Wallock, is one of this month's feature construction articles beginning on page 56. Lovely Miss Wendi Lipka is shown with a fine example of automotive craftsmanship designed and built by a long time modeler, Clarence Johnson. Kodachrome by Dick Tichenor.

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FROM THE SHOP

Don Dewey

Bewitched, Bothered and Bewildered

We found it most interesting to receive a 16 page mailing of Competition Newsletter dated May 1982 with an explanation that there wasn't space available under present conditions for this AMA information to be included in Model Aviation.

Each month we, and every other publication, are faced with available space, priorities, costs, and a myriad of other pertinent considerations. The point is, just what is the purpose of our, or any other magazine?

Just prior to the CN we received another 8 page mailing entitled AMA National Newsletter. Its distribution is:

Circulation: Editors of AMA chartered club newsletter, the Model Press, AMA's Executive Council, Associate Vice-Presidents and Spec. Int. Groups.

Its purpose is:

This publication has been created to foster improved communications between newsletter editors of AMA chartered clubs and AMA's national officers (the President, Executive Vice-President, and Executive Director). By reprinting significant excerpts from various newsletters and offering timely messages from AMA's officers, it is intended for this publication to broaden the distribution of information to and from AMA clubs. Editors are encouraged, therefore, to reprint items from this publication in their own newsletters.

Very good! Then, on page 2:

What You Read Elsewhere: From time to time various magazines other than AMA's own are inclined to publish so-called 'open' letters, typically containing some sort of complaint or disagreement with AMA policies or actions. Unfortunately AMA officers are rarely contacted in advance of publication to offer another view of the same subject, so the open letter appears alone and AMA stands condemned for whatever the writer chooses. If a rebuttal is attempted after publication, the nature of the magazine business precludes appearance less than 2 months later, much too long a delay to have any effective result. In other words, the damage has been done and stands unchallenged long enough so that it effectively becomes the gospel truth, almost impossible to refute.

A word to the wise suggests, therefore, that when and if such a statement appears without any indication of whether anyone has been offered the opportunity for rebuttal, the presentation may well be unfair and something much less than the whole story. If so this newsletter may provide the means to offer a different perspective.

This brings to mind all sorts of thoughts such as: do as I say, not as I do; censorship; rights of membership to question; truth determined by whom; Big Brother; motherhood; etc.

No! We are not going to war with the AMA or anyone. We will, however, question anything both from the viewpoint of the press and as long-time members of the AMA.

• •

Ron Busch, Number One Honcho at Balsa USA, discovered something the hard way. Please read and heed.

Dear Don,

Just a note for your column.

When trimming or cutting ABS with a Dremel cutter, be sure to have good ventilation and don't hold your head directly above your work. The Dremel cutter will melt the ABS, giving off fumes which are very bad for your lungs.

I was doing this and found I suddenly couldn't breathe — it took about two minutes before I could catch my breath. Needless to say, this was a frightening experience and makes one wonder what the long range effects might be.

Sincerely,
Ron Busch

The Big Bird Too flys all around the world. Constantin Arion sent in this photo shot at an R/C field at Kifissia, Greece. The BB Too is in the foreground and check the Cessnas strung out across the field. Big Bird Too is RCM Plan #849.

• •

As a result of a conversation between Jimmy Robertson and Dick Tichenor at Toledo, Jimmy sent in the following letter concerning Lou Ross. I am sure that many of our readers remember Lou as the designer and manufacturer of the fascinating line of Ross engines. He produced single cylinder, in-line and opposed twins, V-4's, flat fours, and flat sixes; each production item was a precision work of art.

Dear Mr. Tichenor,

It was good visiting with you at the Toledo show. It seems that every year the show gets bigger which is great! It was kind of you to listen while I told you some of the history of our dear friend, Lou Ross.

As background, Lou Ross who was 68 years old at the time, was driving a motorcycle in Tucson, Arizona when a van ran a red light and he hit it broadside. He was thrown over 85 feet and his body was completely crushed. He had multiple fractures of the skull, broken arms and ribs, and both legs were crushed. He was in intensive care for 18 days and on the critical list for over 5 months. Only by the Grace of God is he still with us today. Once he regained consciousness, his mind was as alert as ever. His arms and head healed but the legs have given him lots of problems.

About 6 months ago, I visited with Lou and they were getting ready to put a pin in one leg. After about four months, it was determined that this was successful. In the near future, they will put pins and a plate in his other leg. He is very alert and outside of the leg problem is very active. Later, again I flew out to visit with him. At that time, I discussed the Ross crankcases that I had from my original buy-out. (See R/C Modeler, Feb. 1979, Engine Clinic.)

I now have Lou Ross assembling the handful of Ross In-Line Twins, the four cylinder and the six cylinder. His son, Cris, is doing all the precision machine work and Lou is personally assembling these engines. He put all 3 engines through a very severe in-depth test. They passed every phase. My decision of not going into production of Ross engines as stated in R/C Modeler of February 1979 still holds.

Lou says these are the finest engines he has ever produced because with the Northfield Ross, other people assembled the engines. He is hand-engraving his own signature on this handful of engines.

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FLYING LOWE

Don Lowe

Greetings once again from sunny Florida! As I write this late in March, the Florida summer is near at hand. The winter was absolutely super, and I feel we picked a good year to move south. Contact with friends in Ohio indicates a very tough winter; glad I missed it.

I have lots of time to fly --- in fact, most every day is a flyable day. I'll reserve judgment on Florida, however, until I've survived one of its summers. It was a big kick attending pattern contests in November, December and February.

Turn Around:

I have had a chance to discuss the new FAI "turn around" pattern with a number of people including Jerry Nelson. Jerry is a real innovator and his list of modeling credits is impressive. One might include in this list his influence on pylon racing, realistic aerobatics, now exemplified by the I.M.A.C. organization, plus, of course, his years of planning and running the Circus Circus Tournament of Champions. Jerry feels strongly that model aerobatics should simulate full scale aerobatics to the greatest extent possible. This includes not only the type of patterns flown but also scoring methods. To that end he is in the process of formulating a proposal to the AMA and FAI. His ideas are in rough form at present; however, I twisted his arm to draft his preliminary thoughts for your benefit.

Jerry writes: *It is in my opinion that there is a need to improve the basic design concepts of R/C aerobatics to allow more flexibility and to increase interest in R/C aerobatics; also to establish a uniform system of downgrading maneuvers.*

I propose that a new system of R/C aerobatics be established based on the full scale Aresti system. The system is very well-established and internationally known by the world aeroclubs. The system in its basic form identifies all possible aerobatic maneuvers, assigns a difficulty factor (K), and has created a graphic or short-hand description of the maneuvers. The difficulty of an aerobatic flight is determined by the individual K of the maneuver and by the total K possible from all the maneuvers flown in a flight schedule.

Different levels of competitions can be provided for by using a maximum K possible per maneuver, total K possible per flight, restrictions of the aerobatic zone, and by the design or specifications of the aircraft. Consider six skill levels of competition as a possibility:

Level I. *Maximum K per maneuver of 15, total K of 100, any type of FAI aircraft, no aerobatic zone, only fly-by maneuvers.*

Level II. *Maximum K of 25, total K of 200, any type of FAI aircraft, 120 degree aerobatic zone, turn around maneuvers.*

Level III. *Maximum K of 30, total K of 300, any type of FAI aircraft, 120 degree aerobatic zone, turn around maneuvers.*

Level IV. *Maximum K of 35, total K of 400. Any type of FAI aircraft, 120 degree aerobatic zone, turn around maneuvers.*

Level V. *Maximum K of 40, total K of 500. Restricted semi-scale aerobatic type aircraft .90 powered with maximum wing area of 1000 sq. inches, 120 degree aerobatic zone, turn around maneuvers.*

Level VI. *Unlimited K, total K of 600. Restricted aircraft like Level V, 120 degree aerobatic zone, turn around maneuvers.*

With the different FAI skill levels, aeroclubs around the world can organize competitions to fit their local interest. Level I would be a club contest type event. Level V would be similar to our AMA Expert class. Level VI would be like our Masters class and also be used for National and World Championship events.

As time and experience dictates, the Maximum K and Total K of the various levels can be adjusted as required, but they still provide an easily understandable system of international competition both on a club or World Championship level.

The Aresti system provides a very detailed system of evaluating or downgrading maneuvers. Knowing the exact deviations or errors of a maneuver, the system will allow each judge to come up with the exact score. Very extensive training programs and teaching aids, as well as computer programs for scoring, are available from the full scale aerobatic associations.

Going to the Aresti system cannot happen overnight. It will take some time for the aerobatic community to fully understand the system. However, it was proven at the 1980 Tournament of Champions that the Aresti system can be used with excellent results with relatively little time for the competitors to get used to the system.

With the change to the Aresti system, it would be a good time to start a

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Stu Richmond of Orlando, Florida, and his "Cork Screw." See column for details.

SUNDAY FLIER

Ken Willard

Last Saturday and Sunday I spent two weeks in Toledo. Uh-h, that didn't come out quite right. Let's try the opening once more.

I was in Toledo last Saturday and Sunday. It seemed like two weeks. Hm-m-m. That's not really the way it sounds either. One more time.

I was in Toledo last Saturday and Sunday. So many things happened, they would normally fill two weeks.

That's better. Didn't want to insult anybody.

So what all happened? First off, how about this for weather? Arrived in Toledo Friday night --- nice spring weather. Got up Saturday morning; mild --- almost like late spring. Went across the street for breakfast with Ed Whyte and Charlie Bauer. While we were eating, we looked out the window at the clouds rolling in. Finished breakfast, went outside into snow flurries. Drove over to the Arena. Got out of the car into a fierce wind and blowing snow. Temperature dropped from around fifty degrees to about thirty in an hour's time.

And that's the way the weather went, not only Saturday, but Sunday morning as well. Then, driving back to

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Photo #1

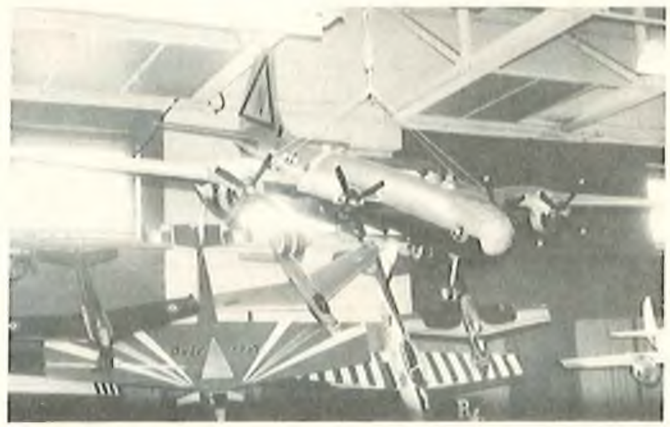

Photo #2

Photo #3

Photo #4

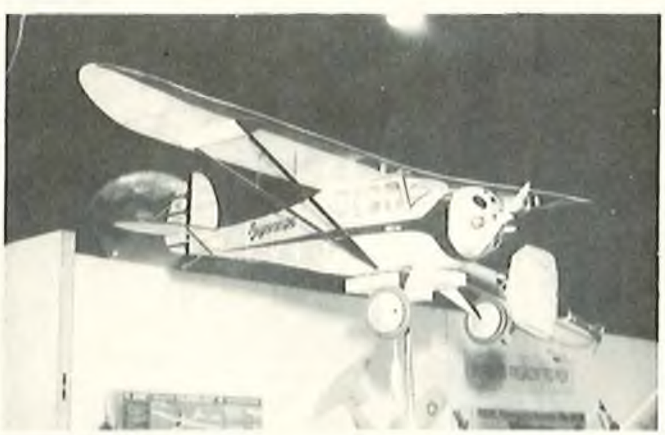

Photo #5

Photo #6

Detroit with Bob Petro, the clouds broke, sun came out, and it was a different day. Oh yes, the wind was still blowing, but in those two days we had about two weeks of weather!

On top of that, I rushed around the Arena Saturday and Sunday, looking at all the good stuff on exhibit, talked with more modelers than I normally would in two weeks, and got more ideas at the same time.

So that's why two days in Toledo seemed like two weeks as I look back on the weekend.

Okay, so what was new at the Weak Signals annual bash? So many things that it would take a book to cover them all, but most of them were not really new in the sense of nothing like it ever having been around. Instead, they were variations on prior developments, improvements on existing units, and stuff like that. All you Sunday fliers will get more detailed reports from the "official" reporters of the various trade magazines. I'll fill you in on what caught my attention.

No way could you avoid seeing the big (and I mean **big**) models. They dominated the scene simply by sheer size. Take a look at the AeroCommander in Photo #1.

Larry Stillo, who lives in the North Canton, Ohio area, says it will weigh around 75-80 pounds when completed. It has two 4.3 Titan engines at 6.5 h.p. each. The fuselage is about 10½' long, all planked with 1/8" balsa over polyurethane foam. Wing span is 14¾'. The wing is planked with 1/64" and 1/32" plywood. Retracts will be homemade.

What a project! As I said to Larry, "You just about bought out the whole eastern forest of Yucatan balsa to finish that job!"

The biggest model was a B-29, with four Kioritz engines. The model spans 17', weighs 145 pounds, and uses 18 servos. Photo #2 shows how it looked, hanging over the crowd.

Just being big isn't enough. A model also has to be beautiful. And the one I liked the most is shown in Photo #3.

Norm Woods built this absolutely gorgeous model of a Sopwith Pup. Norm lives in Ann Arbor, Michigan --- and that's all the information that was given. The model looks to be about 1/3 Scale, and the photo doesn't do justice to the excellent workmanship.

There were more biggies, but that's enough for now about these "giant miniature scale" models, as the IMAA calls them. Sort of a self-cancelling identification, it seems to me. I still think they're "grande" scale.

So let's look at a couple of models that really turned me on. Dick Sprague of Livonia, Michigan, displayed an original design twin engine flying boat, which he calls the "Sea Scooter." (Photo #4.) It spans 64", weighs 9½ pounds, and is powered by two .25's. Scale is 1/6. Dick designed it as a possible homebuilt 2-place aircraft with two 65 h.p. engines. Looks good, but it also looks like a couple of spray rails would help keep water from getting into the props --- and maybe the tip float struts could be a mite shorter to prevent waterlooping on take-off. Maybe Dick will send us a flight report.

Photo #7

The other model that attracted me was this "Megowcoupe" by Flyline Models, shown in Photo #5.

Why is it called a Megowcoupe, instead of a Monocoupe? Because Herb Clukey took the Megow rubberband model and scaled it up to this size — 46" span. It's powered by an .049 and weighs around 15 ounces — a classic.

Sterling Models did a unique job of one upmanship. They displayed their new scale model of Chuck Andrews "Real Sporty," and in case there was any question as to the scale accuracy, they also had Chuck Andrews there with the full size record holding Real Sporty. Photo #6 shows Betty Boyle standing proudly under the Sterling model and in front of the real thing. Interesting fact --- the wingspan of the Real Sporty is almost the same as that of the B-29 model!

Bob Hisey, one of the show directors, was conned into getting into the cockpit of Real Sporty just to prove that it really wasn't a giant Stand-Off Scale job! (Photo #7.)

Part of the attraction of going to the Toledo show is the chance to see so many of your friends and acquaintances. In many ways it is the biggest factor in going.

One of my good friends (no pun intended) who I saw in Toledo was Walt Good. Walt was glad to see me, too; even more so than usual. Remember when I asked all you Sunday fliers to write a note of thanks to Walt for all he's done for us? Well, the response exceeded anything I had expected. Walt says so many cards and letters came in that there is no way he can possibly thank all of you for writing, so he asked me if I would do it for him. I told him you modelers didn't expect a reply, but, gentleman that he is, Walt started to answer the cards until the flood of mail got too big for him to handle. So, to all of you who wrote, Walt says, "Thanks very much. It's nice to hear from all of you." I'll add my thanks to all of you as well. It's nice to belong to such a fraternity of friendly and appreciative guys and gals (yes, some of the letters were from women).

One of the highlights that I enjoyed was attending the International Miniature Aircraft Association's second annual birthday party. Yes, I did get an invitation, even though I don't usually fly the big models. As I told Don Godfrey, "If they weigh more than 6 pounds --- or less than 110 pounds (the lightest RPV that I flew) then I let the other modelers get their kicks from the "intermediate" size jobs. I like 'em small, or else **really** big."

But I got trapped. No, I don't **think** it was a put up job, but when it came time for the drawing of the door prizes, guess who won the first drawing? Yep, I did; and when I opened it and showed it to the crowd, they yelled, "Now you gotta' build a Quarter Scale!" The prize was one of Williams Brothers Quarter Scale pilots. My reaction? I told them, "That's like giving a guy a radiator cap and then telling him he's gotta' build an automobile!" Anyway, Dave Brown gave me an idea he had --- so we'll see how it all turns out. Wait'll next year.

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BIG IS BEAUTIFUL

Dick Phillips

In the May issue, we printed a photo and description of this beautiful Stearman. The builder, Robert E. Bartow of N. Miami, Florida, name was omitted. Our apologies to Bob.

I'm sure most of you are like me, from time to time you see a picture of an airplane and the thought crosses your mind, "Now **that** would make a really fine big model." Those of you who are EAA members should have a long, lingering look at the cover of the August 1981 issue of that publication. Matty Laird's Super Solution (well, okay, so it's a replica!) is a big, barrelchested airplane and one which could hardly help but look good in either 1/4 or 1/3 Scale. Inside the issue are more pictures covering the building of the replica and, the piece de resistance, a cutaway drawing of the airplane. The cutaway is a preview of a large poster to be available from Jim Newman and Associates, 4 Cleveland Terrace, Hobart, Indiana 46342, about the time you read this. The price has not been announced as this is written. Shortly thereafter will be made available a set of general arrangement drawings for the Super Solution based on the original construction drawings and not from factory three-views which are notoriously inaccurate. A later project will include a set of color profiles and that, model builders, amounts to about the best documentation you are likely to find on any airplane, of any era. Those of you who have an attraction to the great race planes of the 20's and 30's will want to have a handful of this material as it becomes available. I know of one large Solution already under construction. I would bet it will fly well and look great. I'll be interested in hearing of any more of them in the works.

The Californians are an inventive lot. Chuck Fuller, Seaside, is currently working on a fiberglass AT-6 fuselage and in a recent letter mentioned that he would try to have an extra fuselage along with him this summer when he attends the many rallies taking place there. If you happen to be a T-6 addict, watch for Chuck at these events; if you're first in line you may be able to pick up one of his molded T-6 fuselages. He tells me he has no plans to market a kit and all he will make available is the fuselage and canopy for the big WWII trainer, plus a set of plans. Chuck will be using a set of Annco retracts in his, along with a 3.15 Kawasaki which should make a good combination. Chuck's Stearman models sound particularly like a T-6 in the air and the use of the powerful Kawasaki engine should be an ideal combination. Those of you who attend the California meets this summer will likely see the big T-6 in the air. Chuck has promised to keep us

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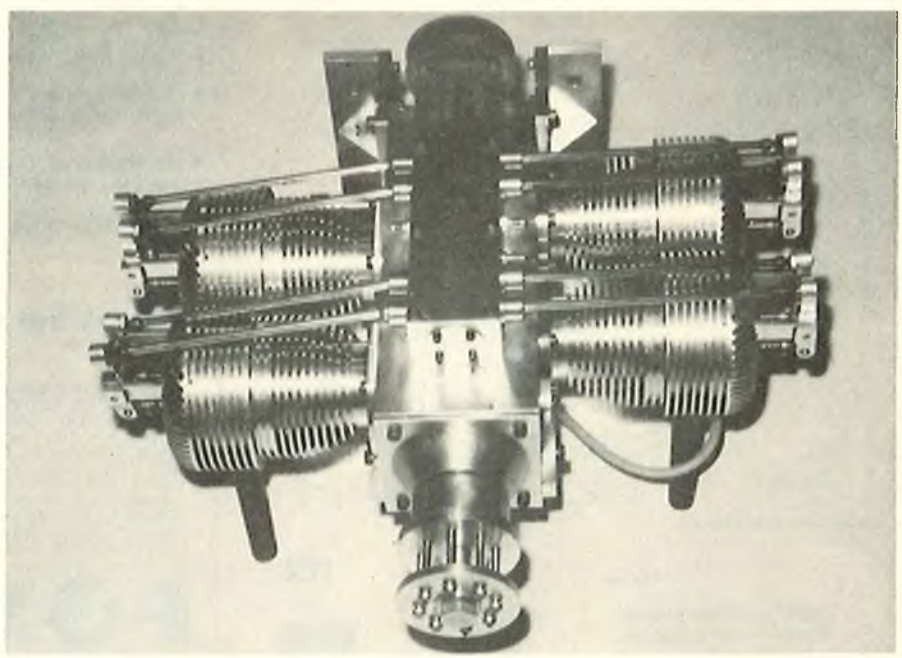
Chuck Fuller of Seaside California, will have glass fuselage and canopy available for AT-6 Texan this summer. Not a kit but a great place from which to start.



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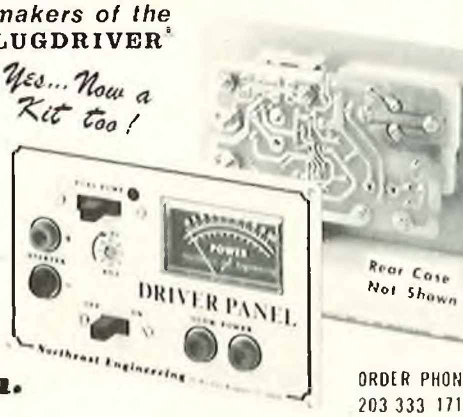

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BIG IS BEAUTIFUL

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informed of his progress so I will be expecting to pass along more information on the project in subsequent columns.

Back in February, I had the chance to spend a few days in Nashville, Tennessee. For me, it was quite a contrast to get on an airplane in the morning with the temperature at −10°C and then to get off another plane later that day to bright sunny skies and a temperature of 68°F. If you think it was difficult to get back on the plane to return, you sure got that right! I was staying at the Opryland Hotel and it was a delight to experience the polite attendance of the people there. It's a gorgeous hotel and their staff are the nicest people I've seen in the hotel business in a long time. Not to mention that some of the prettiest girls in the world live and work in Nashville. It was a really great experience.

Bob Hoskins, whose two cylinder in-line engine was mentioned here a while back, lives near Nashville and I had the pleasure of spending Sunday afternoon with him and his family. Mrs. Hoskins makes a great cheesecake and a piece of that after dinner capped off a great day.

Bob has not been sitting idle since we last heard of him here and his latest mechanical marvel is a four cylinder, four cycle opposed engine of 5 cubic inches. Bob has used the same cylinders as were used in the two cylinder in-line and the four cylinder is a bit heavy at 14 pounds, but its performance is startling to say the least. It swings a 24/16 prop at over 6000 rpm and the prop blast from it is uncomfortable to stand in. The four is a glow engine as was the in-line twin and, at full bore, it can gobble up a good deal of fuel, so Bob is planning to have a go at producing a gas fueled version if this proves practical. A flat twin is also in the plans for the future and all of Bob's engines will use common parts where possible. The pistons, cylinders, rods, rings, bearings and a few other items such as valves, pushrods, and so on, will all be standard parts and the parts will be interchangeable as Bob is holding very fine tolerances on parts. He makes every part of the engine himself in his own workshop and has designed and built a number of ingenious jigs and special tools with which to produce these engines. With over 30 years experience as a machinist, Bob is a very meticulous craftsman and his work is a wonder to

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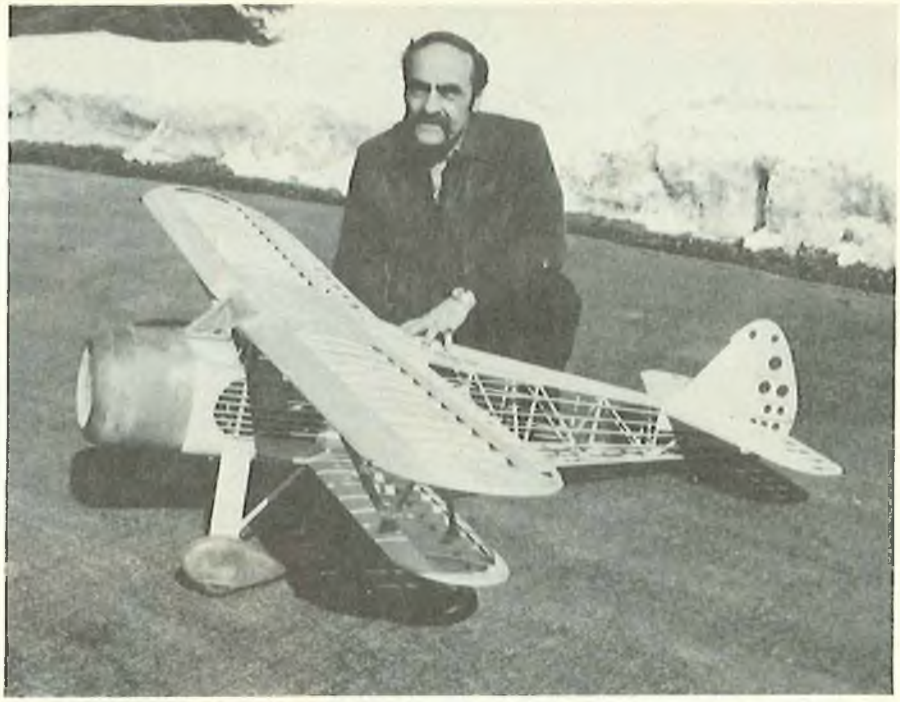
Dario Brisighella and Waco ARE. Plan available along with cowl and pants. As shown model weighs 14 pounds. Simple construction and strong.

the eye. His background includes some years as an A & P with United Air Lines in New York and a few years back he decided to move south both for better weather, and for a better environment for his three attractive youngsters to mature in.

The workmanship in the engines is enough to boggle the mind of the non-machinist and the performance I saw that Sunday afternoon in Nashville with the flat four was impressive. It starts well, runs at idle for long periods of time with no tendency to overheat (I could hold the cylinders with the bare hand after a full tank of fuel, much of it at idle, quite comfortably).

The four presently uses a Perry carb for each cylinder, but this is a bit difficult to adjust properly for the full range of rpm, so Bob has designed and built an intake manifold and will be switching to a single carb in the near future.

No date of availability or price was available at the time of my visit with this master of the mechanical, but a note to Bob (Bob Hoskins, Rte. 1, Box 120, Castalian Springs, Tennessee 37031) will get you any additional information you might want. Bob's intent is to produce a small number of the engines (possibly 100) for sale and after that happens, there won't be any more. Judging by the past performance of such items, they will increase in value forever!

Returning from Nashville, I had to pass through Chicago, which in itself, bouncing around in turbulent and cloudy conditions in a holding pattern over the world's busiest airport, is not my idea of having fun! Twenty minutes of that and I was really pleased to see us land. It was a bit of a 'white knuckle' flight, especially the last twenty minutes and I was glad it was over. It's not hard to believe that O'Hare is the world's busiest. As we were taxiing in to the ramp, there were five other landings, six take-offs that I could see from my window seat and innumerable aircraft moving on the taxi ways. Busy is not the half of it!

As if having had a visit with Bob Hoskins in Tennessee wasn't enough, I was met at O'Hare by a great friend and superb modeler, the guy who invented overbalancing the Quadra engine, Dario Brisighella. We drove the 90 odd miles to Milwaukee in Dario's new toy, a customized Dodge van and there wasn't a moments silence during the time we were traveling! And rather than try to keep things in chronological order, I'll try to keep it all together.

The Quadra. As mentioned here earlier, there is a new needle bearing con-rod which is a great improvement on the old and which is available as a replacement for the old bushing model. Replacing the piston/rod assembly (and they must **both** be replaced) will provide about 200 additional rpm depending on the engine. Cost is $16.50 on a "do it yourself" basis, or $29.95 if you have the old master do it for you.

The flywheel overbalance (without which I would not even start a Quadra) is now worth $19.00 and includes return postage. Send flywheel **only**. Dario's other services and products are included in detail in his catalog sheets which you can get by sending Dario an SASE at: US Quadra, 1032 E. Manitowoc Ave., Oak Creek, Wisconsin 53154.

The new engine (50cc) should be available as you read this but no price or actual shipping date is available as I write this.

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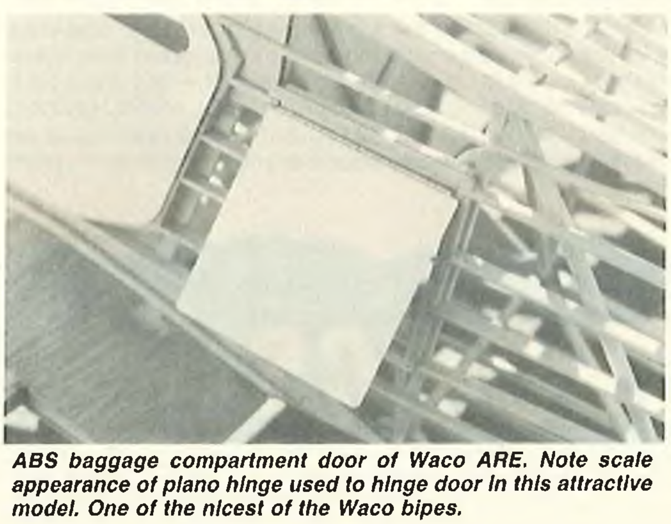
ABS baggage compartment door of Waco ARE. Note scale appearance of piano hinge used to hinge door in this attractive model. One of the nicest of the Waco bipes.


Novel treatment of windshield uses fiberglass frame assembly for ease of fastening windshield in place and also adds to great appearance of model.

WACO AIRPLANES AGC-8

By Fred Reese

To our knowledge, this Waco AGC-8 is a first time presentation of this aircraft in a model publication. Drawn to a scale of 1¼" = 1', this .10 to .25 powered aircraft is a must for the scale builder.

The classic Waco cabins of the thirties epitomize an era of luxurious biplane aircraft. This sport scale model of the handsome AGC-8 is designed for .10 to .25 engines.

The Waco cabin biplanes originated in 1931, and were developed until 1940 culminating in the E series; the SRE being the most famous. After the war, a new W series was started and one was built, but development costs and a slumping post war market ended the project and Waco closed its doors in 1947.

The Waco cabin biplanes were conceived with goals of low cost, good small field performance, and ability to carry four passengers in comfort. The original design goals were exceeded and the 1931 QDC went into production. Thirty-seven QDC's were sold in 1931 along with 149 open cockpit airplanes; an outstanding success for a time when many companies were failing. 1932 to 1934 brought improvements to the model C along with more power and better performance. The 1932 models were the OEC and the UEC, UIC in 1933, and CJC and YKC in 1934. In 1935, Waco announced a new custom cabin series, the YOC, UOC and CUC. These were all new airplanes with features that made them outstanding four place luxury airplanes. The older YKC, UKC and CJC became the YKC-S, UKC-S and CJC-S to designate them as the standard cabin series. The 1936 C-6 Waco custom cabins were further refined with a new landing gear, cowl, and a larger fuselage. Depending on the engine chosen, the models were ZQC-6, AQC-6, EQC-6 or DQC-6 and the standard cabin model was YKS-6. 1937 brought a new longer fuselage and a wider landing gear for the C-7 models designated DGC-7, EGC-7 and ZGC-7. The standard cabin models for 1937 were the YKS-7, VKS-7 and UKS-7.

The 1938 Custom Cabin or C-8 model is the subject of this article and the last of the custom cabin series. The C-8 models had a 12" longer fuselage than the 1937 models and had better appointments and performance. At the same time a new model N went into production with tricycle landing gear using the C-8 airframe. Yes Martha, you could build the AVN-8 from these plans if you wanted.

WACO AGC-8
Designed By: Fred Reese

TYPE AIRCRAFT
Sport Scale 1¼" = 1'
WINGSPAN
44" Upper
29" Lower
WING CHORD
7" Upper
4¾" Lower
TOTAL WING AREA
408 Sq. In.
WING LOCATION
Cabin Biplane
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1¼" Upper
3/4" Lower
O.A. FUSELAGE LENGTH
29 Inches
RADIO COMPARTMENT SIZE
(L)7½" x (W)3¾" x (H)5"
STABILIZER SPAN
14¾ Inches
STABILIZER CHORD (incl. elev.)
5" (Avg.)
STABILIZER AREA
74 Sq. In.
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
4½ Inches
VERTICAL FIN WIDTH (incl. rudder)
4½" (Avg.)
REC. ENGINE SIZE
.10-.25
FUEL TANK SIZE
4 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	**40 Oz.**
Wing Loading	**14 Oz./Sq. Ft.**

In 1939 and 1940, Waco produced the all new E series with a more streamlined fuselage and veneer covered wings. They were the SRE, ARE and HRE. Then the country was at war and Waco turned to making trainers and assault gliders. During the war many of the custom cabins were turned into military transports.

The Waco AGC-8 was powered with the Jacobs L-6 engine rated at 300 hp. Cruising speed was 149 mph and a range of 600 miles. In 1938, the AGC-8 sold for $10,495 at the factory. The ZGC-8 used the 285 hp Jacobs and sold for $9,895. The EGC-8 used the 320 hp Wright engine and sold for $12,860. Meanwhile, the Beech D-17S Staggerwing could cruise at 202 mph and had a range of 800 miles but cost $18,870, almost twice as much as the Waco and the Waco could carry the same load.

This model is the brainchild of Dick Kidd and Dick Tichenor, who sent me a drawing of this airplane with a note in the corner saying what a nice model it would make. Gosh, what could I say, especially since I, too, thought it would make a great model, so I set to work.

Dick said to make it simple and light for a .10. It is not as simple as I would like, but it is light and it is scale in outline. With the cost of everything skyrocketing, the stick structure reduces the cost and the weight. The model could be built using slab sides, if desired, using the shaded outline for the sides. The tail group could also be cut from sheet balsa, but be careful, the model has a long tail moment and heavier construction could necessitate the larger engine and possibly ballast in the nose. Mine balanced as shown on the plan with the equipment installed as shown. Weight, ready to fly is only 2½ pounds.

The engine I used is a ten year old O.S. Max .15 that has a lot of time on it. With an 8/4 prop, I was surprised by the performance. The .15 is plenty of power and a .10 would be more than adequate as the Waco will happily putt-putt around at just a notch above idle. Rudder response is good, but if you build it for rudder steering, increase the dihedral by 5/8" and 3/8" for a smoother roll response. Aileron response is gentle, even with large throws, but it will still do nice rolls. The top wing has 1/16" positive

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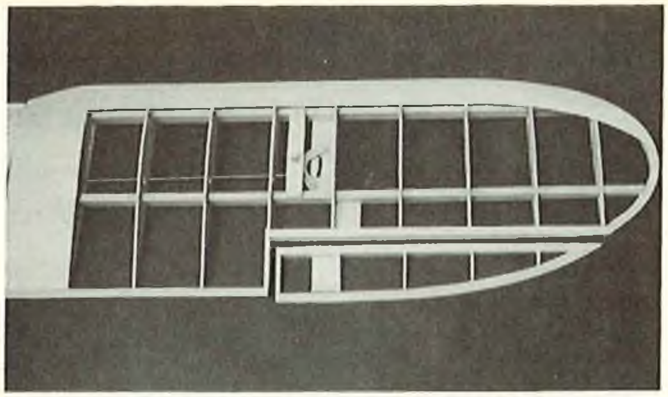
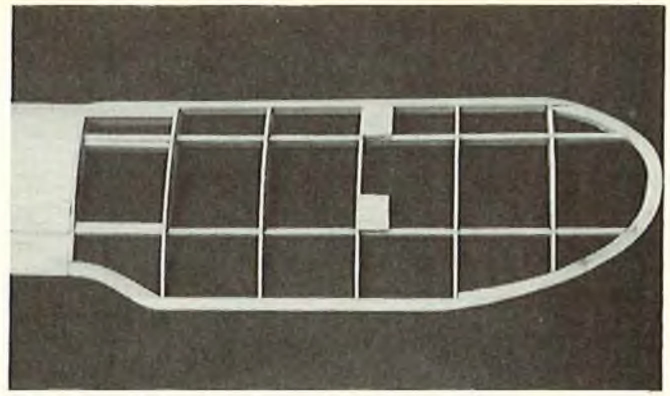
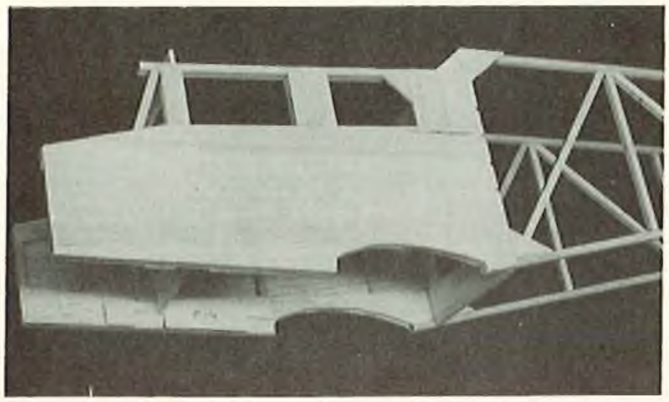


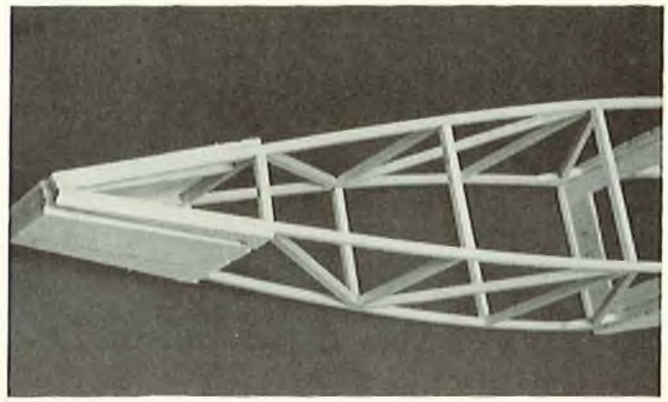
Upper right wing panel with bellcrank installed. Aileron to be hinged.



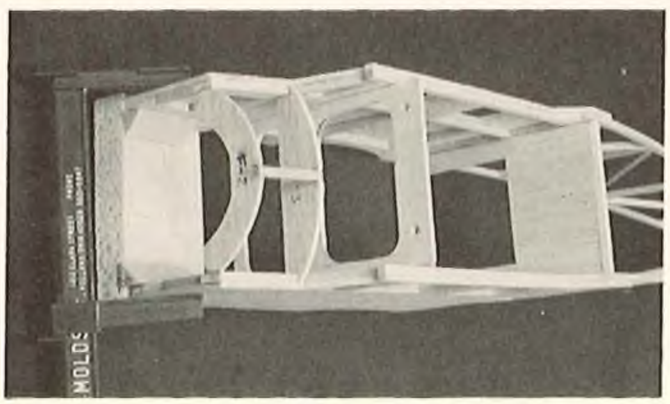
Lower right wing panel — note 1/8" ply strut attachment points.



Fuselage sides joined at front by F-4 and F-5. Note F-6 L.G. support.



Align the fuselage, pull tail together and glue. Add cross pieces.



F-2, F-3, bottom block with 1/2" triangle stock added.

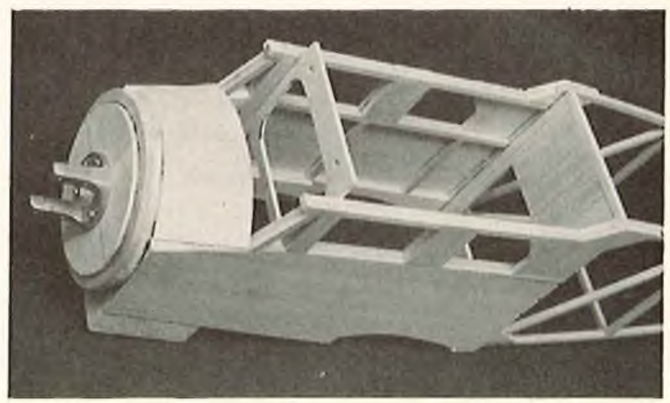
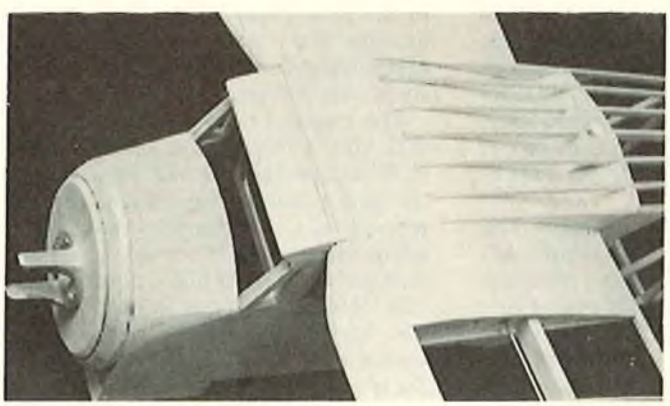
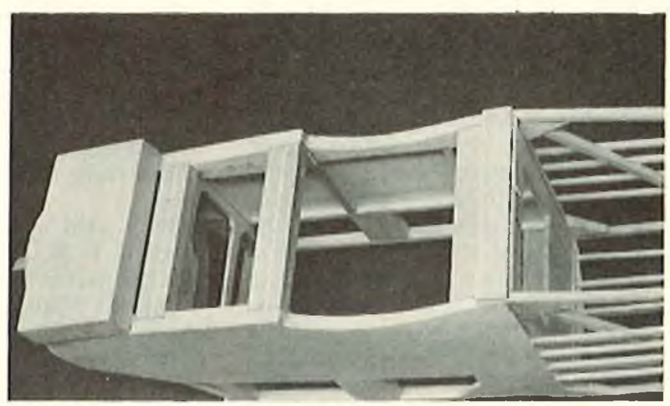


Photo shows 1/16" sheeting, with F-1 and F-1A glued in place.

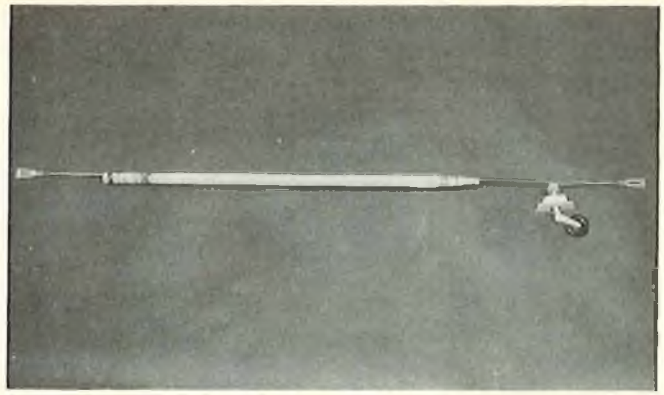


Top wing in place with stringers attached. Wing drilled for 1/4-20 nylon flat head bolt.

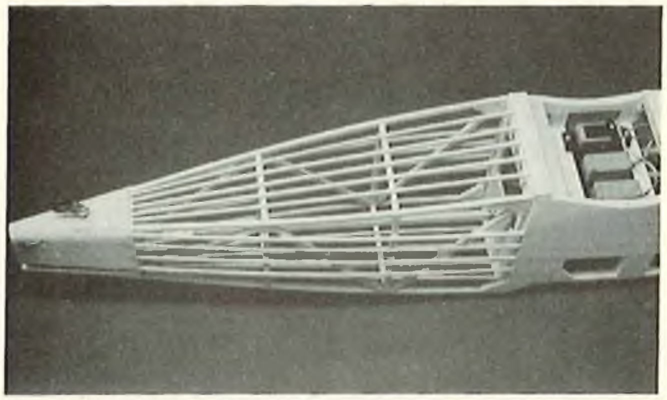


Landing gear blocks epoxied in place.

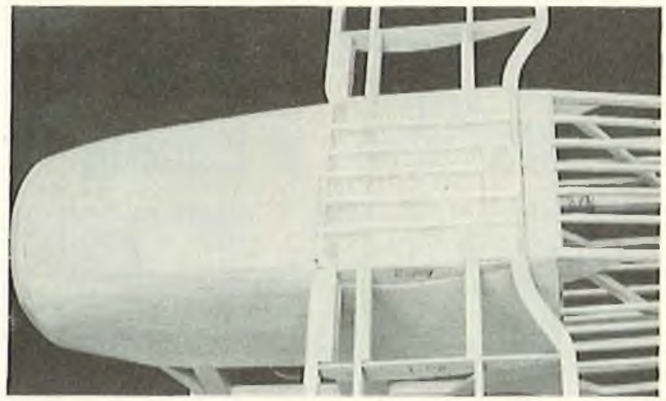
Details of tail wheel assembly.



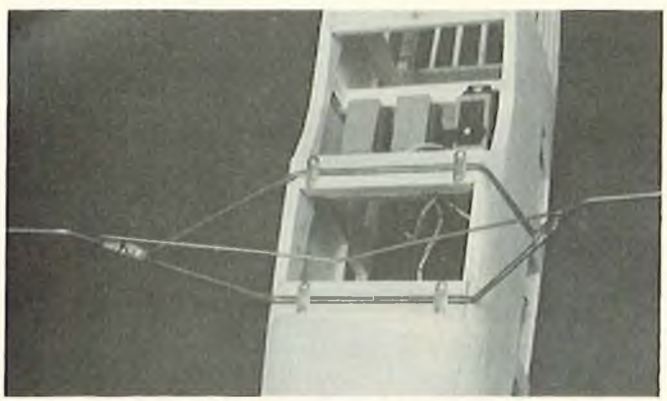
Rudder and tail wheel pushrod. Note clevis at both ends.



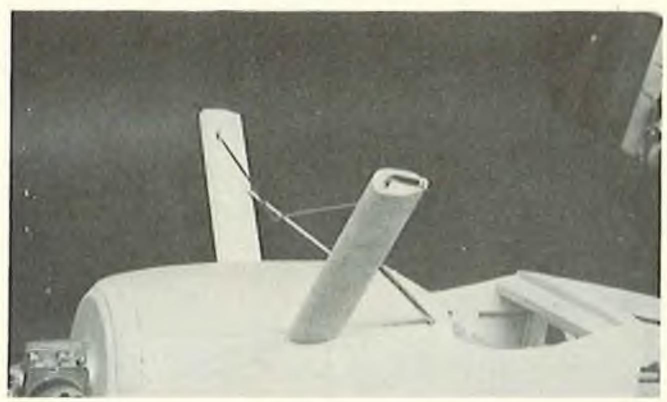
Servos and tail wheel installed. Add the balance of the stringers.



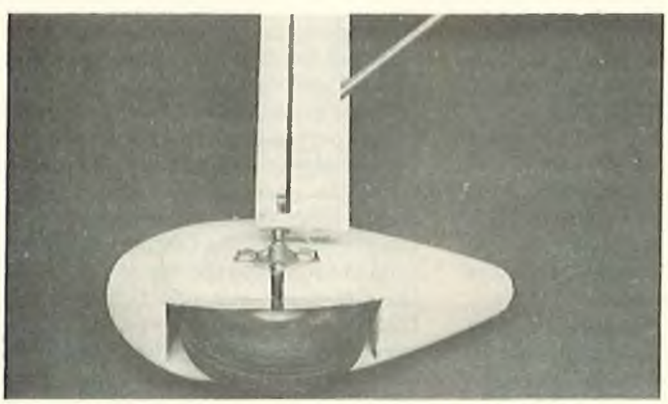
Bottom wing fitted, stringers and nylon bolt added.



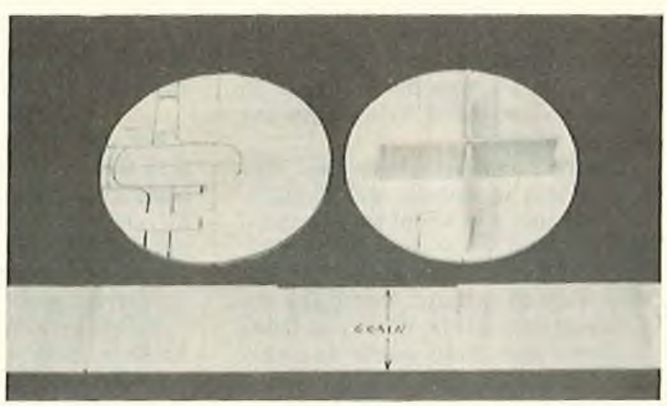
Remove cover block and install landing gear. Held in place with Du-Bro metal L/G straps.



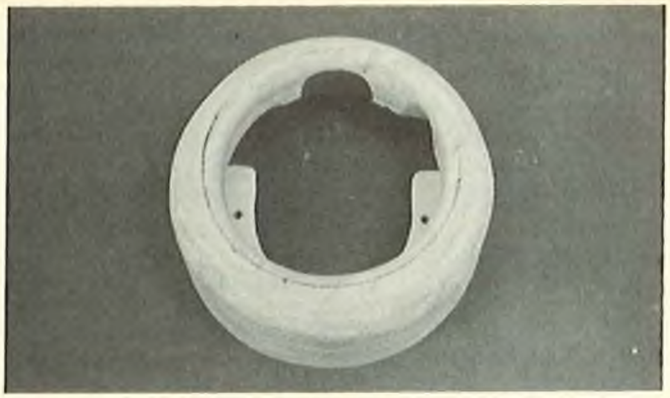
Cover block reinstalled and balsa fairings added to gear legs.



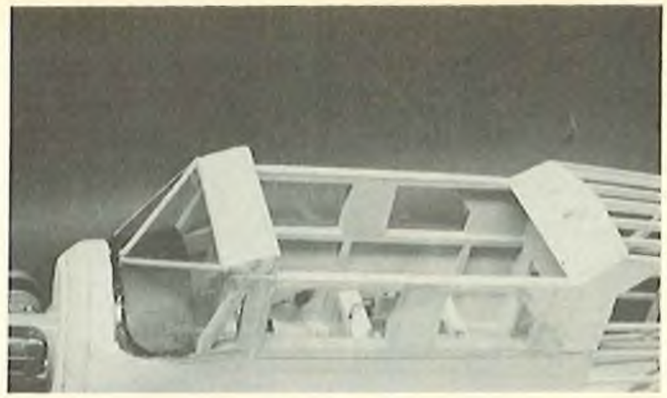
Close up detail of wheel pants and their mounting plate.



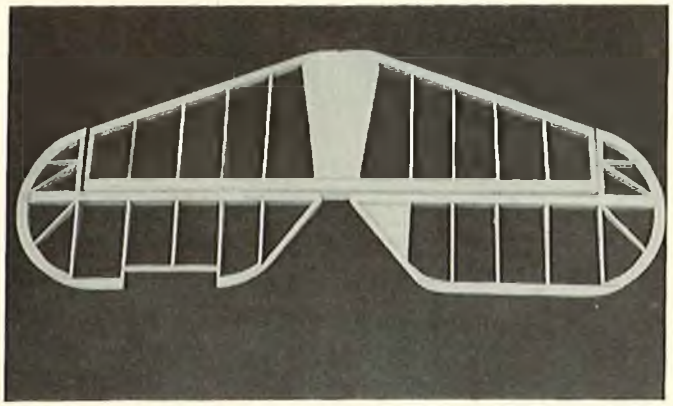
Basic parts for building up balsa cowl.



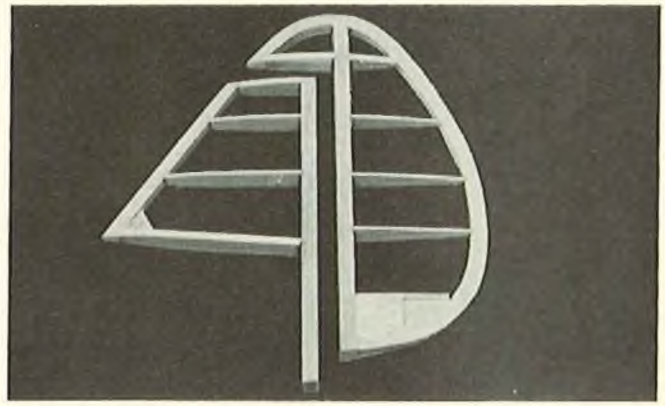
Completed cowl with necessary cut-outs. Cowl has been covered with fiberglass cloth and resin.



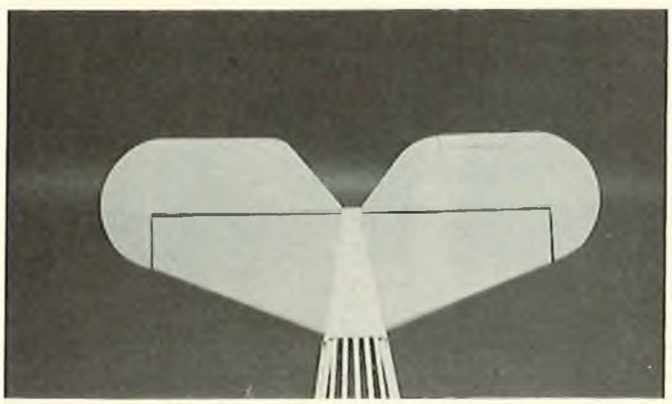
Do your inside painting at this stage. Cement windows in place.



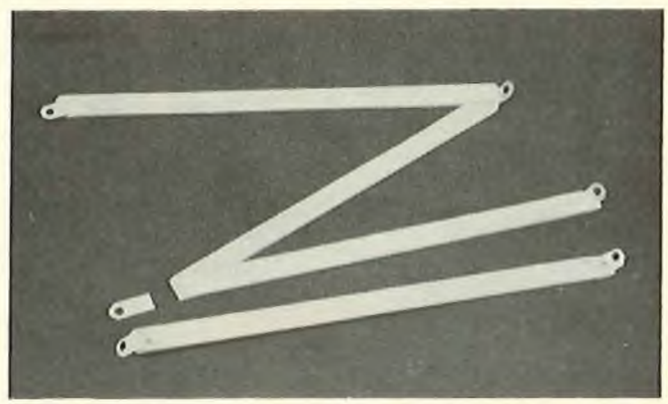
Stab and elevator shown completed. Note the trim tab.



Completed rudder and fin just needs final sanding.



Stab covered, hinged and installed.



1/8" x 3/8" balsa wing struts. Note beverage can aluminum tabs.

incidence which you should probably remove if you use an engine larger than a .15. I added the incidence to improve slow speed flying with the smaller engines.

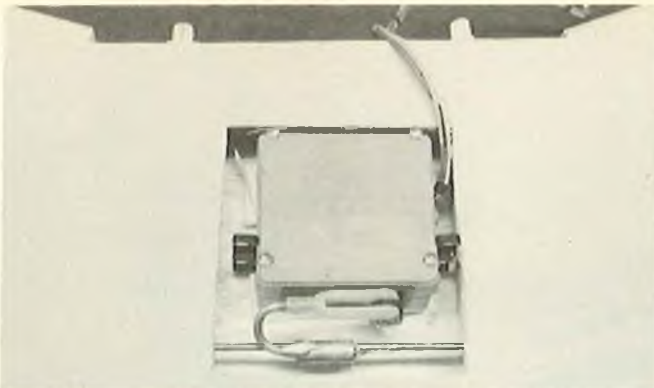
Ground handling is very good. The takeoff run is smooth and straight, needing only a touch of rudder and a little up trim to get it off the ground. The takoff run is only about fifty feet from smooth ground. Landings are slow and easy as the Waco just floats on down and three-points smoothly onto the ground.

Information for this model and the Waco history came from: Waco Publications, "The Versatile Cabin Series," by Ray Brandly, available direct at 700 Hill Ave., Hamilton, Ohio 45015, for $13.95, and "US Civil Aircraft," Vol 7, from Aero Publishers.

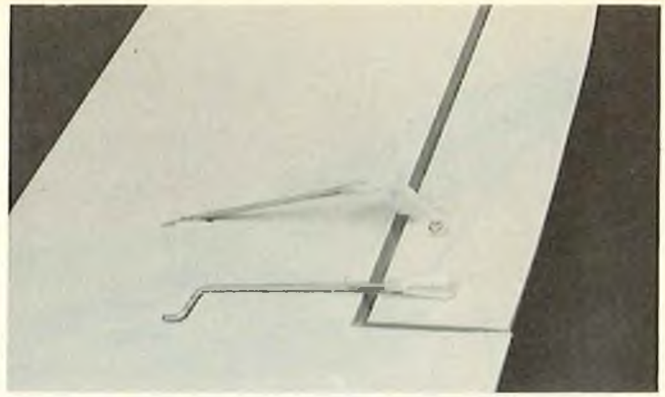
CONSTRUCTION

For ease in handling, cut the plan into three sections on the dotted cut lines. I used Hot Stuff and Super T for all construction except for where I call out epoxy. Use Sig's lite ply for all 1/8" plywood except the firewall F-1, as it is lighter and easier to cut.

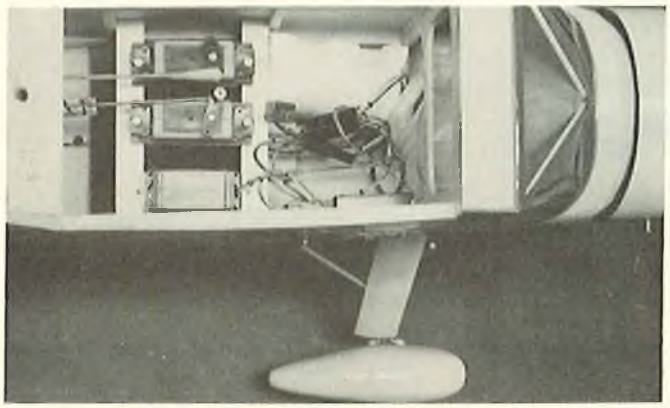
Build the wings first and then the fuselage. Both wings are built flat on the plan in three sections and then joined with epoxy, overlapping the spars at the junctions. Build the outer wing panels by gluing the ribs onto the spars and then add the leading and trailing edges. The wing tips must be raised at the tips and centered on the leading and trailing edges. The 1/8" plywood strut mount plates are glued to the spars and the ribs flush with the bottom edge in the top wing and on the top of the spars in the bottom wing. Scraps of 1/8" balsa are glued on top of the plywood in the bottom wing and sanded even with the top of the rib. In the top wing, the gap between the leading edge and the spar between ribs TW-2 and TW-3 is left open until the wing panels are joined. The center wing panels are sheeted top and bottom with 1/16" balsa. Join the wing panels with epoxy and add the top 1/16" sheeting to the leading edge of



Aileron servo installation in top wing.

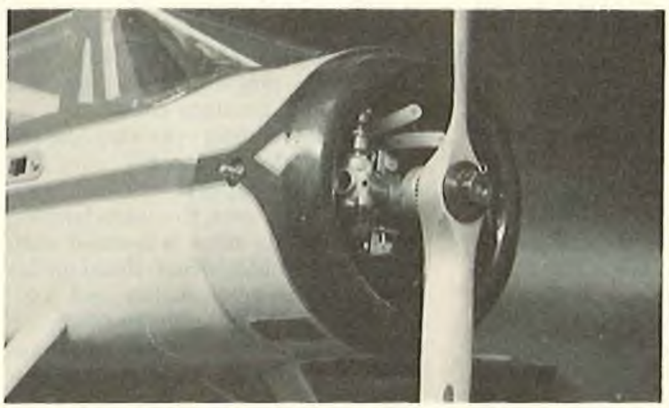


Goldberg's 1/16" aileron pushrods are connected to bellcranks through slot.



Ample room for radio installation throttle servo inverted for better alignment.

Finished tail group showing pushrod and tail wheel.



View of completed aircraft showing side mounted O.S. .15. Note glow just protrudes outside cowl.

Completed beauty rests in snow covered runway. Needs skis to be at home.

the top wing. Build the ailerons separately and pin them in place while you shape the wing tips. Add the aileron linkage and bellcranks in the top wing.

Build the fuselage sides on a soft pine board or a piece of celotex that you can stick pins into. Lay Saran Wrap or waxpaper over the fuselage side view on the building board. The basic fuselage side of 3/16" balsa is indicated on the plan by the dark shaded area. Build one side, remove the pins, lay another piece of Saran Wrap over the side and build the second side right over the first. Adjust the two 3/16" square pieces next to the servo rails for the width of your servos.

The fuselage entrance door is on the left side only so the right rear window is rectangular instead of angled at the rear. Glue on the 1/8" balsa outside doubler over the entire cabin area except the windows and over the tail area. The vertical grain doubler should overlap all of the top glue joints around the windows and the jog up behind the cabin. Glue the landing gear doublers, F-6 to each side. Glue on the top and bottom 3/16" sq. to bulkhead F-5 and glue to one of the fuselage sides. Keep the pushrod opening at the bottom. Glue F-4 in place to the fuselage side with the fuel tank cut out on the right side. Glue on the other fuselage side and pull the tail together and glue.

Check now to be sure the fuselage is straight and the bulkheads are square to the sides. Add the 3/16" sq. cross pieces in the tail area. Glue the 1/2" triangle stock to the sides ahead of F-6's. True up the bottom edge of the cabin with a large sanding block. Glue on the bottom front block even with the edge of the front gear block slot. Add F-2 and F-3 and the 3/16" joiner. Note that the front narrows slightly ahead of F-4 to the firewall. Add the 1/16" balsa over F-2 and F-3.

Mount the engine to F-1 and drill the holes for the fuel lines and the throttle pushrod. Make the two 3/16" balsa rings, F-1A and glue together

and glue them onto the firewall F-1. Glue the firewall assembly to the fuselage. Glue in the top wing mounting plate, F-7. Fit the top wing to the fuselage and drill the holes in the wing for the mounting dowels through the two 3/16" holes in F-4. Glue the dowels into the wing. Glue F-8 to the wing so that it lays flat against F-7. Add the two F-9 pieces to line up with the 3/16" sides. Glue in the screw mount block and the 1/8" sq. top stringers over the wing. Drill down through the screw mount block and F-7 with a 3/16" drill and follow with a 1/4-20 tap. Ream out the screw mount block with a 1/4" drill and chamfer the hole with a 45° tapered reamer to fit the flat head Prather 1/4-20 nylon mounting bolt. Add the 1/2" x 3/4" windshield block to F-4 and shape the top front of the fuselage. Epoxy in the two slotted landing gear blocks, F-10 and the 1/8" balsa piece behind F-10.

Make the scale-like steerable tailwheel from brass tube and brass sheet, or you can use a Goldberg nylon tailwheel bracket at the rudder hinge line. The tailwheel location, as shown on the plan, is too far forward for scale but the linkage wouldn't fit further aft. Neither is scale but the built-up unit looks better to me.

Solder the 1/8" wire into the 1/8" I.D. brass tube which gives you a firm end to clamp to while you solder on the washer and wheel yoke. Drill the ends of the yoke for the 1/16" brass tube axle. Assemble with the wheel, solder quickly, and cut off the excess ends of the axle. Cut down a 1/8" Goldberg steering arm and drill two new 1/16" holes as shown on the plan. Assemble the 1/16" plywood and 3/16" balsa sandwich for the tailwheel mount and drill a 3/16" hole for the brass tube bushing. Glue the 5/32" I.D. brass tube bushing into the sandwich and assemble the unit and tighten the set screw in the arm.

Make up the 1/16" pushrod and clevis from the steering arm to the control horn and the pushrod from the servo to the steering arm using the plan as a guide for the lengths. The pushrod ends at the steering arm should be "Z" bends. Assemble the pushrods and the tailwheel unit and slip them into the fuselage with the rudder pushrod sticking out through a slot in the 1/8" side doubler. Glue the tailwheel unit in place and the remainder of the 1/16" balsa covering the bottom rear. Install the servo rails and servos. Glue on all of the 1/8" fuselage stringers.

Fit the bottom wing to the fuselage. The 1/8" wing dowels key into two holes drilled in the rear landing gear block. Add the bottom 1/8" x 1/4" stringers to the wing and the 1/8" sheet screw block. Drill and tap for the 1/4-20 Prather nylon bolt the same as on top. The holes for the nylon bolts should be drilled perpendicular to the outside surface so the head of the bolt is flush with the finished surface. Lightly glue the bottom block over the gear blocks and carve and sand to shape. Finish shaping the rest of the front so that it rounds off smoothly at the firewall. Now remove the shaped block over the gear blocks and make the landing gear. Bend the wire landing gear parts and screw them in place using the Du-Bro gear straps. Bind the gear wires together above the axles with copper wire and solder. Re-fit the bottom block and glue back in place. Finish shaping the fuselage with a sanding block. The 1/8" side doublers should taper from the stringers to nothing at the top and bottom of the fuselage sides.

Make the landing gear strut covers with a 1/8" slot for the 1/8" wire and sand to shape. Separate the sandwich and glue back over the wire landing gear. Later the strut is covered with the base color MonoKote. Build up the wheel pants from balsa and 1/8" plywood and carve to shape. With the wheel collars on the axles and the pant in place, solder on the brass retainer plates. The pant is held on with two #4 x 1/4" SM screws through the brass plate into the 1/8" plywood side.

Cut C-3 through along the shaded line except for a couple of 1/8" spots to hold it together. Make an egg crate "X" from the two cowl jig pieces and lightly glue the "X" between C-2 and C-3. Make a strip of 1/16" balsa 1¾" x 13½" with the grain crosswise. Wrap the 1/16" balsa around the cowl form with the edge even with C-2. Glue the cowl rings, C-1 together, staggering the joints and glue to the cowl. Shape the cowl front in a 3/4" radius edge. Wrap the completed cowl with 6 oz. glass cloth and either polyester or epoxy resin. Sand and fill and trim the back edge to match the plan. Cut out the shaded area of C-3 and break out the cowl jig pieces. Fit

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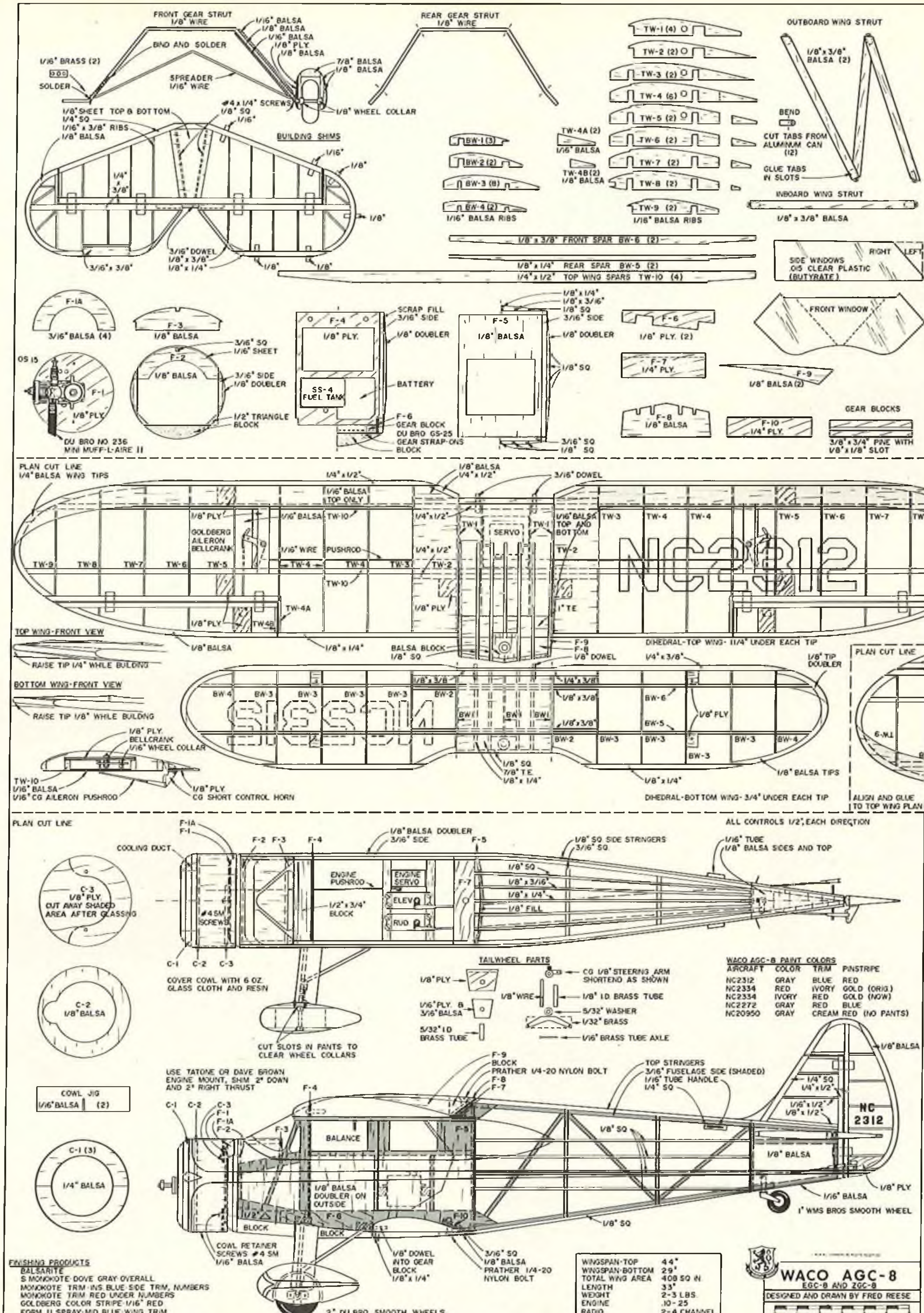
FULL SIZE PLANS AVAILABLE — SEE PAGE 203



PLAN NO. 870

CUNNINGHAM ON R/C

Chuck Cunningham

Gee Whiz, the time between writing columns sure does go by fast. Seems like one is completed, and then it's time to start thinking about another. Kinda like the short time from Christmas to Christmas (for all of us bill paying fathers, that is), or the short time from income tax return to income tax return.

Yesterday was a super day for flying, temps just about seventy degrees, winds light and variable, partly sunny, a really great spring day. Tom and I headed out to the field for the first time in three weeks. The "Trouble Bug" jumped up and bit him in the seat of the pants with a broken carburetor. Didn't know where or when it happened, but the needle valve seat had become bent, so no flying his bird for the day.

We had taken out my Quadra powered Fly Baby and put in a couple of enjoyable flights on her, and had also brought out my re-engined Dopple Decker bipe. This ship has been flown for the past two years with a Max .90. I had planned to remove the Max and insert an Evra 190 in the nose, but I suddenly got hot to try one of the Tartan 1.34 cu. in. engines that World Engines has been advertising lately. I bought one from Indy R/C and discovered that the advertising pictures are correct, it really is a beautiful engine. Very well made. It is a converted gas and oil engine, originally designed to run an Italian built small portable electric generating machine. The reworked engine has the ignition removed, the Welbro carburetor removed and replaced with a Super Tigre .60 carb and a glo plug replaces the small spark plug via an adapter.

Nope, not a Sig Kougar — an RCM Super Joy Stick 61" span modified by Gary Van Patton, watched over by son Patrick.

According to the instructions, this engine is designed to run on a very low oil mixture. For the first five hours of operation the fuel is 10% castor oil and 90% alcohol. After this, change the mixture to 5% castor oil and 95% alcohol. For yesterday's test flights I burned regular 5% nitro model fuel, but plan to mix up some special fuel for this engine in the future. I weighed the Tartan, ready to bolt on the nose, and found that the engine mounting ring, and muffler weighed just 4 ounces more than my Max .90 complete with engine mount and muffler.

Since the Dopple Decker is a big aircraft, and since I had to saw off the balsa nose cowl to mount the engine, I didn't need to worry about rebalancing the aircraft. The Tartan instructions say to operate an 18/6 prop on it.

An extra plus is that the Tartan is a reed valve engine and can run in either direction. I quickly found out that if you flip it in the normal counterclockwise direction it will start and run "backwards" or clockwise. The simple solution to this is to start it by flipping clockwise and wham, she is off and running counterclockwise.

Four flights were made yesterday. The Tartan pulls the Dopple Decker's 80" span, 2000 square inches of area in a most realistic manner. It will loop and roll with ease, idle back for nice landings, and yet sounds totally realistic. It does not have that high pitched glo engine scream that seems so out of place on a WW I biplane. It has a nice throaty roar, not really very loud but most realistic.

Tom did a lot of flying on the DD and kept it pretty high. Several of my friends came by to say that as they were driving to the field they could not be sure if it was a model flying or a home-built from a nearby airport. Can't ask for more realism than that.

If you're thinking of building a big

Don Jensen's customized .20 size Bridi Sun Fly. Complete with retracts beautiful example of customized kits. Photos by Richard Benoit.

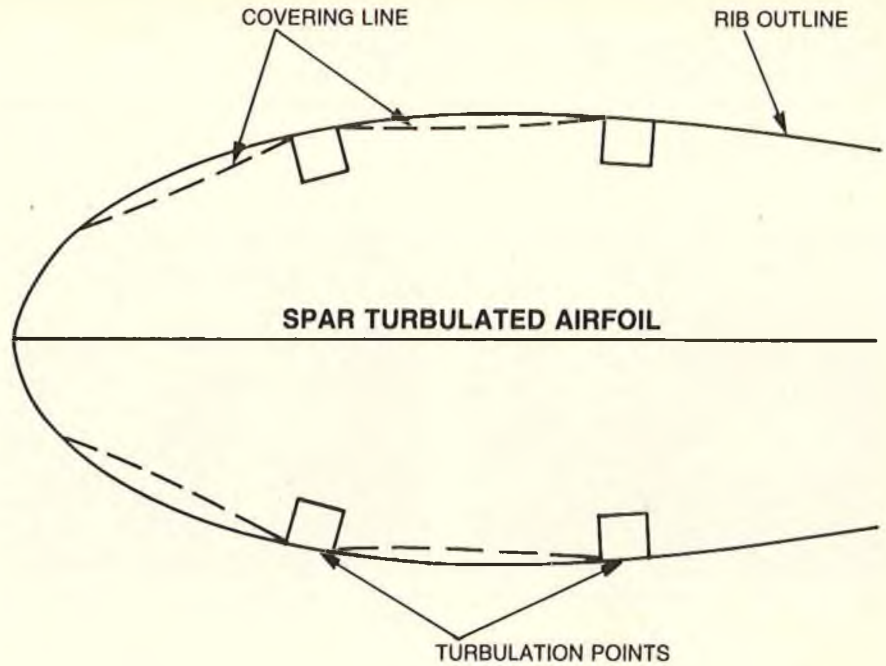
aircraft and want to go a bit smaller than the real biggies, yet you want realistic and potent power while running on the fuels that you are used to using, give the Tartan a good hard look. Right now, to me, it looks very super. The only thing that it could stand is a longer exhaust extension, but this can be built. I side mounted it in the nose of the DD. This places the carburetor and needle valve right at the top where it is easy to get to for adjustment, and also points the muffler openings down toward the bottom of the aircraft. With the addition of some long tubes, the exhaust should be pretty much out of the way, and when I brew up some 10% fuel, the amount of oil dumped out of the exhaust will be much less.

Each month I receive lots of photos that I would like to pass along to you, but cannot do so because they are in color. The only photos that we can use in the magazine are good contrast black and white. Sure, I know that the easiest pictures to take and get processed nowadays are color shots, but the cost to have color shots converted to black and white for use in the magazine is prohibitive. If you're going to send a picture of your kit modification or your original design, or what have you, please send it in black and white (not a Polaroid type) so we can use it. A good case in point. I received the following letter and three color pictures from Jim Berry of Shiprock, New Mexico. Can't show you the pictures, but Jim's letter kinda tells what it is all about.

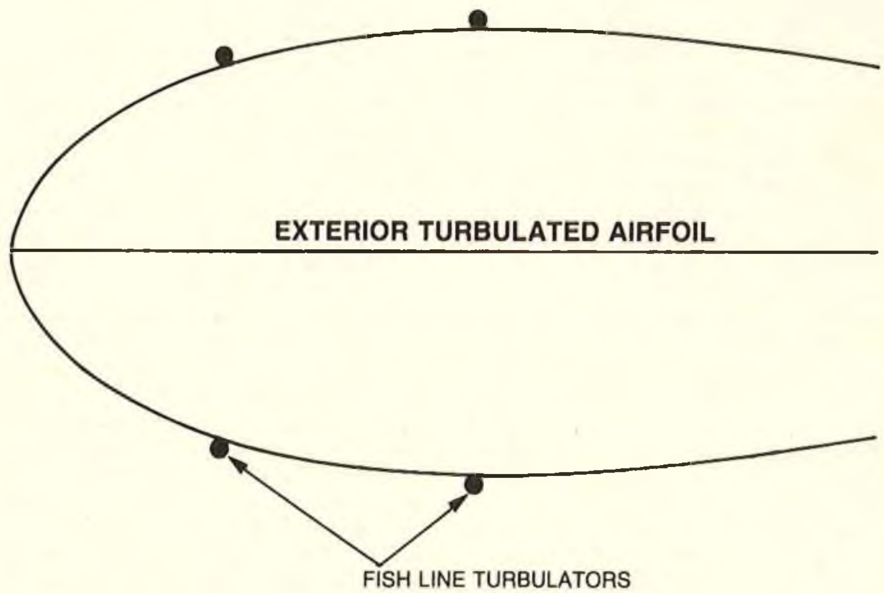
Dear Chuck,

I have been into R/C flying for about two years now and have enjoyed your articles very much. You got me started making changes in basic kits with your article on how to change to bipes, tail draggers, etc. I was especially taken with your Hooker design so I decided to try the principle on a Big Stick. Being unable to locate a Big Stick kit in January, I started from scratch using the picture of a Big Stick in the Tower Hobbies catalog. I scaled up the Ugly Stick wing rib, and used the Ugly Stick construction method. I swept the wings 10 degrees each panel and used the Hooker type tip plates and the airfoil built into the stab. I was shooting for about 14 lbs. as I wanted to power it with an O.S. .90. It came out at 14¾ lbs.

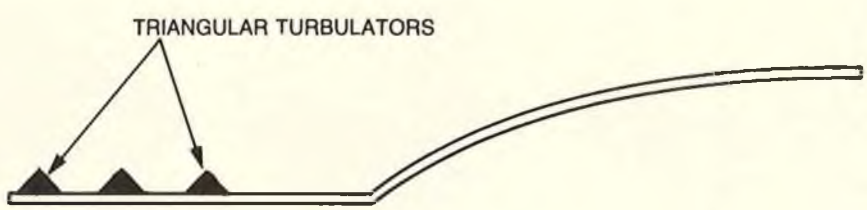
You might call it a "Big Ugly Hooker" as parts of all were used and --- does it fly great! It's very stable both on the ground and in the air. According to our local expert, Stan English, Farmington, New Mexico, who test flew it for me, it does everything it should and makes a great fun and training airplane.



SPAR TURBULATED AIRFOIL



EXTERIOR TURBULATED AIRFOIL



DRAGON FLY AIRFOIL

I am enclosing some pictures and I want to thank you for many hours of enjoyment because of your articles.

Thanks,
Jim Berry

Sorry that I can't show you the pictures but I really love that name, "Big Ugly Hooker."

A couple of months ago I was watching a program on public TV about flying. Not about flying as we know it, but about how certain insects fly, such as the bumblebee, the dragonfly, and the common house fly. Perhaps you saw it also. I do not recall

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POWER BOATING

Howard Power

Big bore carb and mounting components.

Modified backplate and carb adaptor block.

New J.G. propellers.

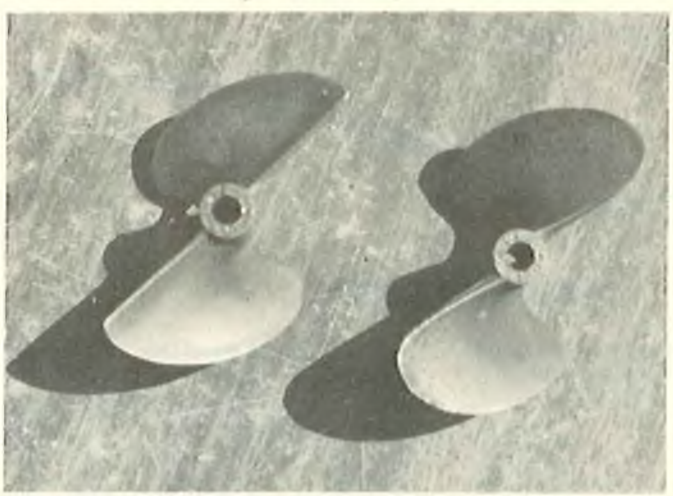
A couple of months ago, in an answer to a reader's question, I discussed briefly the use of big bore intake carburetors on racing engines. Since then several people have asked what carbs to use on various engines. Unfortunately the carbs that are now commercially available are usually not the proper size to simply "bolt on" to many of the engines that are currently used in competition. As a result, the modeler is faced with modifying the carb or the motor to accomplish the desired results. This month we will look at one method of adapting almost any carb to almost any rear rotor racing engine. Before I describe the method used it might be appropriate to review the reasons for using big bore carbs.

Intake carbs have been in use for many years. The simplest design consists of a rotating barrel and a single adjustable high speed needle valve which is used to adjust the carb mixture of fuel and air. As the barrel is closed, the choke area (the cross sectional area of the most constructed part of the carb) decreases. Closing the barrel reduces air flow into the motor and, as a result, power output decreases and the motor slows down. Usually the simple carb design described above, with its fixed high speed fuel setting, shows poor acceleration characteristics. Poor acceleration is caused by too much fuel being drawn into the carb as the barrel is closed. This mid-range richness tends to produce stumbling when the throttle is opened quickly.

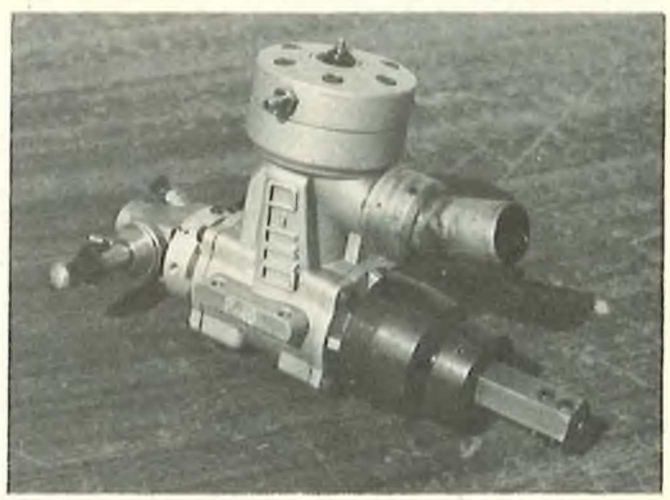
More modern carb designs bypass this problem by providing for a means of controlling fuel flow at part throttle barrel positions. Usually a second needle valve that moves in conjunction with barrel position is used so that mixture strength is maintained consistently throughout the rpm range. These carbs allow tick-over slow speed performance and superior mid-range acceleration characteristics. The carbs used on the O.S. Max, Rossi, and the new K & B 7.5 outboard engine are examples of carb designs of the latter type. In my opinion, carbs using the simple design are just not able to cope with the varying fuel requirements of the modern piped racing motor and, therefore, should not be used for racing applications. Carbs with adjustable mid-range mixtures are necessary for satisfactory throttle control in our racing environment.

In most cases you can improve the performance of any engine by using a carb with larger than stock choke area. The choke area may be calculated by:

$$A = \frac{\pi D^2}{4} - Dd$$



Octura X455 and 1455 Propellers.



Picco 45 marine engine.

where A is the carb choke area, π is irrational number 3.1416, D is the diameter of the hole in the rotating barrel, and d is the diameter of the spray bar that protrudes all the way across the barrel bore. The second term in the choke area equation represents the amount of flow that is blocked by the presence of the spray bar in the carb throat. If your carb does not have a spray bar that spans the throat, you should replace the second term in the equation with an appropriate estimate of the spray bar blockage for your carb. Once you calculate the stock choke area you can try carbs that have greater area to achieve higher power output.

Unfortunately, you can over carburete an engine. A cut-and-try procedure must be used to determine the best carb for your particular application. The carb must be capable of supplying the exact amount of flow required by your engine when operating at maximum rpm. To get the most power it usually is advantageous to operate the motor at as high an rpm as possible without destruction. As the engine builder increases port area and timing in his quest for greater rpm, the air and fuel flow requirements increse, therefore, we need larger than stock carbs. Those of you who are interested in the above theory of motor hop-up should obtain a copy of Gordon Jennings' fine book entitled *Two-Stroke Tuner's Handbook*, H.P. Books, Tucson, Arizona, 1973. This book is available from Shamrock Imports, the home of OPS engines in the U.S.

This brings us to the original problem, how to mount larger than stock carbs on our racing engines. In most cases the outside diameter of the carb mounting stem is larger than the hole provided in the backplate for carb mounting. It has been found that turning the carb mounting stems down to a smaller O.D. usually results in a drastic reduction of strength which leads to breakage. I do not recommend this procedure unless there is no other way to fit the carb. The recommended procedure is to have the backplate mounting hole bored out to fit the carb stem O.D. This can be done using a four-jaw chuck to hold the backplate in your lathe during the boring process. Make the fit as close as you can so that the carb is not sloppy when inserted into the backplate. I recommend using red Loctite to mount the carb to the backplate to insure that it will not come loose due to vibrational loads. If you wish to remove the carb you can heat the backplate and carb body carefully with a propane torch and the Loctite will let go of the parts so that removal is easily accomplished.

In many cases we have found that insufficient material is available to allow this backplate boring procedure. Several years ago when he was trying to increase the carb size used on a Super Tigre X45, Bruce Kaiser of Aptos, California, came up with the idea for the carb backplate adaptor block that will be discussed here. This simple auxiliary mounting device allows almost any carb to be mounted on any rear rotor racing motor. The first photo shows the backplate components required. It was desirable to fit a Rossi .65 carb on a .45 sized motor. The stock backplate assembly is disassembled by removing the rotor pin, rotor, rotor pin set screws, and carb set screws. The cavity on the outside of the backplate is filled with an aluminum filled epoxy glue. The backplate is then chucked up in a lathe so that the carb mounting boss can be removed and the backplate is faced off to a flat surface. In many cases the rotor pin set screw is also included in the carb mounting boss so that when we remove this material we lose the ability to hold the pin. When this happens it is necessary to drill and tap a new hole in the backplate to secure the rotor pin. Cut off the rotor pin so that it does not protrude past the face of the backplate when you remount the rotor. This may be done with a cutoff wheel and your Dremel tool, or you can grind it to the proper length. Be sure to grind a new flat on the rotor pin where the set screw holds the pin in place. I recommend the use of two set screws (one on top of the other) to make sure that the rotor pin stays in place until you want to remove it.

Most rear rotor motors with steel rotors work well when the rotor clearance is set at 3/1000". You can easily accomplish this clearance by using the proper size K & S brass shim stock available at any hobby shop. Cut a piece approximately the size of the rotor and cut a slot to the center of the shim stock so that the rotor pin can pass through. Slide the shim stock between the rotor and backplate with the set screw loose. Push on the rotor pin and lock down the set screw. Withdraw the shim stock and the rotor clearance is set. The second photo shows the finished backplate assembly and the carb adaptor block.

A piece of 3/8" thick aluminum stock is used to fabricate the adaptor block. Rough cut a block approximately to the size of the backplate (approximately 1½" square in this case). A hole is drilled into this block for the carb, making sure that it is not too close to the engine backplate mounting screw position. The block is then bored to final size so that it tightly fits the carb mounting stem O.D. In this case the block has a .550" hole. Carefully position the faced off backplate on the adaptor block so that the intake holes line up as good as possible and, using Hot Stuff to hold the pieces in position, drill the backplate mounting holes through the adaptor block. Mark around the backplate so that the adaptor block outside dimensions can be trimmed to final shape. Separate the two parts by holding the backplate in your hand and tap the block until it drops off. If this technique fails, throw the thing on the floor and it will come apart! If you are not into throwing things you can heat the parts with a torch until they separate.

Using a belt sander or a file, shape the adaptor block outside dimensions. Using a drill the size of the backplate mounting screw heads, drill half way through the block at each corner. This recesses the heads of the mounting screws into the adaptor block. Drill and tap two holes in the block at right angles to each other so that 8-32 set screws hold the carb in place.

The second photo shows the two set screws in the adaptor block that hold the carb in position. Lightly mark the position of the adaptor block hole on the faced off side of the backplate. Using your Dremel tool and a carbide cylinder cutter, carefully smooth the new carb hole into the original hole in the backplate. Do the best you can to allow the intake flow to smoothly enter the original passage. Using a piece of plate glass, or any other flat surface, and 600 wet or dry sandpaper lubricated with WD40 oil, you then carefully lap the mating surfaces of the backplate and the carb adaptor block. Clean everything off and reassemble the backplate on the motor. I use a thin coat of silicon glue between the backplate and adaptor block when assembling these parts. This insures that air doesn't leak between the two parts. The carb can now be mounted and you are ready to run your new toy.

This adaptor system also allows the experimenter a method by which he can adjust the rotor timing of the engine. By slotting the mounting holes of the backplate, the whole backplate can be rotated when the corner screws are loosened. In this way you can experiment with different rotor closing timing. The total rotor duration will, of course, remain the same. You may find that later rotor closing will help performance when the larger carb is used and higher than design rpm is required.

Before we get into the letter section of the column, I would like to mention that Jim Gale (J.G. Propellers) has

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GEARED PROPS FOR

By Robert W. Kress

Photos by Bob Aberle & Jennifer Kress

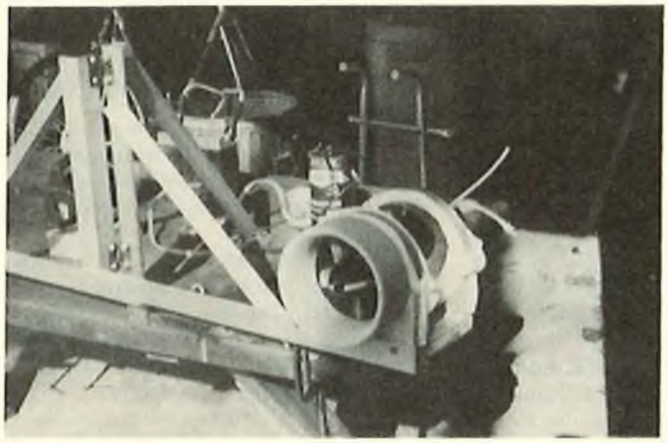


Fig. 1: Vertical axis thrust stand with spring measuring scale to left of picture. For test of .15 and larger props and ducted fans. RK-20 Axiflo shown.

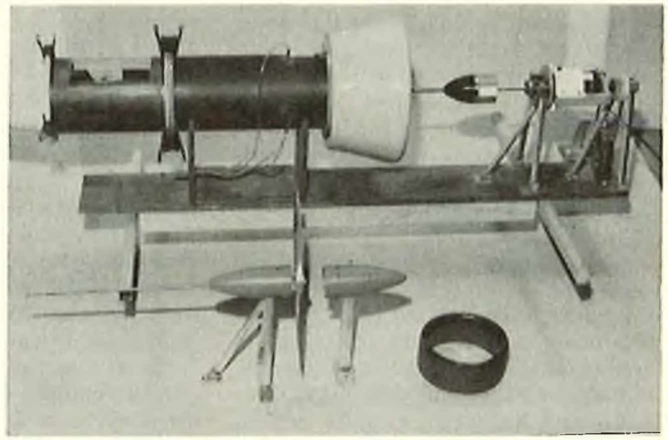


Fig. 2: Bifilar pendulum thrust, rpm and torque measurement rig for 1/2A class props and ducted fans.

Background

Recent years have seen the advent of Quarter Scale behemoths spawned first by the Du-Bro belt driven geared prop unit and then by later gear drives of other manufacturers. More recently large displacement engines such as the Quadra and others seem to be taking over the gear driven engine market. This is quite understandable, since the larger displacements offer more horsepower, which is fundamentally what makes the aircraft fly. Large geared props are merely a means for making the best use of the available horsepower by properly matching the prop to the model.

This article was basically intended to explain how geared props work and where their potential payoff lies. As time went on, however, it grew into a treatise introducing the idea of geared props for very small, light "Schoolyard Scale" models. I feel that due to the diminishing number of standard or large size model sites, the small size, low cost, low noise, safety (due to lightness) and the sheer fun and simplicity of this model class will all combine to generate a large interest in the concept of Schoolyard Scale.

The idea of Geared Props For Schoolyard Scale may at first sight seem preposterous since one has the option of merely sticking in a bigger engine as the Quarter Scale buffs are now doing. But stick with my logic and see if you concur with my conclusions.

How Geared Props Work: Large Model Examples

My original interest in geared props grew out of a technical need to know how much thrust could be produced by a given prop/engine combination and what the rpm would be. Furthermore, I needed to know how these quantities varied with airspeed. The need arose in relation to the Midwest Products Co. AXIFLO Ducted Fans which I designed and manufacture for Midwest. I needed the prop information so that I could make accurate comparisons between fan and prop model in-flight performance. As a result I dug deeply into what makes props tick and searched for good small scale prop data. My search led me all the way back to 1922. The best source of small scale prop data I found was British R & M 829 in which many props of varying width, pitch, diameter, blade shape and number of blades were accurately tested in a wind tunnel. The data correlated very well with my own static tests of some 41 props from 4½" to 12" in diameter. The two prop static test rigs used are shown in Figures 1 and 2. It is not surprising that one has to go back that far to find prop data of a general nature because that was when the need for such general data arose for full scale aircraft. Later prop research tended to deal with perfection of the best types, development of metal blades and variable pitch systems. Such research was largely over by the end of the '40s.

My original intent was to publish the prop design and analysis method in a model magazine. An article was thus written. However, it turned out to be almost incomprehensible and of no use to the average modeler. However, for those technically oriented, I can supply copies with all equations, methodology and basic data for $10.00. The title is Model Aircraft Propeller Thurst and Power Requirements. It is 35 pages long and would be easy to follow for the engineer or technical student. Write to Kress Technology, Inc., 27 Mill Road, Lloyd Harbor, New York 11743.

As I mentioned earlier the foregoing prop design and analysis method was put together to serve my needs in the ducted fan field. Coincidentally, the timing matched the advent of geared props, so I began applying the method, suitably modified to take gear ratio and gear friction losses into account, to finding out what the advantage of such units would be.

To show how geared props of this class work, Figure 3 has been prepared to show the thrust versus airspeed for a K & B .61 driving a 12/6 prop. The prop is installed on a 17 lb. P-51 having the drag curve shown. Maximum speed is 66.5 mph and the best rate of climb is 643 ft./min.

Table I shows what happens when you install a 4:1 geared scale diameter prop. The table is prepared for a given prop "advance ratio" (speed/rpm x diameter) in the jargon of aerodynamicists. Thus, not only the thrust but also the speed changes for

TABLE I
4:1 GEARED PROP CHARACTERISTICS

	Ungeared	Geared
Gear ratio	1:1	4:1
Prop diameter; in.	12	27
Prop pitch; in.	6	13.5
rpm of engine	12,250	12,250
rpm of prop	12,250	3,063
Thrust; lb. @	6.69	10.70
mph	38.3	21.5

TABLE II
P-51 RATE OF CLIMB AND MAXIMUM SPEED VS. PROP GEARING

	Static rpm	Rate of Climb ft./min. @ 23 mph	Maximum Speed mph
Ungeared 12/6	12,250	643	66.5
Geared 2:1 17.8-8.9	6,125	762	64.2
Geared 4:1 27.0-13.5	3,063	977	60.1

TABLE III
FOKKER D-VII PROP GEARING EFFECTS

Gearing/Prop	Rate Of Climb @ 17 lb. & 23 mph; ft./min.	Maximum Speed; mph	Allowable weight @ 23 mph & constant 417 ft./min. climb rate; lb.
Ungeared 12/16	417	43.5	17.0
Geared 2:1 17.8-8.0	548	44.2	22.3
Geared 4:1 27.0-13.5	750	45.0	30.6

TABLE IV
P-51 PROP PITCH AND GEARING EFFECTS

Gearing/Prop	Static Thrust; lb.	Rate of Climb at 23 mph; ft./min.	Maximum Speed; mph
Geared 4:1 27.0-13.5	14.9	941	60.0
Geared 4:1 20.7-20.5	7.9	774	69.0
Ungeared 9.2-9.1	4.9	369	66.5

Table V
KRESS TECHNOLOGY, INC., GP-020 GEARED PROP UNIT PERFORMANCE VS. BASIC PROP FOR A STERLING STINSON RELIANT

Gearing/Prop	Measured Static Thrust; oz. & rpm	Rate of Climb at 17.2 mph; ft./min.	Maximum Speed; mph
Ungeared Cox 4½/2	3.96/14,700	56.7	22.0
Same; w/cowling blockage	3.50*/14,700	23.5	20.0
Geared 2.13:1 8/4 Top Flite Power Prop	5.82/5,350	118.3	24.0
Same 7/4	5.65/6,800	Not shown on Fig 13	

*Calculated reduction

equal prop aerodynamics or blade angle of attack. The comparison of the two props across the speed range is shown in Figure 4.

For the special static case the zero advance ratio line is vertical. This gives you a very useful option if you don't know the basic prop thrust versus speed curve, which the average modeler does not, in fact, know. If you measure your ungeared static thrust (with a spring scale on hard model wheels and a smooth surface) and rpm with a prop known to be of correct pitch and diameter for normal sized models on that engine, you can easily pick a new geared prop which will work well in the air by simply applying Eqs. (1) through (4) to the static thrust and diameter values!

Figure 5 shows the K & B .61 with the 12/6 ungeared prop and two other gear ratios 2:1 and 4:1. Considering first the thrust curves, gearing is seen to produce a large thrust increase at low speeds and some moderate loss near maximum speed. Table II

FIGURE 3
UNGEARED PROP MODEL PERFORMANCE

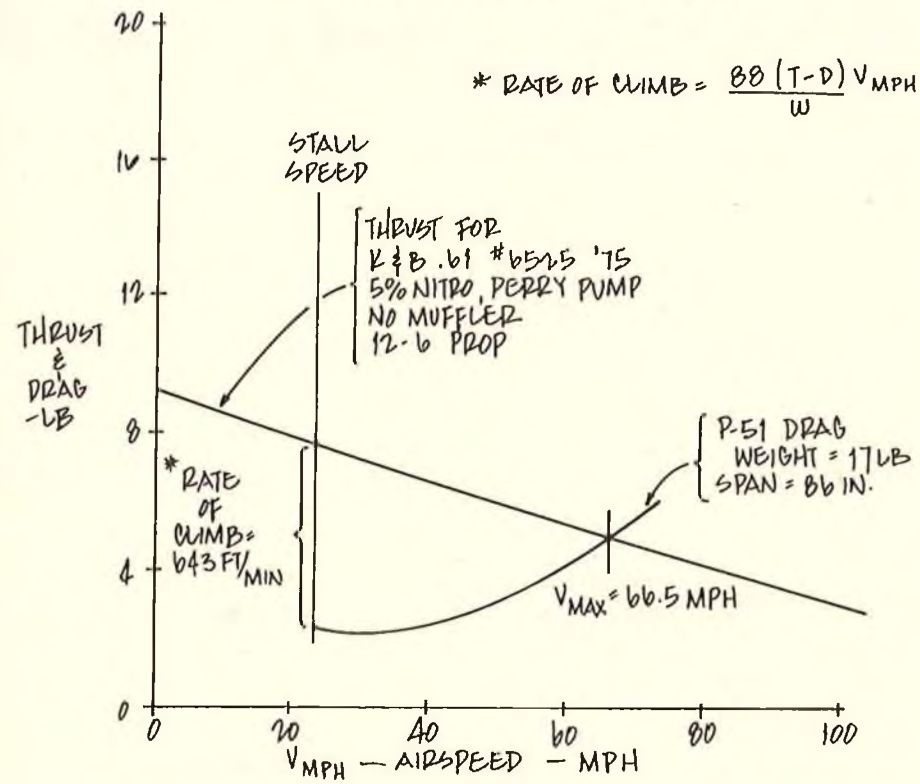
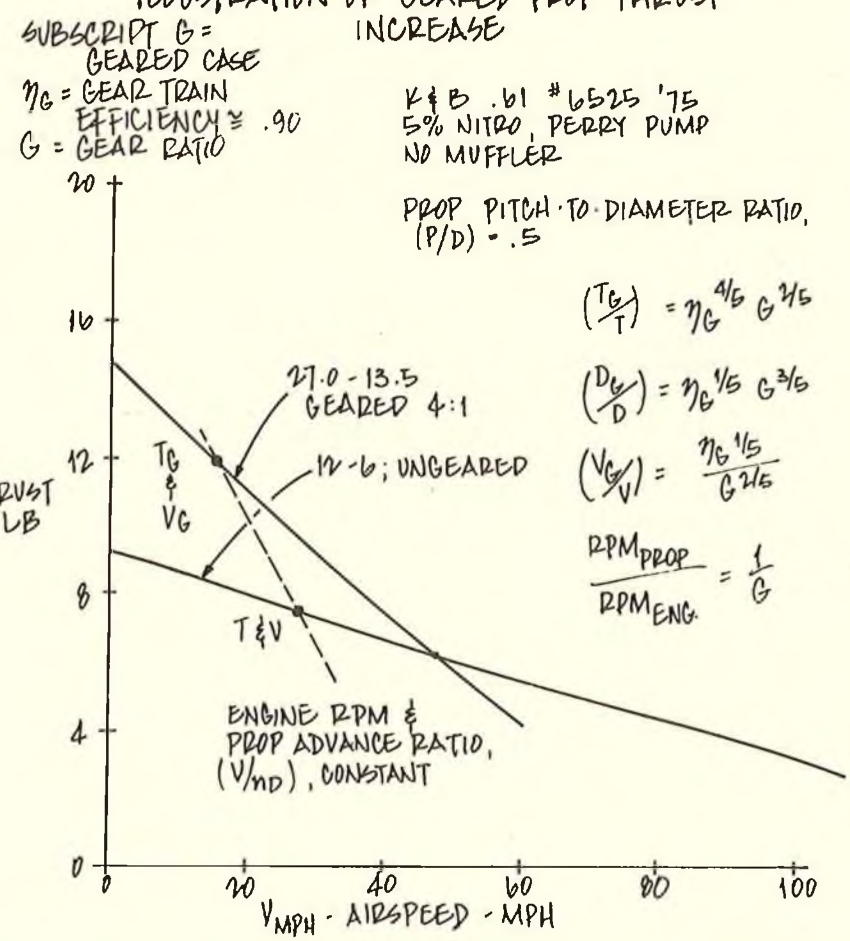


FIGURE 4
ILLUSTRATION OF GEARED PROP THRUST INCREASE



summarizes the situation for the P-51 of Figure 5.

Rate of climb at low speeds is thus increased substantially at some moderate decrease of maximum speed.

So what about the Fokker D-VII of Figure 5? This brings up the topic of matching the prop to the model and peripheral issues such as scale prop size.

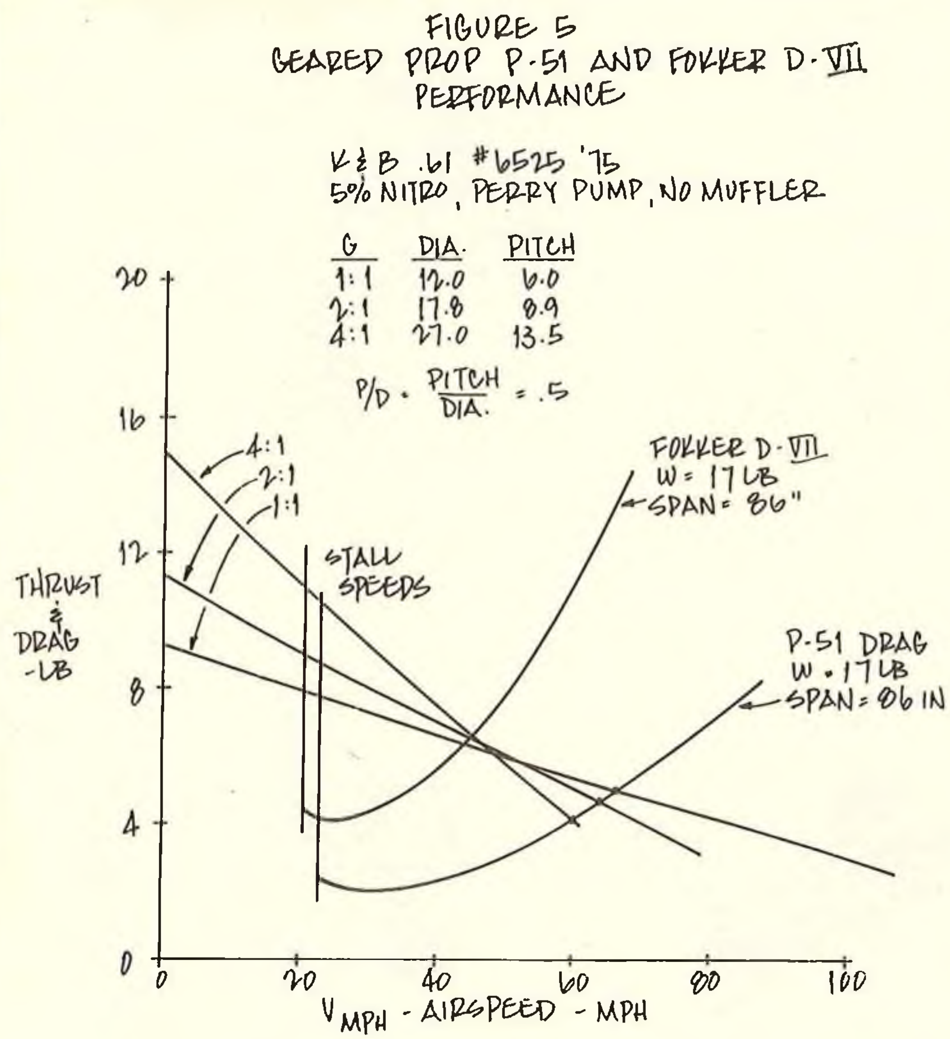
The P-51 of Figure 5 did better by use of a geared prop in terms of either increased available rate of climb or increased allowable weight. This involved some moderate sacrifice of maximum speed.

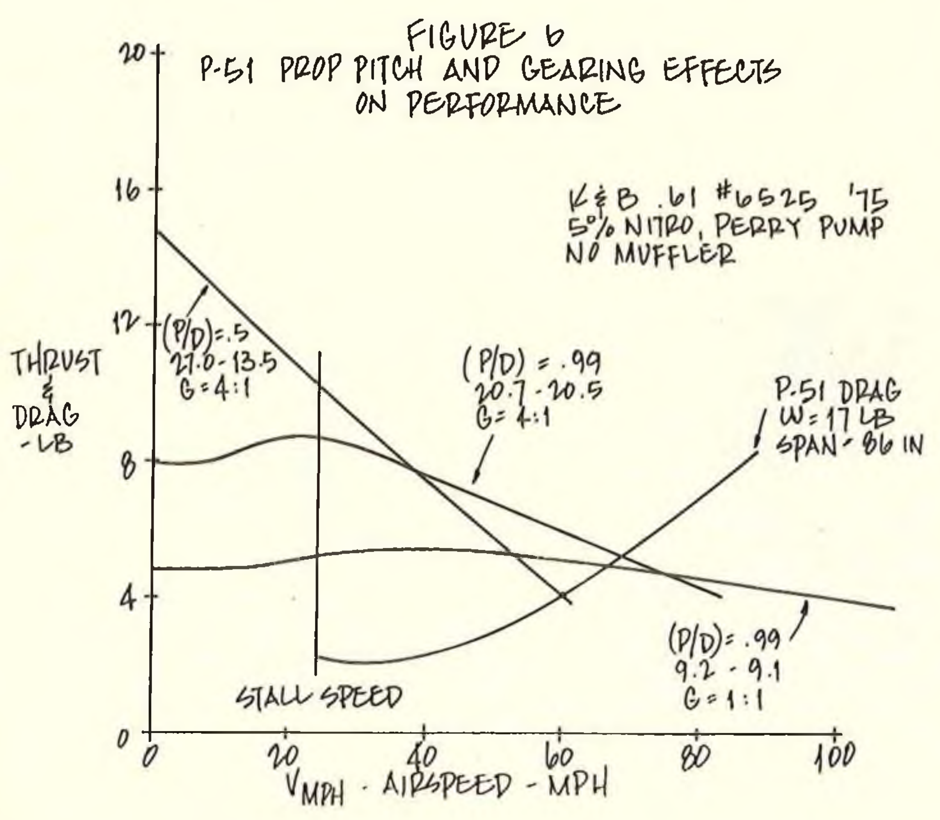
The Fokker D-VII is an even more dramatic case. It is a low wing loading, draggy model which wants to fly very slowly. Here one sees that the thrust minus drag margins have shrunk to where the benefits of prop gearing in terms of rate of climb and weight are almost mandatory. Furthermore, there are attendant **gains** in maximum speed with prop gearing!

Table III illustrates these points.

The foregoing P-51 and Fokker D-VII cases illustrate the concept of "prop/aircraft matching" for good performance. There is one further benefit of geared props. How silly the 86" span Fokker D-VII would look with a 12" prop! But it would be scale or better with the 4:1 geared 27" diameter prop. The case would be almost the same for the P-51, but there, one might like to use a scale four blade prop of roughly 92% diameter or 24.8". A secondary factor in the use of more nearly scale size props is that thrust losses due to cowl blockage of the prop blast are reduced. These losses can amount to roughly 10% or more, and will be discussed again later.

There is one more topic in prop gearing effects which is worth exploration. Figure 6 shows the foregoing P-51, with its 27.0" diameter (P/D) = .5 prop geared 4:1. It pulls well statically and at best climb speed and has a maximum speed of 60 mph. One might ask what would happen with a similarly geared high pitch prop. While the calculations of the thrust of this prop are beyond the scope of this article, the results are shown in Figure 6. The prop illustrated has a diameter of 20.7" and a pitch of 20.5", yielding a (P/D) of .99. While it gives up a minor amount of rate of climb, the major loss is in static thrust, resulting in longer ground runs. The gain is a rise in maximum speed to 69 mph. The change is quite typical of that seen for increased pitch props. Also illustrated is what happens if you put an ungeared prop of the same (P/D) ratio on the engine.





Using the earlier relationships, the prop turns out to be 9.2" diameter with 9.1" pitch. The results are disastrous over the speed range --- and the full value of prop gearing emerges. The results are tabulated in Table IV.

Geared Props For Schoolyard Scale

My prior ramblings dealt with geared props for large models and how they work, while the title of the article is "Geared Props For Schoolyard Scale." You might ask, "what happened?"

It was my original intent to produce a .60 class geared prop unit to compete with the early belt driven units on the market. My reason was simply that belt driven units, fine while running, don't take kindly to starting unless the belts are very tight. Tight belts, in turn, have short life. I felt that "nylon to steel" or brass gear driven units would work better.

Figure 7 shows two prototype .60 class gear drive units built by Kress Technology which had the added feature of being able to select any one of three different gear ratios with one basic unit. Ratios from about 1.8 to 3.2 were available. I never went into production because of the proliferation of geared prop drive units in evidence at the trade shows. Also, large displacement engines were beginning to appear.

Before the .60 class gear driven prototypes were built, I experimented with prop drive systems of various types using, of all things, Cox .020 Pee Wee engines! I felt that problems of the individual types of drives would emerge more quickly with a small displacement engine. Also, the reed valve Cox .020 runs happily backwards, which eliminates the need for an extra gear stage. My experiments were run with 11/4 and 12/5 props; geared 4:1 and driven by belt, chain and gear drives. Photos of the units are shown in Figures 8, 9 and 10, respectively.

The belt drive performed much as expected. Skipping of teeth while starting could not be avoided without excessively tight belts and attendant early belt failure.

The chain drive was a disaster, although it started well. It ran very rough, with chain slap being much in evidence. A lot of power appeared to be going into chain dynamics.

The gear driven units, on the other hand, started easily, ran well at maximum power and wore well.

The original test geared prop unit in Figure 10 was designed for props from 11/4 to 12/5 at a gear ratio of 4:1. This was a bit extreme (borderline

Fig. 7: Two experimental .60 class geared prop units.

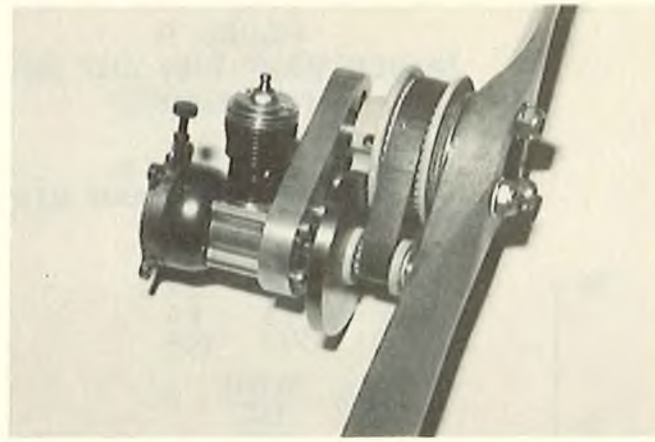


Fig. 8: Cox Pee Wee 020 belt driven 4:1 geared prop. 11/4 prop!

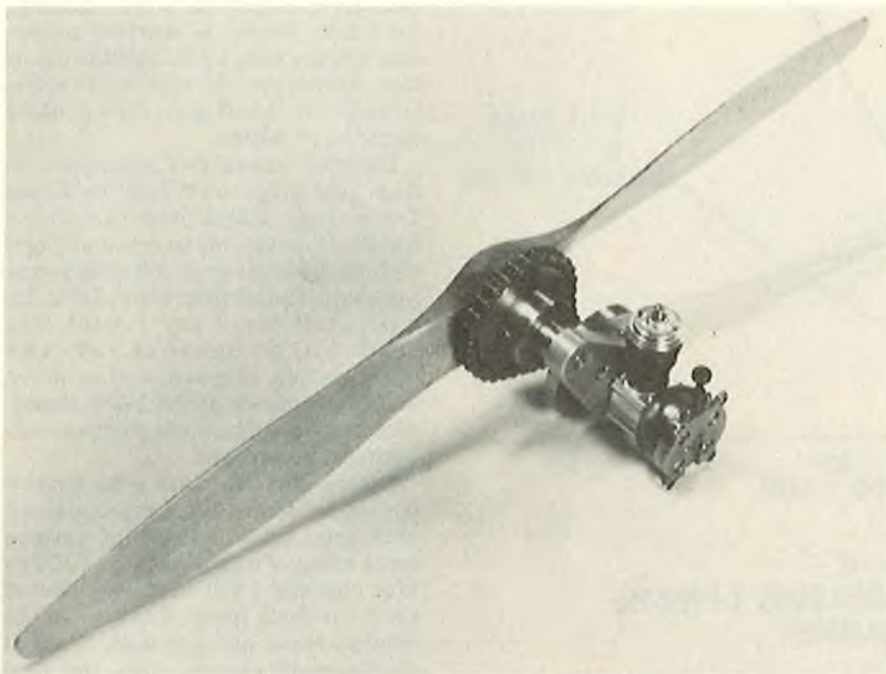


Fig. 9: Cox Pee Wee 020 chain drive 4:1 geared prop. 12/5 prop!

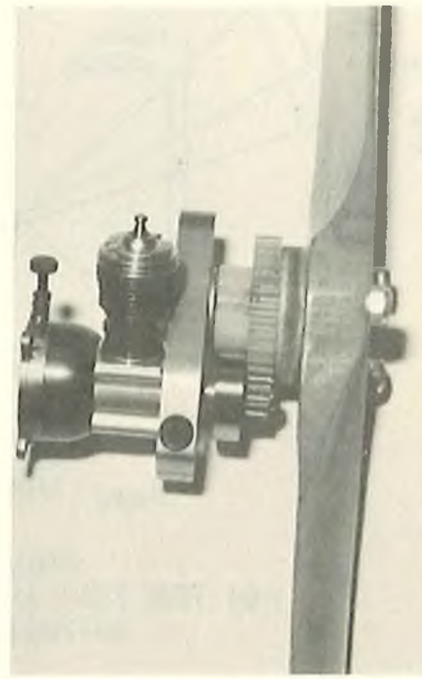


Fig.10: Cox Pee Wee gear driven reduction unit. 4:1 gearing. 11/4 prop.

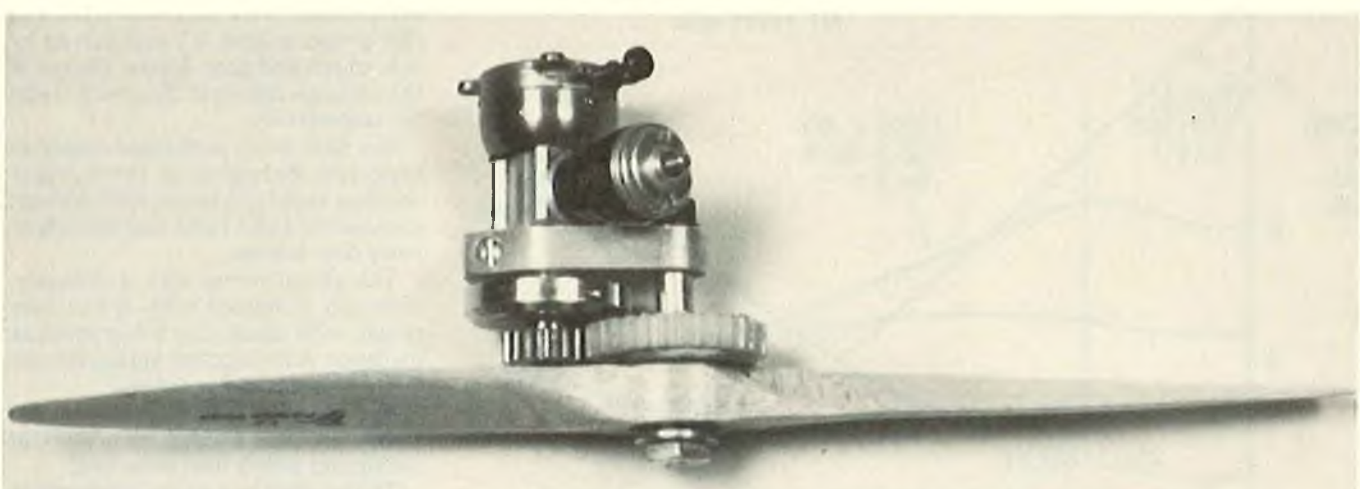


Fig. 11: Production Kress Technology GP-020 gear reduction unit for the Cox Pee Wee 020. 2.13:1 gearing. 7/4 to 8/4 props.

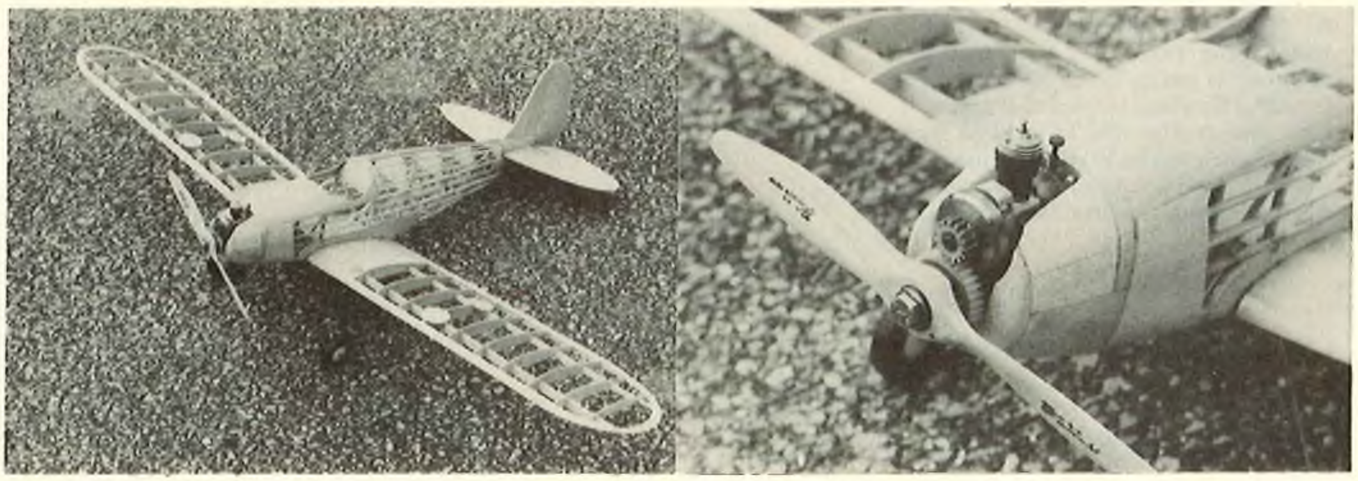
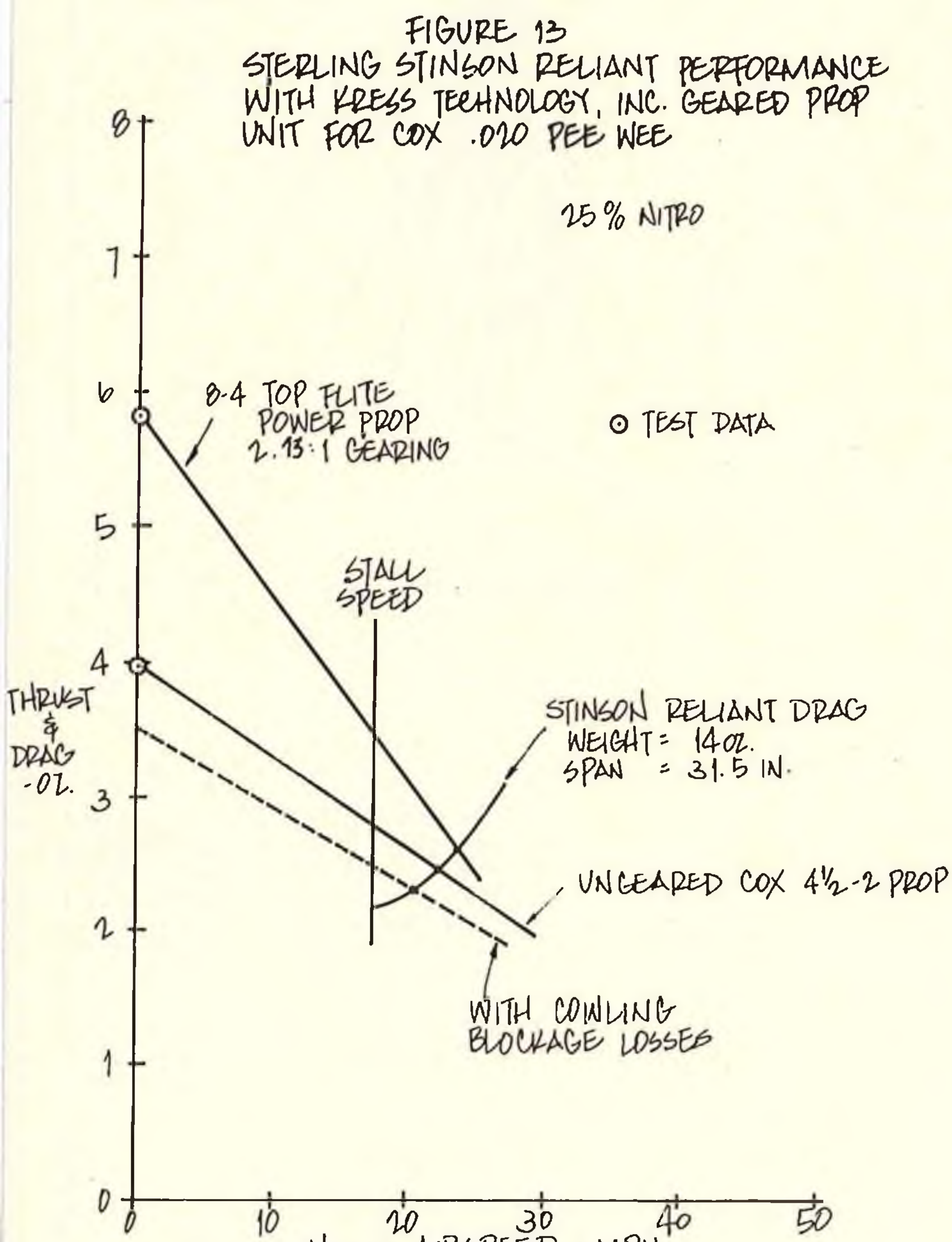


Fig. 12: Flyline Kinner with GP-020 by Nick Ziroll.



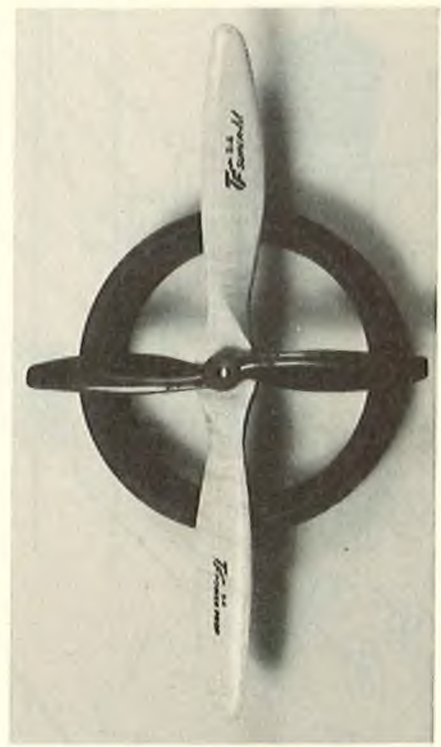


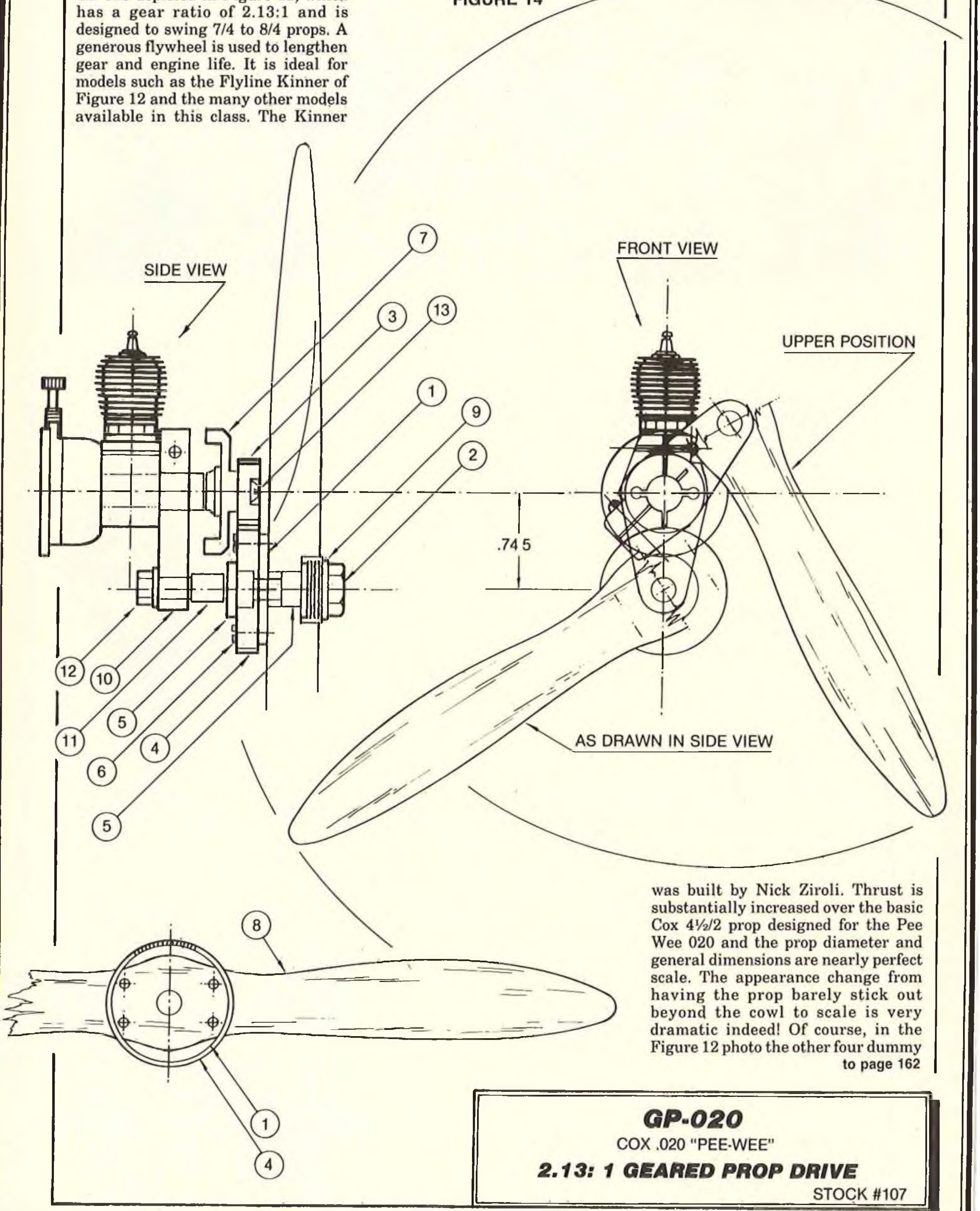
Fig. 15: Scale prop-to-cowling effect is achieved with GP-020.

ridiculous in appearance) in terms of prop diameter, although one possible application comes to mind. Free flight models want to climb at extremely low airspeeds. The direct geared prop on a hot engine thus tends to be a bit of a mismatch, as illustrated earlier, and gearing would probably be a big help. On the other side of the coin, prop-stopped drag would be higher and the trade off might be unfavorable. This brings to mind the possible use of free wheeling, feathering or folding geared props, which might work at the low prop rpm's --- and on and on! Want to try it?

I eventually settled out on the production Kress Technology, Inc.,

GP-020 depicted in Figure 11, which has a gear ratio of 2.13:1 and is designed to swing 7/4 to 8/4 props. A generous flywheel is used to lengthen gear and engine life. It is ideal for models such as the Flyline Kinner of Figure 12 and the many other models available in this class. The Kinner

FIGURE 14



was built by Nick Ziroli. Thrust is substantially increased over the basic Cox 4½/2 prop designed for the Pee Wee 020 and the prop diameter and general dimensions are nearly perfect scale. The appearance change from having the prop barely stick out beyond the cowl to scale is very dramatic indeed! Of course, in the Figure 12 photo the other four dummy

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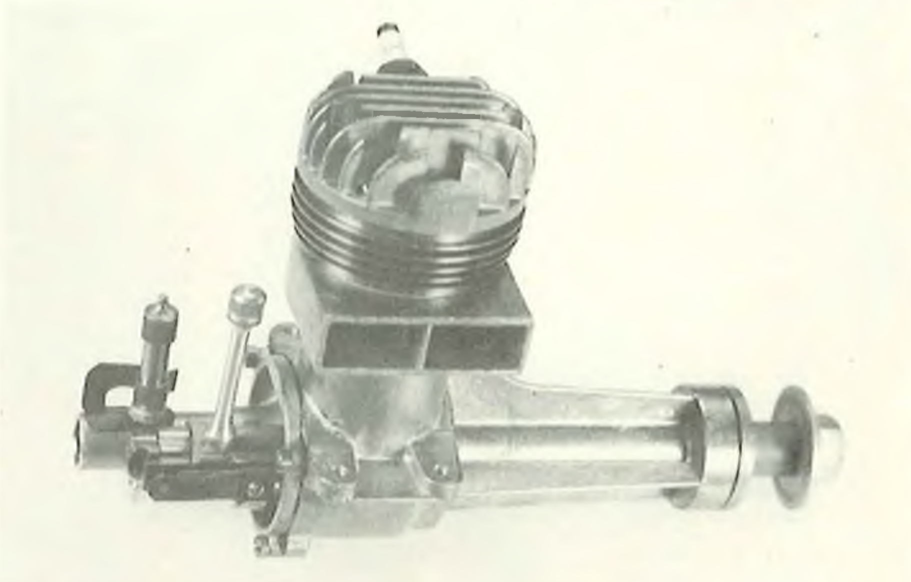
ENGINE CLINIC

Clarence Lee

The past two Engine Clinic columns have dealt with foreign engines. Last month (June) with the Saito line imported into the U.S. by Hobby Shack, and the previous month (May) with the O.S. .40 Four Stroke. While kicking around ideas for this month's column I received a phone call from my long time friend Duke Fox. Duke and I first met back in the late 40's when Duke was just starting his own engine business here in California with the now famous Fox .35. Prior to this, Duke had designed his first production engine the Fox .59 produced by the Claude C. Slate Co., in Los Angeles. I was active in U-control speed and stunt back in those days.

The first of this year Duke released two new engines which he is quite excited about --- feeling these are, perhaps, the best motors he has manufactured to date. The motors involved are a new Schnuerle ported .19 and an updated and revised version of the Fox Eagle II now called the Eagle III. So this month let's take a look at the new Fox Eagle III and give one of the two remaining major U.S. engine manufacturers a little coverage. Fox and K & B being the only two major engine manufacturers still in business in the U.S. Next month we'll cover the new Fox .19.



1st Fox engine — 1947 Fox .59 "Hi Torque" serial No. 16 — price $29.95.

Although Duke Fox has manufactured R/C engines since the late 50's with his first R/C engine being a carburetor equipped version of the Fox .59, his main bread and butter sales have been in the U-control field. The Fox .35 has dominated precision stunt events for many years and his Fox .36 combat engine has been the number one engine in this event. Duke never seemed to get a strong foothold in the R/C field for one reason or another. Duke's aim was always a good running engine at a reasonable price. Perhaps this economy approach was one of the reasons for less than enthusiastic sales in the R/C field. Fox R/C engines usually sell for a little over half the price of many of the competitive imports.

With the introduction of the Fox Eagle III and new Schnuerle ported .19, Duke is taking a new approach. A higher quality engine selling for a higher price. However, Duke will still be continuing to produce many of his "economy" engines. Even though Duke is putting the emphasis on his quality engines in the future the prices will, in most cases, still be below those of the competitive foreign imports such as the Webra, Rossi, and OPS.

During our phone conversation Duke asked if I would like to check out his two new "babies" that he is very proud of and I naturally accepted. After receiving the engines a few days later, running both, and disassembling for inspection, I am pleased to say that both performed extremely well. The power of the Eagle III was quite surprising and the new .19 a real screamer. Inspection of the internal parts showed considerable improvement in tolerances and finishes over Fox engines that I have checked in years past. A lot more attention has been paid to minor details. So this month let's take a look at the Fox Eagle III.

Over the years Duke Fox has probably designed and produced more individual engines than any other manufacturer. Super Tigre is probably running a close second here. I have lost track of the number of .19 and .15 designs Duke has marketed and imagine Duke himself would have a hard time recalling each one. Many of Duke's designs were of a conventional nature but on occasion he would come out with an engine with an unusual design feature or appearance --- strange intake shapes, back covers that also opened up the whole back of the engine, split crankcases, etc. The Eagle III would fit in the latter category being a bit unusual in appearance. For lack of better descriptive terms I will say the engine certainly has a massive, rugged, look. Many engines you can pick up and say, "That's really a beautiful engine," but I do not think anyone would say that about the Eagle III, except possibly Duke. But then beauty is in the eye of the beholder as the saying goes.

The Eagle III is reminiscent of the old Hornet .60 racing engine made shortly before and after WW II. It, too, had a very characteristic look — ugly but attractive. The Hornet, like the Eagle III, used a two piece lower crankcase with a separate bolt-on cylinder block. This type of crankcase design gives the manufacturer many production options. In Duke's case the separate cylinder block and crankcase pieces allowed him to use these same parts in his Fox twin, offer a side or rear exhaust version, or, as in the case of the previous Eagle II, offer either a front intake or rear intake model. I do not know if the rear intake engine will be continued with the Eagle III or not. Both a side and rear exhaust version can be had, however, you cannot buy a side exhaust engine and rotate the cylinder block for rear exhaust. The Schnuerle ports do not line up properly. This operation has to be done at the factory with proper port

alignment machined into the respective pieces.

Some of you may wonder about alignment problems with a split crankcase but Duke has taken care of this very nicely by joining the two lower crankcase halves with "dowel pin" type screws. The two case halves are drilled and reamed for screws having a long centerless ground shank that, in turn, assures perfect alignment when the engine is taken apart and reassembled. At the factory the two case halves are joined and final machining operations performed. The crankcase is a very rugged unit with heavy wall sections throughout. This means you can bounce your aircraft off the runway in one of those uncontrolled landings and not experience bent mounting lugs or a split crankcase.

The crankshaft is supported by two ball bearings. The front ball bearing being of conventional size but the rear being really massive — one of the largest used in a model engine with an O.D. of 1.260, I.D. of .590, and width of .350. The bearing itself weighs more than a Cox Half-A engine. The crankshaft is a bit unusual in that it appears to be made of two pieces; the main journal piece and a separate crank disc / counter-balance piece that is evidently pressed onto the crank journal and then furnace brazed.

The crank pin is part of the crank disc / counter-balance piece. The main purpose of the two part crankshaft being a savings in material used. To turn a crankshaft from one piece of steel 1¾" in diameter results in a lot of wasted material and cost. By turning the journal area from smaller diameter material and then only the crank disc from the larger material, quite a savings in time, material, and cost is the result. Unlike many Fox engines in the past that have used rather small diameter crank pins, the Eagle III utilizes a .280" pin as well as a 5/16" threaded prop section. These sizes are the same as I originally used when designing the Veco .61 so, needless to say, I agree with the choice. The aluminum prop drive unit is of the split collet type that is becoming universal with most engines. One thing I like that Duke has paid attention to for years is the front prop washer. Whereas most manufacturers use a lightweight aluminum or steel hardware store type washer, Duke has machined the washer from steel bar stock and serrates the side facing the propeller the same as the front face of the prop drive unit. This really grips the prop when tightening the prop nut so no slippage can occur.

The piston is machined from a high silicon content aluminum casting and uses a single "pinned" expansion ring. By using a high silicon aluminum, closer running clearances can be used --- high silicon aluminum having a lower expansion rate than standard bar stock aluminum. This same type of aluminum is used in the ABC type engines. A closer fit between the piston and liner makes for less piston "rock" and resulting ring wear. Crankcase compression and fuel draw are also improved. The piston rings used by Duke are manufactured by McQuay-Norris, and they also manufacture piston rings for full size automobile, aircraft, etc., engines. However, Duke purchases the rings in an unfinished state and performs the final sizing operations in his plant, thus assuring a more consistent match between the piston and sleeve. This is one of the reasons all Fox ringed engines have excellent compression. The rings are round. Oftentimes rings supplied by ring manufacturers in the smaller sizes leave a lot to be desired in this department.

The connecting rod is machined from aluminum bar stock and utilizes bronze bushings at both the crank pin and wrist pin ends. Like the rest of the engine, the connecting rod is of very massive proportions. The tubular wrist pin is retained in the piston by two internal retaining rings. This eliminates any possibility of the wrist pin putting a score or polish line on the sleeve that can, in turn, result in a leakage of compression. In years past this could be quite a problem when using brass pads in the ends of the wrist pin that rubbed directly on the cylinder wall. This is especially true in engines using soft steel sleeves. Hardened steel sleeves were not affected as much. Teflon pads helped the problem considerably but occasionally the heads of Teflon pads will wear away and then the bad things happen. In my opinion the internal retaining clip is the way to go. These are large cross section clips that fit into deep grooves machined in the piston wrist pin holes. Unlike clips used by some engine manufacturers (that are formed of light piano wire and have been known to pop out of place) the internal retaining rings used by Fox are the same as those used in aircraft engines for this purpose and many other full size engine applications — only in a considerably smaller size.

Fox .60 Eagle III.

Fox .60 Eagle III disassembled.

In keeping in line with all of the other parts, the sleeve is also a massive item. With a wall thickness of .075" and flange thickness of .125" it is one of the heaviest model engine sleeves I have seen. Three exhaust ports, two transfer ports, and two boost ports directly opposite the exhaust ports are used. A secondary machining operation of the two transfer ports that are cut directly into the sleeve to direct fuel up and rearward has been performed. The two rear boost ports are cut at an upward angle as in all Schnuerle type model engines so that the incoming fuel from these ports merges with the fuel from the transfer ports and is directed upward into the cylinder/combustion chamber eliminating the need for a

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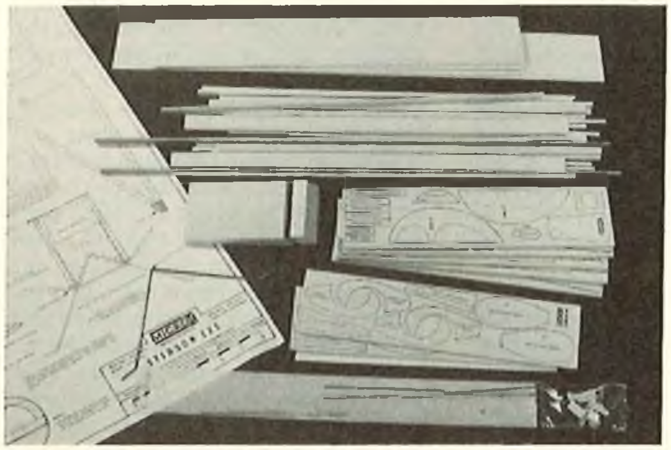
RCM PRODUCT REVIEW

Micro-X Models STINSON 125



SPECIFICATIONS

Name	STINSON 125
Aircraft Type	1/2A Sport/Stand Off Scale
Manufactured By	Micro-X Products P.O. Box 1063-D Lorain, Ohio 44055
Mfg. Suggested Retail Price	$28.95
Available From	Both Mfg. & Retail
Wingspan	38½ Inches
Wing Chord	5¼ Inches
Total Wing Area	200 Square Inches
Fuselage Length	27½ Inches
Stabilizer Span	14 Inches
Total Stab Area	47¼ Square Inches
Mfg. Rec. Engine Range	.049 to .051
Recommended Fuel Tank Size	2 Oz.
Recommended No. of Channels	2-3
Rec. Control Functions	Rud., Elev., Throt., (Throt Opt.)
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Balsa
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	No

RCM PROTOTYPE

Radio Used	Airtronics (XL) 6 ch. w/3 servos
Engine Make & Displacement	G-Mark .061 R/C
Tank Size Used	2 oz. SS-Z
Weight, Ready to Fly	22 Oz. w/225 ma battery
Wing Loading	15.8 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
High quality of wood, ease of assembly, good die-cutting and clear printing on parts to be cut out. Good look and flight performance.

WE DIDN'T LIKE THE:
Wood missing from kit. Ground handling.

Perhaps one of the most appealing aspects of R/C aircraft is building and flying a really good schoolyard scale model.

These small, usually 1/2A powered models that look much like a real airplane, have a lot going for them, i.e., small size, quick building, easy transportation, and the ability to fly from a confined or restricted area. Oh yes, don't forget the cost, these smaller models usually cost considerably less to build and fly.

The Stinson 125 by Micro-X Models is an excellent example of this type of model.

Having previously built another Micro-X kit, I was looking forward to this one with considerable anticipation. The kit comes in a sturdy 29½" x 7" x 3" cardboard box. The packaging of the materials was neat and all parts were easy to identify. The 38" x 25" plans were neatly rolled, contained many building notes and were very clear with all parts shown full size.

This kit is constructed along the lines of some of the old timers. That is, some parts were die-cut, some were rough sawn to approximate size and some had to be cut out on the Dremel jigsaw.

The die-cutting was very clean and the printing on the parts which had to be cut out was clear and easy to follow.

The quality of all of the materials was excellent and the only problem encountered with the materials was that two pieces of 3/16" sq. stringer material were omitted from our kit. The accessories included with the kit consisted of control horns, top cowling, mounting bolt, formed main landing gear wire, tail wheel wire and mounting bracket and windshield material. Also included in the kit is the material for wheel pants which add so much to the model's appearance.

Construction:

Before actually starting to build the model, I decided to cut out all of the printed parts first, which took about 45 minutes. I began building the fuselage first and that's when I remembered how much fun I had as a kid building all of these "old time models." The basic fuselage structure is balsa stringers with diagonal braces. The front section is built up of balsa blocks and sheeting. The two identical sides are built over the plans and then joined together.

A die-cut plywood firewall is supplied for the engine compartment and a die-cut plywood bulkhead is used for the main fuselage former where the landing gear is attached. The remainder of the horizontal bracing is 3/16" balsa. When completed, the structure is very strong and lightweight. The wing, vertical fin and horizontal stabilizer are all of balsa construction and are also built right over the plans.

Only one minor discrepancy was noted during construction, and that was that both forward fuselage

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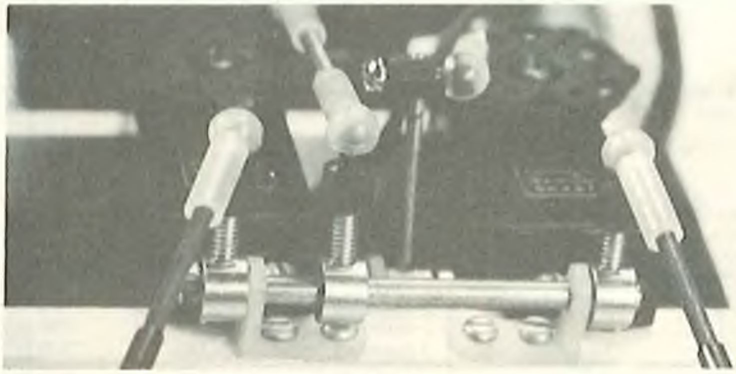
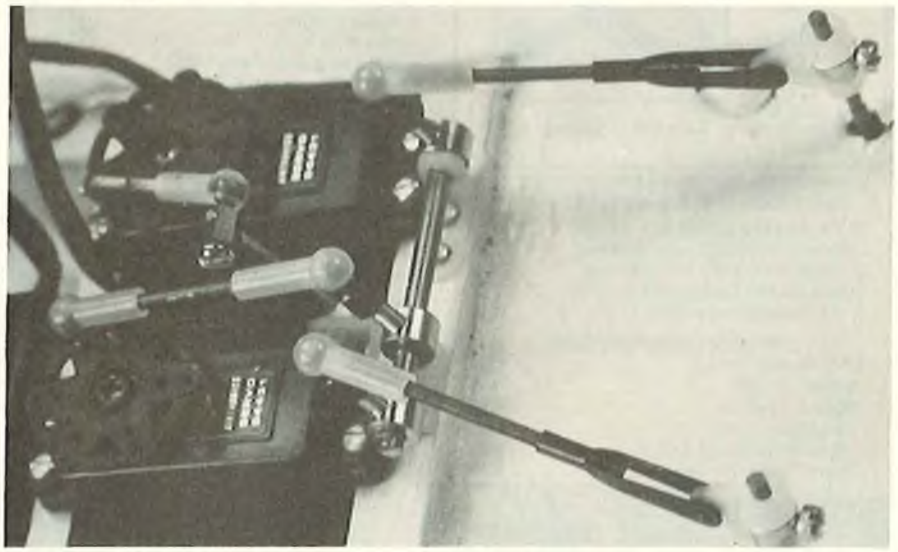
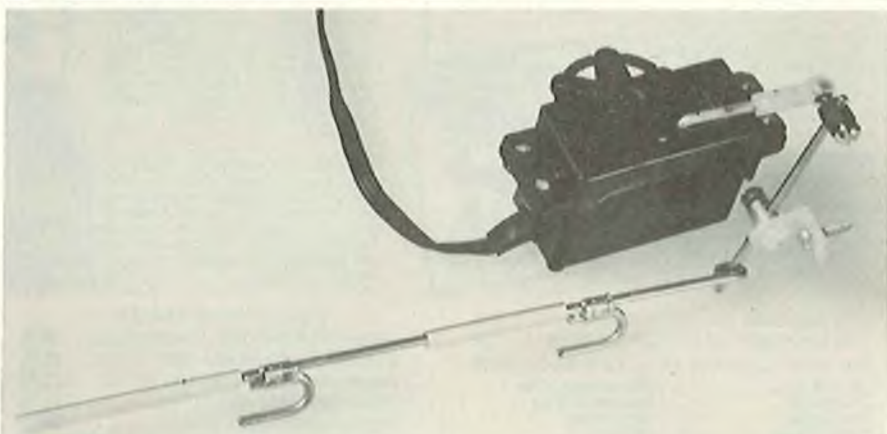
RCM FUNSTER 40 DETAILS

A Couple of How-To's

By Dick Tichenor







FLAP LINKAGE

A method of converting the rotary motion of the servo output into an equal linear movement for the flap controls led to the development of an idler shaft mechanism.

The heart of the mechanism, as shown in the photos, is a length of 1/8" diameter music wire shaft supported by two Goldberg 90° mounting brackets. Three flats were ground on the shaft to index the 1/8" wheel collars. One inch long 4-40 screws secured the collars and the heads were cut-off so that the Du-Bro #180 bolt on ball links could be installed. The 2-56 threaded coupler stock from Sullivan Gold'N-Rods were used to connect the ball link sockets and clevises. A Du-Bro strip aileron linkage was used for the flap control.

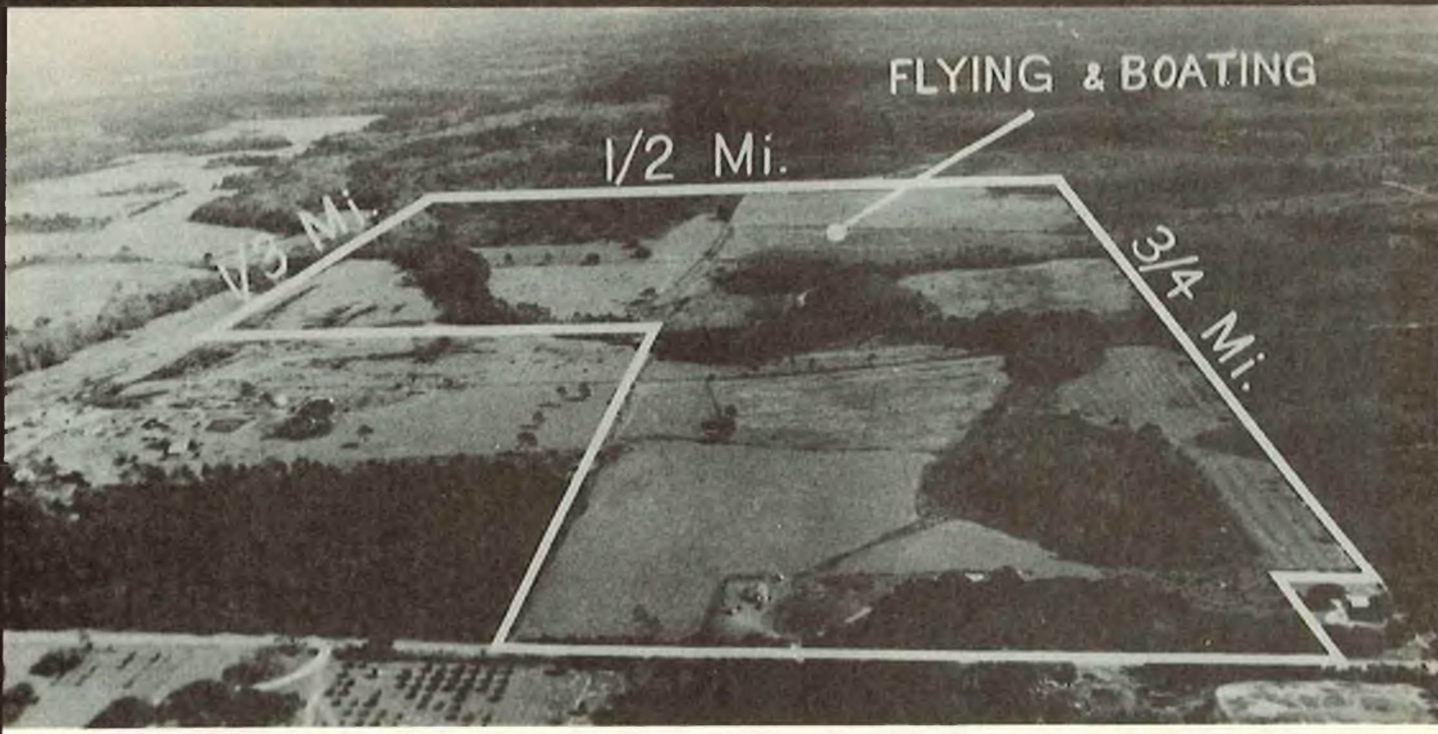
This linkage has provided the desired results and allows a generous amount of adjustment.

BOMB RELEASE

Having a six channel Airtronics Radio while using only five functions in the RCM Funster 40 presented a temptation. Why not install a built-in bomb drop arrangement? If for no other reason it would enhance the Funster's capability in club fun-fly events.

Being both lazy and not too talented, we applied the KISS principal. The bomb would have either one or two wire loops or screw eyes to insert into slots in the bottom of the wing center section. All that is needed are wire pins to slip into the loops to hold the bomb and then to slide back for release. The photos are self explanatory. Short lengths of soda straws were used for guides for the sliding wire and one must be slipped over the wire prior to soldering the hooks in place. The soda straws are stuck in place with CA. The bellcrank wire pivots through a pushrod connector mounted on a Goldberg 90° mounting bracket, (the bracket is mounted onto the servo mounting rail). A Du-Bro aileron ball link is used for the connection to servo.

This arrangement has worked very well and with the slow speed capability of the Funster 40 you can be on target every time.



Aerial view of R/C World looking eastward toward the Atlantic coast, Dean Road in the foreground. George Jenkins photo.

R/C WORLD IS BECOMING A REALITY!

By Drew Alexander

R/C World of Florida, Inc., is making significant progress toward building the world's first residential community for modelers. (See RCM, May 1981.) The corporation's issuance of preferred stock to modelers has provided the capital to purchase 177 acres of land only nine miles from one of the world's greatest resort areas --- Orlando, Florida. Disney World and Sea World are just 30 minutes from R/C World property, and Daytona Beach is less than an hour away. The property, valued at 1.4 million dollars, is located approximately two miles south on Dean Road off Route 50, and is ideally suited for residential development.

The land has been rezoned from agricultural use to Planned Unit Development (PUD) with model airplane and boating facilities under a plan approved by Orange County, Florida. Modelers will be happy to learn that 100 acres is designated for radio control modeling. Plans include paved directional runways 400 feet long with taxi-ways and pit areas, a functional control tower, and a 3 acre lake for R/C boats and seaplanes. Other amenities include an olympic size swimming pool, lighted tennis courts, and a clubhouse with spa facilities.

Architectual design and site engineering work are well-underway for construction of 303 luxury condominiums and 58 1/4 acre homesites. Improved individual homesites will begin at approximately $20,000, and condominiums will begin at about $65,000. Time-sharing will also be available, placing ownership

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Dixie Cutrone, longtime Connecticut modeler and member of R/C World's Board of Directors helps ready Lee Painter's O.S. .60 powered Dirty Birdy for the historic first powered flight at R/C World, January 15, 1982. Bill Sharpe photo.

PIETENPOL

AIR CAMPER

In 1932, the Flying and Glider Manual presented the construction article on the full size homebuilt of the "Air-Camper." It was powered by a Ford Model 'A' engine. This 1/4 Scale replica is a winner with an O.S. .60 four-stroke.

By Gene Wallock

I have admired the Pietenpol Air-Camper for years because of its exquisite simplicity and subtle charm. Several years ago I had the opportunity to copy the original "Flying and Glider Manuals" published by Fawcett Publications in the late twenties and early thirties. The 1932 edition had the construction article for the full size aircraft, including the "Model A" engine conversion. A few years ago I joined the Experimental Aircraft Association (EAA) and to my pleasant surprise, they offered reprints of the original manuals. I ordered the set, saw the Pietenpol article again and decided I had to model it.

The O.S. .60 4-cycle engine came on the market and Quarter Scale modeling was in full bloom. A quick check of dimensions resulted in an 84½" wingspan model. The manual text revealed the Clark Y airfoil was tried on early versions and the Clark Y is an old standby in modeling, so the model designed started to click. Tail area is especially vulnerable to scale modeler's "let's make it bigger" attacks. I figured that at Quarter Scale no enlargement was necessary. (I feel the same way about Peanut Scale.) Let's face it, an airplane is completely scaled down or it isn't scale. It's Stand-Off, butcher or fish, but scale it ain't.

The construction style was the next consideration. I liken solid sheet construction building apple crates and foam is something that makes shaving easier and girls more proportional. After five minutes consideration, I decided to draw it using scale construction. Fortunately, wood sizes in the 1930's were nice and comfortable, like 1" square or the ever popular 1" by 3/4". Dividing numbers like this by four may be done in your head, unless you've been educated with new math. In that case, buy a calculator and get familiar with the number 4 and the ÷ button.

ABOUT THE AUTHOR

Gene Wallock began modeling in 1939. His mom cut the parts out as razor blades are dangerous for a 5 year old. His free-flight contest flying started in 1948 and lasted through 1958. Old-timer FF was his main activity through 1978.

He owns P & W Model Service and produces kits for several well-known companies. He holds a degree in Aeronautical Engineering from Cal Poly, San Luis Obispo (1957). Gene worked in Aerospace until 1977 when he decided to devote his full time to P & W. He collects pre-WWII ignition engines, kits, and magazines. His modeling involvement is reflected in his membership numbers: AMA 598, SAM 22 and MECA 178.

Gene has an outgoing personality and delights in sharing his expertise with anyone requesting assistance. Those of us acquainted with Gene Wallock have learned that he is also afflicted with a subtle and slightly sardonic sense of humor. Don't tell him, but we think he's a pretty neat guy.

After the plans were drawn, I took a few modeling liberties:

(1) Solid ribs were used instead of built-up. I did this because someone else may want to built it and they might not share my passion for building.

(2) The scale landing gear requires an expert tin bender for the fittings and that technique I leave to the master — Lou Proctor.

(3) My '71 Chevy Kingswood wagon would transport the model assembled very nicely; but my good friend, John Camp's Porsche 924 wouldn't. John wanted to build one with me, so his car became the transport envelope. Thus, the three piece wing came to be.

(4) Cabanes that aren't readily removable create building problems because they usually end up in your eye, nostril, or some other part of your anatomy while you're putting a sanding move on the model. A broken cabane in a finished model will cause grown men to weep at the repair prospects. Relax, they're removable.

(5) A steerable tail wheel was used in lieu of a re-bent "Model T" 4th leaf spring. It makes ground handling easier and was used on some full size "Pete's".

(6) Wire rigging was eliminated as a structural requirement. Obviously, it can be added for maximum scale points.

Scale Reference:

The "EAA 1932 Flying and Glider Manual" is my primary source. However, in 1981, there were 54 Air-Campers registered in flying condition, so a little sleuthing and you'll probably find a full size example at a local flying field (would you believe somewhere in your state?). I have old magazines that show them with cub type wheels, motorcycle wheels, Lycoming engines, radiators mounted in the cowl chin and Mr. Pietenpol's latest example had a Corvair engine in it. If you want to build it for sport flying, build and finish it to your own idea of what your full size one would look like. Remember, it is a homebuilt.

Construction Considerations:

Before starting construction, the following must be established:

(1) **Engine:** The O.S. .60 4-cycle is ideal for scale sound. The K & B .61 provides a bit more power on the same prop and fuel (a 16/6 Y & O and K & B 100 fuel). You say a 16/6 won't work on a K & B .61 — **wrong!** Run the engine slightly rich to prevent overheating and enjoy. Actually, any cross scavanged (Non-Schnuerle) .60 will be fine or a 4-cycle up to .90 c.i. I do have a Quadra in my Sears chain saw and it cuts wood, not air. The model is not designed or stressed for the industrial type engine. The model should weigh a little over ten pounds ready to fly. That's the whole airplane, not just the engine. With the 20 ounce O.S. .60 4-cycle, the model will balance with minimum nose weight.

This 1932 flying and glider manual has the complete building plans and instructions for the full size Air Camper available from EAA, Hales Corners, Wisconsin 53130 for a price of $2.50.

PIETENPOL AIR CAMPER
Designed By: Gene Wallock
TYPE AIRCRAFT
1/4 Scale Homebuilt
WINGSPAN
84½ Inches
WING CHORD
15 Inches
TOTAL WING AREA
1267 Sq. In.
WING LOCATION
Parasol
AIRFOIL
Clark Y
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
1/4 Inch
O.A. FUSELAGE LENGTH
51⅝ Inches
RADIO COMPARTMENT SIZE
(L)13" x (W)5½" x (H)5½"
STABILIZER SPAN
22½ Inches
STABILIZER CHORD (incl. elev.)
9⅛"
STABILIZER AREA
184 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7¾ Inches
VERTICAL FIN WIDTH (incl. rudder)
8½" (Avg.)
REC. ENGINE SIZE
.60 4-cycle
FUEL TANK SIZE
8 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Pine, Spruce, Ply
Wing	Balsa, Spruce & Ply
Empennage	Balsa & Ply
Wt. Ready To Fly	**168 Oz.**
Wing Loading	**19 Oz./Sq. Ft.**

(2) **Gas Tank:** The original model uses an 8 oz. Kraft Slimline tank which is good for 15-20 minute flights. The tank's physical size is needed to establish the dimensions of the tank "doghouse." Most models have internal tanks with plumbing running through firewalls. Neat, till they leak or the line deteriorates. The "Pete" has an oil wall with an opening (door of the doghouse). The tank slides in through the oil wall and is held in place by foam tape on the sides and rear (vibration isolation) and the engine mounting plate in the front. If the tank fails, remove the engine plate, pull the old tank out, shove a new one in and hook up lines directly to the engine. The doghouse uses a light ply floor and back, and 1/64" ply cover. Naturally, the inside has several coats of K & B resin.

(3) **Aileron Servo:** The aileron servo output (wheel or arms) driver will determine the location of the aileron bellcrank control rod holes in the ribs. The original model used a Kraft KP-15 III servo and Sullivan Gold'N-Rods. Contrary to popular opinion, temperature stability was no problem with the rods.

CONSTRUCTION

The "Pete" is built in the following sequence to insure proper alignment and minimum wood waste:

(1) Fuselage sides, cabanes and 1/8" ply wing center ribs.

(2) Fuselage frame and landing gear.

(3) Wing and struts.

(4) Tail group.

(5) Fuselage completion.

(6) Assembly and covering.

Fuselage Sides, Cabanes & Center Ribs:

I assume any modeler building the "Pete" doesn't need "glue stick A to stick B instructions," so I'll describe my building technique.

I build both sides at the same time to insure identical sides. I use the outside outlines and the front edge of uprights and diagonals as reference to eliminate wood size tolerance

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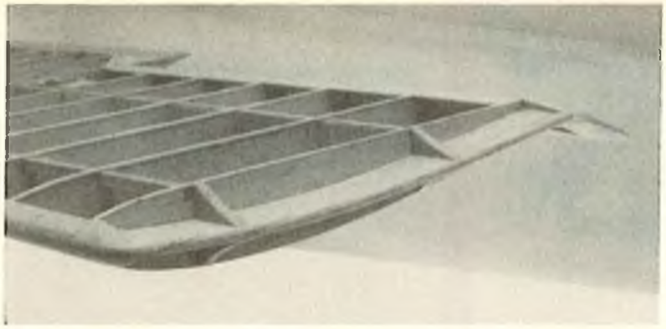
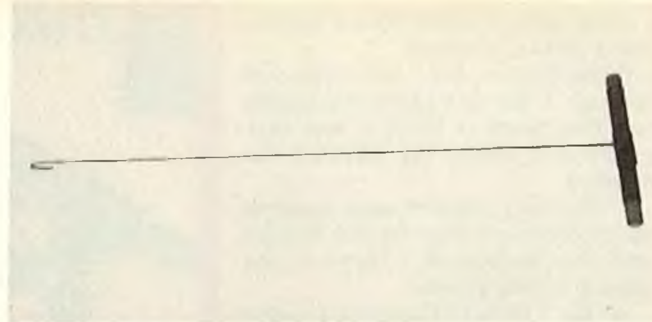
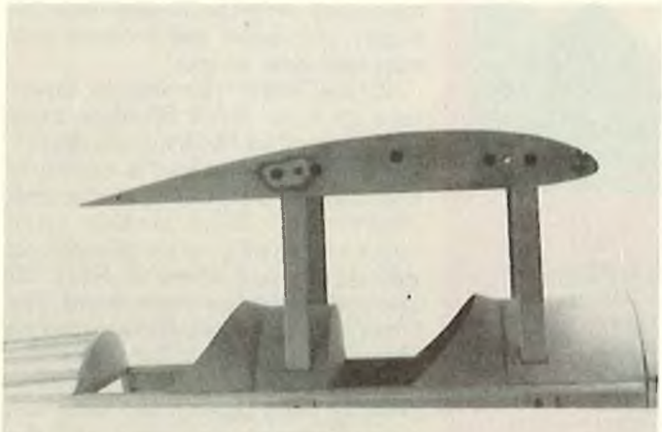


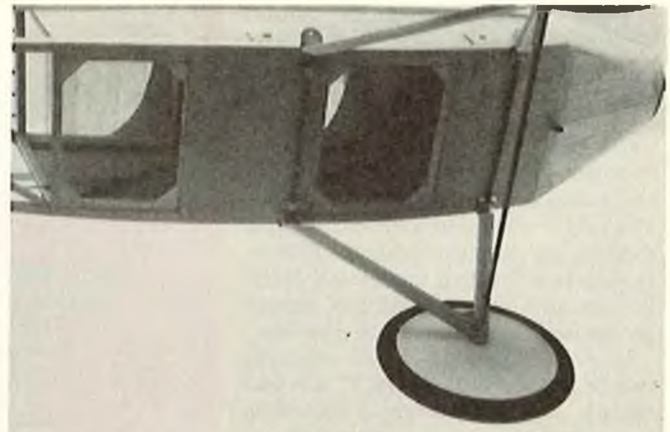
Contoured wing tip and braces.



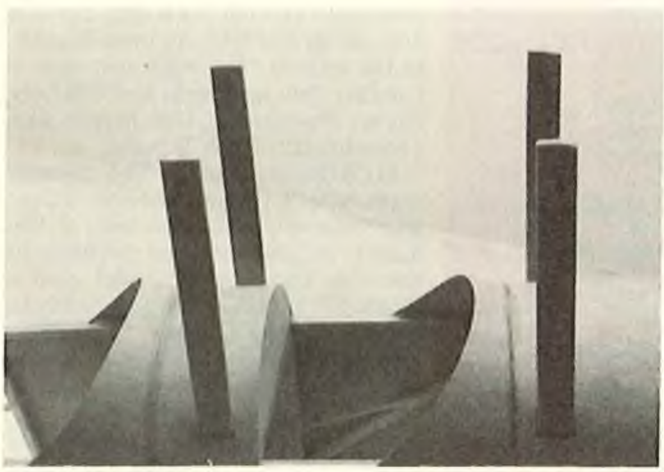
Wing band puller hook.



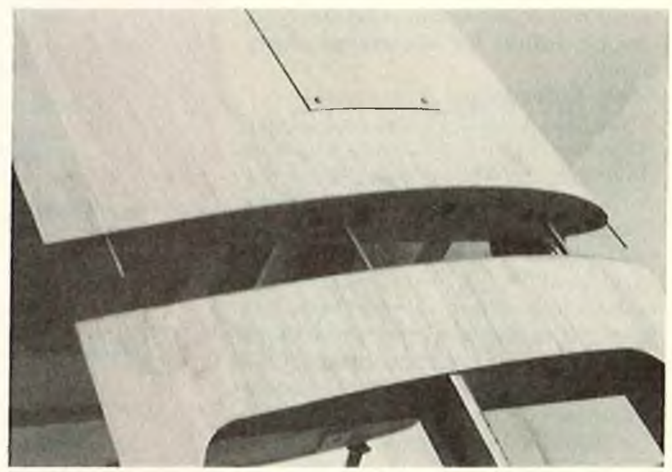
Center section trial fit — note cabane aft tilt.



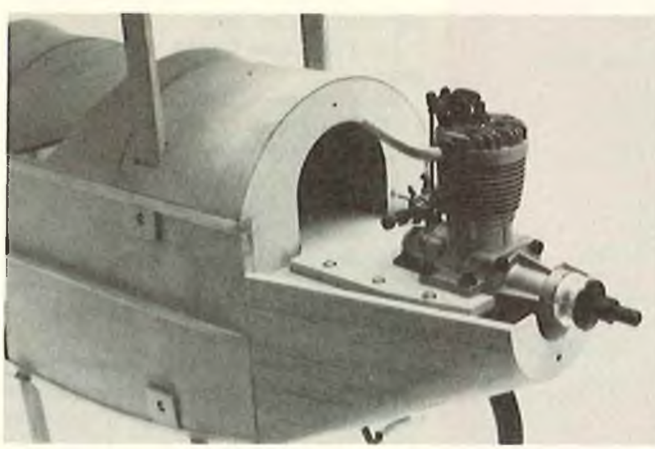
Inset radio compartment hatches and gear mounting.



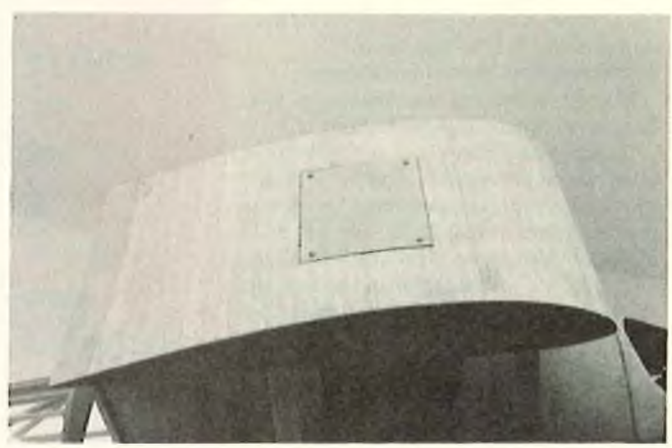
Cabane installation — Note screws in top of cabane struts for assembly orientation.



Trial fit of outboard panel to center section.



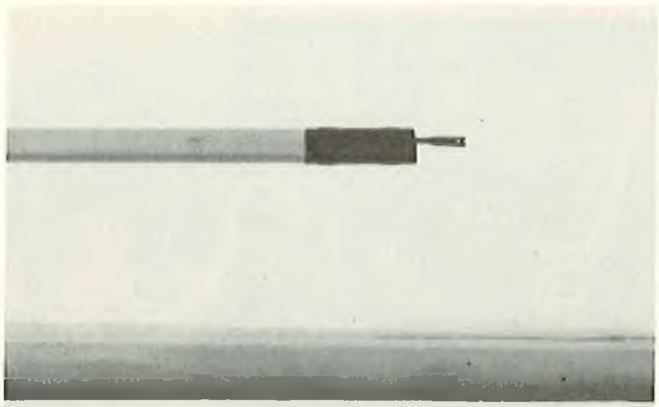
O.S. .60 four cycle installation on engine plate and tank "dog house."



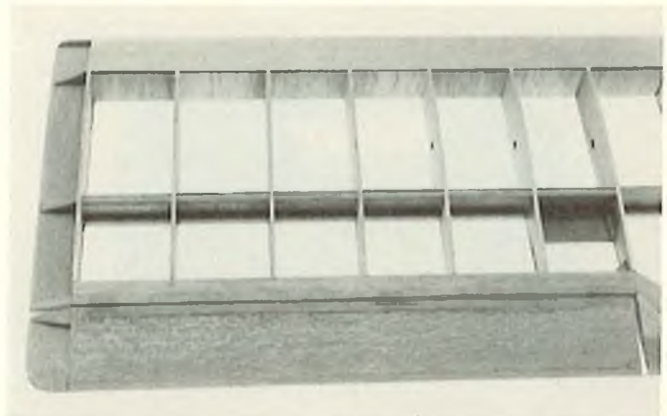
Aileron servo hatch cover on wing center section.

Tail group alignment check.

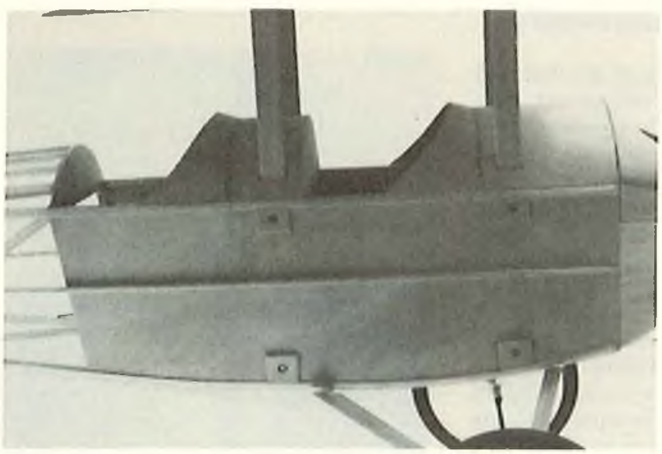
Top cowl and mounting screw.



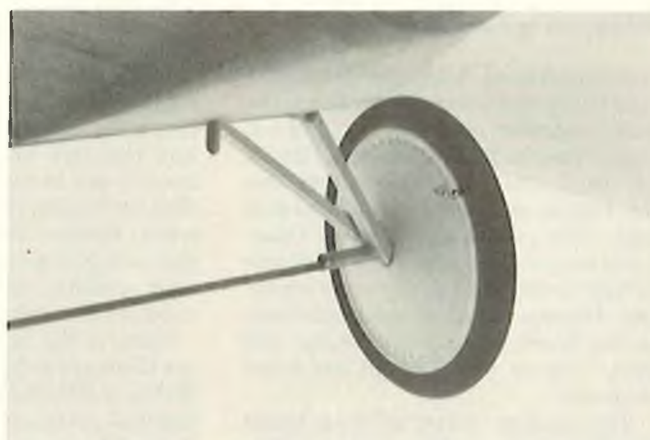
Typical strut end at fuselage.



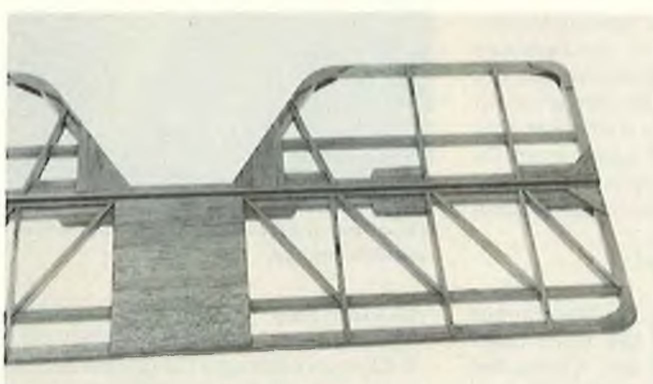
Aileron installation.



Cabane mounting screw fairing plates and covering strips.

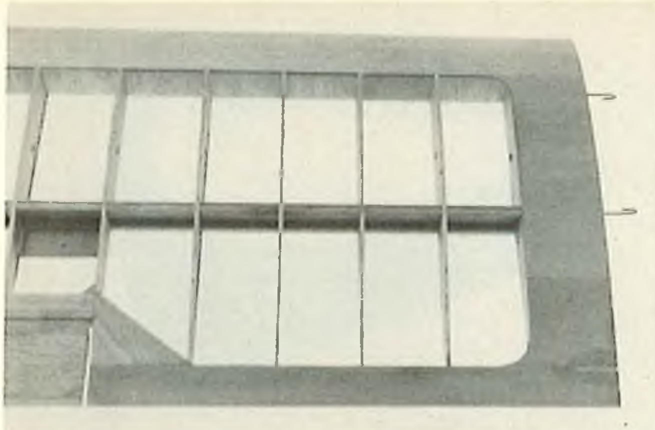


Optional balsa strut fairings and completed L.G. assy.

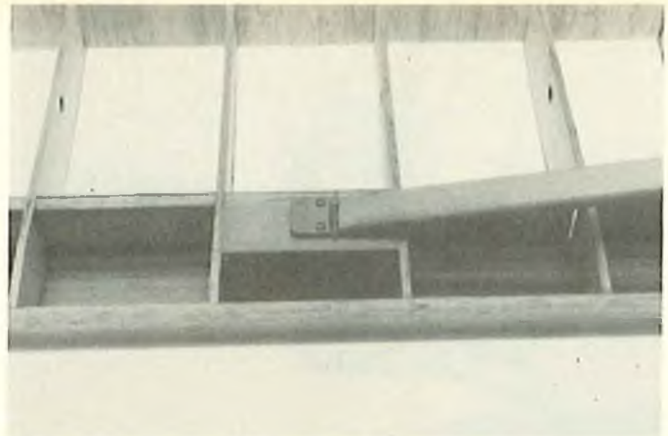


Stab/elev. assembly.

Fin/rudder assembly.

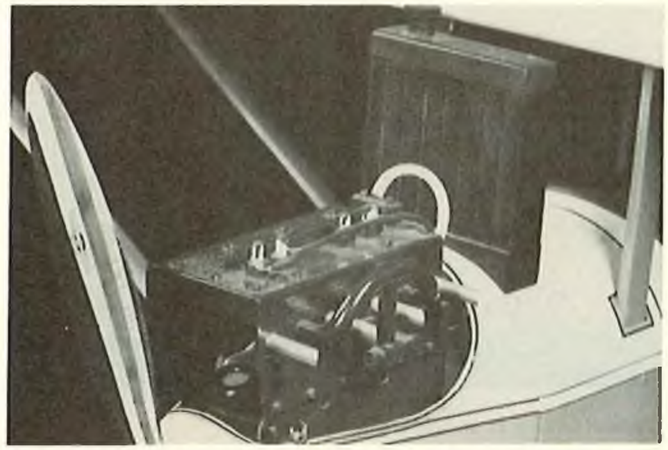


Wing band hook and shear web final assembly.

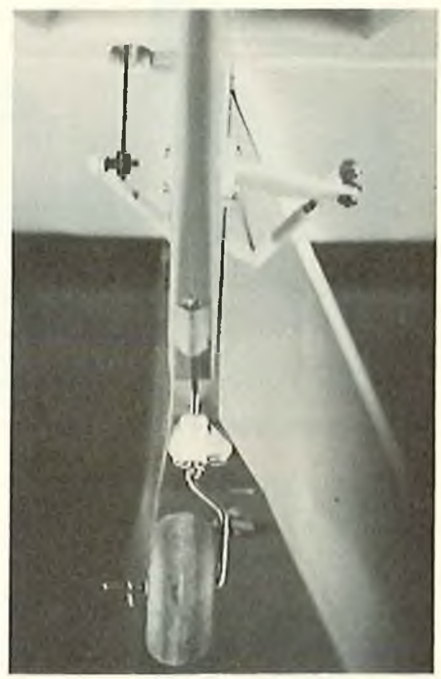


Optional strut attach at wing using large Du-Bro hinges with removable pin.

Aileron servo installation — directions for people who forget quickly (old age and senility).



Model 'A' engine wrapped around a K & B .61. Rear plug is glow plug contact wire.



Rear view from bottom side of tail wheel and tail linkage.

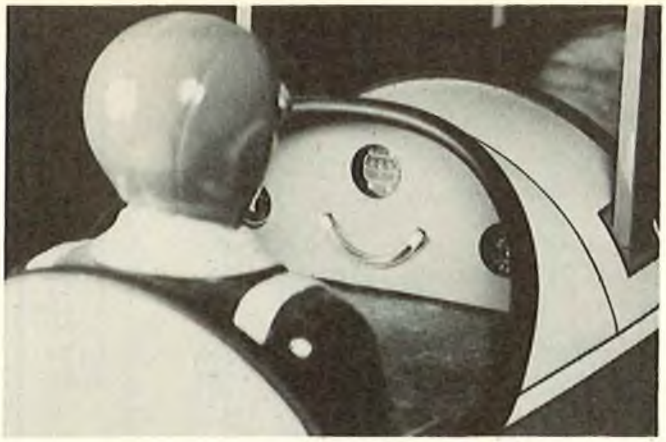
problems. I used "Titebond" for initial glue joints and you're right, the sides stuck together after the glue dried. Upon removal from the board, I had a 1/2" thick side. I was able to sand the top, bottom and both outside faces as a unit, thus producing identical sides. Long pieces of cabane stock were cut as well as the two 1/8" ply wing center ribs. I clamped the 1/2" thick side back to the board using balsa blocks and pins. I never pin through the wood structure.

The cabane material was taped together with masking tape outside the side frame envelope. The cabanes were then tack glued to the side using Duco glue, after I had placed them on the side in line with the plan location. The plywood ribs were taped together and tack glued to the cabanes in their plan position. After the tack gluing was dry, I was ready to drill the cabane mount holes and the wing center section attach holes. A drill press and 1/8" drill were used. Don't use a hand drill because these six holes are the alignment holes that establish cabane aft tilt, incidence and wing position. After the holes are drilled, 4-40 screws are inserted and snugged down with washer and nut. The cabanes are trimmed and sanded flush with the side bottom and rib top. At this point, identify the forward and aft, left and right cabanes with a soft pencil. Also mark the left and right fuselage sides and the left and right ply ribs. I usually try to mark them in an area that isn't going to be carved or sanded away. Remove the 4-40 screw; break the tack glue joints with a razor blade and, presto; match drilled ribs, cabanes and sides.

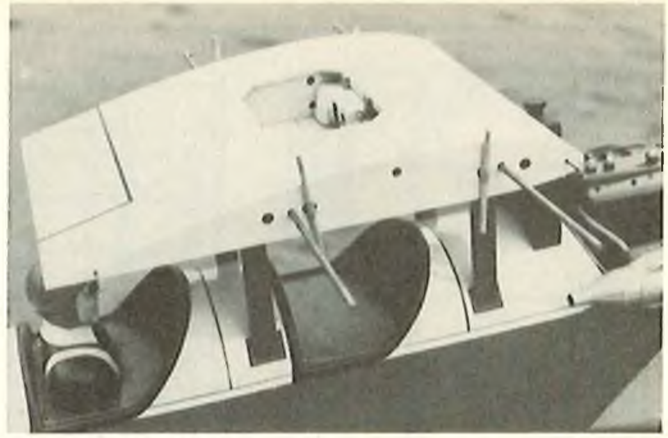
Remove the tape from the ribs and set them aside. Insert the proper drill, for the 4-40 blind nuts you're using, in the drill press and open up the cabane holes for a snug T-nut fit. Press the nuts in and glue with CA and baking soda. Remember, the T-nuts are on the insides of the cabanes. Now, using the razor blade, separate the fuselage sides by pushing the blade through the glue joints between the longerons. If you've been fairly tidy with your glue joints, the sides will come apart in about one minute. Lightly sand the inside surface of the sides and proceed to frame the fuselage.

Fuselage Frame and Landing Gear:

Glue the right hand engine mount rail to the inside of the right hand fuselage side and let dry. Clamp the left hand fuselage side to the outside of the right hand fuselage side with clothespins. Alignment is easy because they were sanded together. You can even hold them together with 4-40 screws through the cabane mount holes and a clothespin at the rear post. Glue the left hand engine mount rail to the inside of the left hand fuselage



Looking into the rear cockpit — note the simplicity of instruments.



Rubberband installation prior to outbord panel mounting.

Ready for assembly after removal from a compact car.

Slow fly-by on gorgeous day. Someone forgot the dummy engine.

Climb out after slow fly-by. This makes it worth all the effort.

Now where's that kid with the chocks and rag to wipe my goggles?

side. Use the right mount rail for alignment. You've now built in the 2° engine down thrust.

When the glue is dry, un-clamp the sides and prepare to build the fuselage box. Pre-cut the cross pieces and landing gear plates. Use your favorite technique to build the frame assembly. I use Kraft rubberband loaded clamps because of the long clamp fingers, the 90° squareness and they won't loosen up. If you're used to building upside down on the top view, have at it. The top longeron is straight and lends itself to this method.

Before joining the sides, I trial fit the radio installation to establish servo rail mount locations. Servos were mounted on a Kraft plate (or radio of your choice). The original model radio was installed through the front and rear cockpits with no problem. If a bottom hatch is your preference, inset them between the landing gear mounting plates and longerons. Building buddy, Bob Brown, used this method and the result was gorgeous. By insetting the hatch, the side view is not marred by a "toy" hatch look. Coupled aileron and rudder is recommended because of slow speed flying and scale control gaps. The July 1980 RCM (page 68) has an article by some obscure author on how to install the linkage.

After the basic frame is built, install the radio and pushrods. Obviously, this installation isn't final, but you'll be able to tie down rod guides, build a battery and receiver compartment without working in closed quarters. At this point, turn the radio on and check servo direction response with respect to control horn location. If your

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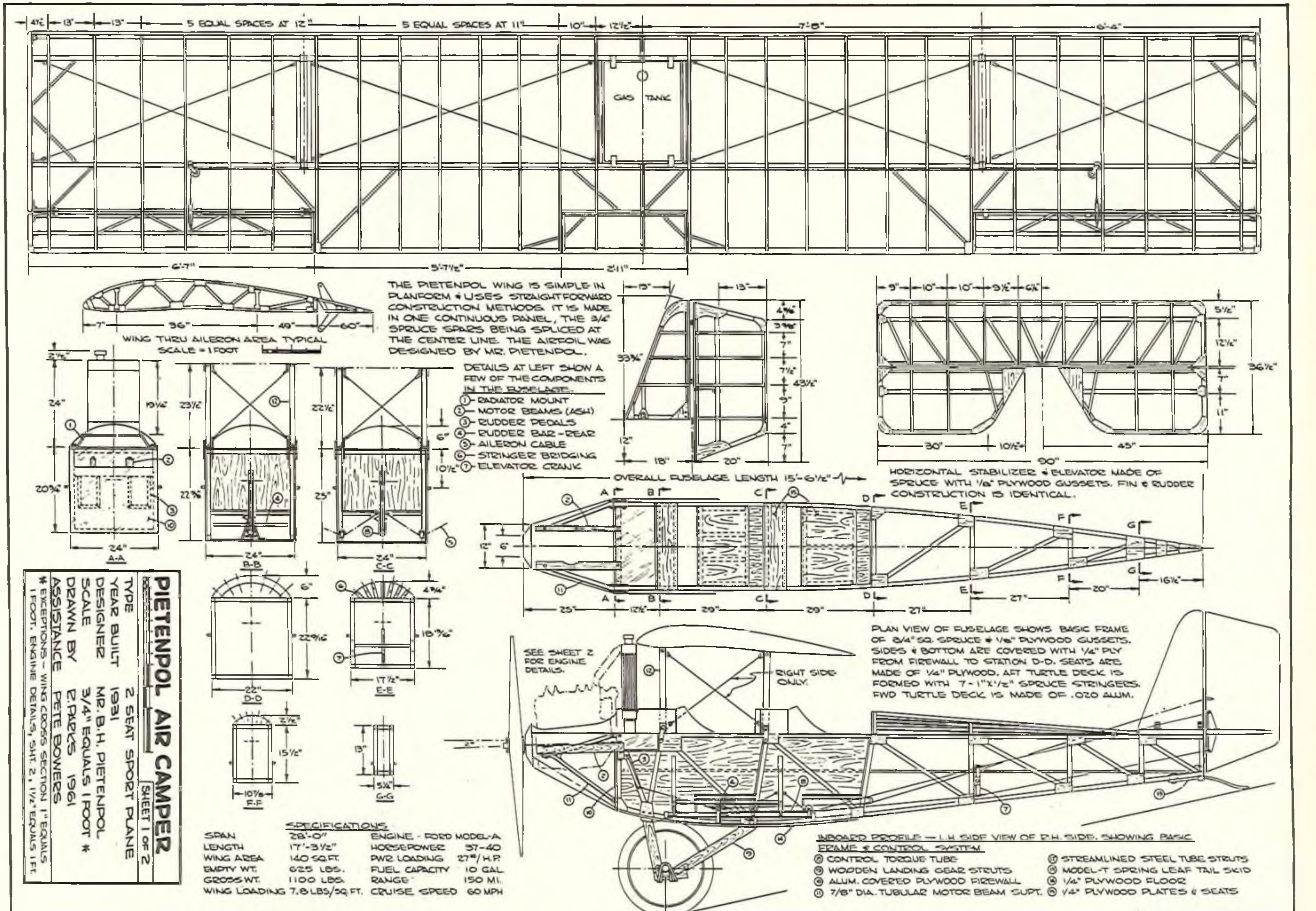
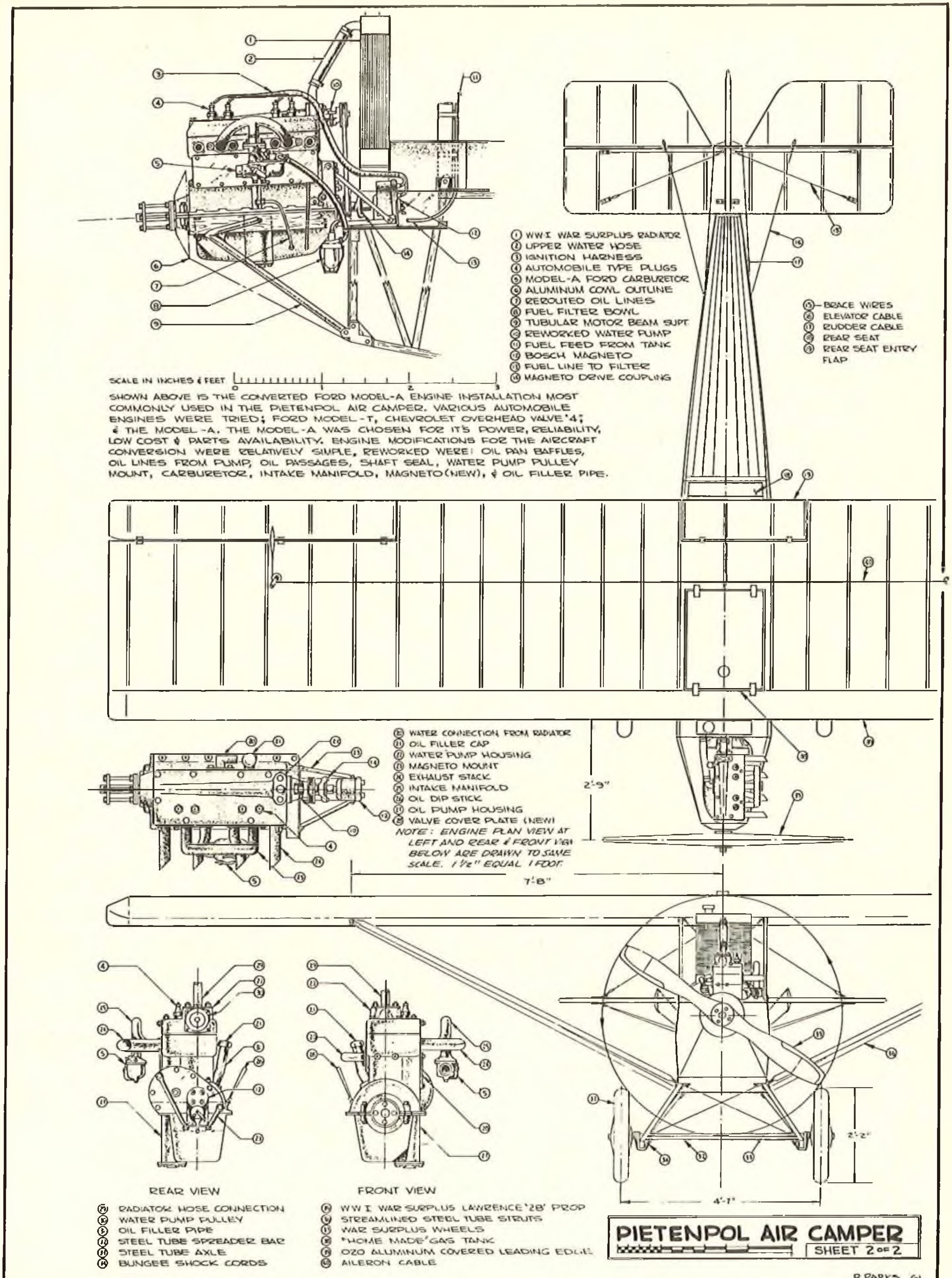

THE PIETENPOL WING IS SIMPLE IN PLANFORM & USES STRAIGHT FORWARD CONSTRUCTION METHODS. IT IS MADE IN ONE CONTINUOUS PANEL, THE 3/4" SPRUCE SPARS BEING SPLICED AT THE CENTER LINE. THE AIRFOIL WAS DESIGNED BY MR. PIETENPOL.
WING THRU AILERON AREA TYPICAL
SCALE = 1 FOOT
GAS TANK
DETAILS AT LEFT SHOW A FEW OF THE COMPONENTS IN THE FUSELAGE.
① RADIATOR MOUNT
② MOTOR BEAMS (ASH)
③ RUDDER PEDALS
④ RUDDER BAR - REAR
⑤ AILERON CABLE
⑥ STRINGER BRIDGING
⑦ ELEVATOR CRANK
HORIZONTAL STABILIZER & ELEVATOR MADE OF SPRUCE WITH 1/8" PLYWOOD GUSSETS. FIN & RUDDER CONSTRUCTION IS IDENTICAL.
OVERALL FUSELAGE LENGTH 15'-6½"
PLAN VIEW OF FUSELAGE SHOWS BASIC FRAME OF 3/4" SQ. SPRUCE & 1/8" PLYWOOD GUSSETS. SIDES & BOTTOM ARE COVERED WITH 1/4" PLY FROM FIREWALL TO STATION D-D. SEATS ARE MADE OF 1/4" PLYWOOD. AFT TURTLE DECK IS FORMED WITH 7 - 1"x1/2" SPRUCE STRINGERS. FWD TURTLE DECK IS MADE OF .020 ALUM.
SEE SHEET 2 FOR ENGINE DETAILS.
RIGHT SIDE ONLY.
INBOARD PROFILE — L.H. SIDE VIEW OF R.H. SIDE, SHOWING BASIC FRAME & CONTROL SYSTEM
⑧ CONTROL TORQUE TUBE
⑨ WOODEN LANDING GEAR STRUTS
⑩ ALUM. COVERED PLYWOOD FIREWALL
⑪ 7/8" DIA. TUBULAR MOTOR BEAM SUPT.
⑫ STREAMLINED STEEL TUBE STRUTS
⑬ MODEL-T SPRING LEAF TAIL SKID
⑭ 1/4" PLYWOOD FLOOR
⑮ 1/4" PLYWOOD PLATES & SEATS
SPECIFICATIONS
SPAN 28'-0"
LENGTH 17'-3½"
WING AREA 140 SQ.FT.
EMPTY WT. 625 LBS.
GROSS WT. 1100 LBS.
WING LOADING 7.8 LBS/SQ.FT.
ENGINE - FORD MODEL-A
HORSEPOWER 37-40
PWR. LOADING 27#/H.P.
FUEL CAPACITY 10 GAL
RANGE 150 MI.
CRUISE SPEED 60 MPH
PIETENPOL AIR CAMPER
SHEET 1 OF 2
TYPE 2 SEAT SPORT PLANE
YEAR BUILT 1931
DESIGNER MR. B.H. PIETENPOL
SCALE 3/4" EQUALS 1 FOOT *
DRAWN BY R. PARKS 1961
ASSISTANCE PETE BOWERS
* EXCEPTIONS — WING CROSS SECTION 1" EQUALS 1 FOOT. ENGINE DETAILS, SHT. 2, 1½" EQUALS 1 FT.


① WW I WAR SURPLUS RADIATOR
② UPPER WATER HOSE
③ IGNITION HARNESS
④ AUTOMOBILE TYPE PLUGS
⑤ MODEL-A FORD CARBURETOR
⑥ ALUMINUM COWL OUTLINE
⑦ REROUTED OIL LINES
⑧ FUEL FILTER BOWL
⑨ TUBULAR MOTOR BEAM SUPT
⑩ REWORKED WATER PUMP
⑪ FUEL FEED FROM TANK
⑫ BOSCH MAGNETO
⑬ FUEL LINE TO FILTER
⑭ MAGNETO DRIVE COUPLING
SCALE IN INCHES & FEET
SHOWN ABOVE IS THE CONVERTED FORD MODEL-A ENGINE INSTALLATION MOST COMMONLY USED IN THE PIETENPOL AIR CAMPER. VARIOUS AUTOMOBILE ENGINES WERE TRIED; FORD MODEL-T, CHEVROLET OVERHEAD VALVE '4', & THE MODEL-A. THE MODEL-A WAS CHOSEN FOR IT'S POWER, RELIABILITY, LOW COST & PARTS AVAILABILITY. ENGINE MODIFICATIONS FOR THE AIRCRAFT CONVERSION WERE RELATIVELY SIMPLE, REWORKED WERE: OIL PAN BAFFLES, OIL LINES FROM PUMP, OIL PASSAGES, SHAFT SEAL, WATER PUMP PULLEY MOUNT, CARBURETOR, INTAKE MANIFOLD, MAGNETO (NEW), & OIL FILLER PIPE.
⑮ BRACE WIRES
⑯ ELEVATOR CABLE
⑰ RUDDER CABLE
⑱ REAR SEAT
⑲ REAR SEAT ENTRY FLAP
⑳ WATER CONNECTION FROM RADIATOR
㉑ OIL FILLER CAP
㉒ WATER PUMP HOUSING
㉓ MAGNETO MOUNT
㉔ EXHAUST STACK
㉕ INTAKE MANIFOLD
㉖ OIL DIP STICK
㉗ OIL PUMP HOUSING
㉘ VALVE COVER PLATE (NEW)
NOTE: ENGINE PLAN VIEW AT LEFT AND REAR & FRONT VIEW BELOW ARE DRAWN TO SAME SCALE. 1 1/2" EQUAL 1 FOOT.
2'-9"
7'-8"
2'-2"
4'-7"
REAR VIEW
FRONT VIEW
㉙ RADIATOR HOSE CONNECTION
㉚ WATER PUMP PULLEY
㉛ OIL FILLER PIPE
㉜ STEEL TUBE SPREADER BAR
㉝ STEEL TUBE AXLE
㉞ BUNGEE SHOCK CORDS
㉟ WW I WAR SURPLUS LAWRENCE '28' PROP
㊱ STREAMLINED STEEL TUBE STRUTS
㊲ WAR SURPLUS WHEELS
㊳ "HOME MADE" GAS TANK
㊴ .020 ALUMINUM COVERED LEADING EDGE
㊵ AILERON CABLE
PIETENPOL AIR CAMPER
SHEET 2 OF 2
R PARKS 61

radio has servo reversing switches there isn't any problem. If you can't reverse servos, save yourself potential embarrassment and pre-check it.

A point to remember. The O.S. .60 4-cycle throttle linkage is on the **left** side of the engine. If you plan to try more than one engine, provide throttle servo mounts on both the left and right hand sides of the fuselage. A big S-bend in the throttle control rod (or cable) is asking for trouble.

Bend the landing gear struts and cut the axle. I glue the wire together with CA glue before wire wrapping, so that tracking may be checked prior to silver soldering. The gear is clamped to the 1/4" ply mounting plates with nylon l.g. clamps. Most brands have 1/2" screw hole centers which is important because the wing strut attach plates are mounted with the same hardware, between the fuselage bottom and 1/8" wire l.g. struts. I avoid sheet metal screws in high load areas. Williams Bros. 6⅝" vintage wheels (p/n 675) were used and installed per their instructions. I trial installed a tail wheel, clamped it straight, and ran a tracking test. With the unsoldered gear installed, I roll the fuselage/gear assembly across 10 feet of smooth garage floor. The assembly should track straight. If it veers left or right, I rotate the wire wrapped joints and reglue with CA. After tracking is straight, the wheels are removed, and the gear silver soldered. Pre-cut the turtledeck 1/8" x 1/4" stringers (long) and save the cut-off for tail ribs. Put the fuselage frame/gear assembly aside and build the wing.

Wing and Struts:

The wing is straightforward construction. However, a bit of pre-planning is necessary:

(1) Place your aileron servo on the plan, plug it into the receiver and note output direction for left and right aileron. Place the bellcranks on the plan and as the aileron servo is activated, make sure the left aileron will raise for left turn and the right aileron will lower. Repeat for right turn (right aileron raises, left lowers) and mark bellcrank orientation on the plan. This may sound basic, but reversed ailerons are not too slick, and ailerons that raise together are called "crash" linkage.

(2) The 1/4" dihedral eliminates the drooped look of flat wings and the wing looks flat.

(3) The wing tips are cut from blocks to the mean camber contour. Straight tips will give you a washed-in tip plate that not only looks terrible, but produces interesting tip stall characteristics.

(4) Cut all long pieces of sheet and strip first. Shorter pieces are used for planking and tail rib caps.

(5) The rib capstrips should be 1/16" x 1/8" for scale size, but 1/16" x 1/4" may be easier to work with.

(6) Many builders build sandwich style, i.e., bottom planking, capstrips, spars, ribs, spars, top planking and strips. I prefer to build a basic unplanked / unstripped frame and check all internal glue joints before they're hidden. 1/16" scrap will raise ribs and spars off the plan for proper positioning.

(7) **Do not** install the wing strut 4-40 T-nuts until the trial assembly.

(8) Aileron gap is 1/8". Closed gaps make little difference because of the slow flying speed.

(9) Aileron differential made no difference because of the slow flying speed.

(10) Large Klett hinges were used for all control surfaces. This allows full length 1/32" wire hinge pins which are removable. This really simplifies covering and clean-up.

The struts are made per plan. If contouring the strut bothers you, invest in a razor plane and shaping will take about ten minutes per strut. Streamline tubing is available but I'd insert a dowel in it. Remember: The struts are functional.

Tail Group:

The tail group is a basic 1/4" thick frame, capped top and bottom with 1/16" strips and gussets. Almost all joints are overlapped so watch wood weight. The original model tail group (uncovered) weighed 3 ounces. Again, use large Klett hinges and full length hinge pins.

Fuselage Completion:

The fuselage frame is now ready for the finishing touches. If your radio is still installed from the trial installation, remove it. Dust is not good for servos and receiver plugs. Complete the fuselage in the following steps:

(1) Cut engine mount plate to suit the size of your engine. The O.S. .60 4-cycle is shown on the plans. Drill the mount screw holes in the mount and rails at the same time. Open rail holes for 4-40 T-nuts.

(2) With CA, glue top forward formers and oil wall. The oil wall top should have tank opening in it before installation.

(3) With CA, glue tank floor, doghouse back and cover. Trial fit tank.

(4) With CA, glue 1/32" ply side plates and bottom. Remember to transfer cabane mount holes and landing gear clamp mounting holes before you glue on the ply.

(5) With CA, glue cockpit covers. Sand plywood joints now.

(6) Glue the lower cowl pieces.

(7) Build the top cowl on the fuselage. Waxpaper and CA make the job go quickly and insure tight mounting face joints.

(8) Glue (with CA) the turtledeck formers and stringers. Remember to scallop the formers between the stringers before gluing in front balsa former.

(9) Glue on the side stringer and taper after mounting.

(10) Glue on the 1/16" x 1/4" covering strips along the longeron sides. These prevent the covering from sticking to uprights and planking between the stringer and longerons. Use 1/32" x 1/4" to transition 1/32" ply and longeron.

(11) Sand the covering strips so that they are feathered to the longeron corners and angled to the stringer. Feather the strips to the cowl and cockpit covers. Glue and sand the 1/4" t.e. stock cabane bolt covering supports.

(12) I closed the cockpits using light-ply covers held on the rear corners with 4-40 screws and T-nuts. If you plan to line the cockpit edges with tubing, allow for the reduced cover size.

Assembly and Covering:

A complete assembly of the model prior to covering is required to locate the strut attach holes in the wings, locating pins in the stab and fin, and to double check that you're not covering before you've finished building.

The wing rods are 3/16" brass tubing, 22" long. To strengthen the tube, I inserted 5/32" dia. x 2" piano wire inside the tube at the wing section joints. To keep the wire in place, I used 1/8" x 1/8" balsa spacers between the wires and tube ends. The balsa is glued in place with CA. This provides a solid rod across the joint without paying a high weight penalty.

Assembly Before Covering:

(1) Install the cabanes in the fuselage. About now you're glad you identified them left, right, forward and aft. Install landing gear and strut mounts.

(2) Install the wing center section on the cabanes. A socket head ball driver is used to tighten the screws. I used shrink tubing on the end of the driver and shrunk it around the head of the screw. This holds the screw in place during installation and removal.

(3) Slide the outer wing panels on and lay the model upside down on your bench or floor. Place a piece of 1/4" thick balsa at the rib high point of the center section to relax the wing in its natural dihedral position. Install the struts on the fuselage and check the aluminum strut mount and strut end plate bend angles for full mounting surface contact. Mark the strut mount fore and aft centerlines on the wing

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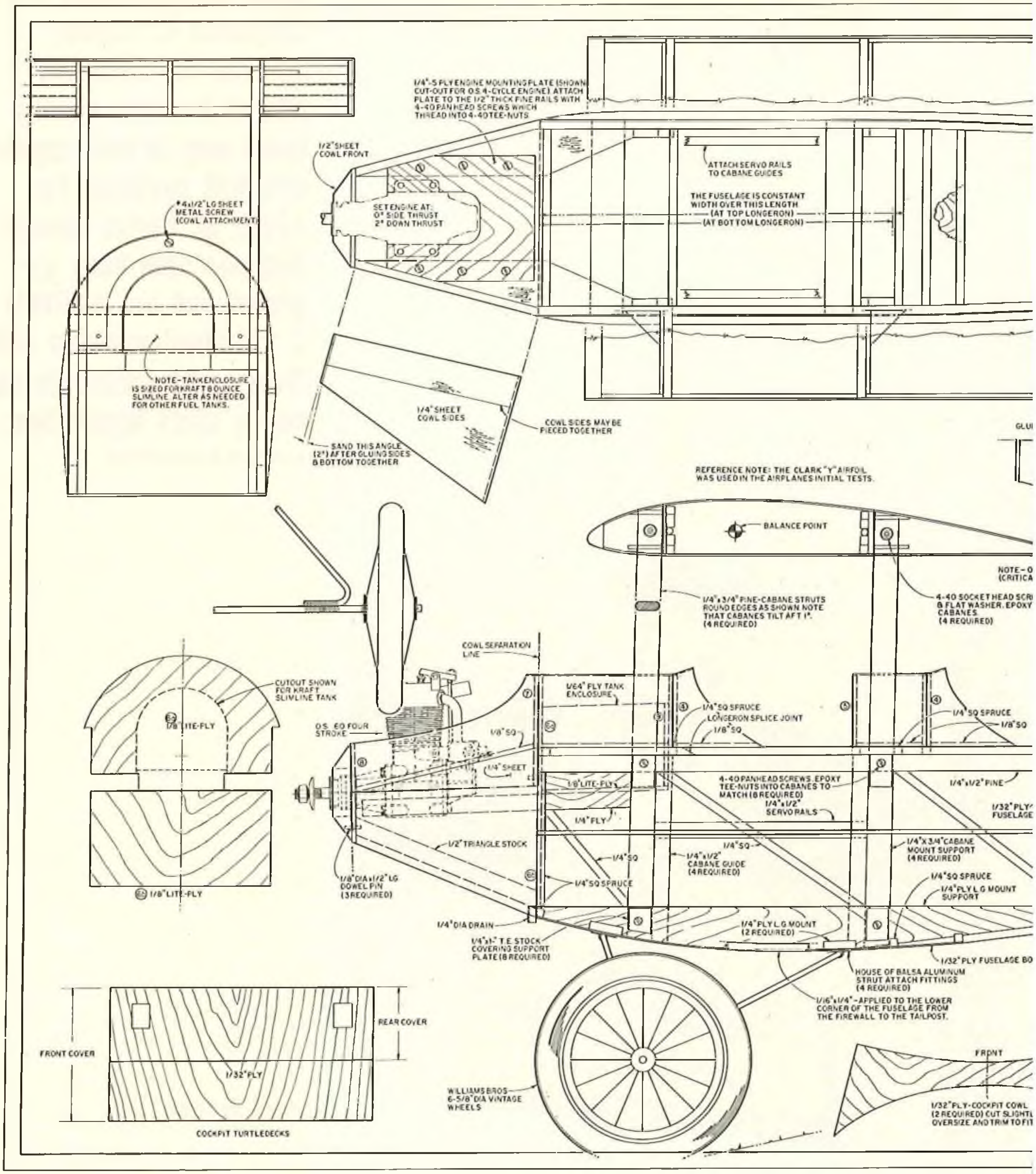
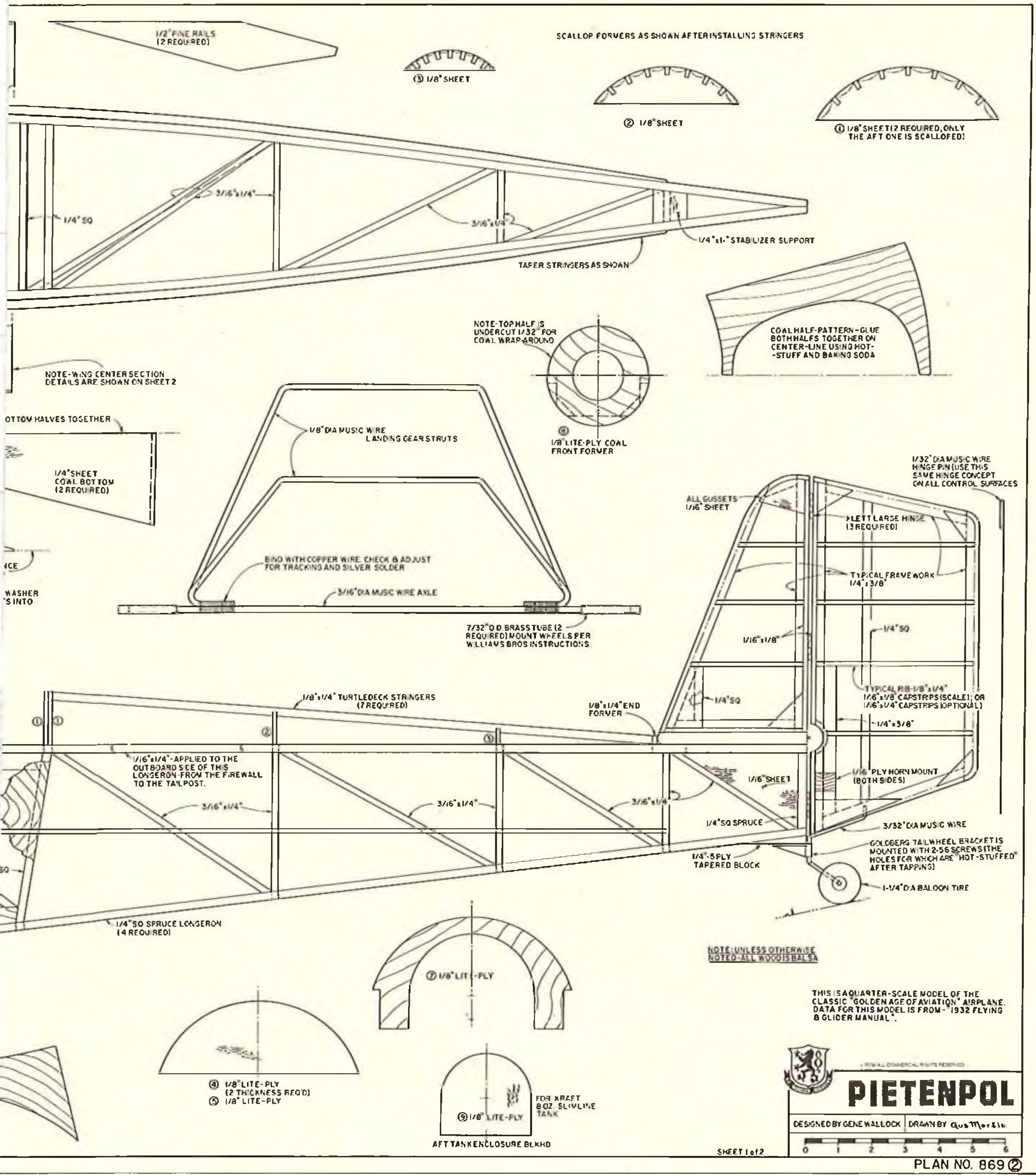


panels. Line up the strut wing mount holes on the centerlines and mark the holes. Drill out the holes for 4-40 T-nuts and glue (with CA) the nuts in the wing. Install the 4-40 strut mounting screws and put the model right-side up on the landing gear. You should be able to lift the assembly by the wing tips with the wing remaining rigid.

(4) Remove the struts and outer wing panels and check out the rubberband joiners. Make a long hook out of 1/16" piano wire that will pass through the center section with 4" to spare. Wrap the other end around a 1/2" dowel, so you have something to pull with. Cut four 1/4" dowels, 3" long and make a 1" thick block out of wood. Install the bands first as follows:

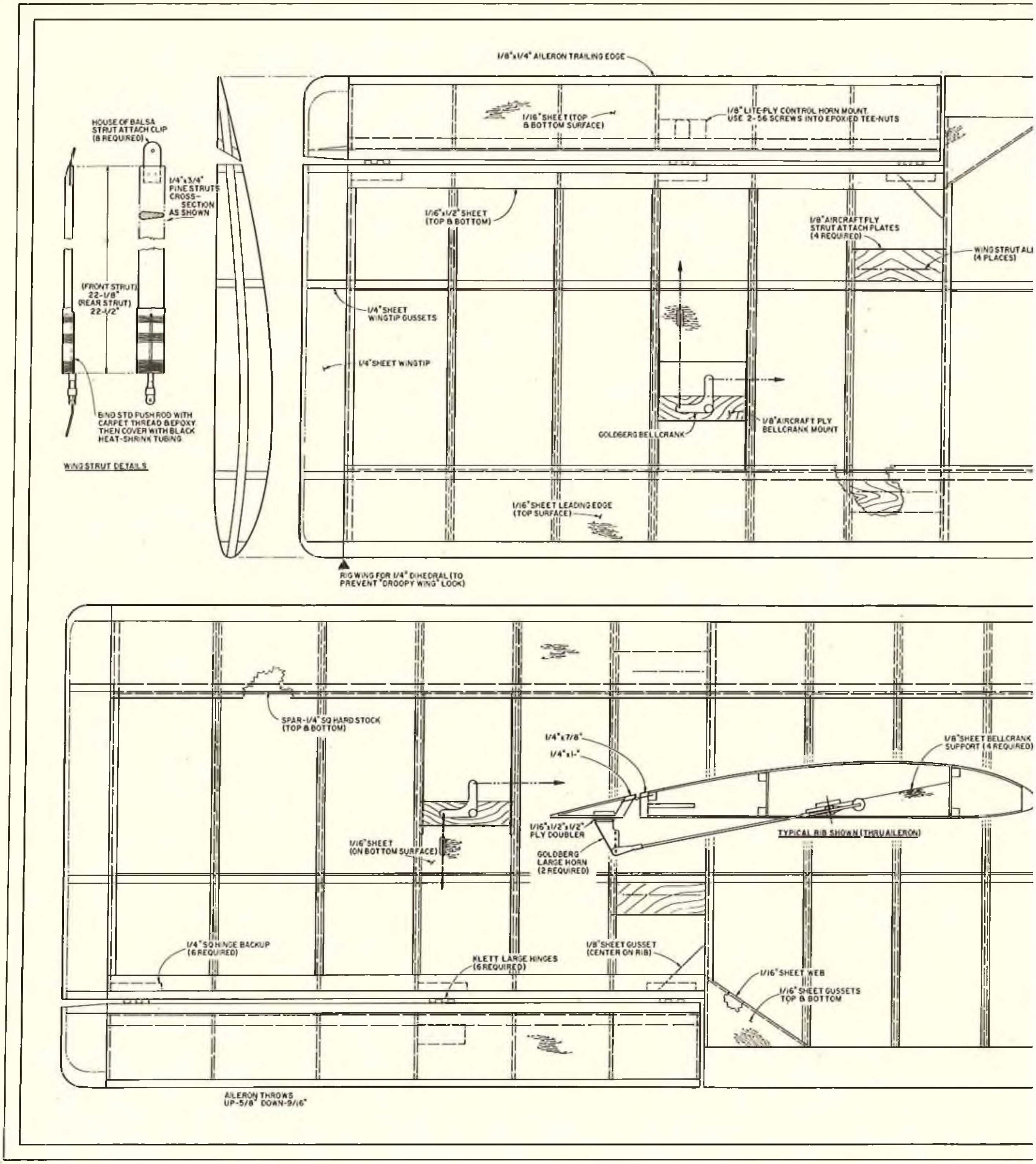
a. Slide the hook through the forward band hole. Slip four #64 bands over the hook and insert a 1/4" dowel through the bands. As you pull the bands through the center section, the dowel will hold them as one end. As the bands come

FULL SIZE PLANS AVAILABLE — SEE PAGE 203



through, slip a dowel in front of the hook between the bands. Relax the hook and the dowel will prevent them from going back through the center section. Slip the hook off and repeat for the aft band hole.

(5) Slip the l.e. and t.e. 1/16" wire guides in the center section and slide an outer wing panel on. Slip the 1" block between the outer panel and center section at chord midpoint. Slip the bands over the forward band hook in the outer panel with the 1/4" dowel. Pull out the dowel. The wing joint is now in tension and will hold the 1" block in place. Repeat for the aft hook. Push the 1" gap open with your fingers and the block will drop out. Carefully close the gap making sure the wing is sliding on the support rods and fore/aft pins. At this point, I pull my fingers out and the wing snaps flush with the center section. Repeat the process for the other wing panel. This system makes an extremely strong joiner which you need because, if a wing panel moves away from the center



section during flight, the aileron will move with it.

To remove the wings, cut the bands with an X-Acto knife and slip the wings off. Never use bands on any model for more than one flying session.

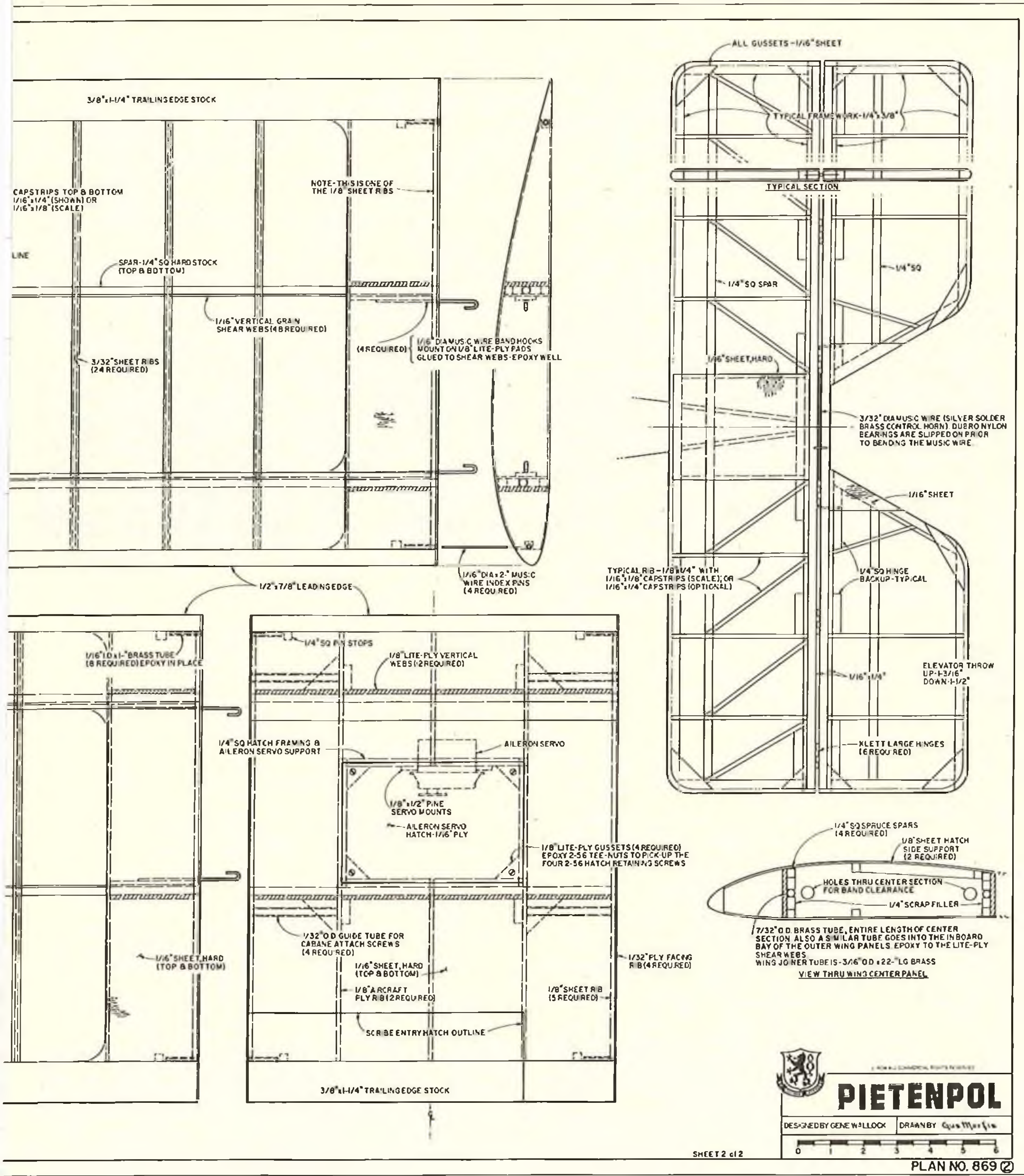
(6) Locate the stab on the fuselage. Hold with masking tape and drill two 1/16" holes through the stab into the stab mount plate and longeron rear joint. Drill the holes on the center line of the stab, which is also the center line of the fin. Transfer the holes to the fin. Glue two toothpicks in the stab, extending 1/8" above and below the stab. Now, the stab and fin have locating pins and holes which makes final assembly very easy.

(7) At this point, you probably forgot to put an inside antenna tube in the fuselage. Nothing looks tackier than a well-built model with a wire tied to the fin or trailing. Put a tube in that exits in front of the tail wheel.

Covering:

Before any covering takes place, a

FULL SIZE PLANS AVAILABLE — SEE PAGE 203



minor amount of fuel-proofing must be done. I've already mentioned the fuel tank "doghouse," now let's include the inside of the cowl and the engine mounting plate. K & B resin was used on the original with very satisfactory results. Put the drainage tube in the lower cowl compartment --- fires are something that no one needs. Conventional .60's may need a muffler exhaust extension. I have found, without exception, that mufflers and extensions don't come with hi-temp gaskets. "Perfect" makes the material and it's easy to make your own. By using gaskets, the oily exhaust doesn't leak through engine exhaust system joints and the inside of the cowl stays very clean. Without the gaskets, you've got the "La Brea Tar Pits."

The original model was covered with MonoKote. Not scale you say? Homebuilts don't shine? Wrong, nitrate dope breath. I've seen photos of actual "Pete's" that had mirror finishes. If you model an existing

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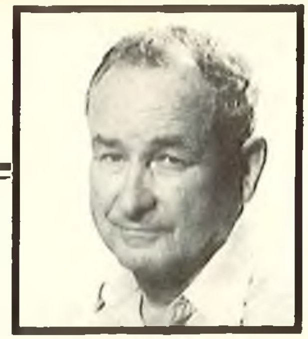
SOARING

Al Doig



Winners 2MWC. Front row L to R: Gary Ittner (10), Fred China (9), Woody Blanchard, Jr. (8), Alex Bower (7), Dick Odle (6): Back row L to R: Joe Newland (5 Oliver Northrup accepts), Rick Schramack (4), Larry Pettyjohn (3), Bill Forrey (2), Don Edberg (1), Joe Welch, C.D. Chan photo.

Don Edberg winner 2MWC and his Hustler-M. Chan photo.

Well, I sneaked in the back door before anyone even missed me. The wife and I had two glorious months in New Zealand and Australia. Everything went as planned and I went to soaring meets, talked to modelers, did some slope flying, met so many nice people, and had a grand time.

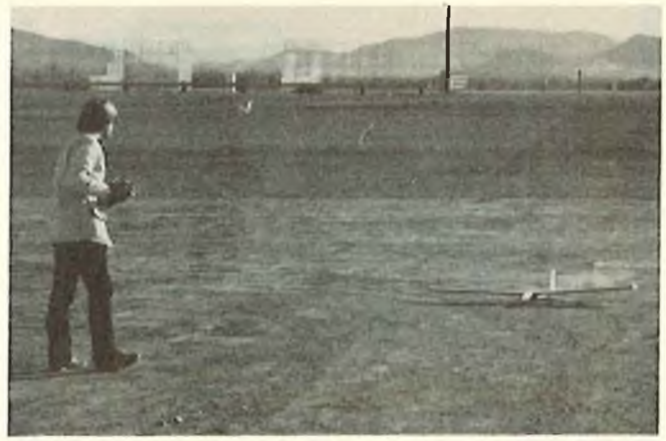
We stopped in Fiji for a couple of days after a long L.A. - Honolulu - Fiji flight on Air New Zealand. This got us accustomed to walking around on the bottom side of the world with our heads hanging down. Then, off to Auckland where we were kinda met by Reg Fleet and his wife. By "kinda met" I mean Reg was at the airport, but it's been a few years since our last

Place	Name	Model	Score	% Leader
1	Don Edberg	Hustler-M	5848.8	100.0
2	Bill Forrey	Poohawk	5553.2	94.9
3	Larry Pettyjohn	Original	5539.1	94.7
4	Rick Schramack	Whisper	5407.0	92.4
5	Joe Newland	Merlin	5348.6	91.4
6	Dick Odle	RO-14	5288.1	90.4
7	Alex Bower	Original	5220.5	89.3
8	Woody Blanchard, Jr.	Original	5170.9	88.41
9	Fred China	Original	5168.8	88.38
10	Gary Ittner	Original	5127.2	87.7

Prizes, 2MWC. Edberg photo.

Bob Torres, 1980 2MWC winner with aileron Sagitta 600. Edberg photo.

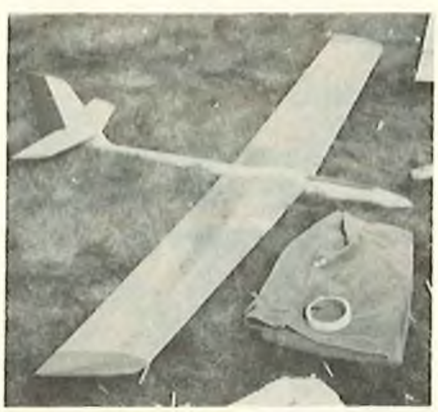
Don Anthony launches Charley Richardson's thermal version of the "Savage" slope plane, 2MWC. Edberg photo.



Joe Wurts lands his original after speed run 2MWC. Edberg photo.

Rich Spicer's all fiberglass original; background is Joe Newland's Merlin, 2MWC. Edberg photo.

meeting and Reg forgot what a tall handsome devil I am. Not expecting a welcoming committee, we walked right by them. They caught up with us at the hotel, however, where we were joined by Brett Robinson, the Recording Officer of the Auckland Club. Sunday after our arrival they had scheduled the Auckland Provincial Thermal Contest, which was well-attended. I'll have more to say on the details of soaring in New Zealand and Australia later on.



1/64" ply over blue foam, Oliver Northrup's model 2MWC. Edberg photo.

Mr. Avis provided a Ford Laser car at a nominal fee, and we took off on a 22 day trip around the North and South Islands. We wound up our tour in Christchurch, on the South Island, where we enjoyed the hospitality of Colin Stace and his wife Rae. Colin is the steam behind the New Zealand Soaring Society.

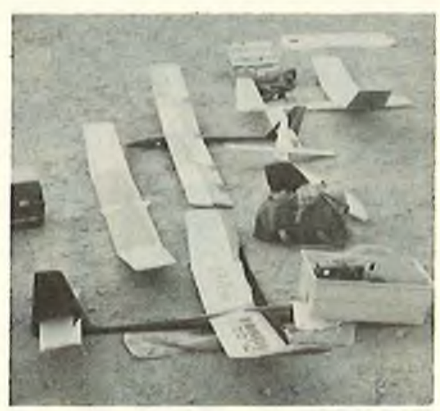
We departed Christchurch for Melbourne to visit my cousin and her family. Our next stop was Hobart, Tasmania, where we had a marvelous time, but we didn't win any money at the big casino there. We did visit an old Amateur Radio friend who I have been in contact with many times, VK7RX, Keith. I was able to borrow his station for contact with a half-dozen friends back in the U.S.

We departed Tasmania from Launceston for Sydney, and a visit to my brother who is now a 15 year resident of that city. His condominium has a breathtaking view of the beautiful Sydney Harbour. Our 17 day stay was broken by a 5 day trip to Surfers Paradise, near Brisbane. On the return trip we stopped at Muswellbrook to attend a most interesting contest, The Hunter Valley Championships. This contest not only has Thermal and Electric Glider events, but has R/C Seaplane, Goodyear T/R, U/C Combat, Hand Launch Gliders, Vintage Power, Open Rubber, Texaco R/C, R/C Pattern, FAI Combat, U/C Stunt, and Rat Race. How about them apples? This takes on the flavor of a big country fair and is meant to bring all facets of modeling together once a year for a good time. There were 47 tents and caravans (trailers) on the field. The less adventuresome, including me, were housed comfortably in motels.

We left Sydney for the long flight home. The flying time — Sydney - Auckland - Honolulu - L.A. — is 16 hours. Throw in 6 hours on the ground in Auckland and Honolulu, and it was one long day. An hour of this time was

Rick Schramack's "Whisper" was heavily ballasted. Edberg photo.

spent watching through the window of the Boeing 747 as a mechanic "adjusted" one engine. Soon he was joined by another, then another, until 7 people were standing around, looking up at the engine, waving their arms. Finally they must have said, "Well, let's give it a go," for they buttoned it up and removed the platforms. Then, we sat at the end of the runway for 20 minutes while



Some winning sailplanes, 2MWC: Dick Odle's RO-14 (6th), Gary Ittner's Checkerboard (10th), Alex Bower's original (7th). Edberg photo.

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"ground personnel checked a computer error in aircraft loading." Finally, 178 nervous people were dragged down the runway, and into the air. I guess everything was right because we made it all the way, through very lumpy air. I'll tell you all about glider flying "down under" next month.

★

One event I missed whilst gone was the 2-Meter World Cup. I understand that there were 68 entries and included some pretty impressive names. Don Edberg, last year's winner, was entered. Don was also a member of the U.S.A. Soaring Team last year. Gary Ittner and Skip Miller, 1st and 2nd U.S.A. Team alternates, were there. And, if I named all the great, and near great, fliers who attended, I'd fill the rest of the column. I commissioned Don Edberg to take notes and photos for me, so here's his account, cut down a bit to fit:

The Third Annual Two Meter World Cup (2MWC for short) took place in glittering Las Vegas, Nevada, a location which offered not only a contest, but money to win as well, by gambling. This year 68 contestants met to battle for the title "Ace of the Duces."

The contest tasks were not the usual duration. In fact, they were quite similar to the ones which will be used for international FAI-F3B competition this year. Task I was the 4 lap (2 round trips) Speed event. Task II was 10 Minute Duration, but flown man-on-man. Landing gave 1 point per centimeter. That means if you land farther than 100 cm (39") from the center, you get a big goose-egg for landing score. Task III was man-on-man Distance (most laps around the 150 meter Speed course).

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PROPORTIONAL RADIO . . .

By Bill Salkowski

Author, Bill Salkowski, was awarded the RCM Grand Champion Perpetual Trophy at the 1972 Winter Nationals by Executive Editor Patricia Crews. Bill also won the trophy in 1970.

A BRIEF HISTORY

I have always been fascinated by radio. From my early years in the 1930's it seemed a little magic to me that radio waves sent through space could be picked up by an antenna and sent through the radio to give us sound through a speaker. Most of the kids of that day would gather around the radio after school and listen to programs like Jack Armstrong and Captain Midnight while their sponsors were exhorting us to buy products like Ovaltine. (It must have worked; I actually drank the stuff.)

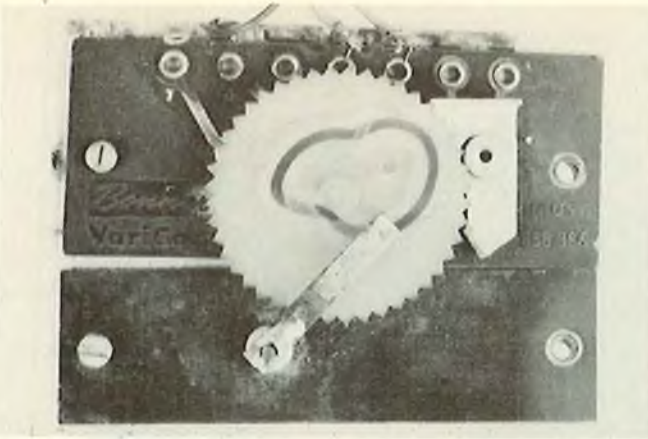
Having been born during the "golden age" of aviation, I also took an interest in airplanes and modeling, but at that time it never occurred to me that we would someday be controlling our models with radio. My first contact with radio control of models came in the early '50s when a friend of mine showed me his receiver/actuator. We never did get it to work, but it did spark my interest in the possibilities of radio control modeling.

My first contact with a radio controlled model that actually flew was in 1956 in Madison, Wisconsin. I was attending the University of Wisconsin at the time and was taking a drive one Sunday afternoon when I noticed some modelers attempting to fly radio controlled models. The models were large "free flight" type planes powered by .15 or .19 cu. in. engines. In other words, they would barely climb out at full throttle. I also noted during their checkout time (which was considerable) that they had sequential control of three functions, rudder, elevator, and throttle. I found out later that this was accomplished with a single channel radio and a compound escapement. Basically by pressing the transmitter "keying" switch, the escapement would step through the functions with each press of the switch. A typical sequence would be: (1) press -- high throttle, (2) press -- up elevator, (3) press -- neutral elevator, (4) press -- right rudder, (5) press -- left rudder, (6) press -- low throttle, (7) press -- high throttle, etc. You can see the problem in trying to fly such a model. First, the plane has to be finely trimmed. Second, you must be able to recognize the "step" the escapement is in. Finally, just pressing the transmitter key was no guarantee that the escapement would step as requested because of the poor radio link and uncertain escapement action.

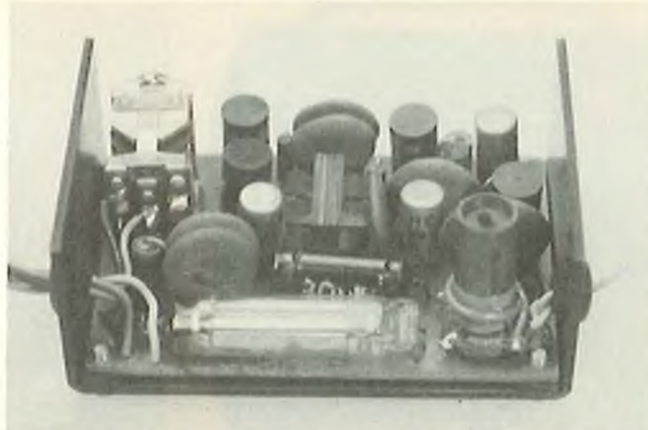
At any rate, after observing for a couple of hours, they did manage to get one plane up for a few minutes and back down to a spot about a hundred yards from where they took off. It was obvious from the handshakes and the excitement shown that the flight was a major accomplishment for them. For me as an observer, however, I was disappointed that the "state of the art" of R/C still had a long way to go. At the very least I envisioned a hand held transmitter with separate controls for each control surface and the throttle. (I believe the Madison radios had ground based transmitters with an extension cord for the keying switch.) At any rate, for various reasons I put R/C on the back burner in 1956.

Actually the radio used that day in Madison was the most complex of the "single channel" radios of the day. More typically only one function (rudder) was controlled with an escapement. The escapement was a sort of psuedo servo amplifier of its day. The escapement was "tripped" by the low level keying signal from the receiver. Once tripped the escapement would step to one of its four positions (right, neutral, left, neutral) receiving its powers from a wound up rubberband. Many a model was lost because the flier forgot to wind up the rubberband between flights. Why not use a servo amplifier instead of an escapement? Because an equivalent amplifier of that day would be monstrous in size and weight.

My interest in R/C was again sparked in the early '60s at Vandenberg AFB in California. I was working for AC Electronics Division of General Motors on the Titan inertial guidance system. As part of the launch programs all missile systems were closely monitored and this information was telemetered back to the ground both for target info and for knowing system condition in the event of a failure. It was fascinating to me that the telemetry section could predict the warhead splash point with amazing accuracy shortly after missile engine cutoff and long before the actual splashdown. But what made all this interesting from an R/C standpoint was the way in which this information was encoded, transmitted on one frequency (i.e., multiplexed), decoded and sent to the proper recorder for printout so it could be



Bonner compound escapement allowed multi-functions from a single channel radio. Cam action was powered by wound-up rubberbands and controlled by a stepping relay on back of board.



Orbit single channel receiver. Relay is shown in upper left, battery eating gas tube is front center.

read. It then occurred to me that if a telemetry system could do all that, why couldn't a radio be invented that would encode control stick positional information, send it out on one frequency, pick it up in a receiver, decode it and send it out to the correct servo actuator to position a model airplane control surface? The obvious answer was that **it already was being done.** In fact I was surprised to find that one of the AC engineers was working on an R/C system in his spare time. I subsequently found that hundreds (if not thousands) of people were spending countless man-hours trying to develop a "proportional" control radio, i.e., a radio where the servos would track the position of the control stick, or the servo output would move in "proportion" to the control stick movement.

The late 1950's and early 1960's was the "golden age" of proportional radio development for models. It was all made possible by the development and proliferation of comparatively cheap transistors (invented only 10 years earlier by Bell Labs), and by the expertise developed primarily by modelers in the aerospace industry.

The invention and development of the transistor was **absolutely essential** for the development of the radios we use today. It's almost as if the transistor was developed specifically for us. Picture the state of the art of radio control before the transistor. Radio receivers used large, delicate, and heavy tubes. And as if that didn't make the airborne system large enough, it required large voltages to operate, so special heavy batteries had to go along for the ride. Finally, any thought of controlling many functions precisely was an impossible dream. So look what the transistor did in one fell swoop: (1) It was small and light, so many of them could be used in complex circuitry without adding a lot of weight. (2) It operated on low voltages and drew little power, so low voltage, lightweight batteries could be used to power the radio. (3) It could take tremendous shocks because it was "solid state"; R/C radios get plenty of "shocks", as you well know. (4) Finally, they were comparatively cheap when compared to tubes, and getting cheaper every year.

So early on in the "golden age" it was obvious to many "electronics types" that with the development of the transistor and the associated radio and electronics handbooks showing their use, there was no doubt that a reliable low cost proportional radio would be developed for R/C use. The only problem remaining was, "How do we get there from here?" It's one thing to refine a known technology, but it's quite another to come up with completely new concepts which were required here. However, in only a few short years a basic radio design was developed that most of the radio manufacturers around the world adopted and have been using for almost **20 years.**

But before we describe the basic radio that we use today, let's cover some transitional radios that bridge the gap from the single channel tube type radio I described earlier. One of these was called the "reed" radio. The reed radio transmitter was characterized by a series of three position lever switches that were spring loaded in the center "off" position. A typical switch would be labeled "up elevator" on one end, "down elevator" on the other, and "neutral" in the center. Since the "up" and "down" switches required separate circuitry in both the transmitter and receiver, each control function required 2 "channels" to operate. What we now call a 6 channel radio would require 12 channels with a reed radio. If a transmitter switch was thrown it would modulate the carrier with its own particular tone, or frequency. When this tone was detected by the receiver, it would cause a reed tuned to that frequency to vibrate and close a switch. This in turn usually set a relay which would cause a servo to drive in one direction. The movement of the servo was not proportional. If the transmitter switch was held long enough, the servo drove to its limit. When the switch was released, a neutralizing servo would automatically return to neutral. A non-neutralizing servo was used on throttle. The expert reed flier could approach the way in which a proportional radio worked by rapidly "blipping" the control switch to hold a particular servo position. When proportional radios were first developed, the reed radios had attained a good degree of reliability, so many reed radios were still in use years later.

It is interesting to note that there were only two major manufacturers of reed radio equipment. Orbit Electronics (Bob Dunham) made a majority of the reed transmitters and receivers; and Bonner Specialties (Howard Bonner) made an even larger majority of the servos. No one manufacturer made a complete radio. In fact, the receiver and servos came without connectors, so the modeler had to buy them and put them on himself. Both Bob Dunham and Howard Bonner later developed their own proportional radios, but neither dominated the market like they did with the reed radios. Yes, Bob Dunham is the Dunham of Dunham's R & R making servo mechanics today. Howard Bonner is retired. Incidentally, Howard Bonner was the manufacturer of the escapement described earlier in the single channel radio.

Another transitional radio was the pulse proportional radio. It was also sometimes called a galloping ghost or

Orbit 10 channel transmitter was a heavy monster. Transmissions were accomplished by "blipping" switches either up or down. Surprisingly, remarkable control and maneuvers were possible with this method.

Orbit 10 channel tone receiver. The Deans reed bank, upper left, was the heart of this concept. The gas tube really gobbled electricity.

WAG radio because the control surface would wag back and forth like the tail of a dog. Pulse radios had several advantages over the single channel escapement type radios. The transmitter had a control stick or knob which would cause the rudder to wag more to the right or left depending on which way the control stick was moved. The receiver/actuator could be made very small and light, so it could be used in very small planes. Also the control stick made it much easier for some people to learn how to fly, so many people who might not have taken up R/C otherwise were introduced to the hobby. Some of the disadvantages were the lack of actuator power making the flying of large models impossible, they were impractical if many functions were to be controlled, and finally with the development of small and cheap fully proportional radios they lost their economic advantage as well.

Another transitional radio was the "Analog" proportional radio. This was the first fully proportional radio where the control surfaces followed the movement of the control stick with no "wag". The analog radios would modulate the RF (radio frequency) being generated with one or more tones (i.e., much lower frequencies than the RF). The pulse rate, pulse width, and the frequency of the tones were all used to position the servos. This concept was an extension of that found in the pulse proportional radios. Several analog radios seemed to spring up almost simultaneously around the country. One of these radios was the Space Control which was in use around 1960 and sold for about $1000. That's about $3000 in 1982 dollars! You can see how desperate the modelers of that day were to have proportional radios. Many analog radios were used to achieve many successful flights, but of course the performance was a long way from that of the radios we use today. The servos "lagged" the control stick movement and servo had a tendency to drift with changes in temperature and voltage. The net effect of all this was that the reed fliers were holding on to their radios. However, the analog radio was a big step forward in the development of proportional radio. I believe some versions were in production up to about 1968.

The last transitional radio we'll cover here is the Digicon radio developed by Doug Spreng and Don Mathes. The Digicon was the first **digital** radio because of its unique servo design. In the analog servo the input was a DC voltage which would be compared to the reference voltage in the servo (set by the feedback pot). If the incoming voltage was higher or lower than the reference voltage, the "difference" voltage was amplified to drive the servo motor which in turn would move the feedback pot in such a direction that it would change the reference voltage to match the input voltage. The problem with this scheme is that the closer you get to matching the voltages, the less "push" you have to drive the motor. In other words, it makes for a very "soft" neutral.

The Digicon servo used an entirely different system. It had its own pulse generator and required a pulse input to the servo. The leading edge of the incoming pulse would trigger the reference pulse generator in the servo and was 180° out of phase with the incoming pulse, i.e., it was a mirror image of the incoming pulse. The output of the reference generator would be compared (actually summed) with the incoming pulse. If the incoming and reference pulses were of identical length, they would cancel out and there would be no output from the summing network. If the two pulses were not of the same length, a difference (error) pulse would be generated by the summing network which would then be "stretched", amplified, and sent to the motor. The motor would drive the feedback pot in the reference generator circuit until the reference pulse would equal the incoming pulse, at which time the motor stopped. The beauty of this scheme over the analog was that for even very small positioning errors between the control stick and the servo, the full battery voltage was applied to the motor. This produced a "solid" neutral.

The stepping of the servo output with small or slow movement of the transmitter control stick is where the term "digital" servo and radio came from. There is actually a finite number of these increments or "stopping" points as the servo is moved slowly from one limit to the other. (When the servo moves fast, it doesn't stop at these points; it moves continuously, [analogly?].) If we were to mount a digital servo in a servo tester with a 6" extension on the

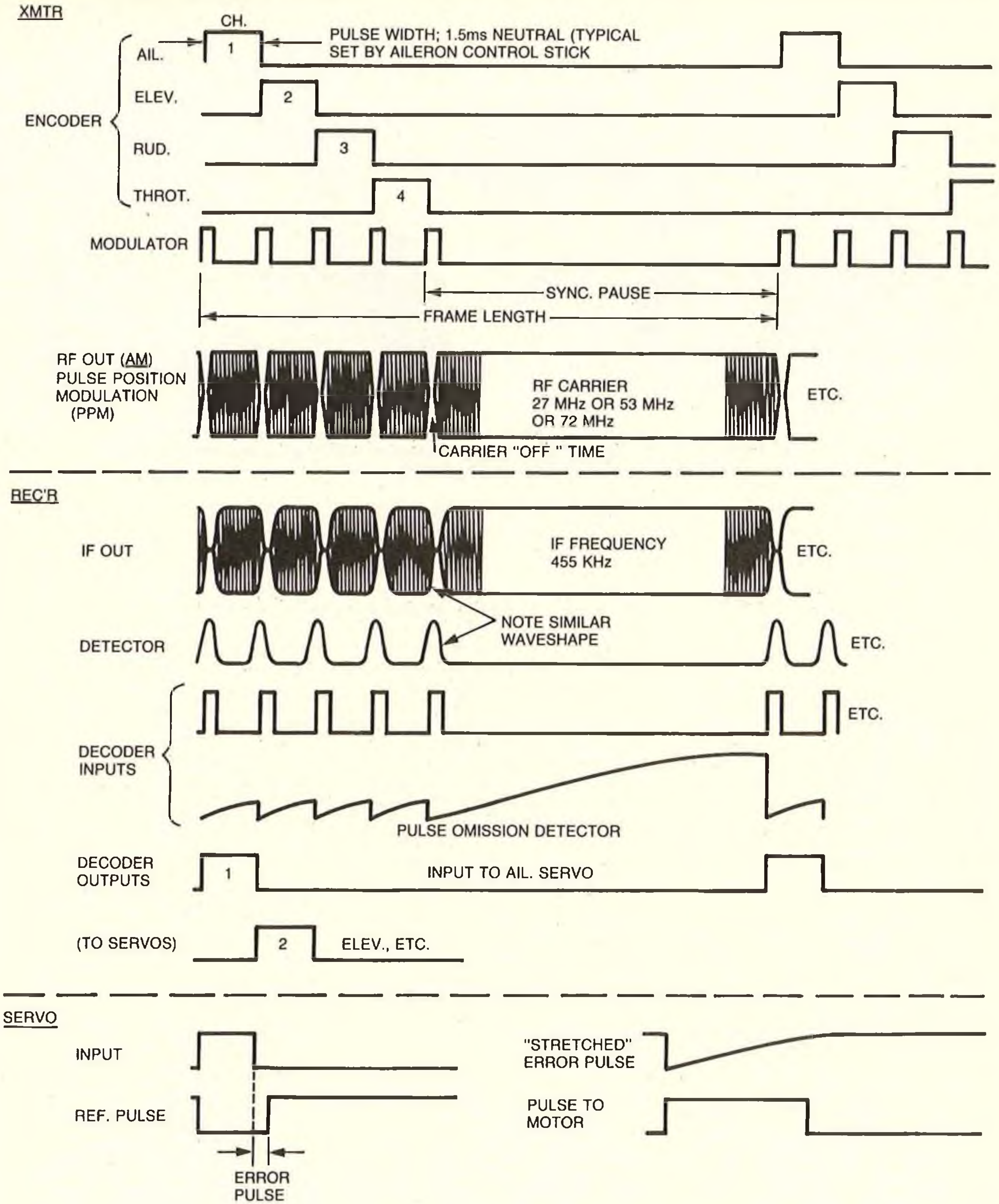
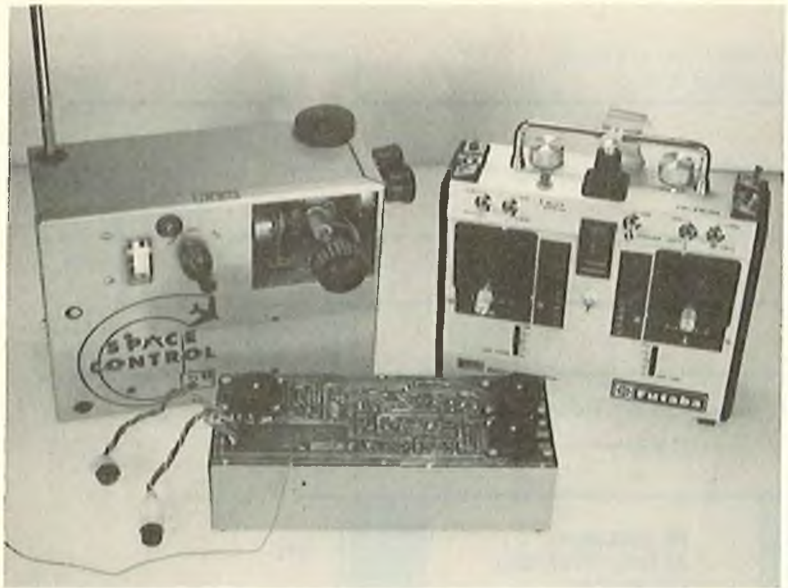


FIGURE 1:
TYPICAL DIGITAL PROPORTIONAL RADIO WAVESHAPES
1964 TO 1982 DESIGNS

output wheel, move the servo output with a control stick to each of the stopping points from limit to limit, numbering each of the stopping points under the output wheel extension, we could say that the servo is moving "digitally" from one number to the next.

You say you don't buy that explanation? Well, how about this one? Remember those wall clocks where the minute hand would step



Space control, an analog system, was the first commercially available proportional radio for model usage. The famous brick contained receiver and three servos. Futaba's multi-function programable transmitter is shown for contrast.

A Sweetheart of a Radio by PROPORTIONAL CONTROL SYSTEMS

How many remember the PCS ads? PCS was an advanced performance radio at a lower price by selling direct from the factory.

from one minute to the next every 60 seconds? The hand on this clock moved "digitally" as opposed to a conventional clock which has hands that move continuously (or in an analog manner). The problem is we can in no way call that clock a "digital" clock, because today that term has a different meaning. In the same manner, we get in trouble with the computer people when we refer to our radios as "digital" radios. But I think you now get the idea of the distinction that Doug and Don were trying to draw between their radio and the analog radio.

I've been told that Doug Spreng was the inventor of the digital servo. He didn't invent the pulse comparator but he was the first to use it in a proportional servo. Doug's servo scheme was picked up by all of the mfgs. of that day and is in fact used by all of the major mfgs. in the world today. Another feature that was eventually picked up by the mfgs. was the AM pulse position modulation scheme shown in Fig. 1. This scheme was first used by Frank Hoover of C.G. Electronics. Most radio designers of that day thought this type of modulation would be very prone to interference during the carrier off times. But time and the real world has proved them wrong. Actually the biggest problem with this type of modulation is the spurious sidebands generated when the carrier is turned on and off. It requires a fairly wide frequency band spacing to avoid interfering with adjacent channel radios. This is one reason why narrow band FM has come into vogue today.

Also important to the development of the radios we use today is the nickel cadmium battery. The two channel fliers of today who don't have them know how irritating it is to have to periodically buy new batteries. The first nickel cadmium had their problems, though. The early "button cell" types had a nasty tendency to explode if overcharged; some early types had a tendency to break welds and "open up" under vibration. Although these problems were solved, there are still some chacteristics of nickel cadmium batteries that still cause problems today. The most basic problem is that nickel cadmium batteries do not always accept the same amount of charge for the same charge input. Excessively hot or cold batteries do not accept a normal charge. Batteries that are repeatedly "shallow discharged" will not accept a full charge, i.e., they develop a memory. And, because the cells must be hooked up in series, individual cells that are weaker will have an accelerated failure rate. The above problems have spawned a whole R/C sub-industry making battery testers, chargers, and cyclers. However, in the hands of a careful modeler who properly tests his batteries, nickel cadmium will rarely cause a crash.

The development of transmitter RF sections and receiver "front ends" was proceeding independently of the proportional radio development. Most early proportional radios simply used a successful single channel or reed radio receiver and tied in the necessary "decoder" to make it compatible with a proportional transmitter.

In the early years, however, the "RF Link" was marginal at best. The first successful receivers of that era used a "Super-regenerative" circuit. Super-regen receivers could be made quite sensitive, but they had extremely poor selectivity. A super-regen receiver on 27 MHz would "see" the signals transmitted by all of the standard 27 MHz frequencies assigned for R/C and CB use. It was several years after the FCC assigned these frequencies before the R/C industry began to develop the "Superheterodyne" receivers that allowed RC'ers to fly together on all assigned frequencies. During the transitional period between super-regen and superhet, the super-regen fliers weren't too popular when they requested the superhet fliers on all of the 27 MHz frequencies to stay on the ground so they could fly alone.

Although much of the expertise in the development of the RF portion of R/C radios came from manufacturers of other types of radios, there were special problems associated with R/C radios that the R/C people had to solve alone. Specifically, miniaturization, operating at low voltages, and operating with extreme fluctuations in signal strength were a few of the problems peculiar to R/C. For the most part these problems were eventually solved and good superhet receivers were available by the early 1960's.

So by the early 1960's many of the elements for a good proportional radio that would stand the test of time were coming together. Many proportional radios were under development including a Kraft-Pullen radio; a joint effort of Phil Kraft and Jerry Pullen; a Bonner radio; a F & M radio by Frank Hoover; an Orbit analog radio, actually a transistorized version of the Space Control; and the Sampey radio, among others. But none of these designs survived for long. The one that

did was a design that Don Mathes did for Kraft Systems. This radio used the pulse position modulation scheme, a simplified encoder and modulator to produce the desired RF waveshape, a simple receiver decoder, and the "digital" servo amplifier. The receiver front end was a proven Kraft design. The servo mechanics and other hardware were also Kraft developed. This radio could honestly be called the father of all the digital radios of today in that many of the concepts used in that radio are still used today. This radio certainly gave Kraft an edge over other manufacturers which through good management and further development made Kraft the most successful R/C radio manufacturer in the world.

The success of that Kraft radio quickly spawned many other similar radios by other manufacturers. Don Mathes and Doug Spreng formed MicroAvionics and came out with their "improved" version of that first radio. One improvement that Don Mathes made somewhere along in here was in the transmitter encoder. Previous to Don's design each channel used two transistors in a multivibrator circuit to generate the required pulse info. Don's circuit used only one transistor per channel which saved a lot of P.C. board space. More importantly, though, his circuit gave tremendous pulse width stability over a wide temperature and voltage range. This along with a stable reference generator in the servo meant that there was very little "drift" of the servo neutral with large fluctuations of temperature and voltage. This, along with "tight" servo performance, and ease of adding additional channels were the big advantages that the digital radio had over the analog. Don's encoder was picked up by most of the manufacturers and in fact is still used in many radios today with refinements.

By about 1964 all of the elements of the basic AM digital proportional radio that we use today **were already designed.** If we were to draw diagrams of the basic radio waveshapes from the encoder, transmitter RF, receiver IF, detector, decoder, and servo amplifier, you would not be able to distinguish between a 1982 and a 1964 radio. This is not to say that the 1964 radios were better than those we fly today, but they did work very well. I had a 1965 MicroAvionics and PCS (Kraft) radios and both worked very well. The RF link was good on both and overall reliability was excellent, i.e., few repairs were required. Oh, the transmitter sticks left a lot to be desired and servo refinements were needed, but my dream of having a hand held transmitter controlling the four basic powered plane functions had come true in only a few short years.

It's difficult to describe to the modelers of today the elation, the thrill of flying those 1965 radios. To really appreciate them you first had to experience the frustrations of trying to fly the earlier radio designs. Prior to my 1965 radios I had two analog radios and a pulse portional radio; two of those radios had super-regen receivers, so I had plenty of "signal losses." I learned early to keep the plane close and directly overhead; no long low approaches on landing or I would "lose it." Although I never flew single channel radios, I also spent many hours helping friends find their "flyaways."

So picture the scene at Aero Park airport near Milwaukee, Wisconsin, in the summer of 1965. Dario Brisighella (he handles Quadra engines today) came out to the field with his exquisite scratch-built airplane. (In fact I've never known Dario to have a model that wasn't **exquisite.**) He had his new MicroAvionics radio that he received that day newly installed in his plane. And did he put on a show! He had a good flying plane so it enhanced the performance of the radio; but the part of the demonstration I liked best was how he flew through those "weak signal" areas I experienced when I flew. He made long low passes without any sign of a "glitch." Based on that demonstration alone about 15 Milwaukee Flying Electrons members bought MicroAvionics radios including mine. A short time later I saw a Kraft radio fly an airplane equally well, so I bought a PCS, the cheaper version of the Kraft radio.

The 1965 radios were a gigantic leap forward over previous designs. In a sense they represented the end of one era and the beginning of another. They were the end of the search for a basic radio design which would go on for many years. Subsequent improvements were really refinements of that basic design. They were also the beginning of the era that saw large scale use of proportional radios. The 1965 radios were modestly priced and were the first radios that were produced in relatively large numbers. From 1965 on, the production and sale of proportional radios escalated rapidly.

Proportional radio development did not stop with those 1965 radios, of course. A big step forward in servo design was made in 1968 by Bob Elliott in his EK Logictrol radio. He introduced the three wire servo which greatly improved system reliability because three wire systems could operate with one cell out on a 4 cell battery pack. Previous servos used a 4 wire system with a battery center tap. Bob also made improvements to the pulse comparator, pulse stretcher, and amplifier circuits which greatly improved servo performance.

The overall quality of radios improved in 1969 with the introduction of the Pro-Line radio. Around 1968 there was a push by the established manufacturers to improve the "cosmetic look" of their radios and at the same time cut costs. They did this by coming out with plastic "enclosed" sticks. Enclosed sticks feature a ball socket on the control stick that drives a bale connected to the control pot. It didn't take the pattern fliers long to realize that overall performance suffered as a result. So some pattern fliers along with Jim Fosgate, who did the electronic design, formed Pro-Line. Ron Chidgey designed a new "open" stick that was fully gimballed, i.e., each control had two bearing surfaces as opposed to the old open sticks which used the control pot shaft as the only bearing surface. Other manufacturers slowly began to realize that stick and pot performance are extremely important to overall radio performance. Today even the moderately priced radios use open sticks; their use was undoubtedly hastened by Pro-Line. Pro-Line also introduced the roll button, rate switches, and the retract switch to the R/C public. Jim Fosgate also designed an efficient small transmitter RF board which was the forerunner of the plug-in module.

Reliability and miniaturization took a big step forward in 1971-72 with the introduction of the integrated circuit (I.C.) servo amplifier. For awhile manufacturers were jumping over each other trying to see who could come up with the smallest servo. However, the increased reliability, improved amplifier performance, and repeatability were also important features.

More recent developments include exponential rates, control mixing, servo reversing, improved servo amp and pot performance, plug-in modules for the transmitter and receiver RF sections, and miniaturization and electronic improvements in the transmitter encoder.

Many of the above features were included in the Kraft Signature Series radio designed by Doug Spreng. It featured a "linear ramp" encoder which yielded a more linear servo movement with control stick movement. The Kraft Signature was the first of the radios that might loosely be described as having "all the

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MICAFILM is the best of two worlds. It is an ultralight film that has been reinforced with extremely thin, but very tough mica fibres. The result is a covering with positive ripstop! No other film has it! Yet MICAFILM is 40% to 70% lighter!

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MICAFILM will outperform any other film covering. Its puncture and tear resistance are extraordinary due to the combined force of its film and mica fibres. For example, Monokote has a 1.69 rating on the Elmendorf Tear Test, while 1-1/2 ounce MICAFILM scored a remarkable 14.1! That's more than 700% tougher. MICAFILM is also less subject to scratches because the film is impregnated through and through with color. The long term durability of MICAFILM is also outstanding. It does not become brittle as it ages, like other films.

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bells and whistles."

A man greatly responsible for recent servo amplifier and transmitter improved performance is Gary Kelson. Gary heads his own engineering consulting firm designing integrated circuits. He was responsible for much of the development work on the Signetics NE544 servo amp I.C. and is the "father" of the NE5044 and NE5045 transmitter encoder and receiver decoder I.C.'s. The miniaturization of the encoder opened up more P.C. board space for add-on functions like exponential rate, control mixing, and servo reversing. The design of the encoder also made it electronically easy to add these features.

You might think in reading this article that the development of the digital proportional radio was one long steady succession of improvements. Such was not the case, however. It seems that many manufacturers would take "three steps forward and two steps back." There was strong motivation to come out with an "all new" radio each year to spur sales. As a side effect they also tried to decrease costs while trying to make the product look better. The net effect of all this was that occasionally some ideas just didn't work out. In a sense, then, the manufacturer would have to "re-invent the wheel." The most obvious example here would be receivers. It was not unusual for last years design to work better than the "new" model. Another problem that manufacturers have always had is the "bad batch" syndrome. If a batch of parts sent to a manufacturer would not perform quite as well as the last batch, radio performance would suffer. Note that these problems exist right up to today. The modeler should

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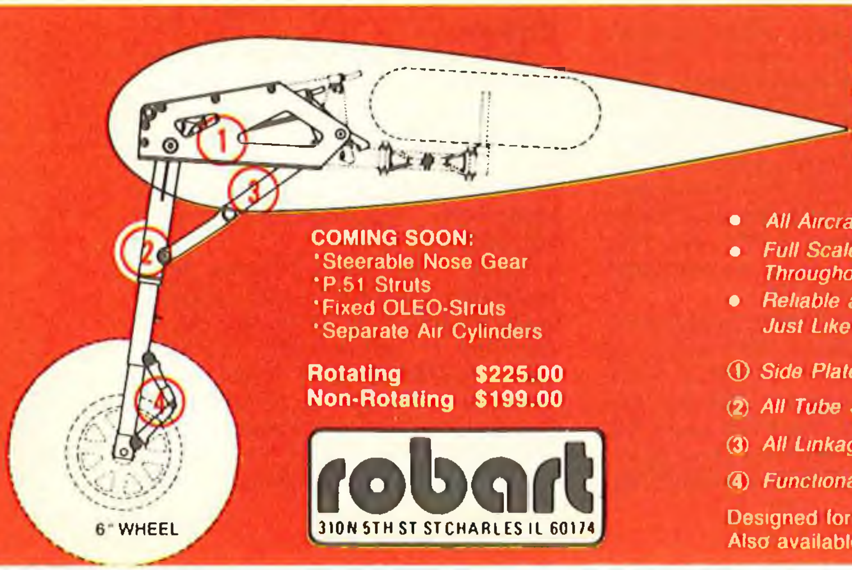

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RCM PRODUCT REVIEW Parma Int. PANTHER

SPECIFICATIONS

Name	PARMA PANTHER
Car Type	1/12 Scale Race Car
Manufactured By	Parma International, Inc. 13927 Progress Parkway North Royalton Ohio 44133
Mfg. Suggested Retail Price	$140.00
Available From	Both, Mfg. & Retail
Length	13¾ Inches
Width	6¾ Inches
Height	3½ Inches Top of Tail Fins
Suspension	Independently Sprung Front Suspension
Power Plant	Renault, 35 Turns 23 Ga.
Power Source	Sanyo, Two 3 Cell Sticks
Recommended No. of Channels	2
Rec. Control Functions	Steering & Throttle
Basic Materials Used In Construction:	
Chassis	Injection Molden Lexan
Body	Painted Lexan
Wheels & Tires	Parma Lightweight Wheels
Building Instructions	Yes
Instruction Manual	Yes (10 Pgs.) + Photos & Drawings

RCM PROTOTYPE

Motor Make	As Supplied in Kit
Radio Used	Cox 8020 Two Channel
Gearing Used	3.38 to 1

SUMMARY

WE LIKED THE:

Precise fit and finish of all component parts. Overall appearance is beautiful. Excellent exploded view drawings in instruction manual.

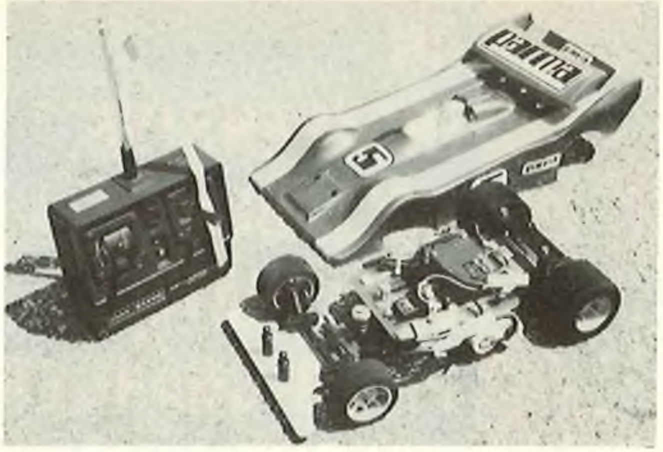
WE DIDN'T LIKE THE:

No complaints --- this is a fine kit.

There is no question that R/C model cars are gaining in popularity, with all types, classes, shapes and sizes becoming more and more available with each passing month — or so it seems to us. Parma International, Inc., 13927 Progress Parkway, North Royalton, Ohio 44133, has one of the most complete line of 1/8, 1/10, and 1/12 Scale cars that we've come across to date. Their inventory ranges from component parts to kits to completed cars, and is likely to be a ready source for all R/C car enthusiasts from novice builder/driver to the expert old timer. One of the most popular class, the 1/12 Scale, is the basis for our review car, the Parma Panther.

Before exploring the kit, a few comments regarding the box itself is in order. The carton measures 13" x 6" x 3", and features on the top a beautiful cut-away drawing (more on the drawings later), rendered in black, white, and silver. On one end of the box is a label that tells you that you have a 1/12 Scale Parma Panther on your hands, and just below that heading are four code numbers; #1850 basic car kit — no electrics; #1855 6 cell kit with electrics; #1860 6 cell kit with electrics and 2 bodies; and #1865 6 cell kit completely assembled. At the bottom of the label are the words, "radio equipment not included." Our label had a mark after the #1855 number, so we knew we had the 6 cell kit with electrics. But, you might ask, just exactly what do you get in #1855, or any of the other numbers, for that matter. Just turn the box sideways and there it all is. Each model number is listed on the foot long label and spells out not only what each kit contains, it also tells you what will be needed to complete the car! For example, #1850 includes: lexan chassis, radio mount plate, servo saver, rear pod assembly, front end assembly, Parma wheel hubs, Parma wheels glued and trued, Allen wrenches, 1 ohm short stroke resistor, and complete differential. Needed to complete (the label reads): motor, pinion, hook-up wire, Parma connectors, batteries, roll over antenna, body, and radio system. Model #1855 (the one we are reviewing) includes: all of kit #1850, plus Renault motor, pinion, computer matched Sanyo batteries, heavy gauge wire, Parma "stay lock" connectors, rear wing and mounting kit, quick disconnect roll over antenna. Needed to complete: body and radio system. #1860 includes: all of kit #1855 plus 2 clear bodies (one sports car and one grand touring) molded from crystal clear lexan plastic. Needed to complete: radio system. #1865 includes: all of kit #1855 completely assembled, plus painted and mounted sports car body and wing. Needed to complete: radio system. Offhand, we think this is one of the best labeling set ups we've yet come across, and particularly like being informed ahead of time not only what our kit contains, but what we'll need to complete it.

When we opened the box, we were immediately impressed with Parma's packaging. Parts were packaged in clear plastic **numbered** bags, and there were eleven of them. Each contained component parts for an assembly. Bag #1 contained the front end kit, bag #2 the rear end kit, and so on. Loose in the box was the chassis plate, rear tires, front tires, radio mount plate, bumper, Renault motor,



Sanyo computer matched batteries, charging cord, pinion gear, "V" wing, wing mounting system, roll over antenna wire, three 8" tie wraps, and servo tape. Also included were three small Allen wrenches to fit the 3 different size Allen head screws used on the car.

Construction:

No plans were included, and none were necessary. The 10 page instruction manual did it all, and a word or two about it is certainly in order. The 8½" x 11" cover features two black and white photos of the completed car minus the body. Details of the suspension, steering, motor, batteries, receiver, and servo set-up are right there for ready reference.

On page 1 of the instruction manual, Parma lists the tools needed to assemble the kit, and they are: #2 Phillips head screwdriver, small blade screwdriver, needle nose pliers, X-Acto knife, small metal file, soldering iron and solder, and wire cutters. In the course of building our Panther we used all of those, and found we did not need any others. Written instructions for assembly were found to be clear and concise, and followed a logical sequence. Each step was covered in detail, and indeed, the car could have been completed by following the written instructions without a glance at the two exploded view drawings . . . but oh those drawings. They were so well-done they could almost replace the written instructions as a building guide. They were signed *"R. Czentorycki-cleve,"* and a tip of the old beret is certainly in order here. These two drawings are a couple of the finest of their type that we have seen . . . score another plus for the Parma organization.

As we put together individual component parts into their major assemblies, we were continually impressed with the quality and fit. We aren't sure of the exact kind of plastic used in, for example, the front end and rear end assemblies, but molding and machining were of a superior order. Everything fit exactly as intended. The chassis plate was a strong injection molded lexan and will not tweek as easily as fiberglass. The bright yellow bumper unit was of high impact Kydex.

During the course of building we made only one very minor modification, and it was one that was not really necessary — just nice. Instead of using a "Z" bend in the steering arm and tie rods where they pass through the steering servo and servo saver arms, we used threaded stock and Carl Goldbergs' snap links. This allowed precise fitting of the steering arm between the servo arm and the servo saver. More importantly, it allowed fast, easy, and exact adjustment of the all important toe in.

The Parma Associated differential uses eight ball bearings, and, like the rest of the kit, went together with no problems. The differential is adjustable, and is a very important part of the car. It allows the inside wheel to turn slower and the outside wheel to turn faster when maneuvering these rascals on quick turns with a fair amount of power being applied. While we speak of the differential, we'd be remiss if we didn't follow with a couple of observations regarding the entire rear end assembly. There are a lot of individual pieces in this group, and, like the rest of the kit, each fit its assigned place perfectly. No forcing, cutting, filing, or swearing was necessary. A nice feature here is the adjustable rear ride height. This adjustment is accomplished by using an eccentric cam, and by positioning it in one of nine setting holes you can change the ground clearance as well as the Center of Gravity. Parma has included some tips on using these adjustments to fine tune your car for various track conditions, and their comments would be especially helpful to the novice.

Mechanical assembly of the Panther can be divided into three major segments or parts . . . front end assembly, rear pod assembly, and chassis assembly. Each of these are assembled as individual units, and final assembly sees the joining of all three as one.

Radio and Electrical:

The radio plate or tray contains the computer matched Sanyo batteries, receiver, resistor (speed control), power switch, throttle servo, and the steering servo. There are pre-cut holes that accommodate the resistor, switch, and both servos. The receiver is held in place by servo tape, and plastic tie wraps strap the Sanyo batteries to the bottom of the tray. Some wiring and soldering is necessary here, but between Parma's excellent written instructions, the beautifully drawn exploded view, and a fine pictorial wiring diagram, it was an absolute breeze. A charging cord was included, incidentally and allowed recharging the Sanyo batteries from a 12 volt car battery. Our Cox #8020 two channel system furnished all the controls we needed to operate the throttle and steering servos.

Finish:

Parma sent along one of their lexan bodies, a Kroll Can Am (#1911), and it was already painted in a beautiful two tone blue when we received it. The lexan wing was unpainted, and we used Pactra enamel in a shade of blue that was a near perfect match with the body. The nice thing about painting clear plastic is that the color is sprayed on the inside, and the crystal clear lexan allows it to show through giving a wonderful surface finish . . . "just like glass."

Performance:

Our trial run was done on a fairly new, dead-end street that, happily, had a great surface . . . no cracks, ridges, potholes or any other car eating obstacles. It did have a wealth of kids on bikes and rollerskates, but all their activity ceased when our Parma Panther made its

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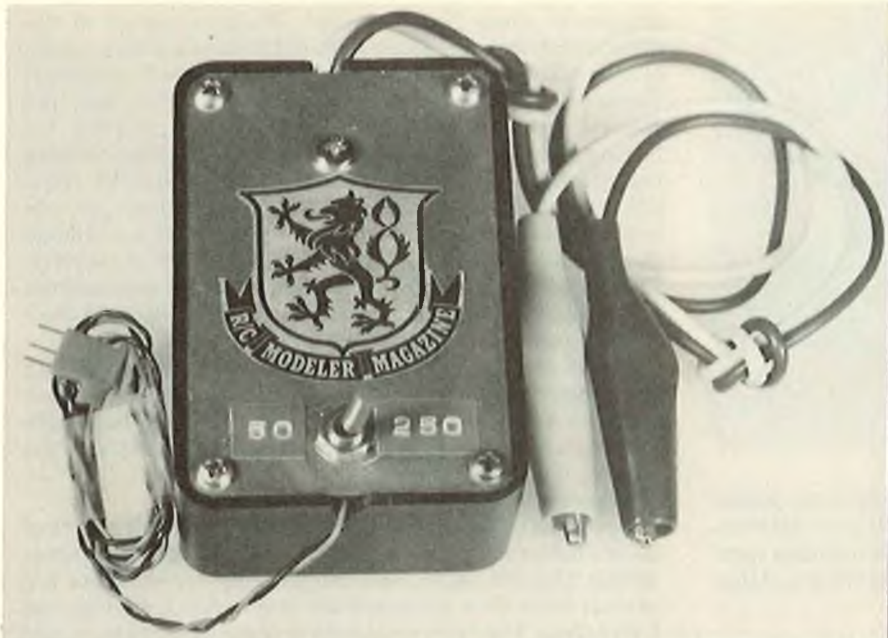


AN INEXPENSIVE, RELIABLE, DUAL RATE FIELD CHARGER ANYONE CAN BUILD

By Clay Howe

Most RC'ers could benefit from having a good RX Field Charger, and I am sure more would be using them if not for the following:

(1) **Cost** — Most assembled units are at least $20.00 or more. They are worth it, but this money would be better spent on other things when the budget is tight.

(2) The "build it yourself" units are either too complicated for the non-electronic types, or require the use of exotic or hard to find components.

The unit described below is the answer to the RC'er who has been reluctant to own a unit for the above reasons:

(1) Very inexpensive to build . . . the basic parts cost is only $8.22!

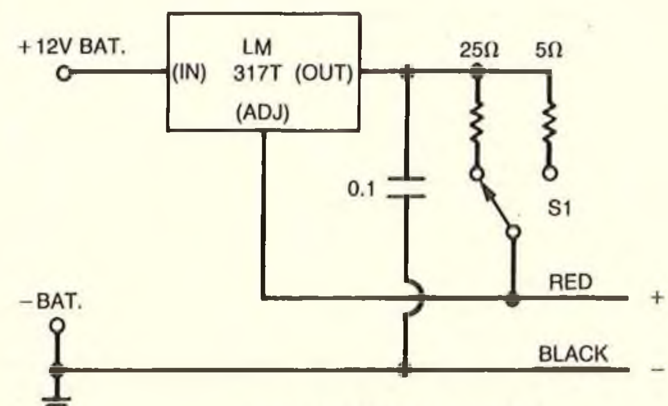
(2) **All parts** are obtainable from the local **Radio Shack** store.

(3) The total parts count is very low . . . only eight basic components including the box.

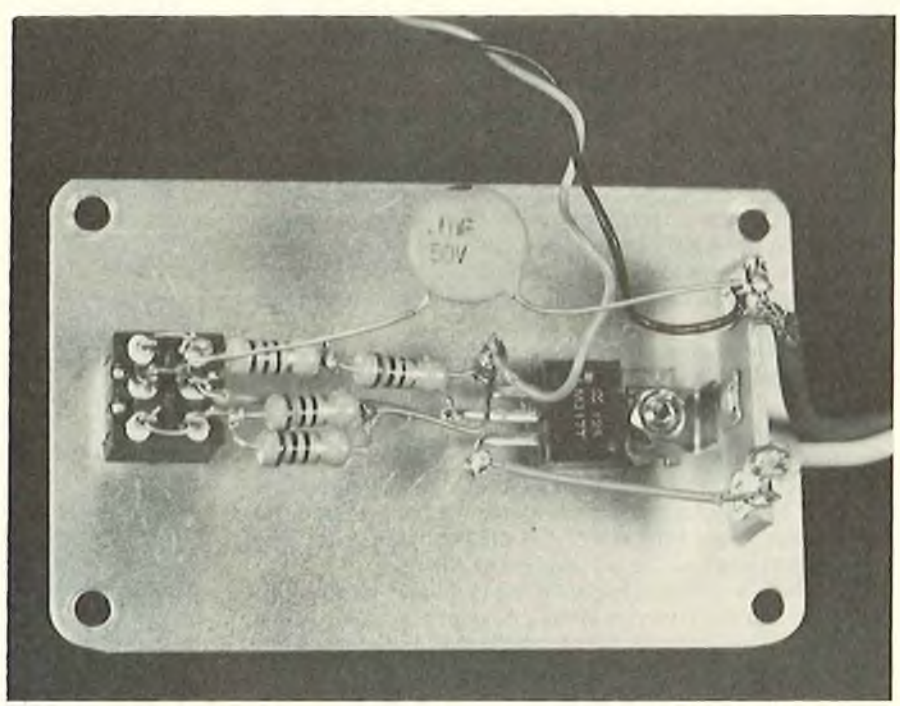
(4) The charger has dual rate, 250mA for a quick zap between flights, and 50mA for a more leisurely charge at the field or from your car battery on the way to the field or contest site.

The complete construction project should only take an hour or two. Minimum tools are required: a screwdriver, pliers, drill, soldering iron, and a small file (unless you have a drill that makes square holes).

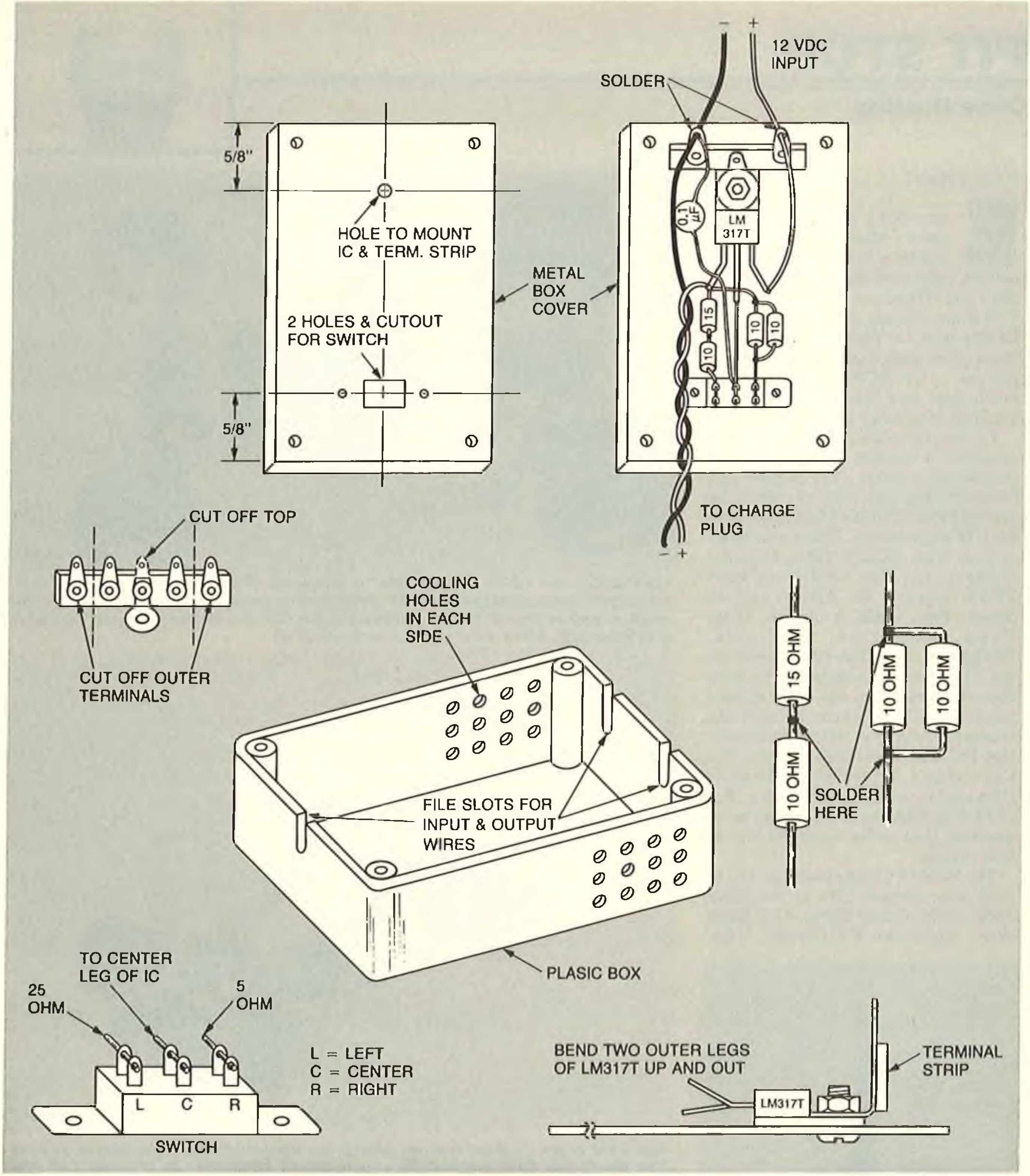
An LM317T Integrated Circuit (IC) is used as a current regulator in this circuit, and will handle battery packs up to 1200mA if the input voltage is at least two volts greater than the battery pack voltage rating. Example: Most RX battery packs are rated at 4.8 volts, so with this unit they can be



CHARGER SCHEMATIC



Case removed showing simplicity of this dual rate charger.



charged from a source of at least 7 volts.

The charger is intended to be used with a 12 volt battery as the source. This could be your car battery, flight box motorcycle battery, or the winch battery at the soaring site.

CONSTRUCTION

(1) Mark the metal box cover for the IC mounting hole and the switch mounting holes. Drill and cut. **Note:** A

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PARTS LIST

1 — 3¼ x 2⅛ x 1⅛ Box	R.S. #270-230	1.59
1 — LM317T Regulator IC	R.S. #276-1778	3.99
3 — 10 ohm 1/2 watt Resistors	R.S. #271-001	(2/.19) .38
1 — 15 ohm 1/2 watt Resistors	R.S. #271-003	(2/.19) .19
1 — .1µf Capacitor	R.S. #272-131	2/.39
1 — DPDT Switch	R.S. #275-407	2/.79
1 — Terminal Strip	R.S. #274-688	4/.89
Total for Basic Parts		**$8.22**

Optional items: Two alligator clips, or cigarette lighter plug. Wire, bolt and nut to mount IC and Terminal Strip. Charge connector for system being used.

PIT STOP

Gene Husting

What's New?

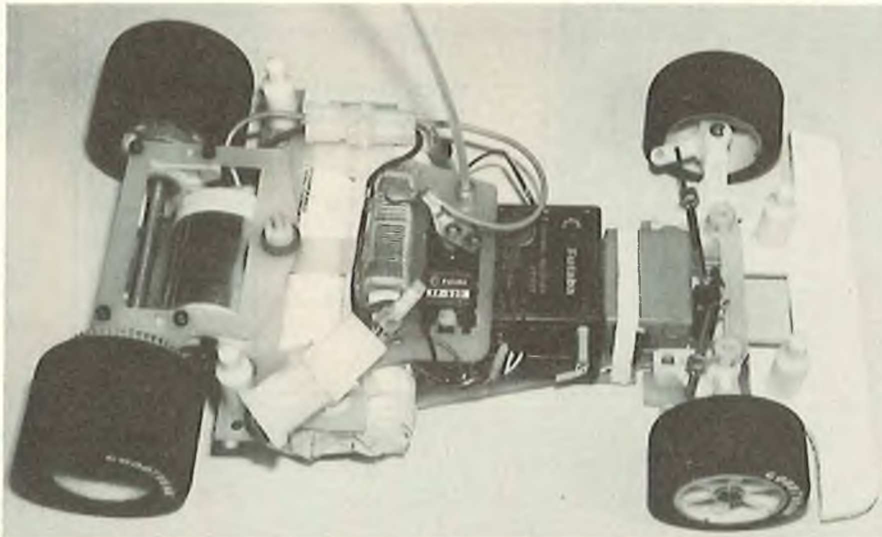
Everybody always wants to know "what's new?" So this month we've got three of the newest, most exciting cars for 1982 to show you. These are Associated's new 1/12 Scale electric car — the RC 12i; Delta's new 1/8 Scale gas car — the Eagle; and Associated's new 1/8 Scale gas car — the RC500. We also have much more new info which we think you'll be interested in.

To begin with, the 1982 race calendar is loaded with events, all around the country. The biggest and most exciting race will, of course, be the first ever World's Championships for 1/12 electric cars. There will be 40 drivers from ROAR (USA, Canada, Mexico, etc.) also 40 drivers from EFRA (Europe, So. Africa) and 40 drivers from JMRCA (Japan, Hong Kong, Singapore, Australia, Philippines, etc.). The 40 drivers from the USA earned their positions from their finishes in any one or all of the 4 major qualifying races around the country. These were ROAR Nationals, the Florida Winternationals, the Cleveland United States Indoor Championships, and the So. California Regionals. There can be no question that we've qualified our 40 best drivers.

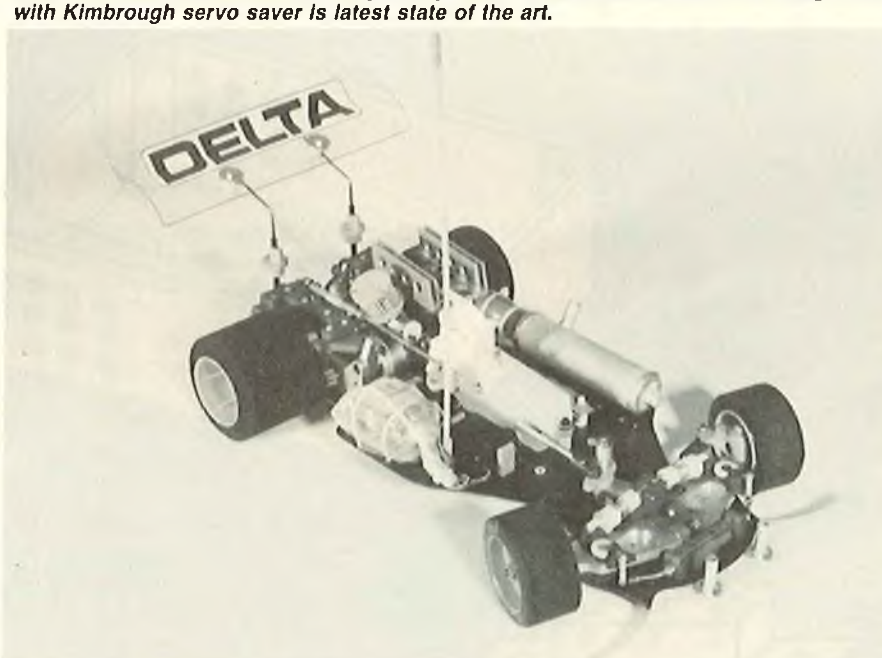
The World's Championships will be held from August 14th to the 22nd, 1982 at the Grand Hotel, One Hotel Way, Anaheim, California, USA. Phone (714) 772-7777. The Grand Hotel is located directly across the street from the main entrance to Disneyland. A better location for our Foreign visitors could not have been found. The Grand Hotel has a very large parking lot and part of this lot will be used for the race.

The ROAR Nationals will be from July 5th to July 17th in Castelton Square, Castleton, Indiana.

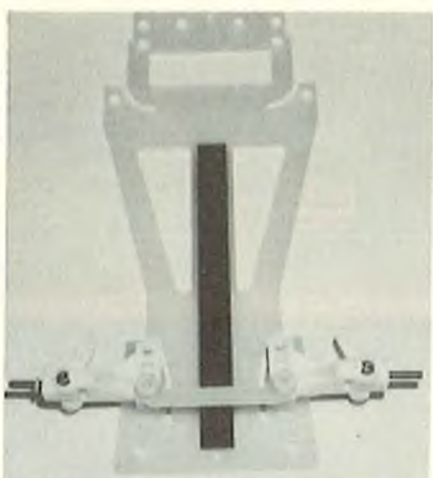
It would be impossible for me to list all the races here, but they are all listed in ROAR's Newspaper "Rev-Up." This is free to all ROAR members. If you're really interested in R/C cars, you will want to join ROAR. You will then receive "Rev-Up," which is packed with all kinds of R/C car info and "how to do it" articles. And being a ROAR member you will personally be able to vote and help make decisions



Associated's new RC12i "Wonder Car" is finally out. The car features a special type suspension system, front and rear that gives superior cornering and steering ability over rough as well as smooth tracks. Lightweight, low C.G., center mounted steering servo with Kimbrough servo saver is latest state of the art.



New Delta Eagle 1/8 IS car features strong, low front suspension with special shocks. New plastic fuel tank. Anglewinder engine design eliminates use of chain. Coil over shocks used front and rear. Full IS rear end. Ball differential.



The RC12I chassis is designed so the front or rear wheels can move up and down without the center section of the car moving. This allows the tires to remain in contact with the ground longer giving better control of the car to the driver.

concerning R/C cars. There is also a list of clubs in the USA. If you want to join ROAR, please send $20.00 to: ROAR, Inc., 12008 Welland, Cumberland, Indiana 46229. Please print your name and mailing address on your letter.

For those of you who might want to watch some races before joining ROAR, I'll give you the names, addresses and phone numbers of the Officers and Directors of ROAR. Please call the person who lives closest to you. None of the other people will be familiar with happenings in your area. They can tell you where and when races are held or who to contact.

President: Mike Reedy, 16661 E. McFadden Apt. #63, Tustin, CA 92680. Phone: (714) 543-7465, after 6 p.m.

Vice-President: Joe Werner, 12008 Welland, Cumberland, IN 46229. Phone: (317) 894-4141.

Region 1 Director: A.B. Markunas, P.O. Box 92, Northumberland, PA 17857. Phone: (717) 286-6461.

Region 2 Director: Doug McNeely, 12119 S. Dixie Hwy., Miami, FL 33156. Phone: (305) 232-1773.

Region 3 Director: N.A. Schmaltz, 810 N. Cousino Rd., Oregon, OH 43618. Phone: (419) 836-7837.

Region 4 Director: Kitten Hess, 22434 Elsnore, Katy, TX 77450. Phone: (713) 392-2875.

Region 5 Director: Arlynn Simon, 108 S. Gant, Sugar Creek, MO 64054. Phone: (816) 833-1036.

Region 6 Director: Chuck August, P.O. Box 5912, Carmel, CA 93921. Phone: (408) 625-2637.

Region 7 Director: Dan Rutherford, 4705 237th Pl. S.E., Bothell, WA 98011. Phone: (206) 481-5760.

Region 8 Director: Dionicio Pascual, Jr., 94-241 Mahapili St., Mililani Town, HI 96789. Phone (808) 623-2111.

AMA — New Frequencies

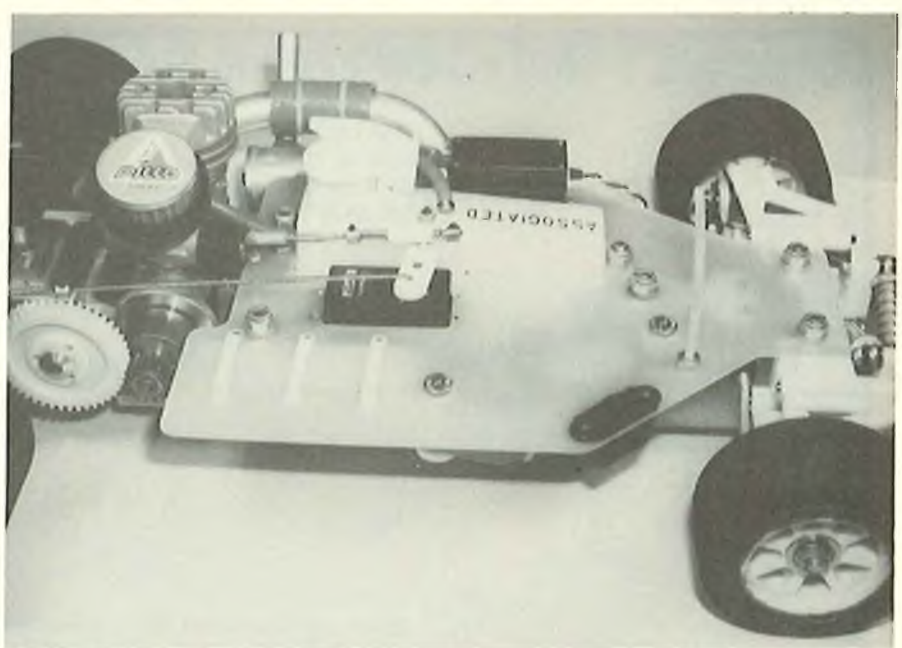
While we're on National Organizations, all R/C modelers including airplanes, boats and cars, owe the AMA — Academy of Model Aeronautics — a great big **thank you** for acquiring 73 new frequencies for R/C model use. There will be 50 new frequencies for airplanes only, 23 for boats and cars. The new frequencies will be ready for use in 1982. You will still be able to use your present equipment for years. The AMA has been working on this problem for years, and trying to get the Government to understand our problem has certainly not been easy. Thank you AMA.

New Associated RC12i

Well, it took almost a year in developing and producing kits, but the RC12i is finally here! Was it worth the wait? No question about it. The first race that the production version was used at, was the U.S. Indoor Championships at Cleveland, Ohio. This was a qualifying race for the World's Championships with 204 entries. All the top teams were there. Kent Clausen with his RC12i was Top Qualifier in both Stock and Modified classes and Kent won the Modified class and took 2nd in the Stock class. Mike Lavacot's RC12i won the Stock class and took 2nd in the Modified class and Re-Pete Fusco finished 3rd in Stock and 4th in Modified. The RC12i certainly worked on carpet, but how would it do on asphalt?

It seemed to like asphalt too. At the 1982 Florida Winternationals, with over 200 entries, and the last qualifying race for the W.C., Jim Aguirre, with his RC12i, was Top Qualifier in the Stock class and Jim won the Modified class. Kent Clausen

Associated's new RC500 1/8 IS car is designed after real 1/1 Scale race car geometry. Coil over shocks are used front and rear as well as anti-sway bars. Ball bearing front wheel are used, as well as ball bearings used throughout car.



Plastic fuel tank is made for Associated by Delta and features Du-Bro filter installed inside tank. Clean design is apparent. Twelve gear ratios from 5.20 to 6.20 can easily be made in less than two minutes. Complete car is easily serviceable. Dual disc brakes and adjustable ball differential is used.

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Futaba FP-3EG/S27	209.95	130.00	2	no
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was Top Qualifier in Modified and Mike Lavacot won Stock class, with an RC12E. Two big races — 2 clean sweeps! The car is certainly working.

What's the difference between the RC12E and the RC12i? Quite a bit! Let's start from the beginning. The first 1/12 electric cars were basically Jerobee 1/12 gas cars converted to electric cars, by Leisure and Bo-Link and others. The motors were mounted **behind** the rear axle and most used Jerobee brick radios. These cars were instrumental in turning 1/12 Scale electric cars into a genuine new hobby/sport.

A couple years later, Associated introduced their new RC12E car. But the car looked funny! It had the motor mounted in **front** of the axle! They said there was no way it could work. But work it did, dominating the ROAR Nationals for 3 years. Now, it would be hard for you to find a 1/12 car with this motor in the rear.

In the last couple years, 4 new very fast and competitive cars have appeared. JoMac, MRP, BoLink and now Parma have come out with cars as good as, or better than the RC12E. It was time for Associated to bring out a new car.

Having seen how the 1/8 suspension cars were working, Roger Curtis at Associated, designed a 1/12 car to do basically the same thing, in a different manner. The basic idea of a fully independent suspension car, is to keep all four tires on the ground as much as possible and to keep the tire's tread width in as full contact with the ground as possible. The closer you can come to achieving these 2 objectives, the faster you can go around a track. There naturally are many other critical chassis tuning requirements, but these 2 are most essential.

In a 1/8 Scale car, as well as in a 1/1 Scale car, this is achieved through 4 wheel independent suspension, spring rates, shocks, roll rates, suspension geometry, weight distribution, ride height, downforce, overall weight, etc., etc.

We couldn't quite make 4 wheel independent suspension, but through experiment after experiment, Roger was able to get closer and closer to the same goal. Roger started on the rear end, and at the ROAR Nationals the rear end traction was superb. The problem is, it was so good the car now had too much understeer. The cars were competitive, but not domineering.

After the Nationals, concentration was put on the front end, so the front end would work as well as the rear end. We told you how well it worked in Cleveland, and also at the Winternationals. When you have the car in your hands, it's quite easy to see

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GIVE IT A WHIRL

John Gorham

Shows

Well, as I write this column, it's three down and two to go. We've now had the "WRAMS" show in the East, the "Northwest Modelers Exhibition" (which I wrote about last month) in the Northwest, and I've just returned from the "Toledo" show. You will be reading all about this show in nearly all the magazines since "Toledo" is the United States' largest R/C model show of the year. The show itself was, as usual, busy, interesting and colorful. The "Weak Signals R/C Club" certainly are to be congratulated for maintaining their enthusiasm and organizational prowess year after year. Thanks, "Weak Signals R/C Club," for another great "Toledo" show.

The only problem yours truly had regarding the show was that Mother Nature decided to dump many inches of snow right where we were traveling and this caused a delayed return to California by a couple of days.

Forward Flight

I have been scratching my head over the past few weeks *(Editor's Note: Have you tried Head and Shoulders?)* in an effort to decide what would be most useful to the majority of helicopter enthusiasts in this month's column. Then, realizing that there are now many, many modelers who have at least learned to hover respectably, but still with a shortage of experts to help them through the next stage, it seemed that some "words of wisdom" concerning your first forward flight would be of the most general interest at this time. This should be especially true since many of you will have shaken the dust off your helicopters now that the weather has turned good, have relearned how to hover, and will be ready for that all-important and awe-inspiring first sally into forward flight (sounds like a launch of the space shuttle, doesn't it?).

Although it is over ten years since I made my first excursion into forward flight, I still vividly remember the occasion. Recalling it here may bring a smile to the faces of those who have been through the same experience. It may also serve as encouragement to those of you who think that some of us are "natural" helicopter fliers and do it without any real effort.

Early in 1971 there was a group of would-be helicopter fliers in California who called themselves "Helicopters Anonymous." The name was coined because each of us needed the moral support of the others very frequently if we were to continue the apparently fruitless task of learning to fly those "fool" things. Our group consisted of four modelers: John Minasian, Nate Rambo, Tino Villenueva and "yours truly." Our skills ranged, at the time, from being able to move in slow forward flight with the big "Cobra," down to many, many short hops and lots of tragedies of the less skillful of the group. There was a time around that period when I would go flying by myself with a blanket-roll containing 30 sets of beautifully finished rotor blades. I would practice and practice until I had destroyed all 30 sets and then I would return to the workshop to hand make (yes, hand make) another 30 sets.

Well, up to the important day of my first forward flight (which I'm going to describe) my helicopters had all spent their (usually brief) existences within about 3' from the ground and, roughly, between the two curbs of the local road on which we used to fly. Of course, at that time, we never dared go near an actual airport, even a model one, since R/C model helicopters were very firmly and vociferously banned from operating anywhere near "ordinary" model airplanes.

Well, one day "we" decided to take my helicopter, which, incidentally, was a home-built, half own-design, .40 powered chopper called the "Jelly Bean" (see photo) for its first forward flight. "Jelly Bean" had learned very well how to hover since it had spent many hours doing just that, but today was the day when "Jelly Bean" would make its first forward flight (the group decided!). We all drove to a model airfield which was well-hidden away in the Ojai Valley in California and we parked our cars by the side of the club's new runway which was located on the top of a small mesa. Plenty of space all the way around and no other modelers to witness our efforts since this was the middle of the week. The other three guys helped me to fire up the "Jelly Bean" and we all moved out to the runway to enjoy the luxury of hovering without the hazard and restraint of high curbs on either side of us. Pretty soon we'd got three or four tanks full of gas through "Jelly Bean" and I was being urged more and more frequently to "program out," as it was known in those days. Since "Jelly Bean" was the only helicopter I had, I was not very enthusiastic about doing this, and especially since I really had

John Gorham's "Jellybean" Circa 1971.

Saturday 'hell' flying session. The question is, 'who is flying what?'. Dick Kidd (L), John Gorham (C) and Carl Goldberg (R).

no idea what to do once the helicopter did "program out."

John Minasian and Tino Villenueva did have some limited forward flight experience so they were urging me on with all sorts of advice on what to do. Well, those of you who are learning know how nervous you can be at this stage of the game and how it's almost impossible to listen and take in advice at the same time that you are wiggling those sticks around trying to keep your helicopter in one place. However, their insistent comments finally got me so nervous that, at one point, the helicopter leaped up to about 10' as a gust of air hit it and I instinctively, but not willingly, put the right stick forward as instructed by John, to "program out." Sure enough, "Jelly Bean" obeyed my commands and started flying just like a plane, going "up and away" from the four of us, three of whom were cheering excitedly and the other (myself) standing with shaking hands and white face watching my one and only R/C helicopter fly off to what seemed to be certain oblivion and destruction.

Well, to cut a long story short, with lots, and lots, and lots of advice, I managed to bank "Jelly Bean" into a left turn and fly her around and around the airfield many times at a very fast "lick." Couldn't seem to fly it slow like the real ones do. "We" finally slowed it up enough about our heads to be able to bring it down (cautiously) from a 50' hover to a very ungracious "thump" on (or at least near to) the runway. Many cheers and congratulations from all!

So, still remembering the horror of that moment more than ten years ago, plus the devastating effect that the whole process had on my nervous system, I'm going to follow this dissertation up with the very best hints I can provide for those of you who still have to do your very first forward flight. For those of you who have already "done it," maybe you've had a chuckle or two remembering your own efforts. Why not drop me a line about your own first experience of forward flight and we will publish the best letter(s) we receive.

Before we describe the best way of approaching your first successful forward flight, it is very important to take note of a few fundamental principles of flight which are different between the helicopter and the fixed wing airplane.

Less Power is Required for Forward Flight

First of all, if you look at Figure #1, you will see that more, much more, power is required for hovering a helicopter than is required for level flight at moderate airspeeds. Of course, if the airspeed is increased to very high values, the amount of power needed can eventually exceed that required for hovering because the aerodynamic drag of the helicopter increases as the square of the forward speed increases. That is when you double your speed and you (approximately) quadruple the drag forces. The important part of the curve to note, however, is the first portion where you will see the power needed to hover is at least 25% greater than that needed to fly the helicopter at "cruising" airspeed. By the way, you will notice that the curve stipulates "out of ground effect" for the hover power which would apply to our helicopter when we are hovering at between 4' and 6' altitude. "Ground effect" usually comes into effect at altitudes below 1½ rotor span and, at these altitudes and below, the amount of power necessary to hover reduces. This accounts for your problem when you come in from the hover to land and find that the helicopter effectively "bounces" off the ground at an altitude of a foot or two. This causes you to reduce throttle to break through "ground effect." Then, if you are not smart enough, a hard landing results. (More about this phenomena in a later article.) Well, let's get back to the significance of Figure 1 and your first forward flight.

As you can see, if you are hovering and decide to go into forward flight you will actually need **less** power. However, to go to forward flight, you would normally want to **climb** anyway so the net effect of this conflict is best solved by moving off into forward flight without changing the

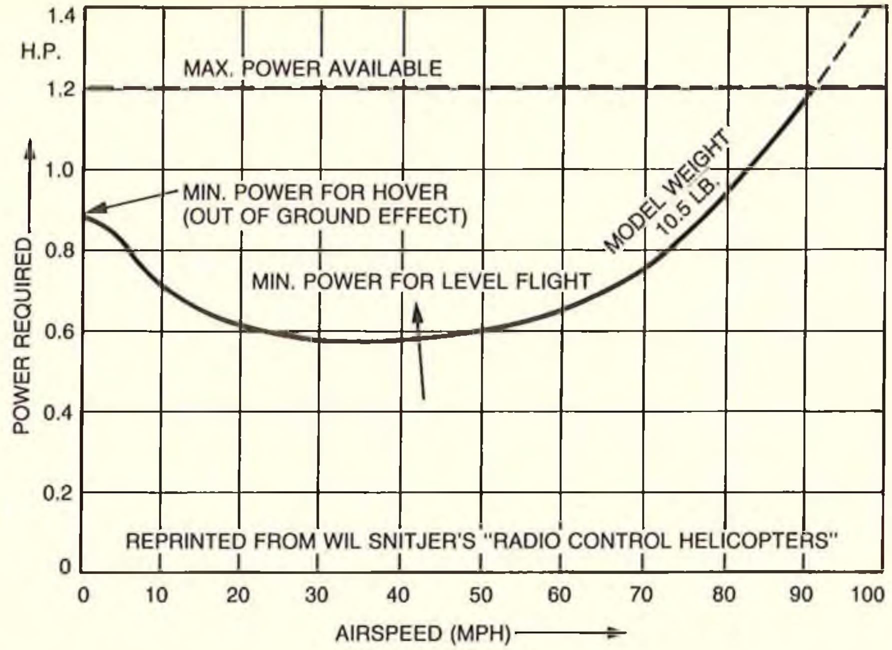

FIGURE 1: HOVER POWER REQUIREMENTS

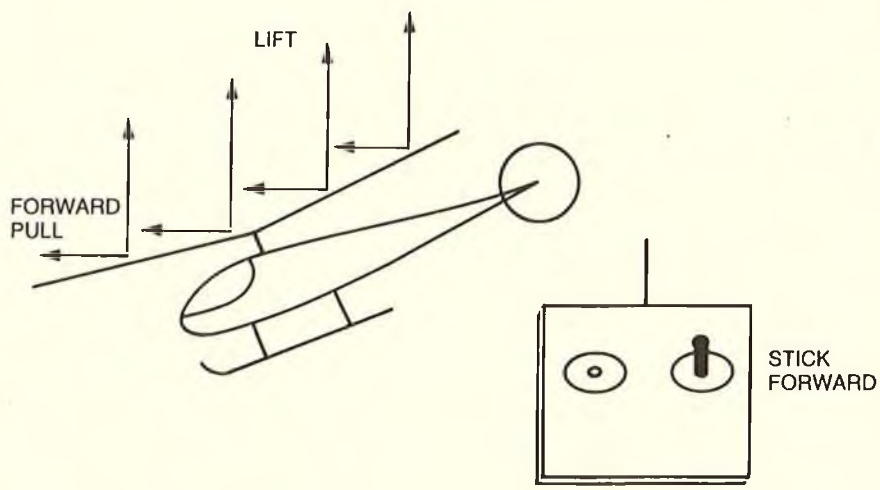

FIGURE 2: STICK FORWARD FOR CLIMB

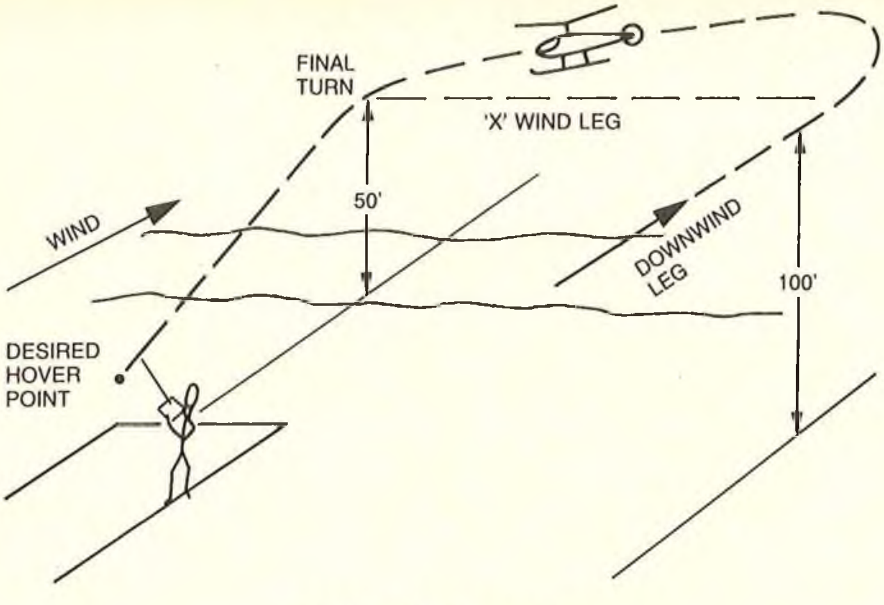

FIGURE 3: 'COMING IN'

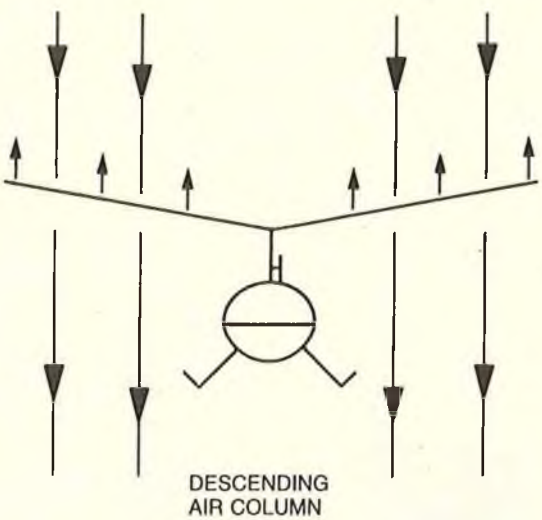

FIGURE 4: "SETTLING WITH POWER"

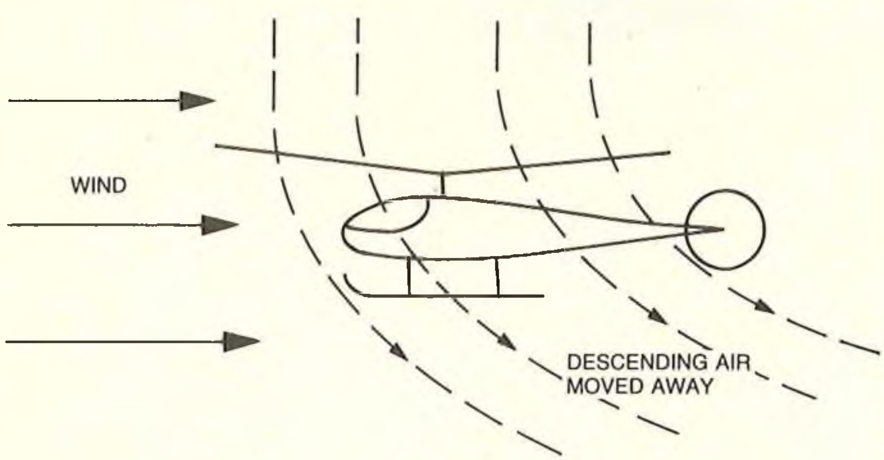

FIGURE 5: WIND HELPS AVOID SETTLING WITH POWER

power level. The result will then be that the helicopter will climb, with the same power setting, which is exactly what we want. The fact that less power is required for level flight, however, means that once you are at a reasonably safe altitude, your power setting will have to be **reduced** if you wish to maintain a constant altitude. Furthermore, if you wish to descend towards a landing, you need **even less** power. But we will get to that shortly. Let's get up there first.

"Stick Forward" Makes the Helicopter "Climb" Out

Now, how do we move into forward flight? If you look at Figure #2 you will see that by tilting the rotor plane in a forward direction (that is to say, moving the right hand stick of your Mode II transmitter "up" the box) the swashplate and, hence, the main rotor plane will tilt forward. The helicopter will, therefore, move off into forward flight and, because of the reduced power requirement, will also start to climb. What should we then do to maintain a reasonable airspeed? Well, to do this we must move the right hand stick to a position which will give us the forward speed which we desire.

Forward flight of a helicopter is almost solely a function of the forward tilt of the rotor blade system. You need this forward tilt accurately set at all times to establish and maintain a given forward flight speed. At the same time you need the proper power (or throttle) setting to preserve the altitude at which you want to fly.

Now, a further complication is that if the helicopter is in forward flight and is flying faster than you want, you can slow it down by **reducing** the amount of forward stick. **However,** at the same time (especially if you are going really slow) the helicopter will need **more power** because of the lower efficiency of the rotor system at slower airspeeds. So a "juggling" of power setting and "forward stick" is required at all times to maintain a given and consistent forward speed with a specific descent or climb rate. This phenomena is what causes the most trouble to us as we commence the descent to bring the helicopter in for the landing.

Forward Flight Turns with a Helicopter are Made Just Like a Plane

The next thing we must remember is, once we are in forward flight (and when we have recovered from the first shock of it all), the helicopter will very soon be reduced to a small speck in the sky. This gives you very little opportunity to maintain any control to bring it back, simply because you cannot see it. So, one of the first things to do once you've reached a respectable altitude of, say 70'-100', is to bank the

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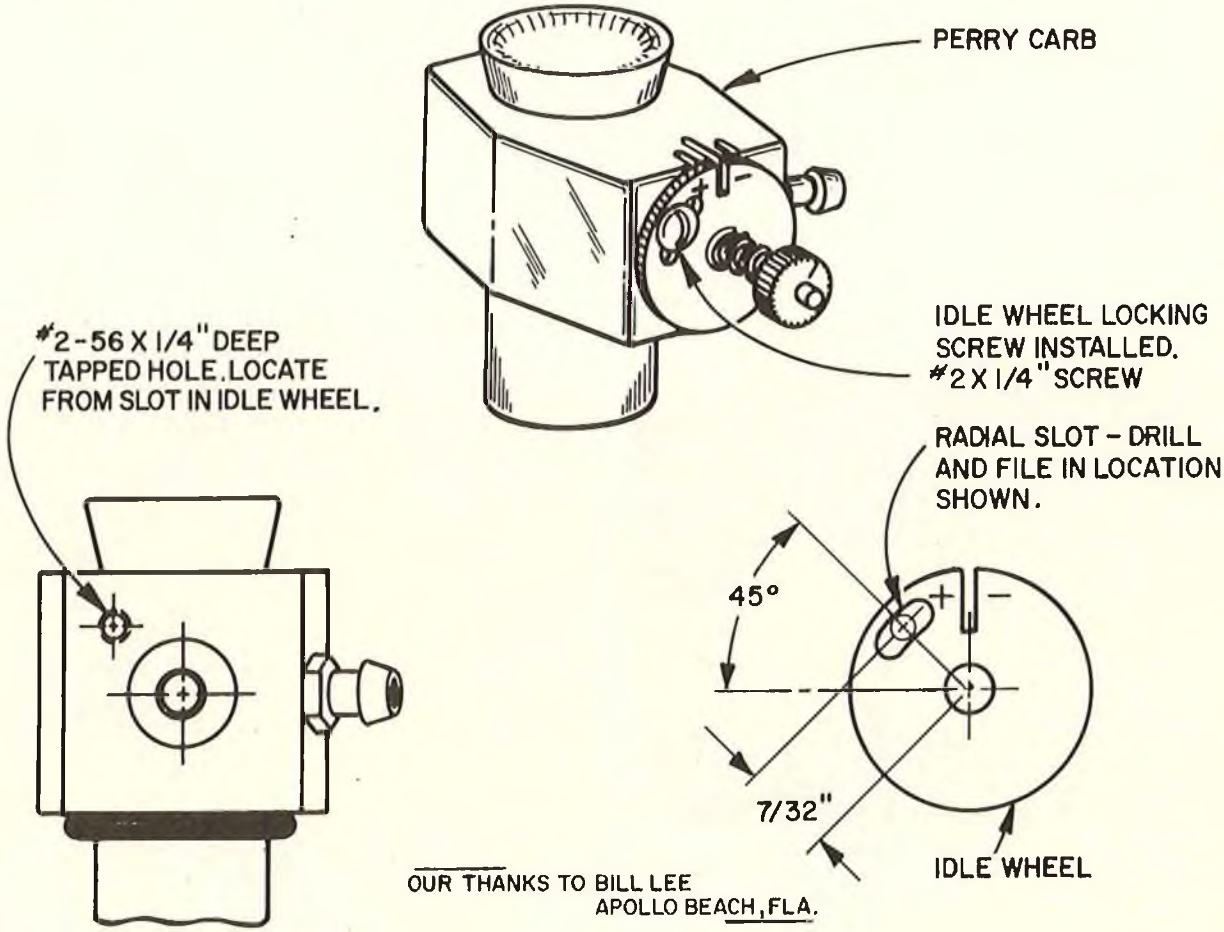
By Jerry Smith

PERRY CARB IDLE WHEEL ADJUSTMENT LOCK



My suggestion this month comes from a good friend of mine, Wallace Lee, who resides in Apollo Beach, Florida. Of course, Bill, as we call him, did not always live in Florida. For many years he lived in my area and belonged to our club. Recently, he surfaced in the form of a letter with a few pictures of his latest creations and the following suggestion, which I will pass along to you.

Many of you are using Perry Carbs and find them first rate. In the beginning, way back when, some of them were not so first rate. For example, I had seen quite a number with the metering slot not cut in the right location causing the idle adjustment wheel mark to be completely out of alignment with the marks on the body. Obviously, this can happen with any high volume product and I am sure Mr. Perry has things well in hand now. I have not heard of nor seen any carbs with the above described problems lately.

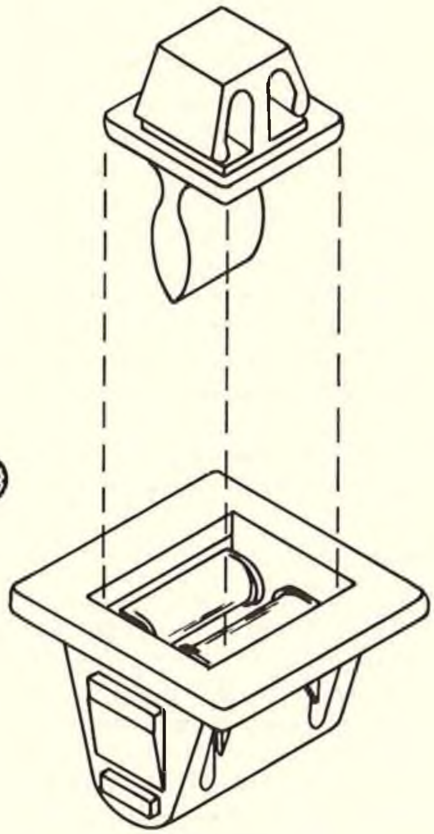
After reading Bill's suggestion, I carefully inspected my two Perry carbs and sure enough, the idle wheel adjustment on both carbs could be easily rotated in either direction! Both of my carbs are 5-6 years old. After disassembly, I inspected the "O" rings. They looked hard and somewhat shrunken in size. I suspect this is what happens with age. With further deterioration, leakage would certainly occur. Replacing the "O" rings will solve the problem, however, Bill's positive lock is added insurance in maintaining adjustment. Both my carbs now have the locking feature incorporated and it took me less than an hour.

Begin by removing the carb from the engine. Most likely it needs a good cleaning anyhow. Remove the needle valve and spring. Carefully remove the "C" washer. Slide the idle wheel out of the body and lightly clamp the wheel in a vise. Layout the slot location as shown in the sketch below. Using a No. 44 drill, drill a hole at each end of the slot. Be sure to make the slot long enough to take care of the full range of adjustment in the wheel. Next, with a round jewelers file, take out the rest of the slot. This is the most time consuming part of Bill's suggestion. Make sure the slot will take a #2 screw with a little clearance. Clean off all metal chips and filings with alcohol and a blast of air. Install the idle wheel and align the +, −, mark with the center mark on the body. Locate the #2-56 tapped hole in the center of the slot. Drill a #50 hole approximately 1/4" deep in the carb body. Keep it straight. Next, tap with a #2-56 thread. Install #2 x 1/4" machine screw. If you were careful in filing the slot, the wheel will move through the whole adjustment range and by tightening the locking screw, at any point, will hold the idle adjustment securely.

If your carb looks like the one in the sketch, the standard Perry carb, it is possible to add the modification just as described. I would like to call your attention to the new Perry carburetor breakthrough with built in in-flight mixture control (I.M.C. Model). Perry has also added a micro adjustment to this version for the idle adjustment wheel making it easy to find the perfect idle setting. I'm for that! No need to modify this one. □

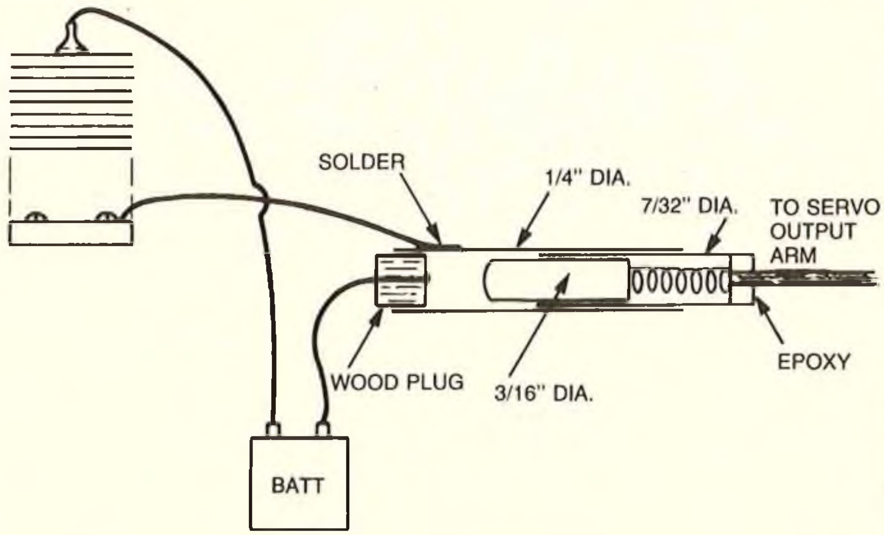
FOR WHAT IT'S WORTH

Keith Rhea of Clovis, New Mexico, uses a dryer door latch kit for holding the canopy of his F-86 ducted fan. The male part is used on the canopy and the female part on the fuselage. This simple little device has really held the canopy on. Just epoxy in place. Remove the spring on the female part. Parts are available at little cost at Sears or Whirlpool appliance stores. part #279280. See sketch.

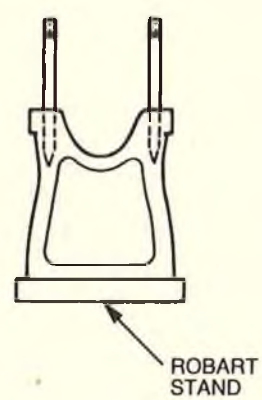


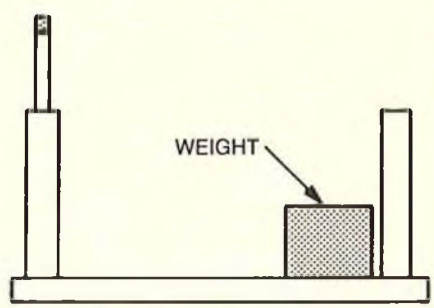
DOOR LATCH KIT
SEARS OR WHIRLPOOL
APPLIANCE STORES
PART #279280

Ralph Kirklin of Spokane, Washington, wanted to use an airborne battery to light his glow plug while flying at low throttle. He didn't have a micro switch on hand so he proceeded to make a substitute from materials that he had in his shop. Cut the 1/4" brass tube 1¼" in length and the 7/32" brass tube 3/4" in length and the 3/16" brass tube 1/2" in length. Make sure the brass tubes slip inside each other and move freely. Take the ball point pen spring and cut it in half. Solder to one end of the 3/16" brass tube and close off the other end of the same tube with solder to be used as a contact point. Now slip this assembly into the 7/32" brass tube and epoxy the spring and connecting rod together as shown in the diagram. The reason epoxy was used is that the heat transfer may unsolder the other end of the spring. Now take the 1/4" brass tube and solder the ground wire as shown. Make a wood plug that will fit inside the tube. Treat with CA adhesive. Drill a hole in the center of the plug the same diameter as the wire you will be using. The wire is to have a 1/8" section of a straight pin (head attached) which will be soldered to the braided wire, and put a drop on the head for a good electrical contact. This will be threaded through the hole in the wood plug and the whole assembly glued into the end of the 1/4" brass tube. Determine the location of attachment in your plane and attach a proper bracket to hold it. The pushrod used is cable attached to an adjustable connector at the servo end for your fine adjustment. The advantage of attaching the spring the way that is shown is to give you an over-ride and to disconnect the contact when not required. Keep the whole assembly free of dirt and oil in order to maintain good electrical contact.

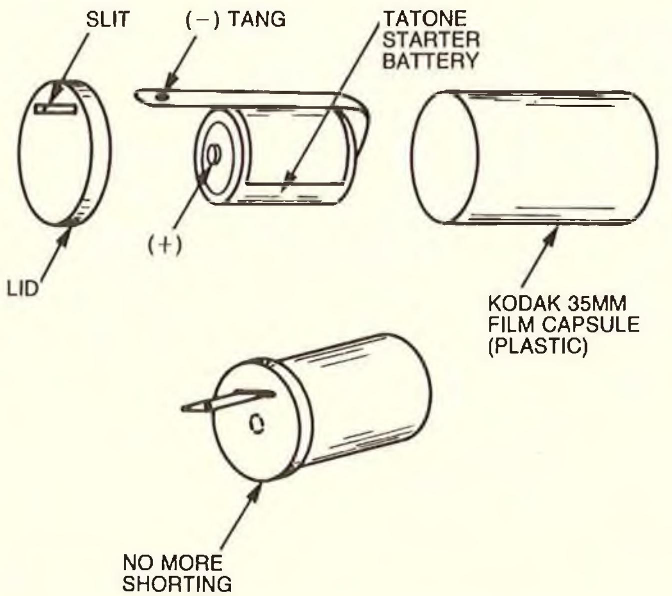


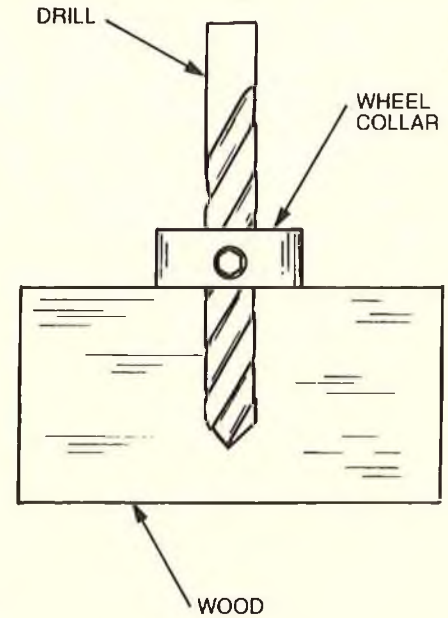
David Naismith of Merritt, B.C., Canada, calls his submittal, The Lazy Man's Balancer. He takes two sharpened, rubber eraser pencils and sticks them in his Robart Plane Stand. He uses a bubble level across the erasers to make sure they are even and level. That takes about 45 seconds. Caution: Put heavy weight in the tray of stand when balancing, as shown in sketch.





FOR WHAT IT'S WORTH





Daniel Walton of Liboral, Kansas, says that his hint has to do with those neat little Tatone 1½V starting batteries. The ones you sometimes put in a pocket with change and then dance around the flying field. His solution to prevent shorts is to use a 35mm film capsule (plastic) that comes with Kodak film. Cut a slit in the lid for the negative (−) tang and insert battery in capsule as shown in sketch.

Jim Uebelhoer, Fort Wayne, Indiana, combines a couple of previously published FWIW ideas for the following helpful gadget.

The following idea is a combination of two ideas that appeared in a previous "For What It's Worth" column. The first suggested using "Foam Core" for ribs, bulkheads, etc., where there wouldn't be much in the way of loading. The other suggestion was using soft foam for the backup for sandpaper because it took the shape of the item being sanded so readily.

Jim's idea is for the use of "Foam Core" for the backing for sandpaper. The cardboard backing on the "Foam Core" allows for the use of any contact cement for holding the sandpaper. Both sides of the "Foam Core" can be used to cement two grades of paper. The foam bends very easily (without falling apart) to almost any shape desired. The 1/4" is all he has tried to this date, but he is sure the 1/8" would have just as many uses in this manner. Jim got his foam from a friend who was doing some home insulation, but it would not be very difficult to find anywhere. It also can be cut to any size required with a good pair of scissors.

The following suggestion was submitted by Ray Moyer of Levittown, Pennsylvania. After trying everything from thinners, removers, and rubbing on foam to clean his sealing iron (Top Flite) with no success, Ray found that oven cleaner (Easy-Off) cleans the iron like new. Turn your iron on to the 1½ mark (just warm) and spray or brush the Easy-Off on the iron. Let it set five minutes and wipe off. Ray's iron was black from using iron-on coverings; it cleaned the iron like new and didn't harm the Teflon finish. If you spray, protect your numbers on the dial as it will remove the painted numbers and marks.

Walter Pawlukanis of Oakhurst, New Jersey, has a nifty approach to limiting the depth of a hole you want to drill on those occasions where this is necessary. Per the sketch, place a wheel collar that comes the closest to the O.D. of the drill that you are using, and tighten at the desired depth. When the wheel collar touches the surface of the material being drilled, the depth has been reached. Most of us have a wide variety of wheel collars accumulating dust in our workshops.

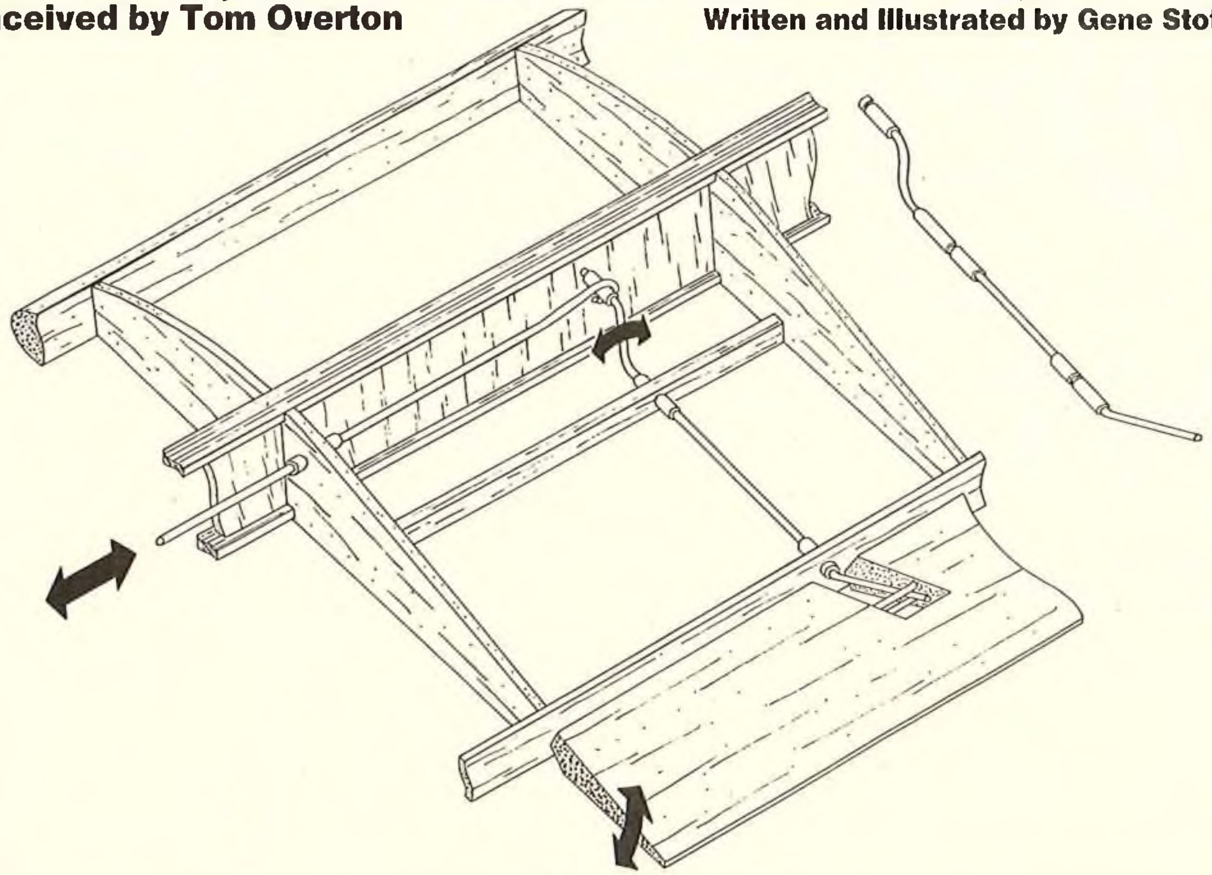
This idea submitted by Karl H. Hensel of Norfolk, Virginia, explains how he streamlines and strengthens cabane struts. Cut a length of the appropriate size K & S streamline tubing to the proper length and, using a cut-off wheel, cut a slot the full length down the back side. Then bevel the ends to fit the structure and slide it over the wire. Hold it in position with masking tape, and also use a piece of tape to seal off the bottom. Now pour epoxy into the tube, level with the top. When the epoxy has cured, remove all the tape and use filler to fair in the ends if required, and to fill any flaws in the rear edge of the tubing. If the servo is located in the top wing, the extension cable may be run through the tubing prior to filling the tube.

Send your hints & kinks to RC Modeler, P.O. Box 487, Sierra Madre, Ca. 91024 & win a free book from RCM's Anthology Library Series if your idea is used.

INTERNAL CONTROL SURFACE ACTUATION SYSTEM

Or, How To Build A Better Mouse Trap

Conceived by Tom Overton **Written and Illustrated by Gene Stottrup**



It has been said that if you can build a better mouse trap the world will beat a path to your door. Well here's the better mouse trap but don't beat that path to **my** door. Tom Overton, of the South Bay Soaring Society, conceived this idea and made a model which is incredibly slop-free, of a system for actuating control surfaces internally. His method uses no external control horns or visible pushrods. Control horns are unsightly and produce drag plus they require an ugly hole in the fuselage for a pushrod to exit. The geometry stays true at the intersection of the bent wire and the two parallel wires (in the control surface) as it is deflected, there is no binding!

Below is an illustration of the system in a built-up wing but it can easily work just as well in a foam wing. This can also work inside a fuselage to actuate a rudder very easily. Here are several things to keep in mind as you build:

(1) The angled bend in the wire (at the control surface) **must** occur at the hinge line. You could put two wheel collars on the wire (and the brass sleeves) **before** bending. Instead of wheel collars you could put on two additional pieces of brass tubing and after the bend is on the hinge line just instant glue the two inner tubes to locate the wire. See the illustration.

(2) The angled bend in the wire (at the control surface) is 30 degrees. This translates to 30 degrees deflection each way.

(3) It is important that the bends in the ends of the wire be at 90 degrees to each other. In other words, when the crank is vertical the angled bend should be horizontal. Differential throw (which counter adverse aileron yaw) could be introduced here but I feel it is best created at the servo where the motive force is greatest.

(4) The sleeves (bushings) should be of different material than the wire. This is to prevent a phenomenon known as galling. The wire will probably be steel and the sleeves brass. Secure the main rod (coming from the servo) to a brass sleeve on the crank very well --- no slop allowed. Consider capturing this sleeve on the crank with collar or tubing to prevent "walking off."

(5) It is important to lubricate "metal to metal" interfaces to reduce friction. Use grease.

(6) The two wire rods in the control surface need to be parallel and glued in very well. Put in one and let the glue dry, then install the second using two pieces of scrap rod temporarily as spacers. The two wire rods that get glued in could be sleeved with NyRod tubing or something other than metal if you are concerned about radio noise or galling. How about Delrin rod?

(7) Don't mar the ends of the wire as you bend it and be sure to have everything slipped on before bending.

(8) Put a hinge in the immediate vicinity. This is a good idea near control horns too.

This system is being used to actuate the ailerons in the wings of my Sea-Gull slope soarer. Having seen Tom's model I am very impressed with the straightforward concept for internally converting linear motion into rotary with a pushrod. Torque rods can do this, but with two part wings or gull bends, a pushrod which can be flexible has some nice advantages. Congratulations Tom and thank you. □

SHOWCASE '82

from page 112/94

AEROSPACE PHOTO PRINTS

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GIVE IT A WHIRL

from page 93/91

helicopter to the left (since this direction is "against the torque" and will tend to keep the nose of the helicopter up. Then commence flying your chopper in slow circles around yourself at a distance of, say, 150'. Don't forget to maintain airspeed and height with throttle and "elevator."

If you fly airplanes you will find the turning of the helicopter very natural since it is very similar to your "plane." If you add some cyclic control to the left by moving the roll stick to the left, then the helicopter will bank in that direction and, hence, will commence to turn. Also like a plane when in turning flight, a little bit of back stick may be needed in order to maintain altitude, although in a left hand turn with a clockwise rotating rotor system, the nose will tend to come **up** anyway so some left tail rotor may be applied to "help" the chopper round the turn. Do remember, though, when applying back stick on a helicopter (to keep the nose **up**) you will also be **reducing** the forward flight forces and, hence, your helicopter can rapidly slow up if you "back stick" too much or for too long.

Coming in to Land is the Hardest Part of Forward Flight

It is generally agreed by all chopper pilots that the approach and landing is the hardest part of all. So, if you can manage to survive flying a few circuits around yourself (don't forget the fuel level!), then you can try your first landing approach (see Figure #3). Wait until the helicopter is flying downwind and commence the last cross wind turn when the chopper is about 100'-150' away from you. I find it helps your final approach considerably if you make your initial power reduction at this point. The reason for this is that you can observe the descent rate of the helicopter much more accurately when it is flying **across** your field of view than when it is flying **towards** you.

So, in effect you will reduce altitude from 100' to, perhaps, 60' or even 50' as you are slowly turning to come in towards you and you will then only have the helicopter facing you for the last, say, 75' of distance and 50' of altitude. At this point you will be flying into wind so you'll probably need even more forward cyclic to maintain ground speed, but don't forget you will be flying with a low power setting — much less than you would perhaps instinctively want to have — on the left hand stick if you want to descend and also fly slowly forward. Occasionally, however, you may need to add power quickly in order to reduce the rate of descent and, at the same time, adjust the forward stick to protract the flight path so that the helicopter will reach you and not land short in the "boondogies." Your objective, at all times, is to gradually and smoothly reduce your altitude but also keep the helicopter coming towards you steadily so that it finishes up in a hover at about shoulder height, level with where you are standing. The beginner finds this very hard to do and usually finishes up with the helicopter way above his head because he has not reduced power enough on the landing approach. He then reduces power at the last minute to bring the helicopter down and he promptly runs into another problem — "settling with power."

Avoid "Settling With Power"

A brief description of "settling with power" is included so you know about it and you may avoid it if at all possible. "Settling with power" can occur if the helicopter is descending vertically in a low wind situation and, usually, because of higher than desired rate of descent, power is suddenly applied (see Figure #4). Since air is being "pulled" downwards by the main rotor blades, the helicopter is actually descending in an even faster descending column of air. Adding power suddenly, further speeds up this air mass, which then, in turn, results in an even faster rate of descent of the helicopter. Adding still more power further aggravates the problem and, almost inevitably, a **very** hard landing results.

The only solution to this situation, if it occurs, is to "fly out" of that descending column of air **fast**. So, do try to avoid vertical descents from a high altitude. Do try to program the helicopter down a sloping path in space by juggling throttle and pitch controls. By the way, "settling with power" is much less of a problem in windy conditions since the descending column of air is no longer vertically below the chopper (see Figure #5).

Back to the Hover and Land

The final phenomena which can catch you out very easily is related to our original graph (Figure #1) and the variation of power required in the hover as opposed to forward flight. Now that we are coming back to the hover we will actually need more and more power as the helicopter finally reduces speed to the hover position.

So we must bear this in mind and when we finally slow right down to the hover we must then **add** some power to maintain our altitude. The experienced pilot will anticipate this need for "last minute" power and he will make a nice smooth transition to the final hover.

Then, after stabilizing in the hover mode, we will reduce power and, hence, altitude, until the helicopter is landed (remembering the "ground effect" bounce, which is always a little tricky).

Well, I hope that this dissertation has helped you a bit. I'll amplify some of the points next month.

Keep the letters flowing in on problems such as this which you would like me to write about and I'll be glad to do my best to assist you.

'Till next month. □

PIT STOP

from page 88/86

and feel how it works. It looks quite simple now, but you'll never know how many hours it took to get it to this point.

The instructions with each kit are designed for easy step by step assembly. They also include instructions on charging, tuning, driving, etc. However, there are 2 very important chassis tuning tips I'd like to pass on to you. The movement of the rear end is controlled by a friction shock located between the 2 rear body mounts. The shocking action is adjusted by the tension on the adjustment nut. The feel you want, when the rear end is moved up and down, is a slight snubbing action at the shock point. If it's too loose, it's not doing any good. If it's too tight, the rear end can't work. You should be able to move the rear end up and down and feel a very slight drag in the shock.

The next tip concerns steering. Most

guys are used to going "lock to lock" on their steering. That is, when they turn their steering wheel on the transmitter fully to the right, then the front wheels should turn to the right until they hit a stop. **Now pay attention.** On the RC12i, it's not always necessary to turn the wheel until you hit the stop. As a matter of fact, on my car I only use about 2/3 of the possible travel. If you don't experiment with what I'm saying, you're going to get beat by someone else who's paying attention. Try different amounts of steering traverse.

One last point. A Kimbrough servo saver is included in each kit. These mount directly to the steering servo. So when you order an RC12i kit from your dealer, be sure to tell him what servo you are using so he can give you the correct servo saver.

Delta Eagle

Delta's new 1/8 Scale gas fully independent suspension (IS) car, the Eagle, is quite a new concept in 1/8 IS cars. It departs from the normal double "A" arm front suspension, by using single swinging arms. And at the rear, the customary chain drive has been eliminated by mounting the engine in an "Anglewinder" fashion, similar to what we did in slot cars.

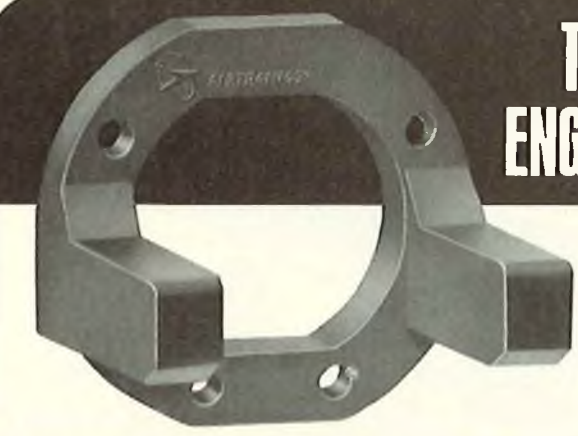
Bill and Ken Campbell of Delta are not overly influenced by current technology, and certainly are willing to try something different, if they believe it to be better. I talked to both Bill and Ken about the development of the Eagle. They said they believed a weak point of all IS cars to date, was the front ends. They weren't strong enough for 1/8 Scale racing. So their design goals were an independent front suspension that was strong, and low enough to be able to use the Spyder and Sorbello bodies.

They said they wanted to eliminate the chain drive if possible. They weren't aware of any mechanical problems with the chain drives, but they felt the fewer the parts, the fewer the problems. They found they could mount the engine at a 10° angle directly to the gear, if the gear was mounted on the outside of the rear bulkhead.

Quite a bit of time was used to develop new shock absorbers, which they feel are superior to any others that are now available. A super new plastic fuel tank was developed.

The first Delta prototype Eagle has proven to be quite successful. It finished 4th in the 24 hours of Miami race, which I think is an incredible performance for any new car. Arturo Carbonell finished 2nd with it at the Winternationals and 2nd again in Spain with it. The Delta Eagle is

to page 122



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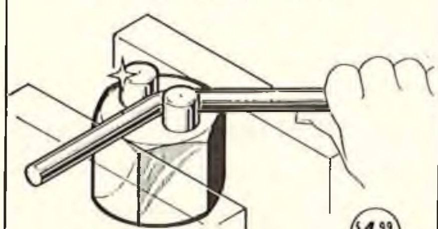

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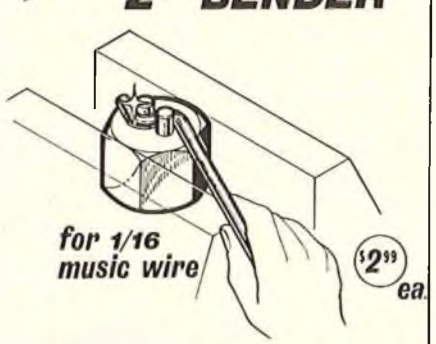

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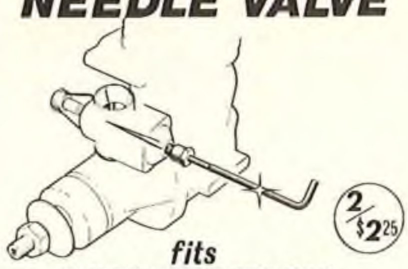

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from page 119/86

certainly destined to win a lot of races. Price is $580 for the kit plus $20.00 for the flywheel. Specify what type of engine you'll be using. For further info write to: Delta Manufacturing, 27 Race Car Court, Lorimor, IA 50149.

Associated RC500

Gene Husting and Roger Curtis, at Associated, were also working on a new 1/8 IS car. After learning as much as possible from technical books on chassis geometry, such as Racing and Sports Car Chassis and Design, New Directions in Suspension Design, Racecar Engineering Mechanics, Prepare to Win, Tune to Win and others, Gene and Roger both agreed on the same basic designs as used in the real Formula I, Formula 2 and Formula 3 racing cars.

This consisted of double, unequal length "A" arms front and rear, with exact lengths and locations being the same as used on the real race cars. All of this was in the blueprint stage. At this time we were approached by Dave Preston and Phil Booth, the two English racers who had designed the successful PB cars. They had approached Keith Plested, the owner of PB, with their new 1/8 IS car, but Keith wasn't interested, because he was working on his own design. We looked at Dave and Phil's car and were very impressed.

A close examination of the car showed the suspension locations were almost exactly the same as what we had laid out. Then Dave told us he had actually raced Formula 2 cars and that he knew some of the Formula 2 chassis designers who helped him with his design. Obviously, Dave and Phil had spent much time in the design of the car, and in an effort to save further development time on our part, an agreement was made for Associated to manufacture the car.

Dave made a few prototype cars which were used in 1981. Rick Davis won the 1981 ROAR Nationals and Bill Jianas finished 2nd, and both were using prototype RC500 cars. Meanwhile in England, Phil Booth used his prototype RC500 to win the 1981 English GT Nationals and Wally Bailey's prototype RC500 won the 1981 English Formula I Nationals. At the 1982 Florida Winternationals, Rick Davis was the fastest IS car qualifier. 1982 is going to be another interesting year. Price of the RC500 kit is $475.00. Please specify type of engine you are using. For further info, see your dealer or write to Associated Electrics, Inc., 1928 Edinger, Santa Ana, CA 92705. □

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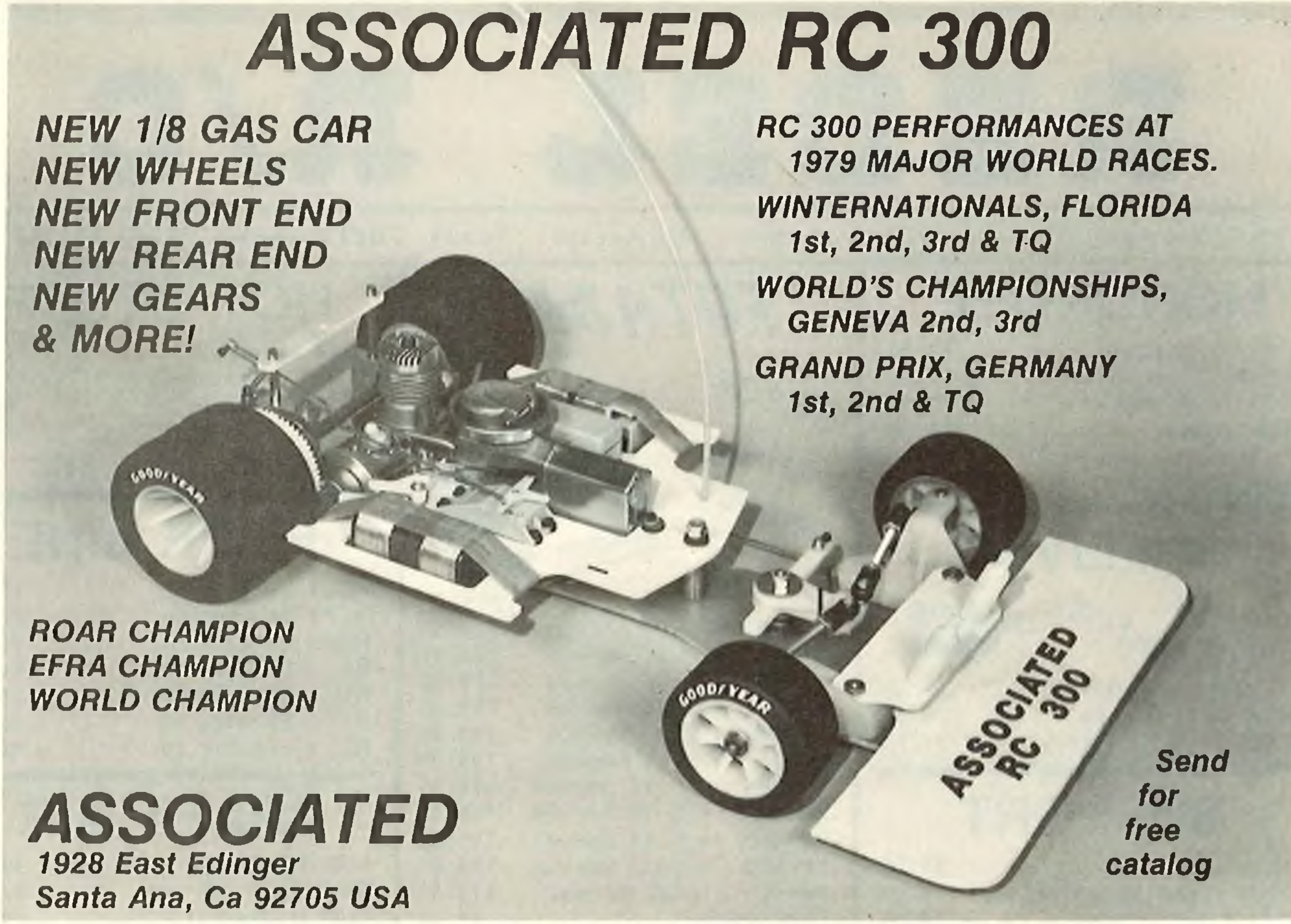

DUAL RATE FIELD CHARGER

from page 85/84

mini-toggle switch may be used in place of the slide switch. It is easier to mount as you only have to drill one hole, but the cost is more.

(2) Cut the two end solder tabs off the terminal strip. Cut off or bend over the center solder tab on the strip. **Do not attach anything to the center solder tab!**

(3) Mount the IC and terminal strip as per the sketch. Then mount the slide (or toggle) switch.

(4) Bend the two outside legs of the IC up and out toward the sides.

(5) Solder a 10 ohm and a 15 ohm resistor end to end. This will make a 25 ohm resistor, which determines the 50mA output.

(6) Solder two 10 ohm resistors in parallel as per sketch. This will make a 5 ohm resistor, which determines the 250mA output.

(7) Solder the 25 ohm (10 + 15) to both left terminals of the switch. Solder the other end of this resistor to the left leg of the IC.

(8) Solder the 5 ohm (10/10) resistor to both right terminals of the switch. Solder the other end of this resistor to the left leg of the IC. (Both resistors will now be soldered to the left leg of the IC.)

(9) Solder a short piece of insulated wire from the center terminals of the switch to the center leg of the IC.

Make sure at this time that none of the parts or wires come in contact with the metal cover plate or other components.

(10) Solder a short piece of insulated wire from the right terminal strip solder lug to the right leg of the IC.

to page 126

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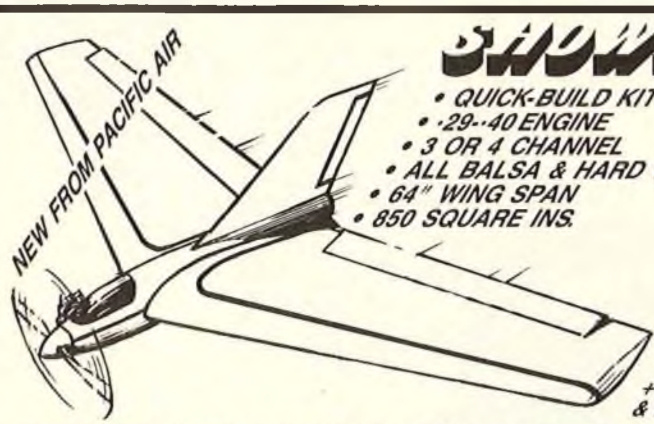
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DUAL RATE FIELD CHARGER

from page 124/84

(11) Solder the positive **(red)** input voltage wire to the right terminal strip solder lug. Solder the negative **(black)** input voltage wire to the left terminal strip solder lug.

(12) Solder the two charging wires, negative **(black)** to the left solder lug of the terminal strip, and the positive **(red)** to the left leg of the IC.

(13) Solder the .1µf cap from the left terminal strip solder lug to the center terminals of the switch.

(14) File slots or notches in the plastic box as per sketch. The two top notches are for the two input wires, the bottom notch is for the twisted pair of output wires.

(15) Attach your choice of connectors to the input and output wires. **Be sure to double check polarity (+ and −).**

(16) Drill a few small holes in each side of the plastic box at the end near the IC. During use in the 250mA mode, the IC and the 5 ohm resistor will get quite warm. The metal cover is being used as a heat sink for the IC so it also will be warm in use.

(17) Fit the wires into their related slots and attach the cover with the four screws that were supplied with the box.

That completes construction. When the switch is in the position toward the 5 ohm resistor, the charger will put out 250mA. With the switch toward the 25 ohm resistor, the charger will put out 50mA. If you have a meter with a scale of over 250mA, you may check the output of the charger by connecting the meter in series with the positive output wire, between the charger and the battery pack. Actual output may not be exactly 50mA and 250mA . . . the prototype measured at 49mA and 248mA.

Using the Field Charger:

Most popular servos have a current drain of up to 100mA when in constant use, so an R/C plane with four servos would have a current drain of about 400mA if all four servos were in operation 100% of the time during a flight. A more realistic figure would be at about half of maximum, as different controls would be relaxed at times (steady throttle setting, etc). This means that the four channel plane is actually only using about 200mA during the flight. Using the 200mA figure as an average, a ten minute flight would require a field charge of 50mA for 40 minutes or 250mA for 8 minutes. Leaving the charger hooked up in the 50mA rate for more than the 40 minutes will not be an extreme

overcharge condition, and should not damage the battery pack . . . but don't leave the charger on in the 250mA mode for longer periods than required to replace used power or the pack could overcharge, overheat, and be damaged. Two or three minutes over the calculated time is about all that should be permitted!

Since it is quite difficult to know the exact current drain of your system, use the following formula to establish charging times:

Flight time x number of servos x 50 . . . then divide the answer by the charge rate selected, 50 or 250. Example: a plane with five servos makes a 12 minute flight. Charge time would be:

12 (flight time) x 5 (servos) x 50 = 3000.

To charge at 50mA:

3000÷50 = 60 minutes

To charge at 250mA:

3000÷250 = 12 minutes.

Note that the final figure can always be considered "minutes."

If the input voltage to the charger is great enough, 24 volts from two motorcycle batteries for example, you may also charge your **transmitter** batteries. The charger does not care what the voltage of the pack being charged is . . . it will always put out 50mA or 250mA if the input voltage is enough greater than the battery being charged. The only restriction is that input voltage should not exceed about 35 volts DC.

Finish the cover plate with a couple of coats of flat black paint, put a wide stripe of **Dayglow red or orange** MonoKote trim on the box so you can find it when you accidentally leave it laying in the grass at the flying field.

Charge!! □

PARMA PANTHER

from page 83/82

. . . . . appearance . . . an instant hit, you might say. Our first impression was a combination of awe and delight . . . a feeling that has lasted. The Panther, like its live counterpart, was an accelerating son of a gun, and to be truthful, we never got up enough nerve to let it hit its peak speed in the crowded (remember the kids), area we were operating in. Handling was superb, with instant, sure responses to our controls. Our biggest problem was the same one we experienced when we first started flying gliders . . . when the blasted thing is coming **toward** you and you want it to go to your right, move the stick to the left, dummy. While

to page 130

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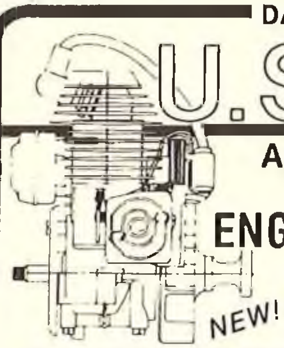

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PARMA PANTHER

from page 127/82

busting along at about 5,000 miles per hour towards us we wanted the little bomb to move to (our) right, away from the curb . . . so naturally we moved the control stick to the right — and hit the curb (we call it the outside wall at Indy). We fully expected to find our Panther on its back with all four legs in the air, but such was not the case thanks to the roll over antenna. We did end up on the side, but not a scratch was to be found . . . a tribute to that tough stuff lexan. As our experience (and nerve) grew, we found that the Parma Panther could be put into a power on turn with a very nice controlled drift, looking very scale-like all the while. The completion of our trial run left us pleased and looking forward to the next one — when school was in session and all those bikes and rollerskates were "that-a-way."

Conclusion:

We haven't yet had the chance to run our Panther against other 1/12 Scale cars, but from the brief trial run we gave it, there is no doubt that it will be a strong competitor. Parma's catalog lists other gear set-ups, and hotter motors for the real afficianado.

A quick look back at some of the highlights of this kit appears to be in order at this point, and three things immediately come to mind. First, the overall design of the individual parts and the final total assembly is, in our opinion, outstanding. Secondly, quality, as we have already stressed is top notch without exception. And finally, the appearance and performance of the car lives up to our expectations, and more.

to page 135

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PARMA PANTHER

from page 130/82

Although this kit is chock full of small parts, and at first glance looks complicated as the devil, we feel that a fairly careful novice builder would have no great difficulty with it. There are no parts to be measured, cut, sanded, or glued, and if Parmas' instruction manual is followed, there aren't any problems, either.

So, if you have been thinking about getting into 1/12 Scale racing . . . or even if you are already in it, give Parma the serious consideration it deserves. As the old saying goes, you'll both be glad you did. □

PROPORTIONAL RADIO

from page 80/74

be wary of "all new" radios until they have been well proven in the hands of the "average" modeler.

Well, after considerable rambling we've gotten the proportional radio development up to the present day. Looking back over those years we can draw one obvious conclusion. That is, the proportional radio was uniquely an American development. The U.S. had developed the basic raw materials needed such as the transistor, nickel cadmium batteries, and technically skilled people. And the affluent American society had created a pool of modelers with plenty of leisure time on their hands who had a dream of flying radio controlled models "just like the real ones." So modelers created the need; and make no mistake, it was modelers who developed the radio. I would draw an even finer distinction here and say that it was primarily pattern (stunt) fliers who developed the radio. ("He said without prejudice," guess which area of R/C I'm interested in?) Pattern fliers need and therefore demand the best radios. Howard Bonner, Bob Dunham, Doug Spreng, Phil Kraft, Jerry Pullen, Gerry Krause, Ron Chidgey, Jim Whitley, Ed Keck, Cliff Wierick, Jim Oddino, and Gary Kelson are but a few of the people prominent in the development of R/C radios who were also pattern fliers.

Now, of course, much of the production and development is done in Japan. How this came about is a story in itself which I couldn't begin to cover here. The big effect that it had on the U.S. R/C business was that radio prices have actually gone **down** over the years. Contrast this with almost any other segment of the R/C business. It boggles the mind of old time RC'ers to think that you now can buy a 6 channel radio with many of the extras for less than a piped Rossi engine. I paid $350 for my MicroAvionics and $300 for my PCS radios back in 1965. The equivalent radio of today would cost less than $60 in 1965 dollars!

Before I end this article it might be a good idea if I mentioned why I'm writing it in the first place. It occurred to me that it has been over 20 years since the development of the first proportional radios. If the RCM reader interest survey is any indication, most

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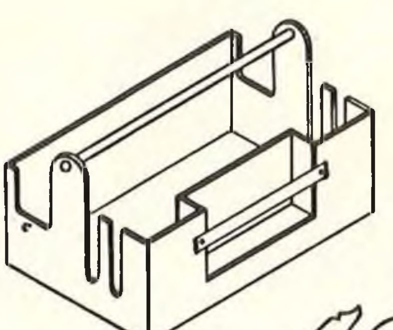
THE SAILPLANE CADDY



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PROPORTIONAL RADIO

from page 135/74

of you have been RC'ers for only a couple years; so I thought the subject might be of some interest. Also I thought that it was time that someone at least make an attempt at cataloging the events leading to the development of todays radios. Although I in no way thought I was the most qualified to write such a history, I made the attempt if only for the reason that it might spark others to write a more comprehensive history.

Once I decided to write the article, another problem I faced was, "Should I name names?" It's easy to write the history of an event that took place over 100 years ago without fear of contradiction by the people who created the event. But of course most of the people who created the proportional radio are still alive today. In the end, though, I decided that the proportional radio was developed by real people who should be given due credit for their accomplishments. If I have created errors of commission or omission, I apologize to those involved. I'm sure RCM will be happy to publish corrections, additions, or separate articles if inputs and interest warrant.

So having said all that, let's summarize what I've said up to here. Who were the people responsible for the "digital" radios we fly today? At the top of the list I would put Doug Spreng, who invented the digital servo and gave the digital radio its name. Doug contributed much to the basic design of the radio. In addition to the Digicon and MicroAvionics radios, Doug was the chief designer of the Kraft Signature radio. His promotional booklet on the theory behind the development of the Signature radio amply demonstrates his technical skill. Also near the top of the list I would put Don Mathes. Actually it's difficult to separate the accomplishments of Doug Spreng and Don Mathes because they have been partners off and on for many years. It appears, though, that Don was a good "hands on" type of designer. He could take a design and make it work in the real world. Don had his hand in the design of several of the radios of the major manufacturers as a consultant.

Because of Frank Hoover's use of pulse position modulation, he would have to be included with Mathes and Spreng as one of those responsible for the initial basic design of the digital radio. In follow-on design you would have to include Bob Elliott for his

three wire servo, Jim Fosgate for dual rate switches and other electronics improvements, and the many people responsible for receiver design.

On the mechanical side, Ron Chidgey's design of "open" sticks for Pro-Line was much more significant than at first thought. Ron's stick design was eventually used on the Kraft Signature radio and led to the widespread use of open sticks today. On the servo mechanics side, Bob Dunham, Chuck Hayes, Roy Klett, Gerry Krause, Dick Rehling, and Joe Martin were some of the people responsible for servo design for American manufacturers.

So that's how the proportional radio came into being, and those were some of the people who made it happen. The initial stages of that development was an interesting time to be an RC'er. At a typical pattern contest here on the west coast, you could rub shoulders with the major designers and manufacturers of the radios of that day, a scene that couldn't possibly be reproduced today. But then all eras eventually come to an end. Its passing, though, brings on a touch of nostalgia for those who lived through it. It was an exciting time. It's a shame most of you missed it. □

SOARING

from page 72/70

Task IV was called man-on-man Simulated Cross Country, and it was one of the more interesting events, as well as the most complicated to score. It went like this: Pilots were given a distance goal of 10 laps (1500 meters) to be completed as fast as possible. If everyone in the heat finished the course, scoring was like Speed, where the fast time got 1000 and other times got their proportion. If no one finished, it was scored as Distance was (most laps wins). But, if one pilot managed to finish, and you didn't, your score was (your laps/10) x (winning time/300 sec.) which tended to drop you way down in the standing. With all this scoring arithmetic, a computer was shipped in from Los Angeles.

The field was advertised to be smooth and flat, but was, in fact, littered with small rocks and dirt. Many planes suffered "landing rash."

Being a veteran of the last two 2MWC's, I filled my suitcase with all available warm clothing. This was a smart move because the temperature never got much above 40°F (4.5°C), which may seem warm to you guys back East, but this California kid was cold, even in ski pants, two sweaters, a parka, and down mittens! Hopefully next year's events will be somewhere


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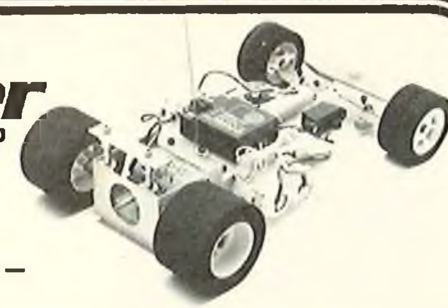

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The sailplanes were quite unlike those at a normal thermal contest. Kit designs were few and far between. By far, most of the planes were originals. The most popular kit-based models were variations on the cut-down Sagitta 900, which won the meet last year. The most promising looking entries were aileron equipped beasts with high wing loading, provided they could get up the winch line. Edberg flew the "Hustler-M" which was one of the models he flew in the World Champs at Sacramento --- the wings were, however, cut to 2 meter length with a razor saw. Another model flown by at least three contestants was the "Mini-Merlin" which sports a one piece foam wing. This ship is soon to be kitted by Soarcraft (remember the Magnum-12?). Other models sported state of the art construction; like Rich Spicer's all-fiberglass original and Oliver Northrup's 1/64" plywood sheeted foam original.

Best time in Speed was Edberg's 30.8 sec., followed by Alex Bower at 32.8, and Joe Newland at 34.2. In Duration, only 5 fliers came within 10 seconds of the 10 min. max., showing the rather poor thermal conditions. Best performance in Duration was achieved by Joe Wurts, with 9:55/83 landing. Best Distance in Task III was Edberg with 13 laps (flying at 18 oz./sq. ft.), followed by Mike Reagan and George Boss at 10.75 laps. In the three rounds of Task IV, Simulated Cross Country, only 23 fliers completed 10 laps, out of 136 attempts. Times for the 1500 meter course, for those who finished, seemed to average around 15 mph (24 kph), with the fastest (Rick Schramack) averaging 22.5 mph (36 kph), taking 149 sec. to complete the 1500 meter course.

One gripe of the contest was its high entry fee ($30). But this seemed more reasonable when we found out it included a free buffet dinner on the 12th floor of a fancy hotel/casino. In addition, there were abundant contest prizes in addition to trophies, with four (count-'em) radios. A Kraft Gold Spectrum 6, Futaba G, Airtronics XL, and an Ace Silver Seven transmitter. There also were many kits and merchandise to be had. The winner of the meet got first choice!

A few conclusions: (1) Pilots now seem to be able to use wing loading and ailerons to their advantage (all the top 5 had aileron ships). (2) This type contest seems to have wider separation in scores. In this contest, 90% of the winners score is 7th place, but at last year's Fall Thermal Soaring Festival, 90% got you 47th place. (3) It's fun to fly in a contest where a zero landing can still win a

to page 150

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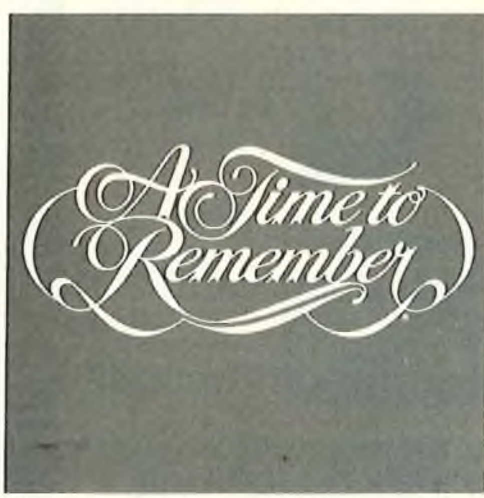

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SOARING

from page 144/70

round. Rumor has it that the next year's 2MWC will be held in Southern California. See you there!

★

A funny thing happened in New Zealand to a flier who shall be nameless. He set his transmitter down to help a mate launch, using a bungee. Upon launching, the line snagged the transmitter and up it went. As it got high in the sky, it started sliding down the line, with the owner running wildly underneath, with arms outstretched. The trannie, however, outdistanced the prospective catcher, fell off the line for an automatic shock test. Howzat! □

PIETENPOL AIR CAMPER

from page 69/56

Air-Camper and the finish is matte and fabric texture, use FabriKote. I modeled mine after one I'd like to see full size; finished in 12 coats of hand rubbed "Berryloid Dope."

The Williams Bros. wheels are molded in white plastic and you might want to paint them to compliment your color scheme. "Formula U" works fine. To mask the tire off, cut a circle in heavy card stock that's 1/8" smaller than the hub diameter. Make sure the stock is big enough to cover the wheel diameter. Slit the stock and slip it between the wheel and the hub. You'll end up with a shallow cone with the slit joint overlapped. Spray away and let dry before removing the mask. Take a razor blade and scrape the paint off the simulated lacing and you've got a very realistic looking wheel.

Strut fairings used to be a real pain to install. Foremost Products came to the rescue with their p/n 113 — 1/8 I.D. plastic fairing material. At first glance, you think you've got to slip it over the wire before bending. Well, try this; slit the front of the fairing material and push it over the wire. The plastic has a good memory, but does need a little help. Hold the slit together with a plastic bag and, using CA, glue the slit closed. It not only seals the slit, but anchors the fairing to the wire. You got it on crooked, right? Rotate the strut and re-glue. Glue ran on the strut? Take the razor blade and flat scrape the plastic. You end up with a consistent matte finish. Several manufacturers make cockpit edging (Foremost and Proctor), but I tried a different approach, mainly

because I had the material on hand. Electronic stores sell chassis molding which is U-shaped rubber with various width slots. I used molding with a 1/32" slot, which is a perfect fit for the 1/32" ply. For the cockpit sides and back, I cut off one leg of the U (which makes an L) and glued it down with CA.

Striping adds detail and I striped to my heart's content. I set the model in the sun for 8 hours to set the adhesive (or get sun-stroke). After the first flying session, the striping was coming loose. Enough of this jazz. I re-striped the model and, using CA with a small tube and gravity for feed, I nailed down the striping. It hasn't moved since. Identification numbers on wings are easy with tissue. I'm the first to admit that MonoKote letters are not my strong suit. The local office supply shop came to the rescue. They carried vinyl house numbers and letters 6" high. They haven't moved since installation either.

A dummy model "A" engine looks good and dresses up the front end. I'll have to admit I hate to cover a gorgeous 4-cycle, because the engine looks realistic when running, but mainly it's almost impossible to install the exhaust stack through the dummy engine. A slot is required which is pretty well-hidden. I tried making a straight exhaust, but, alas, the tube size is furlongs per fortnight (metric). Maybe the engine manufacturers will make a straight tube accessory (hint!!). If you've got some old VG-2 Champion glow plugs, they really set it off. If you've got old V-2 Champion spark plugs, all correspondence will be answered.

If you build a dummy engine, build the radiator. I attached mine, with 4-40 flat head screws, to a pine block glued on the forward top fairing. Just tap the block, CA the wooden threads and re-tap.

Flying:

The model flies about 22 mph. It loops very nicely after a slight dive. Stall turns are crisp. Touch and go's are crowd pleasing. I'm not bragging, just paying a compliment to Joe Zdankiewicz who was generous enough to make the maiden flight and the majority of all other flights. The point I'm making is: If you've taken your best shot at building a model but are a little shaky about flying it, don't be bashful, get experienced help. Several "Pete's" have been built and performance has been very similar. John Camp does a very respectable roll with his (O.S. .60 4-cycle powered). Dave Brodsky made a hard landing and broke his cabanes. Very simple to fix unless you glued them in. (I won't mention names.)

to page 154

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PIETENPOL AIR CAMPER

from page 151/56

Conclusion (at last!!):

I mentioned several manufacturer's products by name simply because their product is what I used. If you choose to build the "Air-Camper," I'd welcome pictures, comments or different ideas. "Not Invented Here" is a term that is not appropriate in modeling circles. Borrow from anybody --- just give them credit. □

R/C WORLD

from page 55

within the reach of every modeler. For a one-time purchase of about $5,000, you can enjoy a condominium in R/C World one week each year for the rest of your life! Sales are expected to begin this fall.

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STINSON 125

from page 52

doublers showed a notch to be cut out at the top rear portion in the area where the cabin framework meets the nose block. This notch is not required

since nothing fits into it. I did make one or two very minor changes during construction which I felt improves durability.

(1) A piece of 1/32" plywood was added to the inside face of each wheel pant. (This has worked quite well so far and we have made several rather hard "landings.")

(2) The wing center section joint was reinforced with glass cloth and epoxy.

(3) The struts were reinforced with a piece of 1/32" plywood where they join together and a small sheet metal screw is used to secure the struts to the fuselage instead of the method shown on the plans. (A "missing link" connector would also work for this attachment.)

Most of the construction was performed using Goldbergs Jet (C.A. Cement), although Devcon 5-Minute Epoxy and an aliphatic glue were also used.

Covering:

To cover our model, light blue Super MonoKote was used and a cream lightening bolt was cut from Super MonoKote and ironed in position. Dark blue trim tape was used to cut the cream and light blue and the cabin doors and ailerons were outlined with 1/16" black tape, from Bridi Hobby Enterprises.

Engine:

The engine selected to power our model was the G-Mark 061 R/C distributed by Cannon. This sweet little engine comes complete with a muffler and fits perfectly into this model. **Note:** I had to slightly modify a 049/051 engine mount to accept the 061 engine. A 2 oz. Sullivan tank was used as shown on the plans and a pressure line was connected to the muffler.

Radio:

For control, an Airtronics XL 6 ch. radio was used with 3 servos and a 225 mA battery pack. With this set-up, all radio equipment was kept in the cabin area including the battery.

Flying:

No control surface travel was shown on the plans, so we set them up with approximately 3/8" travel in each direction. A small amount of lead was added to the nose to achieve the balance location shown on the plans.

For our first flight we tried to R.O.G. the model, but the ground handling characteristics just would not allow it so we decided to hand launch it and this time it flew great. After the launch, it climbed out beautifully and required only minor trim corrections.

With the control travel the model was set up with, it will loop, snap roll, and spin. (**Note:** I have done slow rolls, but they are not very good and you use up a lot of sky.) With full power

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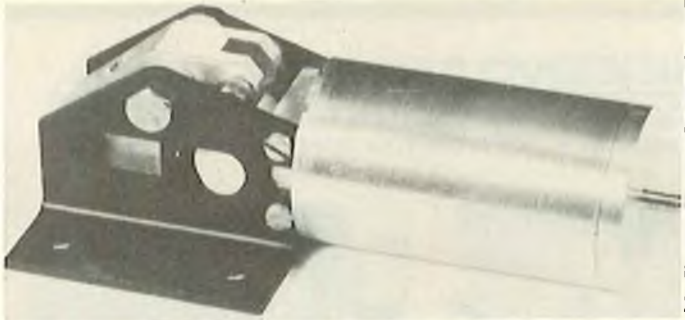
applied, the model will climb quite quickly, but with the throttle reduced to about one half you can make some beautiful slow fly-bys or just slowly cruise around the sky. On landing be sure to keep the speed up and don't get caught too low without power since the model tends to settle a little fast. A number of people have flown our model, from experts to brand-new fliers and all have had a ball flying it. It has proven its durability a number of times and has been quite easy to repair when someone really goofed. The G-Mark 061 engine works great and supplies plenty of power with either a 6/3 or 6/4 propeller. If you're considering a small schoolyard size model, this one certainly deserves consideration. □

ENGINE CLINIC

from page 51/50

baffle on the piston. Both Fox and K & B use this duel boost port configuration believing it aids in better fuel distribution in the cylinder. Many engines use a single boost port in conjunction with the two transfer ports. However, there are other variations used by other manufacturers of the original Schnuerle port design. Two small transfer ports on each side of the exhaust ports and a single boost port, etc. Each manufacturer has his own ideas and theories. The Eagle III sleeve has been hardened by the Nitriting process and is "glass" hard. Any modifications to the sleeve timing would have to be with a grinding stone. I mention this because the sleeve does not have "pipe" timing, however, this is not to say a tuned pipe cannot be used. Fox offers a tuned pipe as an optional accessory which will give a considerable power gain, however, not as much as with a sleeve with full pipe timing. To take full advantage of a tuned pipe the exhaust timing would have to be extended from the stock 140° duration to 165°-170°. However, you then have an engine more critical to pipe length and needle setting. Duke has evidently settled on the 140° exhaust duration as a good compromise.

The Eagle III uses a two piece head — the cooling fin portion and a separate combustion chamber "button." The separate combustion chamber allows the use of different combustion chamber configurations if other shapes are found to be more beneficial. The Eagle III uses a bell shaped combustion chamber surrounded by a wide flat squish band area. This type of head works equally well with straight FAI fuel and low



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nitro. One of the features of the Eagle III is its ability to use straight alcohol/oil fuel with no nitro. More on this a little later. The two piece head is held to the crankcase by eight 6-32 screws eliminating any chance of distortion or leakage.

Although the carburetor looks similar to many used on large Fox engines in the past, Duke has chosen to go with the mainstream and use a rotating barrel type with the barrel moving in and out as it rotates. I believe Super Tigre first introduced this type of carburetor and many other manufacturers have come out with similar models. Webra used a similar carburetor on their Black Head series; the new K & B 7.5 outboard is quite similar, etc. This type of carburetor uses a high speed needle valve on one side of the carburetor and an idle mixture needle valve on the other. The idle mixture needle moves in and out with the rotating barrel and meters the idle mixture. The amount of taper on the needle will control the mid range mixture. A sharp taper allows the carburetor to richen the mixture at mid range more than a gradual taper. The carburetor comes with a medium taper needle. Two other needles — one with more taper and the other with less are available as optional accessories. If your engine idles fine but either loads or goes lean through the mid range, there are optional idle mixture needles available to compensate. Instructions accompanying the engine tell you how to modify the existing needle for minor corrections of the mid range. This is a very desirable feature allowing one to tailor the mixture to his own individual requirement. Aircraft with low tanks will generally go lean through the mid range and aircraft with high tanks go rich. The Eagle III carburetor can be adjusted to compensate for these conditions with the three idle mixture needles.

With a bore of .907 and stroke of .937, the Eagle III can be considered a "stroker." The majority of your .60 displacement size engines use a bore considerably larger than the stroke. Duke has chosen to go the other way around. Evidently he likes those "long legged horses." This is the same bore as used in his Fox .59's over the years but with a .030" increase in the stroke. This longer stroke seems to have proven out when it comes to turning the larger size propellers as our rpm checks will show.

So much for the internal works. I did not run a full dynamometer power check on the engine since to do so requires a fully broken-in engine. Time being in short quantity around here I did not want to spend an hour

to page 161

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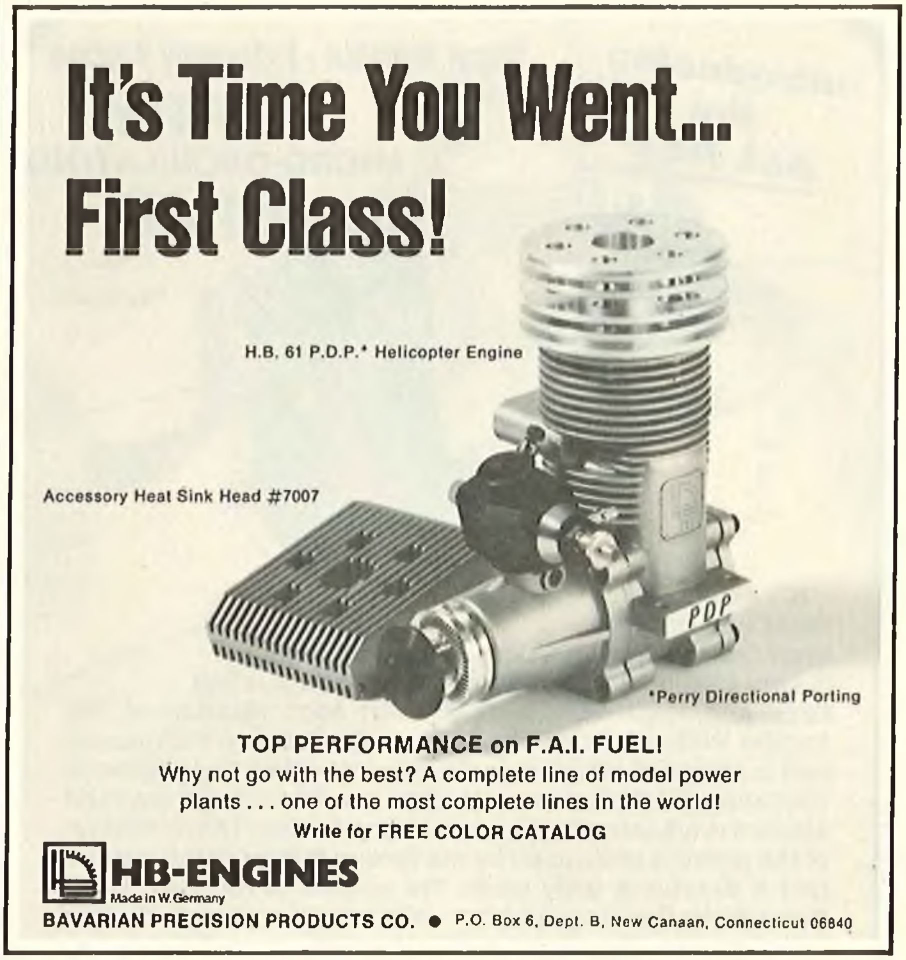
from page 157/50

and a half to two hours breaking the engine in. Needless to say this is not my idea of fun. I did run two tanks of fuel through the engine to give it a little loosening up time and then checked rpm with several normally used size propellers. Bear in mind that the engine was not fully broken-in but would hold a momentary peak, i.e., the engine was run at a rich setting and then gradually leaned in to maximum rpm — a reading taken — and then richened right back up again. Using 10% nitro fuel with 22% Klotz oil, the engine tached 13,500 with an 11/7½ Power prop, 13,900 with an 11/7½ Rev Up, 12,200 with a 12/6 Top Flite maple, and 10,400 with a 14/6 Top Flite maple. These runs were made with an open exhaust — no muffler. The addition of the Fox muffler only caused a 300 rpm drop with the 14/6 prop and 500 with the 11/7½. I next checked the Eagle III using the same props but with straight FAI fuel (80% alcohol/20% Klotz oil). Rpm figures were only 100-200 lower than with the 10% nitro. This was really quite surprising. Duke has certainly succeeded in producing an engine that runs as well on straight alcohol fuel as with nitrated fuel. Needle setting was not critical at all with the FAI fuel as is often the case. The idle and acceleration were a little more hesitant, however, indicating that the use of a little nitro does help the idle and acceleration. The engine idled very well at 2,500 rpm and with the 10% nitro fuel would accelerate instantly. With the FAI fuel it was necessary to open the throttle more gradually. At one time I had the engine idling at 2,200 but for a safety factor I would not recommend idling the engine below 2,500. This is as low an idle speed as needed for any application.

The rpm figures recorded were equal to and, in some cases, exceeded many of the more popular imports. 10,400 with a 14/6 Top Flite is a very high reading — the highest I have recorded with a non-piped .60 and certainly shows the merits of a long stroke engine. Duke did not send a tuned pipe along with the engine so I do not know how much additional power it would be good for. Knowing that most tuned pipes will add an additional 600-800 rpm to a non-pipe timed engine makes the Fox Eagle III a real powerhouse equaling both the Rossi and OPS that have pipe timed sleeves. With modification to the



exhaust it looks possible that the Eagle III would even exceed the Rossi and OPS. Most fellows consider these two engines the most powerful ones available.

So if you are in the market for a new .60 size engine and would like to "Buy American" you might consider the Fox Eagle III. Although power does not go without higher fuel consumption, the Eagle III's ability to run as well on no nitro fuel as with the more expensive nitro mixes balances out the cost. The different appearance of this brute of an engine does take a little getting used to but if you want a really rugged, massive built engine, you will not go wrong with the Eagle III. With the rugged internal parts and external appearance — built like a "Mack Truck" would seem appropriate for the Fox Eagle III.

Due to the size and mass of the Eagle III, it is very important that it be mounted to a solid mount — no flimsy nylon type mounts. I would recommend either hardwood beam type mounts that also stiffen the front end of the aircraft or, if mounting radially to the firewall, the use of one of Fox's machined aluminum mounts. This, in turn, mounted to a well-reinforced firewall. This engine would pull the front end right off one of those ARF plastic ducks that many fellows use to learn to fly R/C.

That about covers the new Fox Eagle III. Next month I'll report on the new Fox Schnuerle port .19. Due to the length of this write-up we will have to forego answering any letters this month. We will get back to the letters next month as the .19 review should be somewhat shorter. Keep the letters and suggestions coming in. They are the basis of this column. □

GEARED PROPS

from page 48/42

cylinder heads had not yet been added.

Figure 13 compares the basic Cox Pee Wee swinging a 4½/2 prop versus the GP-020 using an 8/4 Top Flite Power Prop. The estimated drag of a Sterling Stinson Reliant modified for R/C at 14 oz., is also shown. Note the increase in performance with the geared prop, to say nothing of the scale "prop to nacelle" diameter realism imparted by the unit. A further factor of interest is the thrust loss which is present due to the blockage of the small 4½/2 prop by the cowling, amounting to some 12%. This is shown by the dashed curve and indicates that cowling-induced thrust losses on the small ungeared prop are quite important.

to page 164

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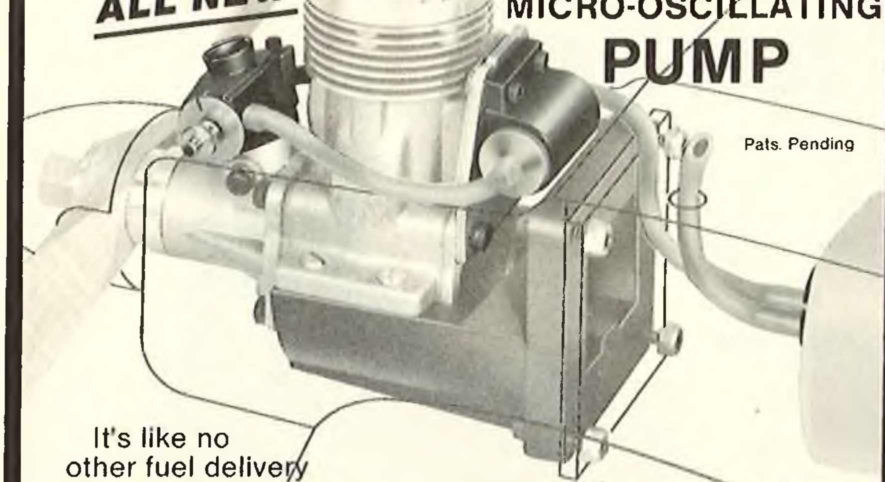

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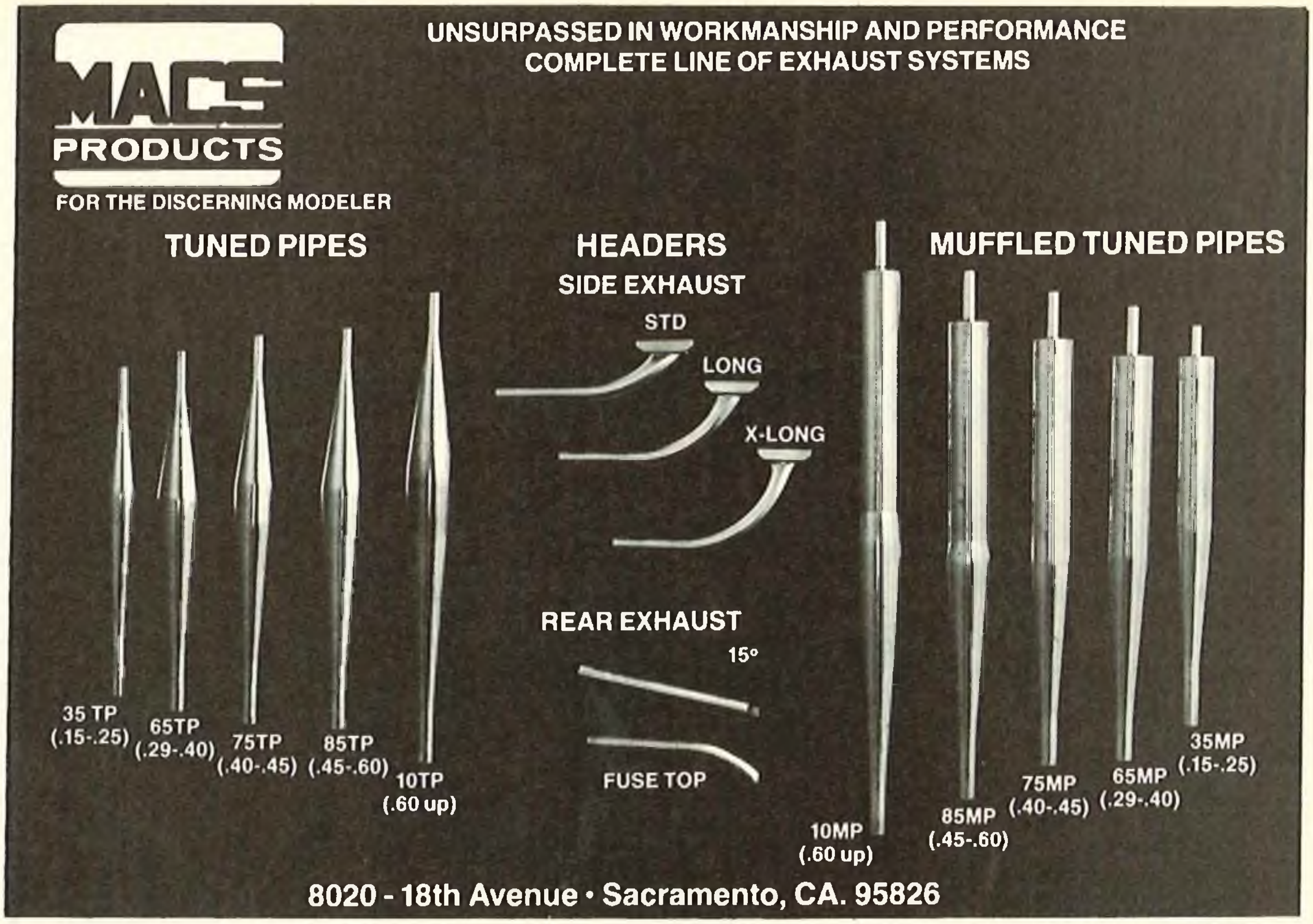

GEARED PROPS

from page 162/42

Table V summarizes the GP-020 performance comparison with the basic ungeared prop for the Cox Pee Wee 020. The static thrust values were measured with a bifilar pendulum thrust rig similar to that illustrated in Figure 2. While the 8/4 is a bit better for static thrust, the 7/4 will yield somewhat better thrust at higher speeds.

Figure 13 and Table V are pretty much the "bottom line" of this article. Before signing off, however, I shall summarize the benefits of geared props as I see them.

Geared Props:

(1) Improve the performance and/or extend the allowable weight range for glow engine scale models of a given class. Thus were spawned the geared .60's. The giant engine approach, however, will probably prove better ultimately from a power plant "thrust to weight" ratio viewpoint.

(2) Allow scale diameter props and scale number of blades. This benefit becomes particularly significant with very small scale models where the ungeared props barely extend beyond the scale cowling.

(3) Counteract adverse Reynold's Number effects on very small props such as those used on the Cox Pee Wee .020. Nothing has previously been mentioned about this factor in the article, but the author's tests showed particularly severe Reynold's effects for the Cox 4½/2 typically used on the Cox .020 Pee Wee.

Figure 14 is a drawing of the Kress Technology GP-020 "Schoolyard Scale" unit for the Cox .020 Pee Wee. Note that the thrust line to cylinder head relationship is adjustable over

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Figure 15 shows the scale prop "diameter to cowling" effect previously mentioned.

You may ask "Why didn't he just stick a bigger engine, like a .049 Bee, into the airplane?" Well it boils down to the fact that the .049 Bee will swing a 6/3 prop, at the limit. Being a larger engine, the cowl will be larger and the "prop to cowl" diameter ratio will still be off. More thrust, yes, but the model has grown. So the problem has just escalated to a different model size class. Noise and fuel consumption? Way up? Why not draw your own conclusions? □

POWER BOATING

from page 41/40

just released two new propellers. These props have been specifically designed for use on the new 7.5 K & B outboard engine but I have tested them on 7.5 inboard deep vee type hulls and have found them to be very effective. These props have been designated RH25 and RI25 and are shown in the third photo. As in all other JG props, the last two numbers determine the pitch (2.5" in each case). I'm not sure what the first letter R denotes except that it is probably used to denote the new blade shape of this series of props. The second letter denotes the propeller diameter measurement. As is the case of all JG H series propellers, the diameter is 1.75". The I series, likewise, has a larger diameter of 1.875".

These new props exhibit very low lifting characteristics and, therefore, should be very successful on monos and outboard applications. My own testing was done on a Muck Streaker deep vee hull with the strut set at 7/8" deep. Using both the O.S. 46 VRM and

to page 168

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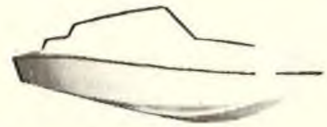

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POWER BOATING

from page 165/40

the new Picco 45 engines, the boat was easily capable of approximately 45+ mph speed when the RI25 prop was used. These tests were conducted using 15% nitro fuel (which we in Northern California now use in our heat racing). Engine rpm was approximately 23,000 with this set-up. If higher nitro fuel is to be used, more pitch will be needed to properly load these motors. After talking to Jim about these props, I have found out that he is considering adding 2.75" and 3.0" props using the same blade geometry characteristics. If these latter props become available it would surely give the boater another series of props suitable for a wide range of monos powered by both 7.5cc and 11cc engines.

This might also be a good time to mention that Tom Prezenka (the other "Prop Pop") of Octura Models has completed his very successful X400 series of propellers. This series of props has the pitch distribution of the 1400 series propellers. To refresh your memories, the 1400 series all have a pitch which is 1.4 times the diameter of the propeller. The last two digits of the prop nomenclature signify the diameter of the prop in millimeters. For example, the 1455 propeller has a diameter of 55 millimeters and a pitch of 77 millimeters or 3". Instead of the round tip configuration of the 1400 series, however, the X400 series has a pointed tip shape. Photo 4 shows a comparison of these blade shapes.

The X400 series propellers also have cupping applied to the tips as well as the trailing edge. As a result, you will find that your motor will not turn the X400 series as many rpm as it will a 1400 series prop of the same diameter. Because of the cupping and

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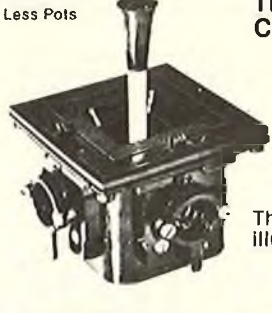

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increased area at the tip, however, the X400 series of propellers has more effective pitch than the same size X400 series prop. As a result, most racers find that they use one size smaller diameter prop when changing from the 1400 series to the X400 series. The X400 series props exhibit very low lift and seem to help many boats achieve a few more mph. The X440/3 (a three bladed prop), X455 and X447 are good candidates for use on 3.5cc outrigger hydros. The X445, X447, and X450 propellers work really well on 7.5cc deep vees and on the K & B 7.5cc outboard boats. The X450 and X455 work well on 11cc powered deep vees. The X455 and X460 propellers will usually wake up your 7.5cc powered outrigger hydro. The X460 and X462 props are recommended for use on 11cc powered outriggers. In addition, the X455 and X460 propellers push 1/8 Scale unlimited hydros very well. All these props should definitely be in your prop box for testing since many of us have found them to be superior in many applications.

Next month I will hopefully have a review of the previously mentioned Picco 45 Marine engine shown in photo five. By that time all my photos will be back from the developers and I will have a few more weeks of running on this engine. Although I don't want to pre-judge the engine, let me say now that if my preliminary findings hold up, the serious boat racer will have another very fine powerplant to use in this year's racing season. In fact, my early tests indicate that this motor may develop slightly more power in its stock condition than any motor of its size that we have had our hands on! It remains to be seen, however, if we can break it with hard use. More on this subject next month.

* *

Dear Mr. Power,

I would appreciate any information you could give me concerning the power of different kinds of engines. You see, I have a Dumas Deep Vee 10 "Short Stuff" with an O.S. Max .10FSR and my friend has another "Short Stuff" but with a Fuji .099 SR, same propeller (JGC7), same fuel (K & B 500+). We race together and he always wins; on straight line his boat is faster. We took off the engine and checked our engines. The Fuji is bigger and heavier than an O.S. Max; I thought that the O.S. Max was more powerful. When we started our engines the Fuji was noisier than the O.S. Max. Do you think that maybe because the flywheel or the muffler is different it affects the power? We both have a Deep Vee 40 with K & B 7.5 with no problems. They are real fast. Also, we would appreciate any book about electric boat racing that you could recommend.

Again, any help would be appreciated. Thank you. We are boating in Puerto Rico and here in New York. I don't know of any place where we can go boating except for electric boating at the Central Park.

William Lopez
New York, N.Y.

Racing similar boats with different engines can be misleading when you are trying to find out which engine is most powerful. A better procedure would be to mount both engines in the same hull and make comparisons. Many racers forget that many things determine the speed capability of a given boat. For example, do both your boats weigh the same? Increased weight leads to higher hull planing drag and, therefore, less speed if horsepower is the same. Are both the boats equally clean on their undersides? Are both the planing surfaces equally smooth? Is the hardware sharp so that its underwater drag is the same? Is the riding attitude of both boats the same? Are the propellers really the same sharpness and pitch? Seemingly small differences in any of these factors can cause surprisingly large speed

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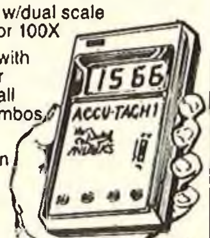

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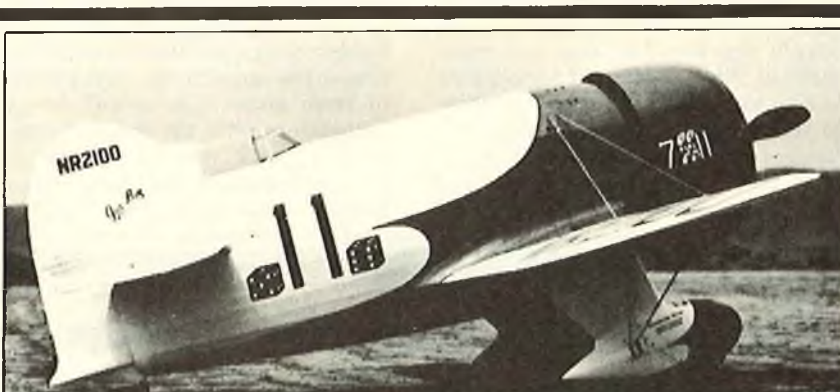

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changes. The Fuji engine may really have more horsepower but you can't tell for sure unless you compare its output fairly. The flywheel mass only affects the acceleration and deceleration characteristics of the motor, not its steady state operating rpm and power. Mufflers can affect power output greatly. I am assuming that you are using the simple untuned mufflers supplied with both engines. In general, the louder the muffler, the lower the exhaust restriction; therefore, the lower the power loss. If the Fuji has greater power, it may be the result of its less restrictive muffler. I am not familiar with any books on electric boat racing. If any of my readers are aware of such a book, I hope that they will share their knowledge with us.

* *

Dear Howard,

I would like to request some information on where we can race our model boats.

The collection that I have is two deep vees, the first having a .65 Picco Marine racing engine and is 40" long. The second deep vee has a .40 HB PDP Marine engine and is 32" long. Both deep vees are very fast and are very well-equipped to handle rough water like a true deep vee should. The third and last boat in our collection is a small tunnel hull made by Dumas and is called the Hot Shot and has a .21 outboard engine. We live in Fort Dodge, Iowa, and are willing to go any place in the state and perhaps Minnesota. We have several lakes in our area. These lakes are ideal for model racers like us, but we don't know if anybody else in our area is participating in model boating.

If you could also send me some information on the different types of hulls, it would be greatly appreciated. I know there are basically four types of hulls — deep vees, tunnels, hydro and mono hulls. We are particularly interested in the last three listed because we are familiar with the deep vee and very confused about the others.

I would also like some information on where I could purchase a scale hydro kit that would handle a .65 Marine engine such as the two photographs that I have enclosed in this letter. Thank you.

Sincerely yours,
Rodney Niemier
Fort Dodge, Iowa

Information concerning racing model boats can be obtained by joining one or both of the National model boating organizations. They are:

North American Model Boat Association International, Myrtle B. Coad, Exec. Sec., 6073 Sunrise Dr., Lower Lake, California 95457. Phone: (707) 994-6643.

International Model Power Boat Association, Pat Bridge, Sec., 24310 Prairie Ln., Warren, Michigan 48089. Phone: (313) 779-0338.

For Iowa, NAMBA district director is Dick Brust, 6211 Nebraska Ave., Omaha, Nebraska 68104. The IMPBA district director is Richard Jones, 1811 Mullberry Dr., Muscatine, Iowa 52761. Write these people for information. When you join these organizations they will supply you with a rule book which describes the definitions of the types of hulls you mention. As strange as it might seem, each organization has slightly different ideas as to what hulls are legal for each class. You can purchase fiberglass 1/8 Scale hydro kits from Steve Muck's R/C Boats, 6003 Daven Oaks Dr., Dallas, Texas 75248. If anyone else has such kits available, please advise me so I can pass this information on to the many readers interested in this class.

Well, that about does it for this month. Send your questions, comments, race results, etc., to the address at the end of this column. If you desire an answer before magazine publication, enclose a stamped, self-addressed envelope so I may answer your letter by return mail. Howard Power, 766 Broadway, Seaside, California 93955. Phone: (408) 394-1200. □

CUNNINGHAM ON R/C

from page 39/38

the name of the program. I was working on a model at the time and just flipped it on the tube not knowing what it was about. What it was, was so interesting that I stopped working and sat down to watch.

Through extremely fast lenses and stop action photography, the scientists were able to determine the wing motion of the bumblebee and the house fly, and found that they did not move their wings in the normal bird-like flapping motion, but rather in a circular motion — kind of a combination between flapping and a helicopter type movement. This allows an insect to fly that has much greater mass and weight for his wings than does a bird. No doubt this type of action will appear in a powered aircraft some day. What really grabbed my attention, however, was the commentary on the design of the dragonfly's wings. Its wings have a very different airfoil from the normal bird-type that we have been using in models since flight ideas were born.

to page 174

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June 26, 27, 1982.
For further info, contact: C.D., St. Paul Model Radio Controllers, Inc., 4849 105th Lane N.E., Circle Pines, Minnesota 55014.

RADIO CONTROL CLUB OF CHICAGO
20TH ANNUAL R/C^3 RADIO CONTROL PATTERN CONTEST
June 26, 27, 1982.
For further info, contact: C.D. Mike Bless, 5527 White Oak, E. Chicago, Ind. 46312 (219) 397-4861; or C.D. Pete Cantele, 14727 Dante Ave., Dolton, Ill. 60419 (312) 849-3715.

LONG ISLAND SILENT FLYERS
5TH ANNUAL EMPIRE STATE R/C SOARING CLASSIC
June 26, 27, 1982. Syosset, New York.
For further info, contact: C.D. William Meleske, 786 Grand Terrace Ave., Baldwin, New York 11510.

ROCKFORD AEROMODELERS
AMA SANCTIONED CONTEST
June 27, 1982.
For further info, contact: C.D. A.J. Johnson, 1818 Oslo Dr., Rockford, Illinois 61108.

CUNNINGHAM ON R/C

from page 171/38

The dragonfly's wings are turbulated and made somewhat in reverse of the "normal." The scientists made a glider using this type of airfoil, and tested it against a similar glider with the standard bird-type airfoil. The flights were very conclusive, the dragonfly-type wing outglided the other every time. The test flights were photographed and the glide angle and rate of descent were much reduced. The drawing shown here is as I remember it from the TV program.

A lot of us like to experiment, so perhaps some of you glider guiders may want to give this type of airfoil a try. Sorry, I can't fill you in on any real statistics of how the airfoil should be constructed, but try making several balsa hand launch gliders to try out different modifications. The idea of turbulated airfoils has been around for a long time. Several free flights back in the fifties used this method with very good results. I have been moving this way in the past couple of years in my R/C designs because the turbulated airfoil will allow your aircraft to land at a much slower speed because the turbulated airfoil generates much more lift thus a much slower stalling speed. The Ugly Stick is a good example of a turbulated airfoil, & the Ugly Stick is one of the nicest landing aircraft. We all follow the same path when we are building or designing. Sheeted wings have been popular for some time, so most wings are designed to be sheet balsa covered. Foam core wing construction became popular, so wings are designed to be foam core covered w/cardboard, balsa or ply., with a very smooth surface. Plastic films have become popular, so wings are designed with a smooth surface, covered by an

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even smoother surface. In the case of a powered aircraft, the engine yanks it off of the ground, pulls it along at speeds slightly below super sonic, then brings it in for a hot greased-in landing. All of this goes along and we really forget just how the airfoil works, or what types of aircraft show good handling at all speeds. Take the case currently popular among the soaring branch of our fraternity. To effect turbulation on the wings, thus gaining more lift and longer flights, the wings are being covered on the top side with a fabric that has a rough surface, such as silk and dope or Coverite or FabriKote, and on the bottom with a smooth plastic covering such as MonoKote. This turbulates the airfoil and generates more lift.

I first started building turbulated wings as an economic matter. On my big models I started using 1/4" balsa spars to carry the covering material around the leading edge of the top and bottom of the wing rather than the much more expensive balsa sheet. All of these aircraft had my normal semi-lifting airfoil section for the horizontal stab, and each one exhibited very gentle landing characteristics. All are tail draggers and each is able to get into the air with a very minimum take-off run. Yesterday the Fly Baby was getting airborne in less than 100', just a nice smooth lift off.

When designing the Hooker (about a year and a half ago), I decided to use the 1/4" spar technique at the leading edge on a 20% thick airfoil. The Hooker, with its swept back wing, airfoiled stab (in this case a symmetrical airfoil), turbulated airfoil and large tip plates, can land so slow that you are amazed. It began to filter through my old grey head that this type of airfoil was far superior to the sheet covered wing that I normally used in designing my aircraft.

When I started working on my

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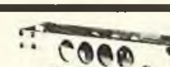

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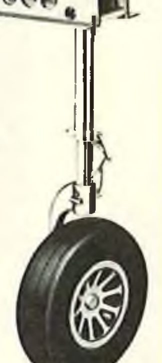

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Turbulent series there was no question but that this type of airfoil would be used. It has proven to be just as successful on this series of aircraft as it has been on the big aircraft from the Eindecker through the Fly Baby, and the swept Hooker. Something that the Ugly Stick has been telling us for almost twenty years. What really bugs me is that thirty years ago I designed a series of free flights from 1/2A to .19 to .35 with leading edge turbulators that really flew great. I was stationed at Fairchild AFB in Spokane, Washington, at the time, and you simply couldn't get these aircraft out of the sky. Took me a heck of a long time to return to basics and realize that the turbulated airfoil is not just for soaring aircraft. Lift is lift, and if your aircraft's wings generate more lift, you will be able to land that aircraft much more slowly.

Want to try and experiment with a sheeted wing? Want to see if turbulating the airfoil will allow it to land slower? Then do as many free flighters did some years ago. Add a turbulator to the airfoil by gluing a piece of fish line to the top and bottom surfaces of your wing. Glue a couple of strands dividing the distance between the leading edge and the high point of the wing into about three sections. See the drawing. Stick the fish line to the covering with model cement. If you find that you like the new airfoil better, go back and stick it to the covering with Hot Stuff. If you're building a new wing, and it is sheet covered and you want to try the fish line turbulation, simply stick the fish line to the sheeted surface before covering. The covering material will shrink and leave the turbulator sticking up.

If you experiment with the dragonfly airfoil, please drop me a line and tell me how you made out. I expect that it will take a lot of trial and error to come up with a really good working airfoil, but who knows, you may just hit on the right dimensions.

Let me remind you one more time that the Fifth Annual Southwestern Jumbo Fly-In will be held at Thunderbird Field, just west of Fort Worth, Texas, this coming July 17 and 18. As you know, this is a show and tell event for the big models, so plan to load up and come on to T-Bird Field for this great two days of fun. Any type of aircraft is allowed, just so long as the wings have a minimum span of 80" for a monoplane and 66" for a bipe. Any size engine can be used. For more information write to me at 2440 Colonial Parkway, Fort Worth, Texas 76109. □

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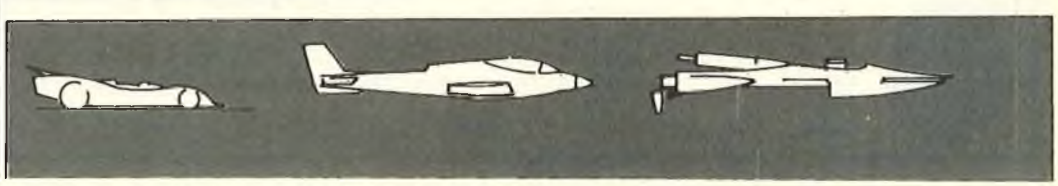

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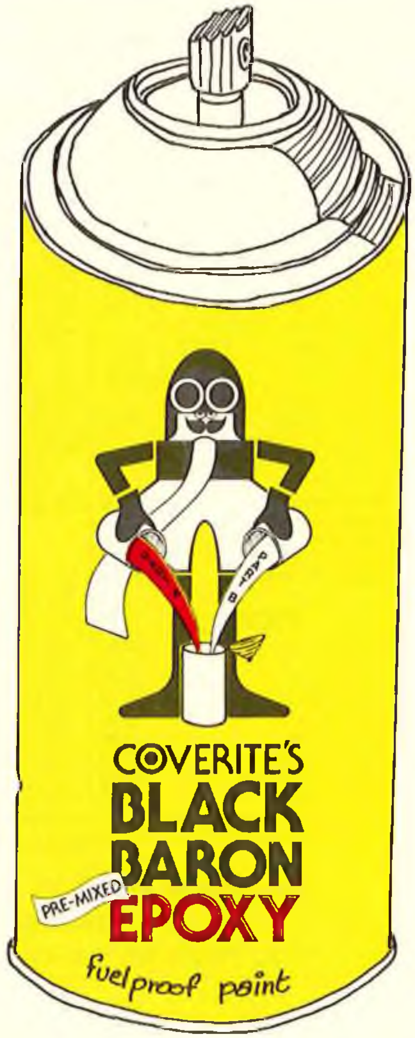

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WACO AGC-8

from page 30/24

the cowl to clear the engine, muffler, needle valve, and glow plug, and then cut the cooling duct over the cylinder head. Resin the inside of the cowl and reinforce C-3 to the outside 1/16" balsa and glass with little scraps of glass cloth. Cut off the Du-Bro Mini Mufll-aire II even with the edge of the cowl. I did not cut a hole in the cowl to adjust the needle valve, rather, I set the needle originally with the cowl off. Later the needle can be adjusted if needed between runs with the cowl on.

Paint the inside of the cabin gray and the instrument panel and cover flat black. Epoxy the windows in place.

The stabilizer and rudder have a symmetrical airfoil. The stabilizer uses a 1/4" square leading edge and 1/8" trailing edge and tips which must be centered, relative to the 3/8" spar. All ribs for the stab are 1/16" or 1/8" x 3/8" balsa which are sanded to airfoil shape after the structure is completed. Pin the spar to the plan. Place 1/16" shims under the leading edge and glue in all of the ribs. Pin down the elevator spar to the plan. Separate the halves after sanding. Place 1/8" shims under the tip and trailing edge and glue in the ribs. Pin the elevator and stabilizer together and sand to airfoil shape. Separate the elevator halves and rejoin with a 3" length of 3/16" dowel. Cover the stabilizer and elevator and hinge together. Glue the stabilizer into the fuselage.

Build the rudder the same as the elevator by shimming the edges to center them on the spar, and then sand to shape. Glue the fin onto the fuselage and cover the rest of the airplane.

The iron-on covering should cover to the edge of the windows. MonoKote trim is applied over the windows cut to the outside trim shape. Use the light shaded area on the plan as a guide. To cut away the trim over the windows, point a flashlight or reading light into the cabin area and the windows will be perfectly outlined. Trim away the covering with a razor blade. Give the glassed area of the cowl a coat of Balsarite and cover with MonoKote up to the curve in the front. The front of the cowl and the wing leading edge trim is painted on using Pactra's Formula U spray paint to match the trim color. Midnight Blue Formula U does not exactly match the Insignia Blue MonoKote trim but it is the closest match I could find. The paint is slightly darker than the trim. The red trim and paint are very close.

to page 186

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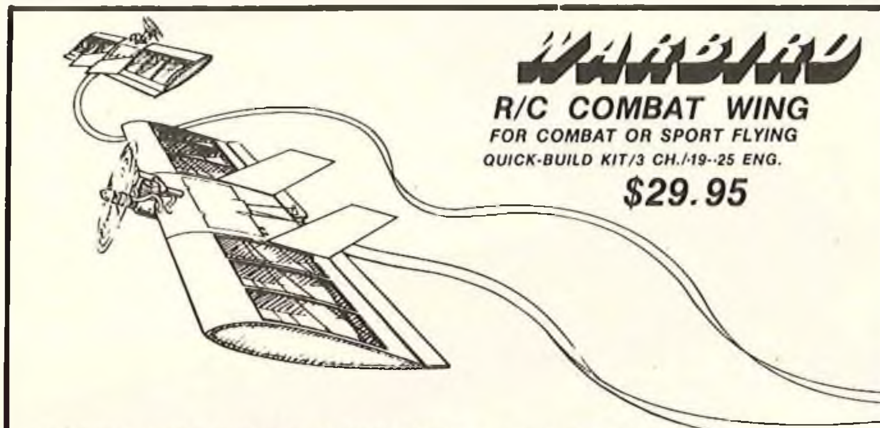

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WACO AGC-8

from page 184/24

The numbers on the wings are cut from blue trim and applied onto red MonoKote trim which is then cut to give a 1/16" red edge to the numbers. You can make a one piece transfer of all the numbers. Tape down two strips of masking tape sticky side up. Apply the numbers to the tape in order and evenly spaced with the protective back still on. Apply three strips of Scotch Tape over the row of numbers. Carefully lift the Scotch Tape and it will pick up the numbers from the protective back and can now be applied to the wing. The Scotch Tape will peel off of the numbers.

Apply Goldberg 1/16" red color stripe around all of the other trim patterns. NC 2312 has a fancier trim than most Waco's while the others did not have the inset diamond on the cowl and wheel pants.

The wing struts are made of 1/8" x 3/8" balsa covered with MonoKote. The screw tabs are cut from an aluminum beverage can and glued into razor saw slots cut in the ends. The struts are held in place by #4 x 3/8" SM screws into the 1/8" plywood pieces in the wings.

The aileron pushrods and servo clevis rod are joined with a piece of 5/32" I.D. brass tube & soldered. The servo is mounted with foam servo mounting tape. Be sure to seal the wood before mounting the servo with dope or varnish or the servo may loosen in time. The ailerons are connected to the bellcranks with Goldberg 1/16" aileron pushrods bent to match the plan. The pushrods can be slipped into the hole in the bellcrank, through the slot after covering. Mount the control horns with #2 SM screws or use the screws supplied after shortening, by screwing them into 1/16" holes with a drop of Hot Stuff. Install the rest of the radio, switch and charging plug. Adjust all control surfaces to move 1/2", in each direction.

The Waco turned out to be more of a project than I originally thought, but I feel the results are worth it. The real Waco is a handsome airplane and to do less would be a disservice. The model can be further enhanced with additional details such as running lights, baggage door, pivot tube, pilot, etc. The model was designed for sport flying, rather than competition, and since I plan to be flying mine for a long time, I left off those details that add weight or can easily be broken off.

I hope you enjoy your Waco as much as I do mine and can recall some of the nostalgia from an era that will not be seen again. □

BIG IS BEAUTIFUL

from page 18/14

Dario, as mentioned above, is a close and good friend, and it was a real pleasure to be able to spend some time in his company and that of two of his pals, Lee Richter and Chuck Ecklund. I had a good chance to talk with them since, in the evenings, Dario spends most of his time on long distance answering your questions and giving you advice. From 6:30 to 11:00 pm he was on the phone more than off it, so there must be a real gang of you out there.

Lee Richter is just into the final stages of proof building his latest creation, along with the consultation of the master, Dario. For those of you who have been waiting as long as I have for the M.E.N. Staggerwing Beech, here is some good news. The plan Lee will have available (through US Quadra) is for the G 17 Stag and from what I have seen of the plans (pictures to come in a future column) it will be a beauty. I had not fully appreciated how much sleeker the G model looks than the D, but it's there when you see it in three dimensions. You can bet that a set of those plans will end up in my collection and I bet in a lot of yours as well.

That's not all the good news. Dario has been looking around for a plans project with which to follow up his beautiful little Starduster Too and I have been leaning on him for over a year to do a Waco E model. To say I am pleased to be able to tell you that these will be available soon is a gross understatement. You will see from the 'bare bones' pictures accompanying this column that he has both designed and built well. There are about four different wing ribs, a very few bulkheads and lots of simple and strong construction. The E model could be built in a much shorter time span than you might think and it weighs, with engine, 14 pounds. What engine? I thought you'd never ask, a Quadra, of course; after all, what else could Mr. US Quadra use!

Those of you, who, like me, are biplane and especially classic biplane fans will want to have both of these plans close at hand. They are both excellent plans and will build to good looking, good handling airplanes. They will also steal the show wherever they go. Cowls will be available for both, pants for the Waco, a simulated retract gear (appearance) for the Stag with, hopefully, a set of retracts to come later. For me to discover that two of my all time favorite flying machines are going to be on the market soon was a real capping of whipped cream on what had been a great trip!

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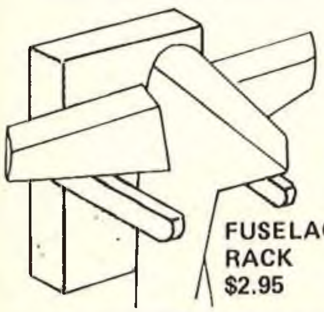

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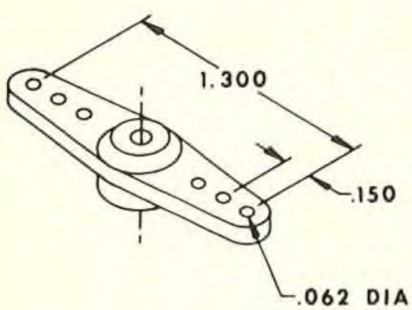

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BIG IS BEAUTIFUL

from page 187/14

But . . . there's more. I have been an EAA member along with Antique/Classic division for some time. The next day, Dario took me up to Hales Corners and we had a few hours in the EAA headquarters and museum. While there, I had the chance to meet President Paul and son Tom Peberezny as well as have a look at the shop area where all those neat restorations take place. I felt honored to be told that if I wanted any pictures, I was to feel free to cross the guard ropes and to help myself to any pictures I felt I wanted. Unfortunately we only had a couple of hours or I would have been there yet! I mentioned the Laird Super Solution as being a good model subject earlier and lo and behold! I get to touch it, smell it and practically devour the thing this month! Having had the chance to see it up close, I am even more convinced that it would be a great subject.

The museum is so chock-a-block with airplanes, artifacts and memorabilia that it is difficult to get good pictures inside. The new building at Oshkosh, for which the hole has already been started, will provide additional space and better facilities for the containment of so much aviation history. The modeler is well-represented by his handiwork with many plastic models and several well-done flying models representing a broad spectrum of aircraft technology. Several one of a kind machines are shown including an excursion into flying boats by Goodyear. Having seen the only one ever made, I can say it is a pity, it is a good looking, well-designed and capable aircraft and it's a shame it never got into production. I guess Goodyear had enough on their plate at the time and they were probably right since the market, at today's prices, for such an airplane would have been rather small. Perhaps too small to be economically viable.

It's pretty obvious that two hours is not enough time to crowd in all of the above and properly see much of it. The place was quite uncrowded, however, and it was great to be able to move as quickly or slowly as we wanted without a crowd delaying our progress. I'm going back there one day (and to Oshkosh) and I'm going to make sure I have enough days to do things properly. Dario insists we could have filled a week with the things he

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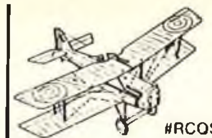

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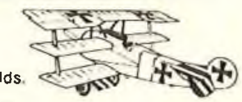

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September 11, 12, 1982 — "11th Annual Western Front WW I Jamboree." For further info, contact Hank Pajari, 1220-189 Tasman, Sunnyvale, CA 94086.

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BIG IS BEAUTIFUL

from page 189/14

wanted me to see and I'm going to give him the chance to prove it one day!

As an EAA member, I'm impressed with our headquarters and with all of the fine people I met there. To have been made welcome and to have had so much courtesy extended to me indicates that modelers are part of the aviation scene and are made welcome within it. President Paul agreed when I suggested that all airplane type people are great whether they are in models, full scale, or just interested onlookers. I know I'm pretty proud to be able to include myself in that group and I hope you are too.

The two visits mentioned above came about rather suddenly and passing the information along to you has messed up my schedule a bit as I had intended to talk about radio installations this month. I am about out of space so will have to postpone it once again until next month. You're already flying this year by now so it's perhaps not quite as topical as it might have been last winter or spring, but we will get to it next month, for sure.

Balsa USA's new 9' Monoplane Fly Baby is now ready for market. Don't let the price of $99.95 ($184.00 complete with Quadra engine!) scare you off. Balsa USA's kits are not skimped on to keep the price down. I have all three of their other large models and they are all good quality kits and well-worth the money. The Mono Fly Baby is 1/3 Scale, should come out around 19 pounds unless you're heavy handed. It's Stand-Off Scale but all outlines, rib spacing and sizes are to scale. Rolled plans include both wing panels, die-cutting is 'fall out' quality and a formed ABS cowl is included. For a hundred bucks, that's not too shabby!

Their other offering is even more amazing (even it it doesn't fit into the Big Is Beautiful category). A 68" span, formed music wire gear, formed ABS cowl, good die-cutting (fall out), hardware and complete plans and building instructions for . . . are you ready for this . . . $27.99! If I were still building small models, I'd buy that just to have one! What is it? It's a Fokker EIII or Eindecker, quick and clean to build and the one I had years ago, flew very well and looked properly antique as any WWI airplane should.

Anyway my friends, see you next month here and hope I had the chance to talk with you at Toledo last spring.

to page 195

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BIG IS BEAUTIFUL

from page 192/14

Site for the 1st Annual Western Canada Giant Scale Rally at Bawlf, Alberta Canada, July 1, 2, 3, 4, 5, 1982. Generous runway area permits take-offs and landings in almost any direction. Camping available, plan to attend for a relaxed five days of fun flying. See text for more details.

For those of you near enough to make it, don't forget the Western Canada Giant Scale Rally at Bawlf, Alberta, July 1, 2, 3, 4, 5, 1982. It's planned to be the largest Giant Scale Rally in the west for 1982 and will be the first annual such event. There are no rules other than safety rules with camping available on the site and a huge field from which fo fly. No trophies, no prizes, just fun. If you have planned a trip into Canada as a family vacation, you can see the Canadian Rockies, participate in the Rally, and attend the Canadian Nats at Edmonton July 10-17, then take in the Calgary Stampede right afterwards. This is the year to make that visit to Alberta and July is the month.

As an added incentive, the US Dollar is at a premium in Canada and you'll get at least $1.15 for it and our gas is less costly than in the US, so Canada is a very good bargain for travelers from the US. For further information, contact me at 9 Geneva Crescent, St. Albert, Alberta, Canada T8N 0Z3 or (403) 459-3727. Hope to see you there. □

SUNDAY FLIER

from page 11/9

Finally, in winding up this Toledo tale, I think you'll get a kick out of this anecdote. I haven't seen Jerry Jarvis since last year's Toledo show. Jerry markets a kit of one of my designs. I hadn't received a royalty check from him for quite some time, so when I saw him in Toledo, I said, "Hey Jerry, I didn't get my last royalty check. Y'know I'm retired, and can always use the money."

"Well," Jerry opined, "1/2A kits have been real slow for the past few months."

"So I've heard," I replied, "but even so, wouldn't it be a good idea to keep current?"

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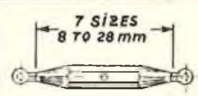

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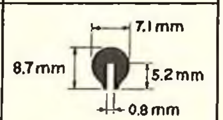

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"Yeah, I guess you're right," said Jerry, "so let's balance the books. Have you got change for a buck?"

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FLYING LOWE

from page 6

reorganization of the R/C aerobatic organizations and system of proposing new rules. Take the various organizations we now have (USPJA, IMAC, NSRCA, FAI committee) and combine them into one new organization. Create different groups to handle various needs. Results of this organization under a common leadership would go to the AMA contest board for passage of rule changes in the AMA rule book. Suggestions of rules changes for all aerobatics would go to the new organization and not to the AMA contest board.

At this time there appears to be a lack of organizational capability for the various organizations. Having a common leadership would allow more time for doing creative work instead of trying to keep an organziation solvent.

I have also been in touch with Floyd Lawrence, Editor of the IMAC Newsletter. Floyd's opinions mesh with Jerry's. Of course, IMAC has been pushing "realistic" aerobatics for models for years. Their competition program is very similar to the full scale aerobatic approach.

It is certainly apparent that much serious thought must be given this subject, since many competitors, potential competitors, and the industry are involved. I mention the latter since a precipitous change to a new system could have a drastic effect on airplane design, which affects not only the industry but also the fliers who already have several of the current competitive types.

Personally, I like the basic idea of the Aresti system. I, also, strongly feel that we need some kind of standardized international level system. If we adopt a new program, it should be on a planned, phased basis; such as, introducing the concept at the Masters level and then moving the concept to other levels as we gain experience and develop new aircraft to meet the challenge. I, also, very much like the idea of an elective pattern, i.e., choose your own pattern out of a list of possibilities. I don't really care for a fixed pattern, such as proposed for FAI

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The Good News

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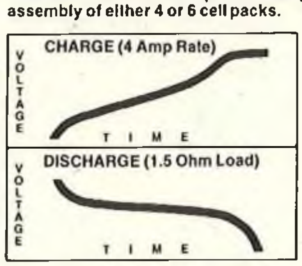
R/CARS Sub-C's come as pairs for easy assembly of either 4 or 6 cell packs.



Charts show charge/discharge characteristics of R/CARS 6 cell pack. Curves are typical of prime commercial grade Sub-C Nicads.

Price Comparison:

	GE	R/CARS
6 cell	$32.50	$15.00
4 cell	$24.50	$10.00

These are typical prices as supplied by various OEM sources and are subject to change.

The Bad News

1st - R/CARS Sub-C's are homely — Plain Gray Wrapper.

2nd - GE Sub-C's come pre-assembled in a pack of 4 or 6 cells. R/CARS don't, they come as pairs with solder tabs. That means you have to make a couple of solder connections for a 4 cell pack — a couple of more for a 6 cell pack. A $16.50 savings for 10 minutes work. At that rate you'll be saving about $100 an hour. And that's the bad news!

4 sub-C's — $10.00
6 sub-C's — $15.00

Add $2.00 for handling
Add another $1.50 for COD's
We'll pay shipping (N.Y. residents add 7% sales tax)

R/CARS will replace any defective cell for up to 60 days upon postage paid return from original purchaser

R/CARS

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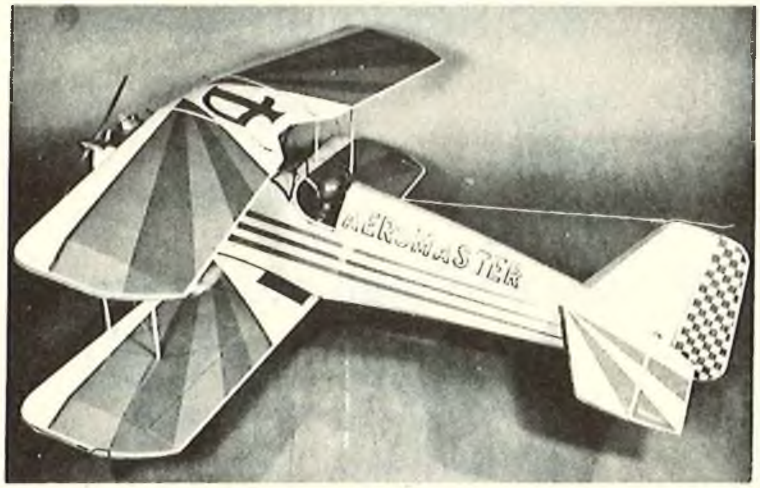
*Depending on which configuration you build.



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competition in 1984.

I would like to have your ideas on the subject. Where possible, I will include them in this column, and I'll try not to debate you on the subject. I feel that an issue of this importance should be given careful consideration by concerned modelers.

Design with a Purpose:

The model in the photo is not just another neat little sport airplane. It was designed by friend Stu Richmond, specifically to perform some wild and wooly maneuvers, namely the flat spin and Lomcevak. As Stu found out, it ain't easy to get a model to perform those maneuvers safely and predictably pull out again. After much trial and error with areas, moment arms, C.G. locations, wing design, etc., he has a model that will perform those maneuvers and live to do them again. Stu is in the process of preparing an article on this design, so you will be seeing it again as a construction article in a future issue of RCM. **Please don't write me for plans.**

EGT:

EGT is short for exhaust gas temperature. To modelers it refers to the temperature of the gases blowing out the tailpipe of their favorite engine. It is important, since it is probably the best measure of a correct mixture setting for operating your engine. Some modelers set their engine's mixture by reading rpm. This is okay, but could lead to an overly lean mixture on a hot day unless you develop some method of compensation for air temperature. Most modelers set mixture by sound. Unfortunately, too many set it for maximum rpm and suffer lean runs and damaged engines. I might suggest here that you **never** should set the engine for maximum rpm, but should back it off to the "rich" side close to a "four cycle" condition. Curt Oberg and wife from Fort Walton Beach, Florida, use EGT to set their pattern engine. It seems that she holds while he cranks. While it is running, she holds her hand in the exhaust stream and tells him if it is too hot or too rich --- now how about that? A more scientific method would employ a temperature pick-up in the exhaust stream with a meter readout. The ultimate system would "close the loop" back to the needle valve for automatic mixture in flight adjustment --- how about it, some of you inventive types?

I have been very busy lately preparing for the 1982 Circus Circus Tournament of Champions to be held in November in Las Vegas. I have been running the Webra twin engine geared set-up. This package produces phenomenal horsepower with

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4 CHANNEL RADIO for .40-.61 ENGINE

1032 square inch wing area
59" span 44"length weight: 4.5-5 lbs.

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When was the last time you were grounded by a bad part?

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809 St. Charles St., Elgin, Illinois 60120

relatively small displacement (1.2 cu. in.) and flies my big 17 lb. Laser 200 with ease. I have trouble setting up the individual engines, since it is difficult to really know how each is operating. Now, if I could read EGT --- it would be easy!

'Nuff for now. Next time I'll report on a very unusual modeling experience; so, if you're interested, tune in. □

FROM THE SHOP

from page 4

I have, in my collection, several 6 cylinder engines of the Northfield Ross vintage. I can truly attest to the quality of the latest Ross engine.

Anyone who would like to drop Lou a note can write him at 1010 S. Plummer, Tucson, Arizona 85719.

Anyone interested in these engines can contact me, Jimmy Robertson, 35 Stonecrest, St. Joseph, Missouri 64506. (816) 279-1127.

Sincerely,
Jimmy Robertson

Jimmy, thanks for the information. Our best wishes to Lou for a complete and speedy recovery.

• •

We picked up an interesting tid-bit from Hot Air, newsletter of the Fresno Soaring Society, Mike Bitner, Editor:

Bill's Helping Hand

Bill Benton recently took his dog, Seven, flying with him for the first time. Bill was using a high start to launch with. While all this was going on, Seven was being very observant. He watched Bill retrieve the chute several times. As Seven brought in the newspaper each morning, he figured that retrieving the chute from the high start would be puppy's play.

Well, the next time Bill launched, he took off after the chute, caught it and started bringing it back. As you can imagine, Bill was really cracking up. He nearly crashed while attempting to land and help Seven.

Seven had to pull hard and he bowed his neck and kept coming. One problem . . . when Bill reached down to get the chute, Seven opened his mouth like a good boy and . . . zing, the chute took off! Well, it took Seven several tries but he was finally successful. Seven retrieved the chute many times that day. Several times it took more than one try as the chute kept getting away. Seven finished the day a tired but proud dog.

Let's buy Seven a Dr. Pepper Tee-shirt and bring him to the next contest.

• •

That should do it for now, see you next month. □