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RCM radio control MODELER

THE WORLDS LEADING PUBLICATION ... CONTROL ENTHUSIAST

VOLUME 13 1976 NUMBER 8

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THIS MONTH'S COVER

Socorro Swan, Hostess of her own TV Show, poses with Doug Grunst's U/C Sig Chipmunk modified for R/C slope soaring. A how-to for slope soaring in your own area appears on page 84 of this issue. Kodachrome transparency by Milt Swan.

AUGUST

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FROM THE SHOP

Don Dewey

"How I Learned To Like RC Flying" or, "How I Learned To Dislike Almost Everything Else."

By T.E. Thomas

● Here it is April first and another fun filled summer of R/C flying is about to begin. I can look out my window from here and see the beautiful thirty-three degrees and rain mixed with snow flurries that makes me just want to take up a new hobby, like knitting or basket weaving; the basket weaving may come in handy if my second season of attempted R.C. flight progresses like my first. If this is to be the case, I may end up at the local institution for the mentally unstable. Of course, I could always say I got that way from watching the evening news.

Hobbies are supposed to be relaxing, entertaining, and constructive. Have you ever seen a forty powered "Fledgling" go straight in from about one hundred feet? That's constructive?

Most people look for excuses when something like this happens, you know, glitches or radio or servo failure; not me, I'm unique, my elevator fell off. It must have, because we never found it in the wreckage; of course we never found six inches of the wing either, out of the middle of it yet. It took a borrowed metal detector to find the engine. It also took two of us an hour and a half to find the airplane in the corn field that surrounds our postage stamp landing field. To top it off it took the two of us, my instructor and I, forty-five minutes to find our way out of said cornfield. I never had problems like this when my hobby was surfing; of course, since I make my home in North Central Ohio (Akron area for those of you who have heard of Ohio), all I ever did was wax my surfboard, while hanging ten over the back porch. I'll bet my board was shinier than any you would find at the Bonzai Pipeline.

Well, getting back to my anticipation and/or anguish of the upcoming season. The Fledgling incident by the by is in reality true, and is how I finished my 1975 season. The fact that the aircraft was a wipeout, was eased by the fact that it was in October and, therefore, about the end of decent flying weather, normally. I think by becoming planeless in October, I caused the warmest November in the history of Ohio in 73 years and am, in fact, due homage from all dwellers in this part of the country for my great personal sacrifice. I will exclude, of course, all ski freaks in this area.

I did, by superhuman effort involving long evenings at my workbench in my subterranean basement shop which I humourously refer to as "The Dungeon", manage to finish an H-Ray the same weekend as the arrival of the worst winter storm and cold spell in Ohio in 73 years. I shall not claim any homage for this, except maybe from the skiers.

Let's see now, so far I have learned to hate snow and winter and have developed a dislike to skiers. I guess I can't stand to see them laughing and enjoying themselves, when all I have is balsa dust in my hair, epoxy under my fingernails, and a sickly bar room palor from too many hours in "The Dungeon".

I also no longer care for cornfields; somehow, probably due to my forgiving nature, I have managed to maintain my taste for fresh corn on the cob.

When I decided to give R/C flying a whirl, or a ground loop might be more applicable in this instance, I was told by a friend to start with a medium sized, medium powered, 3-channel, high wing, flat bottomed, airfoil, forgiving trainer type airplane, that was fairly simple to build and rugged. Unfortunately, he told me this two days after I had completed my 40 powered, 4-channel, 5 pound "Fledgling".

I no longer count him as a friend.

So being eager, and not having enough money to purchase another kit at that particular time, I elected to go with the "Fledgling" which, "hats off to Sterling Models", I didn't regret. Too much.

Having explained to my wife, who being a typical woman likes to keep abreast of the family budgeting by casting the gentle eye of an overseer on a galley slave ship on my expenditures, that I could get pretty well established in R/C modeling for about $300.00 (she still thinks I intentionally lied about that figure). I spent numerous hours pouring over the model magazines for the best bargains in equipment and airplanes. Really I didn't do too bad, having purchased a World Seven Channel with four servos, an O.S. 40 R/C and the airplane kit for about $300.00 dollars. However, I did miss out on one of the best sources of information and help available, that being a good honest hobby shop proprietor.

I did get lucky and purchased, for a measly $10.00, a terrific book from RCM Magazine, with the provocative title of "Flight Training Course" which was worth a hundred times its price to a novice such as myself.It would have been nice if I had bought it before I finished the airplane.

Having been in and out of U-Control airplanes most of my life, I had every intention of attempting to teach myself to fly, thanks to the aforementioned publication, I decided not to try it alone.

Next, was to locate a club in the area. The book listed two in my neck of the woods. After spending three weeks locating the first club, I discovered it was primarily a glider club; so I set about to find the second, which to my surprise, had its field about a 10 minute drive from my house.

I stopped by one evening expecting to find a bunch of people much younger than I and, lo and behold, they, for the most part, were around my age (probably takes this long before you can afford a hobby like this one, right?). I was very warmly received and was invited to the next meeting. I remarked on what a nice location and big field they had, which I found out later when I tried to fit my airplane onto it, why the remark was received with a few laughs and snickers.

I stopped by the next evening and one of the club trainers, which was later to be my instructor, let me fly his airplane. Wow, was that advice about not trying it alone proved to me! The trainer put it up a ways and handed it over to me. Now, I had been "dry flying" myself to sleep for about two months, but all of a sudden my gentle and pre-trained thumbs turned into two spastic, bone crushing, vice grip pliers with rusty hinges. In the first three seconds, I did a "Lomcevak" with an H-Ray, in the next eight seconds, the instructor took the trans-

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CUNNINGHAM ON R/C

BY CHUCK CUNNINGHAM

● Each month I try and bring a little gem of wisdom to you readers, gleaned from experience, or from pages in other publications. This month, I want to get off of the normal track for just a minute and discuss something that should be of interest to all fliers.

Possibly this subject might not be too informative for you modelers that live in the northern part of the country, but for many of us who live in the sunny South, Southwest or Pacific Coast, this subject should be high on your list. The subject is Skin Cancer.

Flying RC is, by nature, an outdoor sport and, as such, we all spend a lot of hours outside in the sunlight and in the weather. For those of us in sunny climates, and especially those of us with light complexions, brown or blond hair and blue eyes, and even more especially if we are of English, Scotch, or Irish descent, skin cancer is a very large problem. Add another factor of increasing age, and many years of exposure to the sun, and you have a problem that can be serious. But, not if you are careful, and know what to look for.

Skin cancer usually makes itself known by being a small "cut" or sore on your skin that does not heal in the normal time. Often you will find a small break in the skin that bleeds just a bit if you touch it. It tends to stop bleeding for a few days, and then will start up again. Generally you never feel anything, not itching, hurting, stinging, or other sensation. The most common sites are on the areas that are exposed to the sun, such as your face, arms, the backs of your hands, back of your neck, ears, or shoulders. If you detect this type of a sore, watch it for a couple of weeks and, if it doesn't heal up, take yourself in to your doctor and ask him to check it. Removal of this type of cancer is easy, just about 30 seconds is all that it takes. Most of the time, the lab tests will check out that it was benign, but every now and then one will turn out to have been malignant. This kind can grow undetected on your face, arm, or what have you, for quite a period of time, and then, when you realize that something isn't quite right, you may be in for much more extensive surgery.

It's kinda' like checking over your radio once it is installed in a new aircraft. . . just a few moments time may save a lot of hours of re-building, or in the case of the sore that doesn't heal, a lot of time re-growing a bunch of skin. Naturally there are many, many more problems with cancer than Skin Cancer, but a word to the wise should help out. Each year, in the USA, over four thousand people die as the result of skin cancer . . . something that you can see, and detect, and care for, and about yourself. I know, in the past ten years, I have had over twenty malignant skin cancers removed. None have ever been allowed to spread, because I keep a close watch — and I have blue eyes, fair skin, brownish hair and Scotch/Irish ancestry. It's not something that may happen to the other guy, it may happen to you, so in the same line of reasoning that I usually try and pass on . . . take the time to check it out.

• • •

This is the middle of the flying season all over this country, and no doubt, most of us are working hard at getting our birds into the air as much as we can. Daylight Saving Time adds a great deal to our fun, since it's pretty nice to make the last flight on a long Spring or Summer evening, making a landing just as the sun sets below the horizon. But, there may be just a few modelers around who are simply wishing that they could make this last flight because their pride and joy bit the dust last week, and they didn't have a back-up aircraft in an almost ready to fly condition. This is really a shame, but all too many beginners hang all of their eggs in one basket, and when the bottom drops out of the basket . . . whoops, no more eggs, and nothing to fly during the flying season. No matter how good a builder or flier you are, always keep a back-up aircraft just in case something happens to old Number One. It sure does beat sitting around and watching the other guy fly!

• • •

The first part of April, I received a letter from L.W. Griffith, writing from Houston. L.W. had constructed a "Big Lifter" from my sketches in the February 76 issue of RCM. He constructed his Big Lifter primarily from plywood and hardwoods, and came up with a very rugged, albeit a bit heavy aircraft. Even so, with 1116 square inches of wing area, and carryding a 1 pound payload, the first flight got off of the ground in less than 50 yards from a grass field. L.W. plans to install a camera in his aircraft, so he can fulfill a long time dream of in-flight movies. He has no plans to use his aircraft for commercial uses, but has demonstrated that his aircraft can be easily flown carrying a payload of up to 4½ pounds. L.W. used a Merco .61 for power and a 16 ounce fuel tank. I hope that he will send in some pictures of his "Big Lifter" in the future.

• • •

Have you ever been glancing through the pages of a model magazine and have looked at plans for an aircraft that you think would be super to build, if only it were for a different size engine?

Or, have you built a kit model and wished that you could change it from a large model to a small one?

Or, have you ever wondered just what the mechanics are to take a Super Kaos down to the size of one powered by a .10 engine?

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engine clinic

By Clarence Lee

● Because of the old timer engine article last month and the article on proper adjusting of the Perry pump/regulator the previous month, we have been getting behind on the letters so let's get right to them this month. The first letter asks some questions regarding the Perry pump that I did not cover in the article.

Dear Mr. Lee,

I enjoy your column very much and it is one reason I buy the magazine. Up to now I've been able to deal with my minor engine problems. My questions are directed toward the K & B .61 with the pumper. First of all the instructions about the pump say not to alter those 4 little holes inside on the back side of the pump in any way, as this will alter the performance. Okay – now when you hit the dirt and I mean Texas black dirt and the engine fills up with it, cleaning it out is really no problem, but the next time I flew it, it ran very badly for about 3 flights then it was as though it blew itself clean and now works fine. How are you suppose to clean out those little holes if you suspect dirt in them? Secondly, the instructions tell you exactly how to adjust the pump. That's fine, but what they don't tell you is to adjust the pump in reference to what high speed setting. On my Veco .61 my high speed adjustment setting was at 1¾ turns open, now with my K & B .61 with pump, which is well broken-in, it has a high speed setting of almost 1 turn open. It runs fine but doesn't really seem to have any more power than did my Veco .61. Should I lean the pump out a bit and open up the high speed adjustment accordingly or what? Also when using the air cleaner, I have to open up the high speed adjustment screw even more to keep it going well.

I would appreciate any information you could give me. I think this engine with the pump is the greatest thing to come into our hobby in years.

Many thanks,
D.K. Swenson,
Dallas, Texas

If the holes in the face of the Perry pump/regulator ever need cleaning it should be done with a cleaning solvent and soft brush. Never stick a pin, piece of wire, or any object through the holes or make any attempt to enlarge them. Directly behind the holes is the pump diaphragm and any object stuck through the holes is going to puncture this diaphragm. Quite frankly, if you got enough dirt in the engine to plug these holes I doubt if the "unsticking" had anything to do with these holes. You probably had a bind somewhere else that wore itself in (bent crankcase, crankshaft, etc.) or dirt elsewhere in the fuel system that flushed itself out.

You do not have to be concerned with the exact setting of the needle valve in relation to pump pressure as it is not that critical. After all, this is what the regulator part of the pump is for. This is the mistake that many fellows are making — using the pump pressure adjustment like a needle valve in order to have the carburetor needle valve run exactly 1 turn, 1½ turns, etc., open. If the engine will run rich at 2½ turns as per the instructions this is all that is required. Leaning the engine in with the carburetor needle valve will bring about the proper mixture setting and, whether this is 1/2 a turn, 1 turn, etc., does not matter. Variations in the length of the needle itself, depth of the drilled seat, etc., will cause a variance between engines and carburetors. The fuel you use, propeller, and individual engine characteristics will all have an effect on how far open the needle valve runs. With a proper mixture setting the engine is going to develop its maximum power and trying to set the needle so that it runs farther open will have no effect on power.

As far as your new pumped .61 having no more power that your older non-pumped engine there is one thing a lot of fellows are not taking into consideration. The older 72/74 model engines had a flow-through muffler that only decreased rpm by 300-400. The new 75 series engines have a closed expansion chamber muffler that is considerably quieter. This is at the expense, however, of an rpm loss of 800-900. The pump and large bore carburetor is good for 300-500. So when comparing engines, the power is about equal — the pumper should show a slight edge. However the 75 series are much quieter complying with the new noise regulations. Try running both engines with the same muffler and I am sure you will find quite a difference.

The air filters do cause a small rpm loss, somewhere in the 200-300 rpm range. There is not much that can be done about this. It is a small penalty to pay for the engine protection you are receiving when flying off of that black Texas dirt!

Dear Clarence:

Let me first thank you for an interesting, informative column in each issue of RCM.

Problem 1:

Several of my modelling friends and I have encountered a similar problem with a particular carburetor (Webra .61 Blackhead). The problem is: (1) After adjusting high end needle and (2) adjusting idle needle and air on low end, the engine runs rich in lower mid-range.

The severity of this problem seems to vary from engine to engine and installation to installation, and can be "tweaked" to minimize this effect, but we have not been able to completely eliminate this problem.

One of my more astute colleagues suggested that the blunt end of the idle needle caused this sudden "richness" as, while advancing from idle to mid-range, the idle needle suddenly allows more fuel abruptly as the blunt end clears the spray bar. Have you ever been acquainted with this problem? Is there some other cause we might have overlooked?

Problem 2:

Surely you have covered this before but I do not recall seeing a discussion myself. All my .60 size engines were scrounged or obtained cheaply and needed parts replaced. Specifically: (1) If a piston is replaced be-

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RADIO SPECTRUM

BY JIM ODDINO

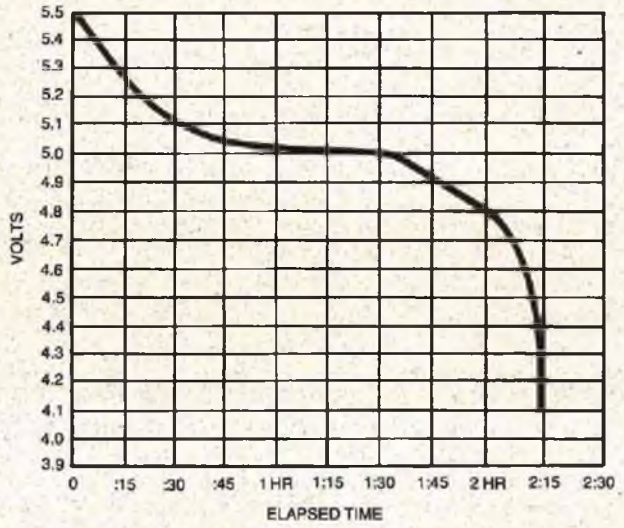

FIGURE 1

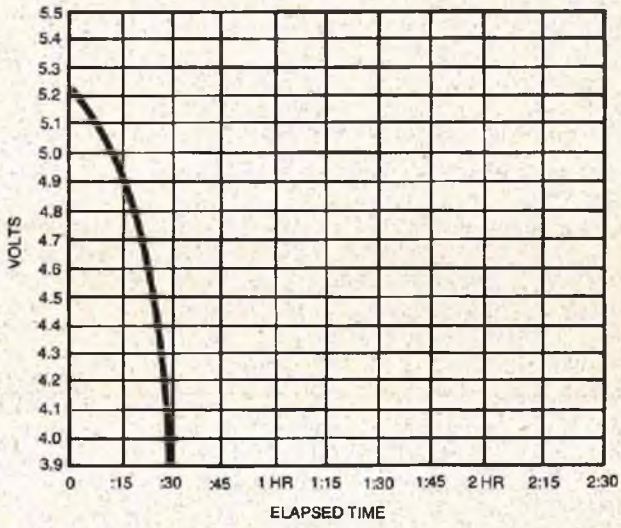

FIGURE2

● I'd like to begin this month by answering some questions regarding the April, May, and June columns.

Many people wanted to know where to get the SN Z1919 in the electric motor control circuit we published in April. It should have read SN 21919, but that wouldn't help you much either because this circuit is built exclusively for EK Products by Texas Instruments. I believe they can be obtained from Royal Electronics in Denver. Other IC servo amps could be used in the same manner, but you would be required to make the proper circuit modifications to be compatible with the IC chosen.

In the May issue, we discussed the Exar IC Servo Amplifier and, yes, the ground connection was left off pin 12 on the schematic. If you can't get the circuit from your local Exar distributor, try Ancrona Electronics, 11080 Jefferson Blvd., Culver City, California 90230.

In June we really got in trouble. Gary Kelson should have been given credit for the excerpt from the Pioneer Newsletter and the bold print ended too soon. There were also a bunch of typos that are probably due to my submitting hand written copy. We hope to fix that. The big goof, that I'm sure is going to confuse people, came in the explanation of battery charging.

The word **not** was left out of the following sentence:

"That doesn't imply that you can **not** fast charge or quick charge if you insure that you don't overcharge."

Yes, regular charge (c/10) cells can be fast or quick charged as long as you don't overcharge.

I sure hate to go over old material, but I guess there are new people coming along all the time and they haven't read all of the earlier columns.

• •

Dear Jim:

My Super Kaos made an easy right hand turn, the nose dropped and appropriate correction was sent to the aircraft but no response. The turn tightened and became a spiral which ended as a dull thud. What could have happened to the beautiful bird?

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Ambient Temp	Capacity Obtained After Chg. at .1C	at 2C
+20°C	100% (Ref)	80-100%
+40°C	65%	70- 90%
+50°C	45%	60- 80%

FIGURE 3

Temperature	-20°C	0°C	+20°C	+40°C
Charged @ 2C	500 cycles	◇2700	2500	1100
Charged @ .1C	—	1000-1500	1000-1500	700-800

FIGURE 4

SUNDAY FLIER

BY KEN WILLARD

● Course speed — 52 miles per hour. Average air speed, including turn radius distances — 68 miles per hour. Straightaway speed — 82 miles per hour. Ground speed on downwind leg (with quartering tail wind 30-35 mph) — 102-105 miles per hour!

That's what Mike Mitchell, flying his Mongoose V slope racer, had to do to win the 1976 RCM Slope Racing Trophy.

On April 24 and 25, at Thornton State Beach, the greatest RCM Trophy Slope Races ever staged were put on by the South Bay Soaring Society. Tom Christian, Contest Manager, and Whitey Pritchard, Contest Director, aided by Roger Nelson and Don Scott, California State Park Rangers who were assigned to maintain crowd control, were able to complete seven rounds of racing during the two days. With an average of eight heats per round, and one fly-off, that's fifty-seven races. And the wind really put the designs to the test — some races were with a wind of 8 mph, and some with a wind of 35 mph and gusts to 40.

Of thirty-four contestants, twenty-one completed their races. Most of the non-finishers dropped out due to mid-airs; there were 10. I was in one with Cliff Tanaka — flew right through him and continued on to finish. My wing was buckled, but held together, and due to yeoman repair efforts by Angus Foss, I was able to continue. Others weren't that lucky.

The event was marred by one unfortunate incident. Jerry Wolfram, after winning a race, was landing his racer, which was ballasted up to almost 11 pounds, and misjudged the speed and distance, with the result that his airplane overshot the landing area, flew right into his transmitter, which snapped back and broke his wrist. It's the first serious accident we've ever had, but pointed up the need for constant vigilance to maintain safety at a premium.

Except for Jerry's unhappy experience, everyone had a great time, and next year's races will be even greater, as the guys go back to the drawing boards to come up with even faster designs - - - if they can.

The pictures tell the story best.

Picture No. 1 — Mike Mitchell with his winning design, Mongoose V. He not only won the event overall, but had the fastest time, and also won the pilots' vote for best new design.

Picture No. 2 — Jerry Arana holding his new "Grand Boss," with which he won Second Place. What a race he and Mike put on to fight it out for first!

Picture No. 3 — Bob Andris holds up Ken Willard's "Top Slider" for identification while Tom Christian observes. Ken Willard in background, with transmitter, wearing goggles (the Chief Sunday Flier's old eyes water in the strong wind - - - note flag blowing straight out). Lap counter on the left. Ken placed third, after a fly-off with Len Ledson.

Picture No. 4 — Len Ledson, holding transmitter, waits while Gary Hover gets flag identification for fly-off. Design is an enlarged "Ridge Runner" originally designed by Dave Katagiri and published in RCM. Len took Fourth Place, and Gary flying the same design, placed fifth.

Picture No. 5 — The race for First Place!

Mike Mitchell and Jerry Arana make the turn at the near pylon in virtual unison. Note consistency of bank and dive. Photo taken from down course gives illusion that Jerry is leading, but at the pylon sight line they were crossing the line simultaneously. At the far pylon, Jerry bobbled the turn slightly — and Mike didn't. In the RCM Trophy Races, one mistake is too many.

Picture No. 6 — Pilots Fred Weaver, Warren Germann, Ken Willard, and Gary Hover, orbit for position before the flying start of a race. Whitey Pritchard ready to call the start. Note graduated boxes for pilot positions, providing all pilots with good view of pylon sight line. An innovation this year, and worked very well.

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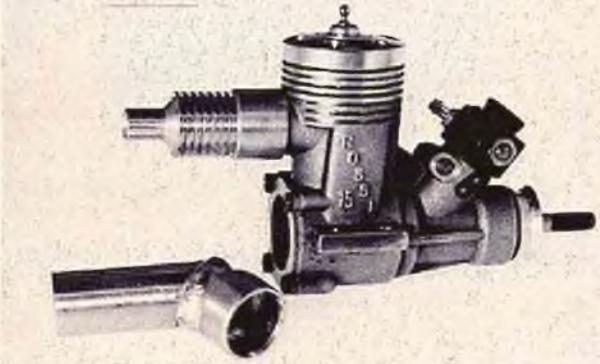
Quarter Midget

BY
DON DOMBROWSKI
AND FRED REESE

RACING AT RANDOM



Rossi .15 RC with muffler installed. Bent exhaust retractor on the table.

Cox .15 installation with the extension in H of B Dara. Fits Tiger mounts.

●The trade shows are all over now and, looking back there were not many new racing airplane kits except in 1/2A. Allied's Streaker and Glen Spickler's Quickie 200 will probably be the largest sellers. Bob Reuther is showing his Skyglass kits of his Miss Cosmic Wind and Minnow. Jack Stafford is marketing his Brown Racer as a sport model with an optional racing wing. The Brown is really a beautiful little airplane. What was most satisfying to us is that all of the new .15 engines will be less than $60.00 which means that the modeler can control what happens to him if he speaks up. George Zink received a letter from John Worth saying that there were no dollar rule precedents in the AMA rules and that the ultimate acceptance is up to the RC Contest Board. It looks like NMPRA-QM has a green light so far.

We talked to Bill McGraw of Bill's Miniature Models, who is the US distributor of Rossi engines and parts, about recommended Rossi break in. Since the current list price of the Rossi is $59.95, it is being allowed to race in most areas. The Rossi has an intricately ground piston and should not be hand lapped. Performance will be lost. Rather, the Rossi needs a long break-in, running at very high RPM. Some engines may take several hours of running before they come in. Break-in should be near 23,000 RPM with a rich needle setting. This figure was reached with a 7/5 Rev Up 400B prop cut down to 6" or a little less. Run at least four 4 ounce tanks of fuel before attempting to fly and have at least an hour of running before attempting to race and still be very careful to avoid a lean run. When break-in is completed, check the rod for wear and replace it if it appears worn (any sign of slop). The glow heads are available in four heat ranges, #1 being for FAI fuel and #4 for high nitro fuels, while #2 and #3 are in between. Bill also has .003 and .008 head gaskets, or shims, although they may not be necessary. There is a straight exhaust extension for $5.65 and a muffler for $3.95. Engines and parts are available directly or through your local dealer.

●

The following is a list of NMPRA-QM District Representatives:

Leonard Wiederhoeft, North East
27 Creek Rd.
Camp Hill, PA 17011

Jack Aycock, No. Central West
1422 Tesla Dr.
Colorado Springs, CO 80909

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FIGURE #1 — REGISTRATION CARD

Code Name Color

Address Frequency

AMA # FCC #

Aircraft #1

Aircraft #2

FIGURE #2 — HEAT CARD

N.M.P.R.A

Code No.	Start	Name	Place	Finish Time

Heat No. 1 Round No. 1

Dennis Bielick, No. Central East
3013 Mary Kay Ln.
Glenview, ILL 60025

Bob Gillespie, West Coast
12271 Epsilon St.
Garden Grove, CA 92640

Bob Waechter, So. Central East
P.O. Box 288
Brentwood, Tenn. 37027

Dr. Chas. Monnet, So. Central West
1606 Elmhurst
Oklahoma City, Okla. 73120

•

Back in 1967 or 1968, RCM published a matrix system for setting up a Formula I race and this system is the one in general use all over the country, however, we are finding out that many groups new to racing do not know how to do it. Therefore, we are reprinting the system, slightly edited by Betty Stream, which was written for NMPRA several years ago by Jack Fabri.

Pylon Racing Matrix System For Setting Up A Race

The purpose of this section is to serve as a guide toward organizing aircraft, frequencies and handicaps in such a manner as to arrive at a reasonably equitable series of heat races for contest participants.

The methods of selecting and recording can be tailored to suit individual preferences and forms. The important thing is to be sure that frequency groups do not conflict and that there is a list of groups readily available and easily interpreted throughout the event.

FIGURE #3
CONTESTANT CODE LIST

CODE	NAME	FREQUENCY
	GROUP 1	
1	Ed A.	26.995
2	Charlie S.	26.995
3	Bill D.	27.045
4	George V.	27.045
5	Tom I.	27.045
6	Stan R.	27.145
7	Jack J.	27.145
	GROUP 2	
8	Carl F.	72.08
9	Bob R.	72.08
10	Sam D.	72.08
11	Willie P.	72.08
12	Hue H.	72.08
13	Mike R.	72.96
14	Dave J.	72.96
	GROUP 3	
15	Howard Q.	72.24
16	John P.	72.24
17	Ike M.	72.24
18	Bartholomue G.	72.24
19	Fred. F.	75.64
20	Tony T.	75.64
21		
	GROUP 4	
22	Gladys C.	72.40
23	Dan W.	72.40
24	Paul J.	72.40
25	Roy R.	53.10
26	Jack F.	53.20
27	Tonto	53.30
28		

The following are the definitions of some of the items used during race set-up:

Contestant Code List — That list which matches each contestant with a code number (all heats are set up with numbers because they are easier to work with than names).

Race Coding List — That list on which each heat of each round is first recorded using the code numbers.

Round/Heat List — That list upon which the contestants and their starting orders for each heat of each round are recorded. This list is prepared from information on the Race Coding List and the Contestant Code List and is used for preparing Heat Cards.

Heat Card — That document upon which each contestant in a heat and his starting position and code number are recorded. One card is required for each heat of each round.

Score Board — Blackboard, prepared chart or whatever that is used to record the running score of each contestant in each round. Times should also be recorded here.

"Excedrin" — Self-explanatory, for use by whoever does this job.

While the aircraft are being handicapped, the contestants' information cards should be divided into their respective frequencies. The total number of contestants is then divided by four. This result is the ideal number of contestants in each of four frequency groups for 4-plane races. If this happens to come up a whole number, water will probably run uphill that day. So, assuming that there are 26 entries, each group must be adjusted to whole numbers, such as:

Group 1	**Group 3**
7 cards	6 cards
Group 2	**Group 4**
7 cards	6 cards

If the frequencies work out, this will produce six 4-plane heats and one 2-plane heat in the first round.

Assume the stack of frequencies look like this:

Frequency	No. of Cards
26.995	2
27.045	3
27.145	2
72.080	5
72.240	4
72.400	3
72.960	2
75.640	2
53.100	1
53.200	1
53.300	1

The cards could be arranged as follows:

Group 1
26.995 (2)
27.045 (3)
27.145 (2)

TOTAL 7

Group 2
72.08 (5)
72.96 (2)

TOTAL 7

Group 3
72.24 (4)
75.64 (2)

TOTAL 6

Group 4
72.40 (3)
53.10 (1)
53.20 (1)
53.30 (1)

TOTAL 6

Of course, if four groups simply can't be worked out, the total number of contestants should be divided by three to make three groups. This way, only 3-plane heats would be flown.

It is clear that the next higher whole number above 26 that four will divide into is 28. The Contestant Code List is therefore begun by writing down a column of the numbers 1 to 28. Match the contestant names to the information cards in Group One and enter them to the right of numbers 1 through 7, Group Two to the right of 8 through 14, Group Three to the right of 15 through 20 (21 is left blank) and Group Four to the right of 22 through 27 (28 is left blank). These Code Numbers should also be added to each contestant's information card.

The Code Numbers must then be divided into individual heats. To begin with, write down four columns of numbers, 1-7, 8-14, 15-21, and 22-28 as follows:

1	8	15	22
2	9	16	23
3	10	17	24
4	11	18	25
5	12	19	26
6	13	20	27
7	14	21	28

This is Round 1. Each row (1, 8, 15, 22) constitutes a heat. Using the Contestant Code List, match the names and handicap positions to the Code Numbers on the Round/Heat List (see

to page 143

FIGURE #4
ROUND/HEAT LIST

	ROUND 1 — HEAT 1
1	Ed A.
8	Carl F.
15	Howard Q.
22	Gladys C.
	HEAT 2
2	Charlie S.
9	Bob R.
16	John P.
23	Dan W.
	HEAT 3
3	Bill D.
10	Sam D.
17	Ike M.
24	Paul J.
	HEAT 4
4	George V.
11	Willie P.
18	Bartholomue G.
25	Roy R.
	HEAT 5
5	Tom I.
12	Hue H.
19	Fred F.
26	Jack F.
	HEAT 6
6	Stan R.
13	Mike R.
20	Tony T.
27	Tonto
	HEAT 7
7	Jack J.
14	Dave J.

NOTE: The 2-plane heat advantage will distribute itself into varying 3-plane heats as the vent goes on. Note also that Jack F. (by frequency) could be put into heat 7 and make two 3-plane heats.

A long time favorite, the Curtiss Hawk is presented here as a good looking airplane that is easy to build and fun to fly. Designed for three channel operation, the Hawk will fly on engines in the .19 to .30 power range.

BY BOB RICH

Photos By Bob and Doris Rich and Carl Noyes

CURTISS HAWK P-6E

The Curtiss P-6E has been a favorite of most modelers for years and I am no exception. I'm not sure whether it is the overall lines or the squadron markings and the Snow Owl. Whatever it is, it is an airplane that has the "look".

The model was meant to be a good looking airplane that is fun to fly. The fuselage and tail were designed to match the Goldberg Ranger 42 foam wings that were cut to shape. The overall effect is an aesthetically pleasing plane that is easy to build, and best of all, is easy and fun to fly.

The use of the foam wings on this project makes it much easier and quicker to build and it doesn't look like a foam wing plane. The details added on the original model were easy to put on and they add to the overall appearance. There was no real attempt to make the model scale, but all dimensions other than the wing chord are very close to scale. The plans were drawn from the drawings in the September-October 74 issue of National Aeronautics. If you plan to finish the model realistically, the Profile Publications on the Hawks should really turn you on.

CONSTRUCTION NOTES

As this plane is not meant to be a beginners project, it is not necessary to go into great detail on construction methods. The plans and the photos cover most of the items and there is nothing difficult about any part of the model.

Fuselage: All wood sizes are marked on the plans. Construction is sheet sided box type with a 1/16" plywood doubler in the nose section. If you have trouble finding the sheet sizes then build them up from narrower sizes. Zap or Hot Stuff is good for joining sheets if the joint is a good match. Make sure to make one right side and one left side! Glue the 1/4" sheet balsa forward sides to the fuselage sides before joining the sides. Mark the location of the formers and braces on the fuselage sides from the plan, then join the sides making sure the fuselage is kept square.

The hardwood bearers and plywood motor mount plate are used for versatility and strength. Changing to different engines is also very easy. The false formers added to the formers at the cockpit make it easier to glue the cockpit sides on, rather than trying to match the pieces on half the former width. The rear turtledeck is easier if it is made in two pieces rather than trying to bend it from one piece.

Bend the wire cabane struts to shape. Wrap the joints with copper wire and solder. Using heavy carpet thread or dacron, wrap and secure the struts to the 1/4"square hard balsa fuselage cross braces. Coat the wire, thread and balsa cross brace with epoxy for additional strength and security. When the epoxy has set, install the wing struts in the fuselage with epoxy. Re-check to make sure the wings will set level with zero incidence. When you have decided on the engine you are going to install, make a motor mount plate from 1/4" ply to fit the engine. Use Goldberg blind nuts to mount the plate to the bearers and the engine to the plate. Remove the engine and build-up the nose cowling

and carve to shape. After hollowing the removable cowling piece to match the engine, re-mount the engine with down thrust. Cut a hole in the fuselage side to match the engine exhaust port. A Du-Bro muffler worked well and does not detract too much from the looks.

The tail is built up to save weight at the tail. Glue the fin and stabilizer on the fuselage. Be sure to install the elevator before the rudder. When the fin and stab are in place, use 1/16" sheet, or soft balsa blocks, to continue the turtledeck contour to the tail post.

The wheel pants can be laminated from 1/4" and 1/8" sheet balsa to get the proper thickness or made from three pieces of balsa of the proper thickness. They can also be molded from fiberglass or, using the Hobbypoxy "Easy Does It" method, whichever way suits your preference. The landing gear struts are built up from 1/4" balsa sheet then cut to shape. (Don't forget one right and one left.) The top of the landing gear strut does not touch the fuselage. Leave enough clearance for the shock absorbing action of the gear and it won't damage the fuselage on a "not-so-soft" landing. The pants and struts are held to the landing gear wires by small sheet brass supports soldered to the landing gear wire and #2 sheet metal screws, screwed into plywood inserts in the pants and struts.

The Care And Feeding Of Goldberg Foam Wings:

The Ranger 42 Molded foam wings were used for this project for good reason. They are excellent wings, have a good airfoil, are strong, and near the correct shape.

Follow the instructions given in these paragraphs for best results with the wings. If you aren't prepared to follow the instructions to a reasonable degree, don't start the project or, alternately, cut ribs and build the wings out of balsa. If you follow these procedures, I'm sure you will agree that the results justify the effort.

The Goldberg foam wings are available from hobby shops (they may have to order them for you) or if they can't supply you they can be ordered directly from Carl Goldberg Models, Inc. The designation for the wing is RC1W and the cost is $5.50 per wing (2 required).

Top Wing: With a razor saw, or equivalent, cut the wing in half at the center marks indicated on the wing. Trace the tip and center section pattern from the plans and lightly mark it on the top of each half. With a razor blade, or X-Acto knife cut the foam roughly to shape. Carefully finish shaping the tip and center section with a good grade of 250 grit, or finer, sandpaper. Make sure the sandpaper stays clean so it doesn't dent or scratch the foam. If your sandpaper causes scratching of the foam, go to a finer grade. Carefully sand the center cut of the two halves to give the proper dihedral angle as shown on the plans. Join the wing halves using one of the fast epoxies. Maintain the proper dihedral angle while the epoxy sets. Reinforce the wing center section, top and bottom, with silk, silron, or your wifes or

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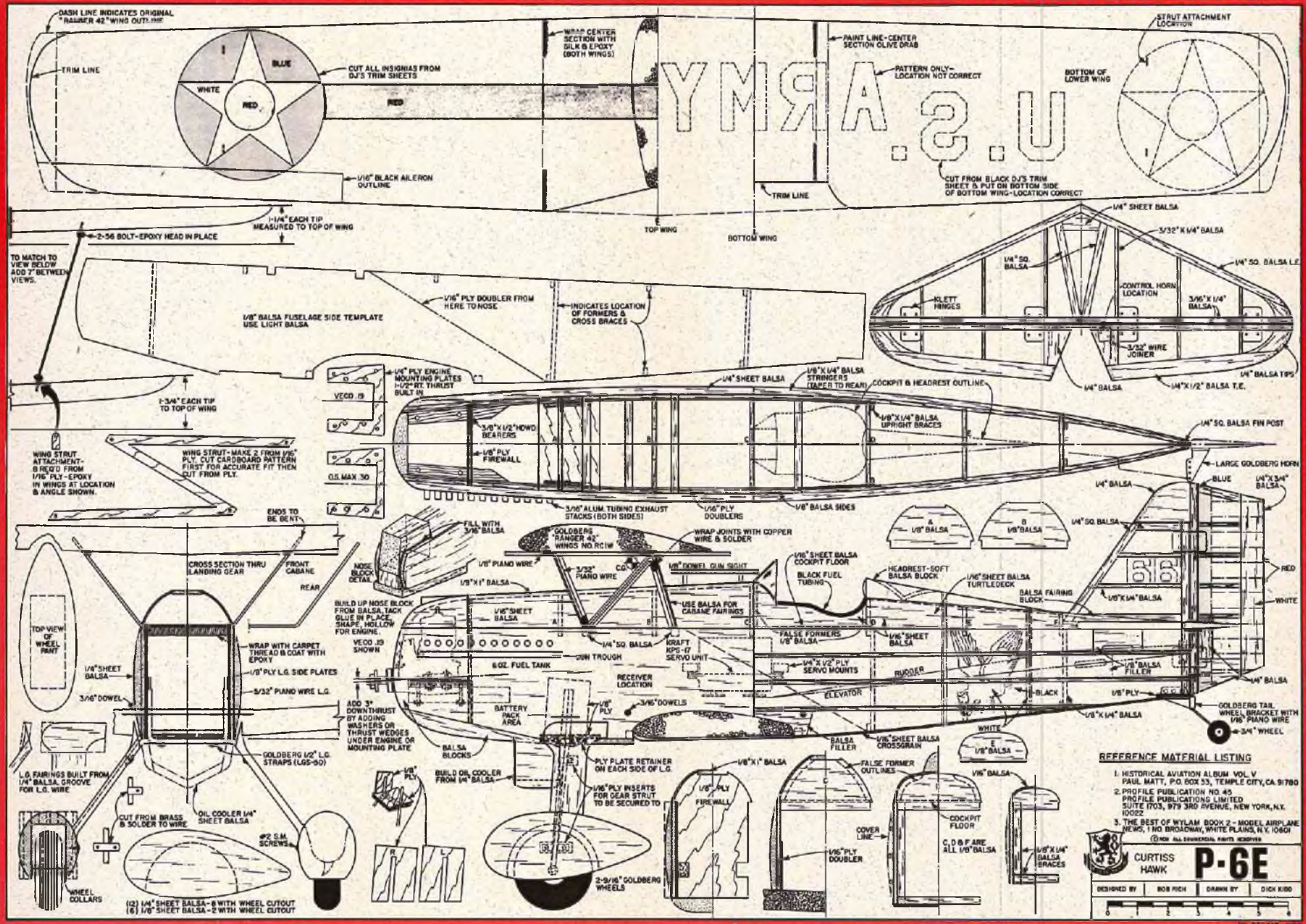
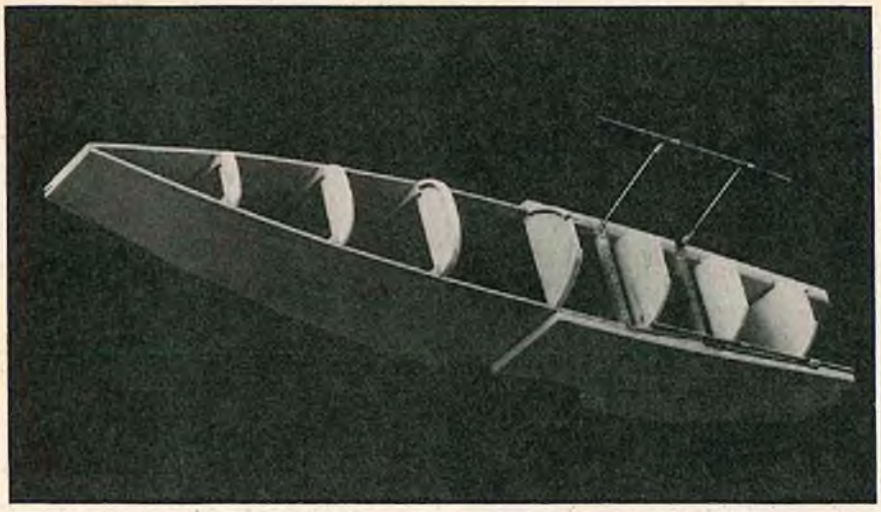
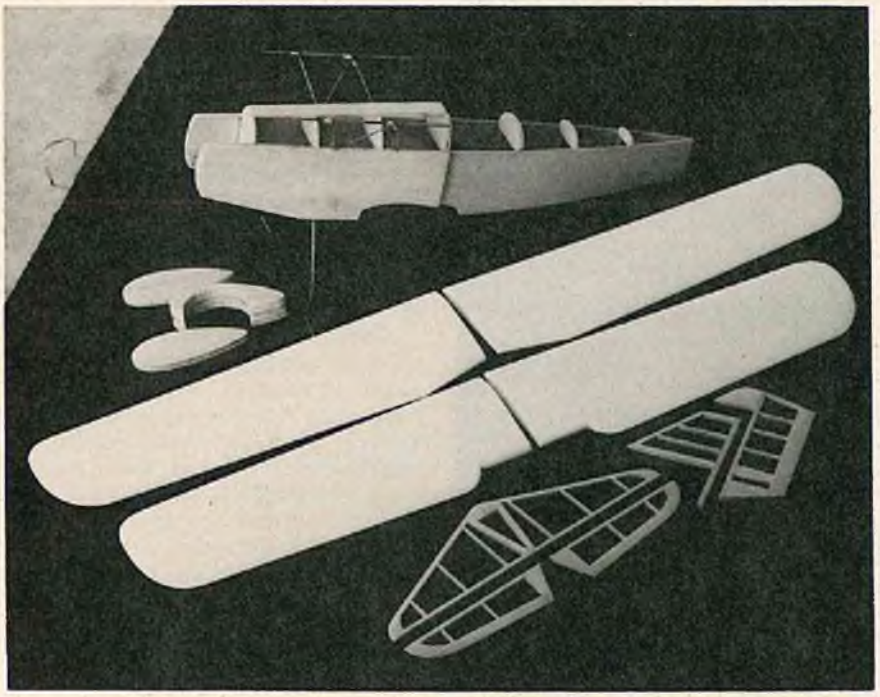
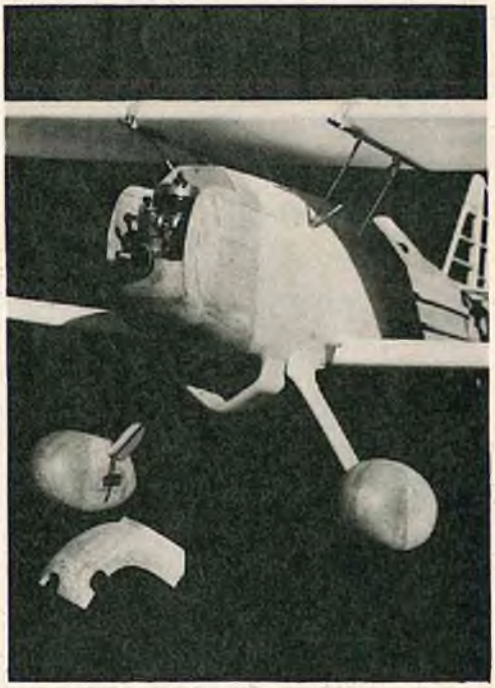
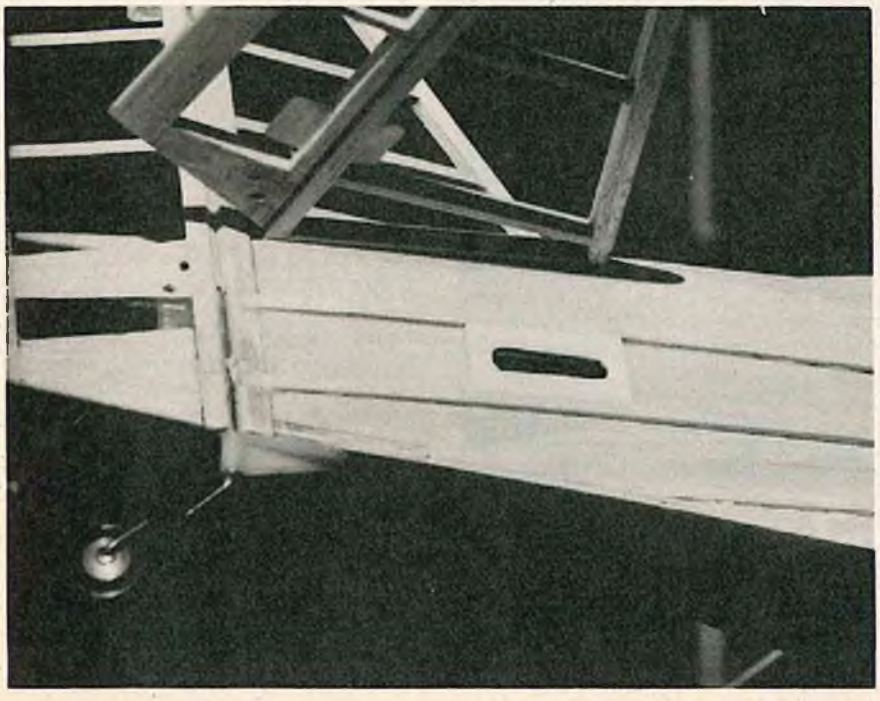
FULL SIZE PLANS AVAILABLE — SEE PAGE 174











girlfriends nylon stockings and epoxy. Spread epoxy on the wing section and covering, working it through the weave and smoothing it with your finger or a hard rubber squeegee. Using Hobbypoxy Formula I, it is possible to do this in one operation. If using a faster setting epoxy, do one area, mix more epoxy and go on to the next section. When the epoxy starts to set don't try to go farther, but simply discard it and mix more. Keep it as smooth as you can — the squeegee helps in this operation. Feather the edges of the covering onto the bare foam with a small overlap of epoxy. If care is used very little sanding is necessary. It's easy and doesn't take long. Clean your finger or squeegee with dope thinner, but don't get thinner on the foam wing or you can buy a new wing and start over.

When the epoxy has thoroughly set, carefully sand the whole wing until it feels smooth, a little like velvet. Using Testors Countour Putty for Plastic Models, fill all dents, dings, and large holes in the foam beading and sand smooth. The more you fill at this stage the better your finished wing will look. When you are satisfied that your wing is smooth enough you are ready to cover.

I prefer to cover the wings with silk, but silron, silray, or any other covering can be used. I like the silk because the edges can be sanded and feathered to a smooth lap. I think that medium or heavy silkspan can be used successfully, although I have never tried it.

Fill a container or jar (4 to 6 oz.) about half full of Titebond, or any aliphatic resin glue, but do **not** use white glue. Add just enough water to make the mixture like heavy cream, so it can be brushed easily. If you get it too thin, add more glue. Cover the bottom of the wing first. Cut a piece of the covering material larger than the wing half.

Using the glue mixture, and a 1/2-1" brush (or whatever suits you), cover the wing with the silk. It is almost like covering balsa with silk and dope, but it does require a little more smoothing because it doesn't dry quite as fast as dope. It will tend to wrinkle at first. Keep smoothing out any wrinkles with the brush, but don't pull too tight as it is possible to induce a warp. Don't be skimpy with the glue mixture, that is what seals the foam and fills the weave of the covering. Cover the other half of the wing, overlapping the center joint 1/4" to 1/2".

When the covering is dry, trim off the edges of the covering, leaving about 1/4" border. With the glue mixture, seal the border over the top of the wing. When this is dry, lightly sand the edges of the covering. Try to feather the edges so they don't show when the top covering is applied.

Cover the top of the wing in the same manner. When the wing is dry, lightly sand with fine sandpaper. Give the wing two more coats of the glue mixture, then sand lightly between coats.

Follow the same procedure for the bottom wing.

Using this method, the strength and durability of the foam wing is greatly increased at a relatively small increase in weight. One of the other advantages is that colored dopes may be used with no damage to the foam.

Install the eight 1/16" ply "N-strut" fasteners at the locations marked on on the wing plan. Be sure they are on the bottom of the top wing and the top of the bottom wing.

CURTISS HAWK P-6E
Designed By: Bob Rich

TYPE AIRCRAFT
Stand Off Scale Biplane
WINGSPAN
Top 41½" — Bottom 35"
WING CHORD
5¾" (Average)
TOTAL WING AREA
419 Square Inches
WING LOCATION
Biplane
AIRFOIL
Flat Bottom
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
Top 1¼" — Bottom 1¾"
O.A. FUSELAGE LENGTH
29 Inches
RADIO COMPARTMENT AREA
(L) 10½" X (W) 2¾" X (H) 2¾"
STABILIZER SPAN
14 Inches
STABILIZER CHORD (incl. elev.)
4 Inches (Average)
STABILIZER AREA
52.5 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
4½ Inches
VERTICAL FIN WIDTH (incl. rudder)
5 Inches (Average)
REC. ENGINE SIZE
.19 — .30 Cu. In.
FUEL TANK SIZE
6 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rudder, Elevator and Throttle
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Foam
Empennage	Balsa
Weight Ready-To-Fly	59 Ounces
Wing Loading	20.3 Oz/Sq. Ft.

Using epoxy, set them at the angle that matches the slope of the 1/16" ply "N-struts".

The wings are now completed and ready for painting.

The fuselage and tail were covered with light silk and five coats of thinned dope to fill the weave. MonoKote could be used if you desire.

The original model was finished with Aerogloss dope. Wide DJ Multistripe was used for the trim and markings. The Snow Owl was cut from white Wide Multistripe and marked with a black ballpoint pen. Wide DJ Multistripe is an excellent trim material and if you aren't familiar with it, give it a try. Remember to peel off the top protective film before marking on it or putting other trim over it.

The exhaust stacks are cut from aluminum tubing and epoxied into holes drilled to accept them. The gun trough is sanded into the side and a small piece of 1/16" aluminum tubing simulates the gun barrel. The gunsight is hardwood dowel epoxied in place. The pilot is a 1½" Williams Bros. unit with balsa glue on the bottom to raise him to the proper height.

The Kraft three channel brick fits easily with lots of room to spare. The battery fits in the nose under the six ounce tank, with room left over. The switch and charging jack are mounted in the cockpit and are easy to reach. Shift the radio installation to obtain the proper balance.

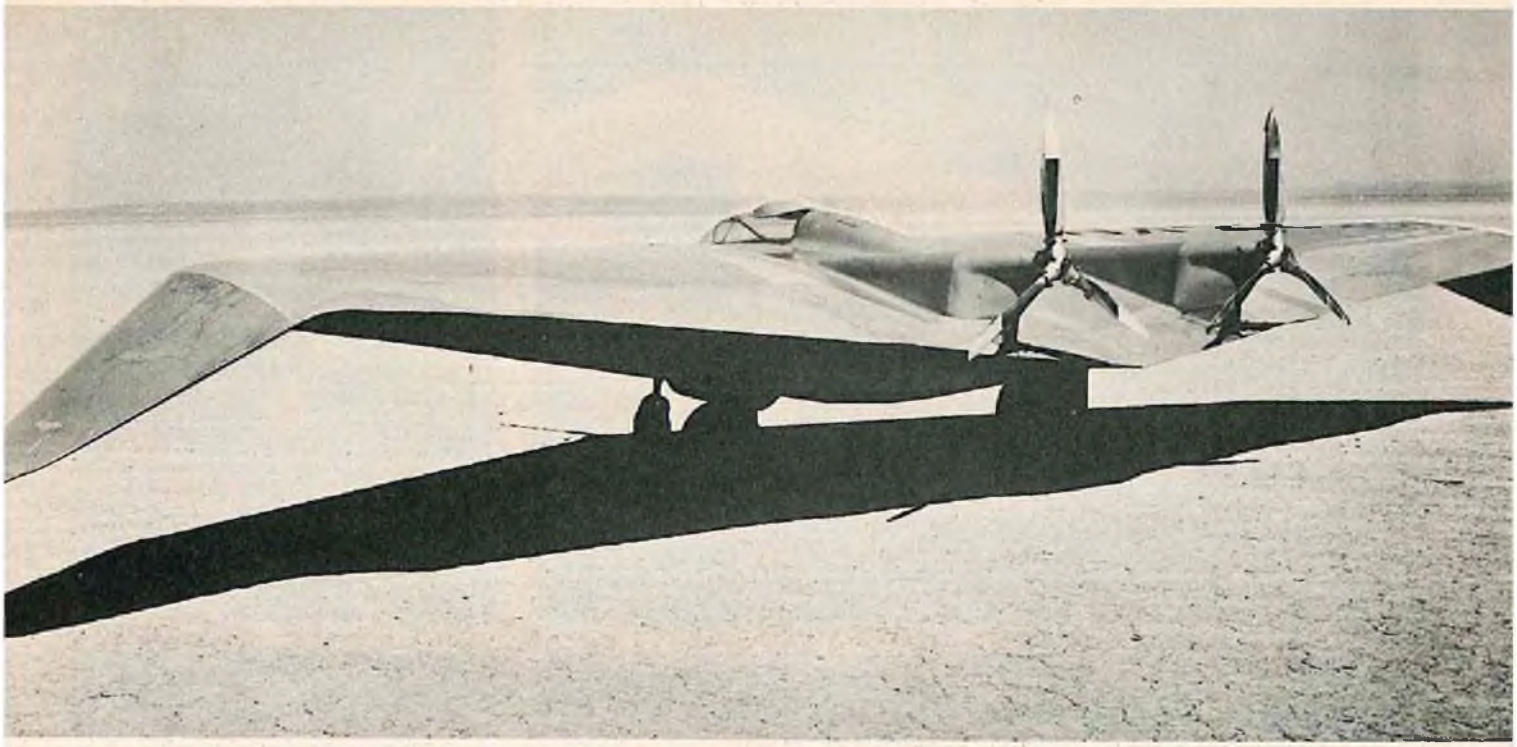
Allied Hobbies Scuff Guard was used on the front of the wheel pants and bottom of the engine cowl to protect them in the event of a nose-over.

Flying: An OS .30 was used on the original model and this was more than enough power. A good .19 would give enough power and fly the model quite realistically. Re-check the balance point to make very sure the plane balances as close as possible to the point marked on the plan. Make sure the engine has the proper downthrust. Put a little toe-in in the landing gear for easier ground handling. For the fist flights remove the wheel pants and struts, since there is no sense in getting them dinged up while checking out the plane. After you are completely sure that the engine and the radio are working properly, try a little taxiing to get the feel of the ground handling characteristics. When your hands and knees stop shaking enough for you to have a little control, line the plane up on the runway and gently increase the throttle, making rudder corrections as necessary to keep it lined up. When flying speed is reached it should fly itself off, requiring very little up elevator.

Fly it around to get the feel, then, at a good altitude, slack off on the throttle and set up a glide. See how it acts at low speed, nose high. Do this high enough so that if any surprises happen you can give throttle and fly out of the difficulty. It's much better that way than when you are a few feet off the ground and the corrections come too late or too low. The original model had no bad traits and no surprises, except it flew much easier than I had hoped. It was a real pleasure to fly and it sure looks good.

Do not fly the model with the engine cowling in place. There is no way to properly cool the engine and it doesn't look bad without the cowling anyway.

You'll enjoy your sport scale Curtiss Hawk P-6E. □



A rear quarter view of the real N1-M. The airplane changed shape frequently during its career as elevators, allerons, elevons, dihedral and anhedral were altered during the flight test program. An interesting project for someone who wants to try out twin engines and retracts. Photo courtesy of Northrop Aircraft.

NORTHROP N1-M

One of the most unique aircraft ever built, the Northrop flying wing makes an equally unique and excellent slope soarer.

By Gus Morfis

● This model of the Northrop N1-M is really the result of a number of different forces coming together.

First, the slope soarers around here began to develop along two broad paths; the highly refined, high aspect-ratio "Cirrus" types and the close-coupled highly loaded flying plank designs. Both have their place and their admirers, but to my eye the development potential was not there. About the most "improvement" possible was to change the shape of the vertical fin to something more stylish.

Second, my working at Northrop Aircraft developed my interest in Jack Northrop's flying wing designs. I don't think that anyone who has ever seen one of his Wings fly went away unimpressed. They seemed "right" and "natural" somehow, evoking that old saying that something which looks right will probably fly right, which apparently they did. I had long felt that the Jack Northrop's wing concept would have potential on the slopes. Its appearance would be distinctive; no mistaking these drooped tips and highly tapered surfaces for anything else around!

There is no vertical tail on this model and none is needed, since the toed-in drooped tips provided all the directional control the model needs. It is something weird to stand underneath the model and notice that there is not the slightest tendency to yaw or hunt. Aileron and elevator provide instant turns — in fact, there is a tendency to yank the model around. However, as soon as the controls are released, the N1-M settles into its new heading with no fooling around. Like most clean designs, this wing is fast, and the absence of fuselage and empennage drag is very evident.

Construction

Our construction approach is novel but not difficult. Using the building jigs will result in your putting in the correct amount of twist, dihedral and tip-droop automatically, as well as holding everything steady while you install all the small bits. The absence of the fuselage and empennage makes the whole thing that much simpler to build, which means you can get out on the slopes

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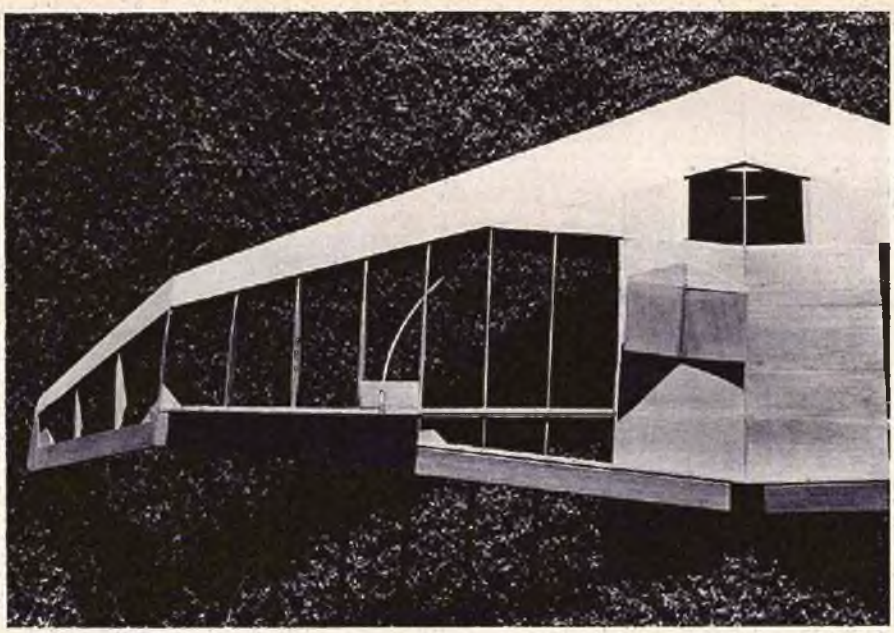
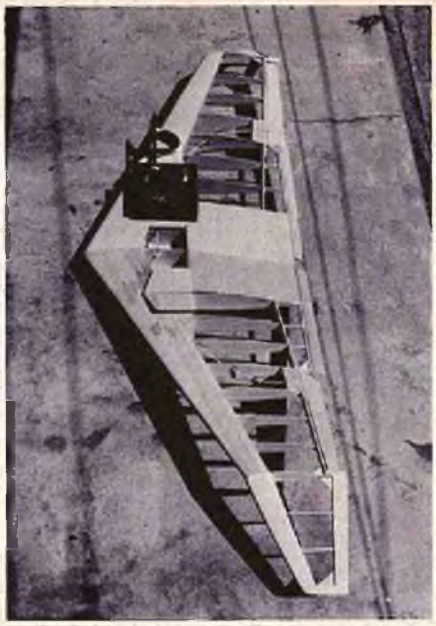
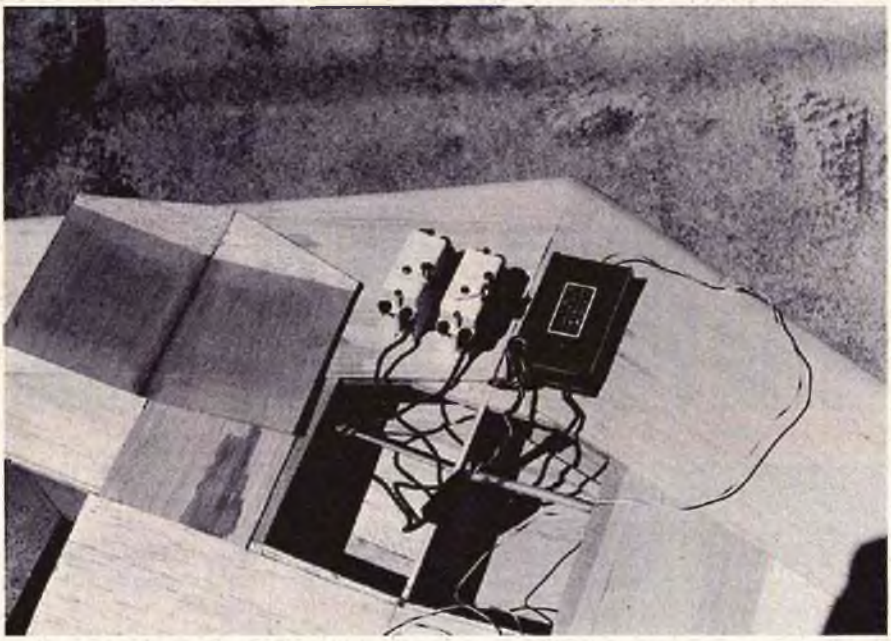
NORTHROP N1-M
Gus Morfis

TYPE AIRCRAFT
Semi-Scale Flying Wing
Slope Soarer
WINGSPAN
72¾ Inches
WING CHORD
Root — 22¼ Inches
Tip — 3⅞ Inches
TOTAL WING AREA
942.5 Square Inches
WING LOCATION
Flying Wing
AIRFOIL
Symmetrical
WING PLANFORM
Tapered L.E.
DIHEDRAL, EACH TIP
See Template on Drawing
RADIO COMPARTMENT AREA
(L) 7" X (W) 6" X (H) 2½"
LANDING GEAR
Ply Skid
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Elevator and Aileron
BASIC MATERIALS USED IN CONSTRUCTION
Wing ..... Balsa & Ply
Weight Ready-To-Fly ..... 36 Ounces
Wing Loading ..... 6.5 Oz./Sq. Ft.

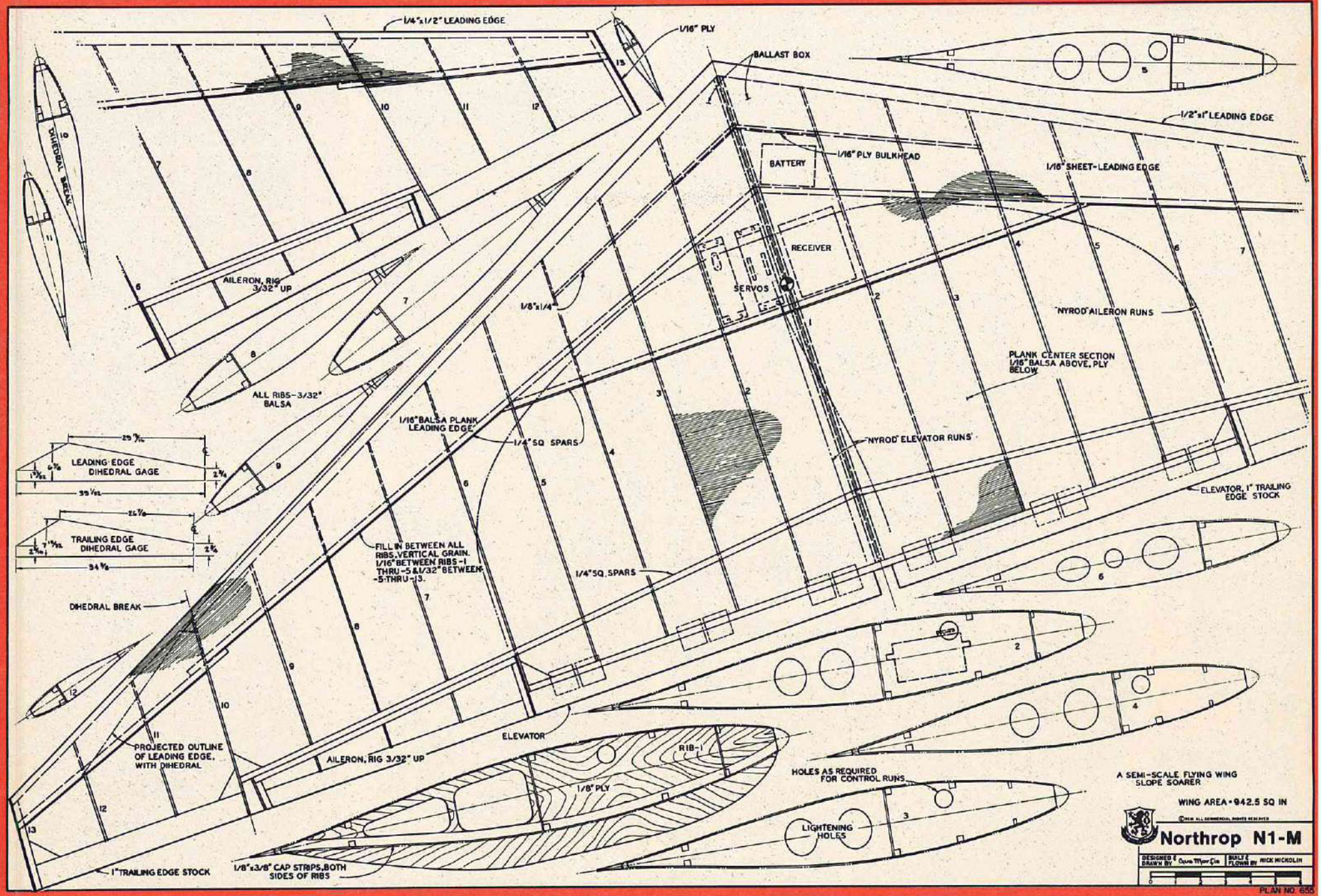


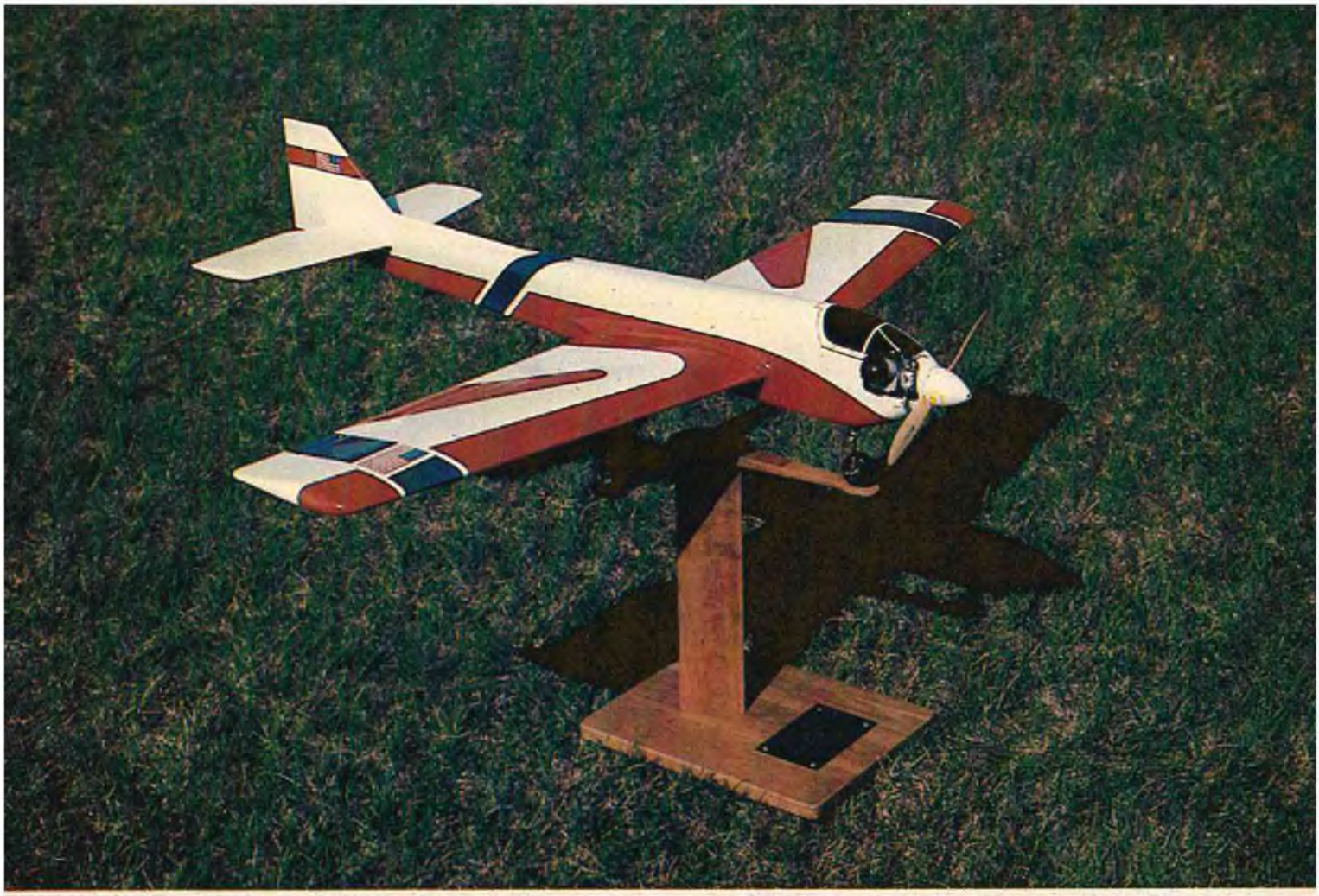


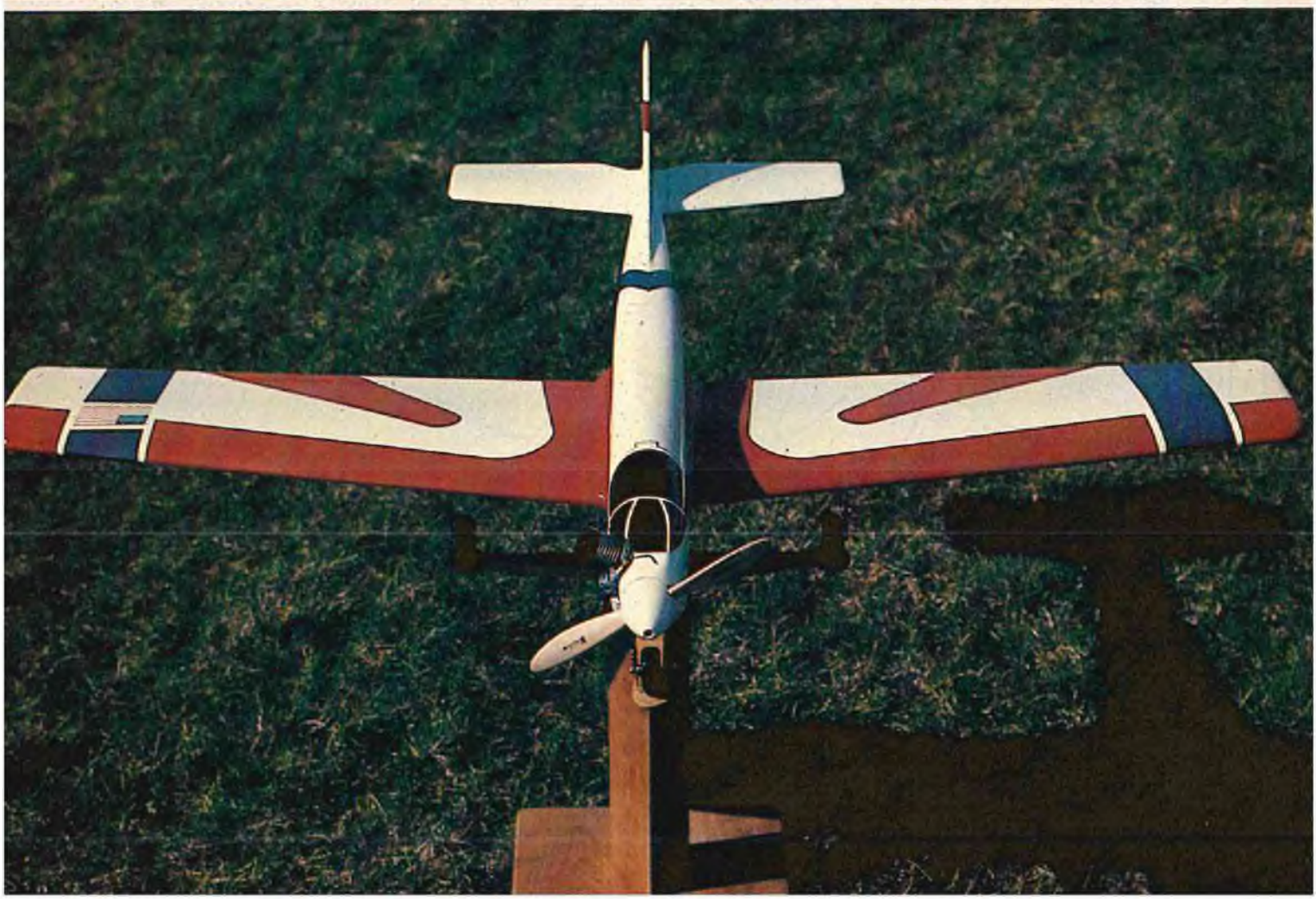


TOP ROW, LEFT: Top view of Northrop N1-M wing panel. Note servo compartment in center. NyRod linkage can be seen. RIGHT: Overall top view of complete N1-M structure. Orbit transmitter rests on center section. SECOND ROW, LEFT: View of radio compartment showing two servos and Orbit receiver. RIGHT: View of bottom of uncovered N1-M structure. Note plywood skid on center section of wing. LEFT: The Northrop N1-M flying wing riding the slope waves over the beach at Torrance, California.

FULL SIZE PLANS AVAILABLE — SEE PAGE 174







COBRA

● For years, 60 size pattern airplanes have dominated the contest circuit. Everyone said they flew better than smaller ships, although many weren't sure why and, besides, fuel was inexpensive and supplies plentiful, so smaller airplanes weren't necessary.

Those days are now gone forever. Prices have skyrocketed. The time has come to challenge the "supposed" superiority of the 60's. Instead of scaling down the successful pattern ships of the past and designating them sport/pattern models, the time is right for a 40 powered aerobatic airplane, designed from the ground up, that will successfully compete in today's pattern contests. The Cobra is offered as just such a design concept.

Areas where a smaller pattern airplane is superior to its larger brother are immediately obvious. The cost of building and finishing materials, engines and fuel, are close to doubled for a 60 ship, when compared to an equivalent 40 size model. The problems of storage and transportation are noticeably reduced for the smaller airplane. It also pays not to overlook the difference in loss incurred after one of those inevitable "radio failures."

On the reverse side of the coin, many current 40 size designs lack smoothness in the execution of maneuvers. Some of this is due to design and can be improved, as I will discuss later, and some is due to technique. A 5 pound pattern airplane exhibits a smaller opposing force to a change of direction than does an 8 pound airplane, a fact which must be accounted for at the transmitter by avoiding quick stick movements. Control inputs must be introduced and removed smoothly. What this all means is that a flyer accustomed to 60 ships needs to fly the new 40's more than a few times to make the transition properly and to pass fair judgement on their capabilities. It isn't more difficult, just different.

The domination of the competition scene by the sixty powered pattern ships gives way to the new breed of fast-striking, high performance forty ships epitomized by the Cobra. Designed to win, this machine is your ticket to the winner's circle.

By Jim Cooper

A second criticism of the 40 is that its wind penetration isn't up to par. Admittedly this is the smaller design's weakest point, but much can be done to bring the wind performance within acceptable limits. The most effective adjustment available is wing loading. For normal flying, a wing load factor of around 23 oz./ft.^{2} is ideal on a 40 ship. Using weights at the C.G., the wing loading can be increased up to 27-28 oz./ft.^{2} to increase wind penetration. Another helpful aid in conquering the wind is a good, powerful engine. One of the best on the market is the Schnuerle O.S. 40 FSR and is highly recommended for this airplane. The important thing is to not get a hang-up on wind effects. Whether we like it or not, all pattern airplanes are affected by the wind and practice in the wind, not design, will improve your score the most.

The decision to try a 40 or stay with the 60's boils down to one's personal priorities. Keep in mind, however, that for a very large percentage of contest flyers, the airplane, be it a 40 or a 60, has a flight potential equal to or greater than the flyer's ability to guide it. If you're aiming at a national title and have the money to support your habit, your choice is clear. For the other 99%, this new breed of 40 deserves your consideration. The important thing is to try it for yourself. Don't take someone else's word for it.

Design Philosophy

The Cobra was designed with several goals in mind. In order of importance they were: (1) To display competitive performance. (2) To be rugged yet simple in construction, and (3) To be economical to build. At each decision point in the design, secondary goals were considered after insuring that all performance criteria were met.

The fuselage design pivots around two main themes; first, the necessity of retractable landing gear to keep the ship as aerodynamically clean as possible, and second, the requirement for balanced side area fore and aft of the C.G. to enhance both crosswind taxiing and knife edge flight. The nose is faired smoothly, if rather bluntly, from the spinner to a maximum cross sec-

tion well forward of the C.G. where it begins a constant reduction to the tail end of the aircraft. Low speed aerodynamics show that blunt shapes have minimum drag characteristics, as exhibited by a raindrop. The canopy is purely cosmetic. A separate canopy has a severe drag penalty, considering that it is an esthetic feature.

Internally, plywood is used extensively for its high strength to weight ratio. Fuselage moments were sized by the minimum nose moment necesary to accomodate the engine, tank and retracts. By bringing the firewall down well below the thrust line, a reduction in nose gear strut length was accomplished, allowing for the shortest possible total nose moment. A tail to nose moment ratio of 1.85 was selected. Although slightly higher than many 40 designs, the long tail moment contributes significantly to smoothness of flight.

The wing airfoil selection was based on leading edge sharpness, maximum thickness percentage and chord location of maximum thickness. To insure good stall characteristics, a fairly blunt "high volume" airfoil was selected. By designing a wing with a 15 percent root and a 16.5 percent tip with a constant radius leading edge, the effective leading edge sharpness increases towards the root. This causes the wing to stall sooner at the root than the tip, eliminating a nasty snap roll on those slow landings. The chord location of maximum thickness is well back from the leading edge to insure laminar flow over the entire wing. The wing area was set higher than average to provide an initially low wing loading. The sweep was designed into the wing for effective, positive dihedral, upright or inverted, to improve tracking in the round maneuvers. The remaining dihedral necessary to roll stabilize the aircraft is indicated on the plans. It must be emphasized that the right amount of dihedral is a function of each particular airplane. Although the figure indicated is the best place to begin, the best dihedral can only be determined for each airplane through experimentation.

The wing location, with respect to the fuselage, is a compromise of positioning the wing close to the thrust line, yet retaining adequate space in the fuselage for radio installation. The Cobra wing is one inch below the thrust line. This location, coupled with the deep forward fuselage, results in a spacious belly pan under the wing. Using an access hatch allows mounting an inverted aileron and landing gear servo (definitely recommended for Goldberg retract units). This set-up gives a straight route for the nose gear retraction link which can be easily removed at the servo for wing removal. The aileron horns can be adjusted through the back of the belly pan.

Because of the smoothness problem with smaller pattern designs, a flying stab has been employed in place of the conventional elevator. The thick airfoil also provides smooth, positive response while allowing for zero trim drag. The fin and rudder are also quite thick to keep the center of drag behind the C.G. for good directional stability and, again, smoother maneuvers.

Construction

In keeping with one of the original objectives of this project, the construction of the Cobra involves a fundamental knowledge of the basic building techniques used on current pattern-type aircraft. The airplane is standard balsa and foam with plywood formers and doublers in the fuselage. General building procedures apply and will not be covered here. I will, however, review the sequence used, and any tips that may prove helpful.

Build the wing first. Use extra care in forming the core and tip templates and aligning them on the foam block. Anything less than a true wing is totally useless for competition flying. Sheet and joint the panels in the usual manner. Ailerons are of the standard strip variety, but remember that the control horns go **down** on the Cobra. Also, achieve a no-gap fit between the wing and aileron at the hinge line. Air leaking through the gap from the high pressure under surface of the wing to the low pressure on top can make true round maneuvers nearly impossible to do. Don't worry about the belly pan with formers F-2A and F-3B at this time.

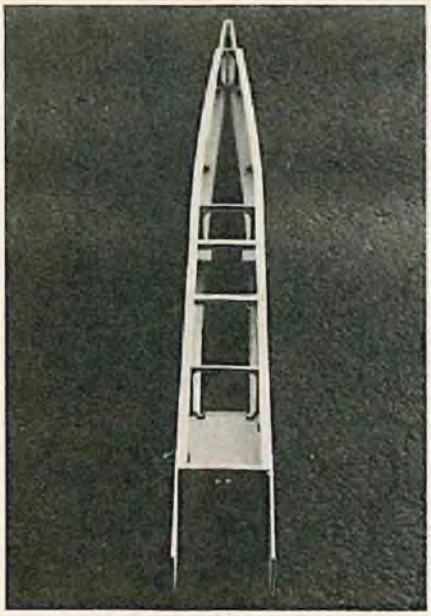
The flying stab should be tackled next. I machined my own mechanism from a block of Delrin, but the commercial units are as good and may save you some time. The two critical points on any flying-type surface are (1) a no-slop system must be achieved, and (2) the correct location for the surface's pivot location must be determined and strictly adhered to. The "no-slop" arrangement only requires that care be taken in fabrication (if you build your own) and installation. Item number (2) however, requires some knowledge of aerodynamics. A lifting surface, such as a stab, has a location through which the lifting forces act, called the center of pressure, Cp. This point occurs at the intersection of the mean aerodynamic chord (MAC) and the 1/4 chord line. If you decide to design your own stab, be sure to calculate the MAC correctly. Get the proper method from a good book on aerodynamics. The chord section that includes the Cp is the reference chord and all pivot location calculations are made with respect to it. Theoretically, if the pivot for the stab were located at the 25% location of the reference chord, only frictional forces would have to be overcome to change stab trim. However, because this system is unloaded, it is also unstable. A small vibration is undamped and could lead to flutter which can easily destroy the stab and, consequently, the airplane. By moving the pivot point aft of the 25% location, the moment caused by the force at the Cp loads the mechanism and damps out unwanted oscillations. Naturally, if the pivot location is moved too far aft, the force required to control the stab becomes more than the servo can handle. Because the stab airfoil on the Cobra was selected for its stable Cp through large changes in angle of attack (25% is only an approximation for most airfoil sections), a pivot location at 29% of the reference chord was selected. A safe bet for most airfoils is 33%, although this places a slightly higher load on the servo.

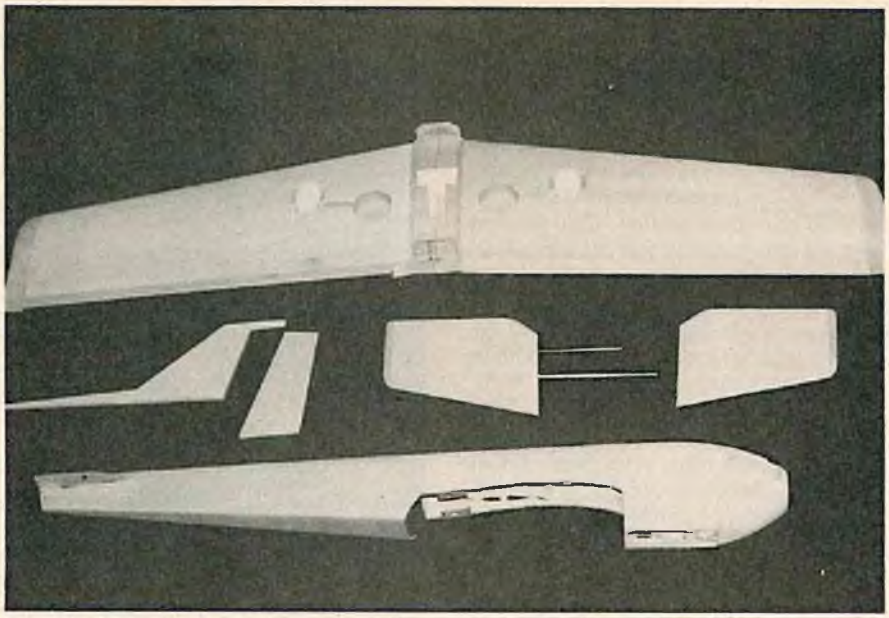
A sheeted foam stab is probably the easiest construction method to adapt to the flying stab mechanism. Begin by joining the **unsheeted** foam cores, then add the trailing edge strip. With the foam cores resting in the bottom half of their blocks, use a hot wire to cut a 5/16" wide slot for the pivot tube and a 1/8" wide slot for the actuator tube. Be sure the slots are properly located. At the same time, make a cut-out in the center section for the horn and bearing assembly. Epoxy a full length 5/16" brass tube centered vertically in the pivot slot and a full length 1/8" brass tube centered vertically in the actuator slot. Take care not to epoxy the actuator tube to the foam inboard of the stab separation lines (this portion will be cut free later). Fill in the top and bottom of the slots with balsa spars as shown and sand to the foam contour. Again, don't glue balsa inboard of the separation line on the

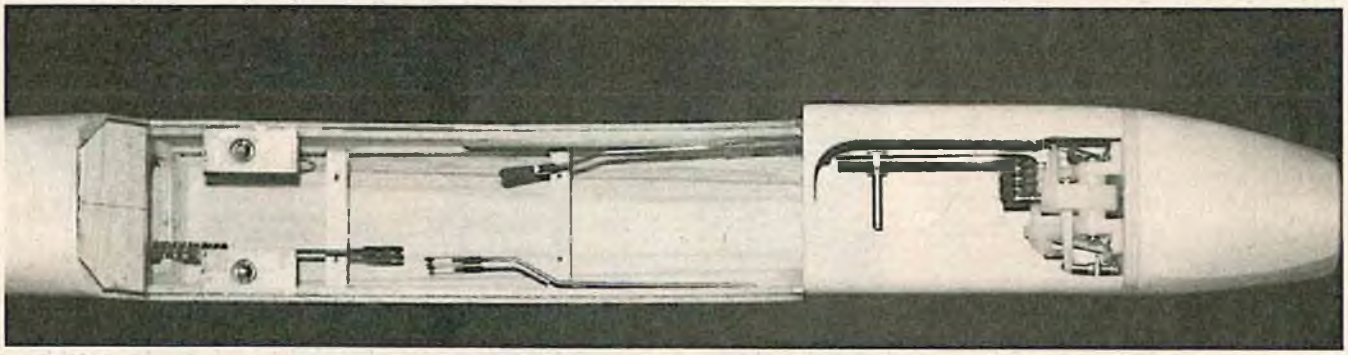
COBRA
Designed By: Jim Cooper

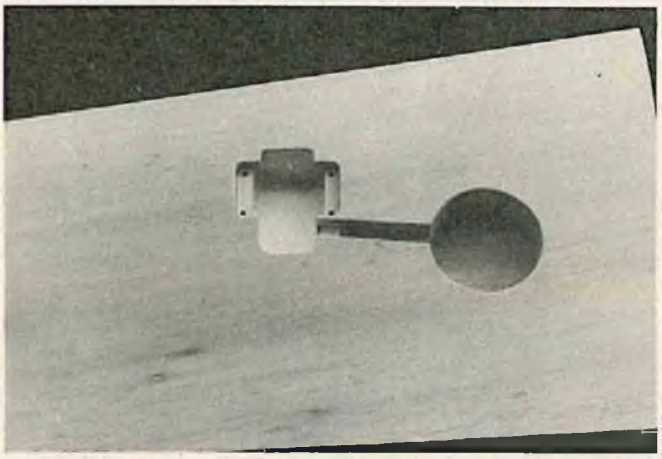
TYPE AIRCRAFT
Pattern
WINGSPAN
54 Inches
WING CHORD
Root 11" — Tip 7½"
TOTAL WING AREA
500 Square Inches
WING LOCATION
Semi Mid-Wing
AIRFOIL
Mod. NACA 64²A015 (15.5%)
WING PLANFORM
Tapered, Swept
DIHEDRAL, EACH TIP
3/4 Inch
O.A. FUSELAGE LENGTH
46½ Inches
RADIO COMPARTMENT AREA
(L) 10" X (W) 2½" X (H) 2"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (incl. elev.)
6¼" Average
STABILIZER AREA
120 Square Inches
STAB AIRFOIL SECTION
Mod. NACA 64²A015 (10%)
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
5½ Inches
VERTICAL FIN WIDTH (incl. rudder)
7½" Average
REC. ENGINE SIZE
.40 — .46 Cubic Inch
FUEL TANK SIZE
8 Ounce
LANDING GEAR
Tricycle (Goldberg Retracts)
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail., Retr.
BASIC MATERIALS USED IN CONSTRUCTION

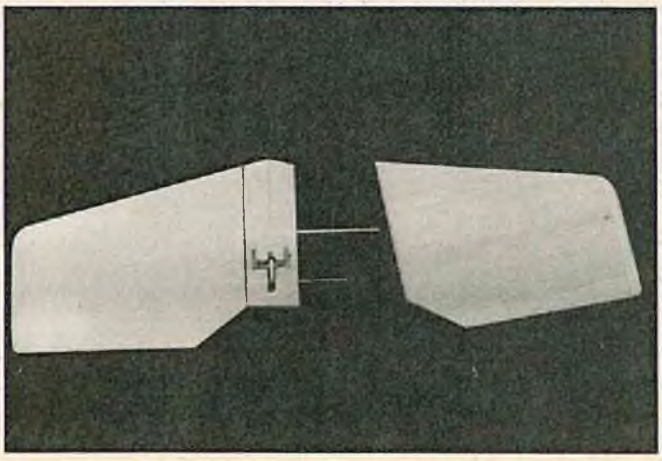
Fuselage	Balsa & Ply
Wing	Balsa & Foam
Empennage	Balsa & Foam
Weight Ready-To-Fly	87 Oz.
Wing Loading	25 Oz./Sq. Ft.

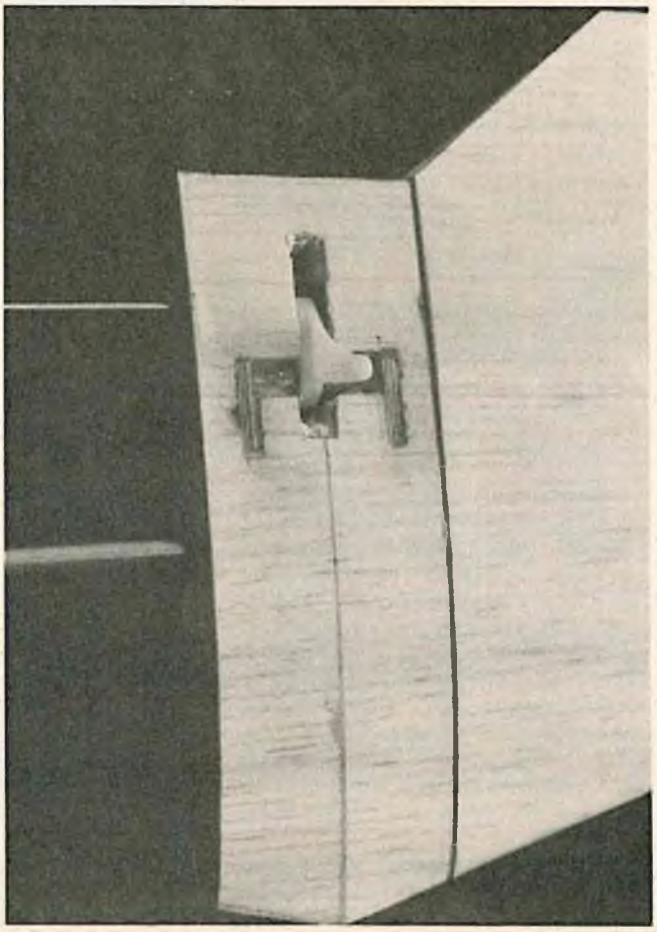












actuator tube. Now, sheet the stab bottom, add the small trailing edge ribs, sheet the top, add the leading edge and tip blocks and sand everything to shape. After carefully indicating the separation lines on the sheeted surface, cut the panel into three sections with a band saw. The two flying surfaces now contain tubes that precisely align them to the center section. Cap the four exposed ends that were just cut with 1/64" plywood and cut clearance holes for the pivot tube and 3/32" actuator wire. The clearance hole in the center section for the actuator wire will be a slot from top to bottom to allow for the required surface movement. Remove just enough sheeting from the bottom of the center section to install the horn bearing assembly in the foam. I used plywood end blocks with 5/16" brass tubes epoxied to them to provide a pivot for the horn and its 1/4" brass tube axle. To assemble the stab, a full length of 1/4" brass tube slides through the bearing tube in the center section and a 3/32" music wire is passed through the center section and the horn jaws. Stab panels are then epoxied to the 1/4" pivot tube and music wire on either side of the center section. A thin Teflon washer on the 1/4" pivot tube will reduce friction at the separation line. For now, however, leave the stab panels off until after the finishing process. You'll be amazed at how much easier it is to finish a fuselage with the stab panels detached.

The fuselage has been designed so that it can be assembled on a flat board to insure accuracy. Begin by assembling two fuselage sides. Glue all the bracing, doublers and triplers to the sides, using the formers to help locate them. Leave the belly pan sides attached to the main fuselage sides since the belly pan will be cut away after the final shaping of the fuselage. The completed fuselage sides, formers and fuel compartment floor are now joined, inverted on a flat building board to insure good alignment. Do not include F-2A and F-3B in the assembly. Sheet the fuselage bottom and remove the building board.

The flying stab center section is now installed. Determine which horn hole gives a trailing edge movement of about ±1/2" when attached to a medium length arm on your servo. This will allow for some fine tuning at the servo without having to cut into the tail of your airplane. The elevator movement is sized by the stall-spin requirement and varies slightly from aircraft to aircraft. Once the correct hole is determined, attach the pushrod and glue the stab center section in place with the pushrod located in the fuselage. It's a good idea to solder the control horn clevis to the pushrod end to keep it from unscrewing during the remaining construction. Complete the fuselage by gluing the top formers (F-2B, F-3A, and F-5) in place, the 5/16" top sheeting strips, canopy block, nose block, tail filler block and fin. Shape and hollow where necessary.

Cut the belly pan loose just aft of F-2 and in front of F-3C. Adjust the wing saddle for

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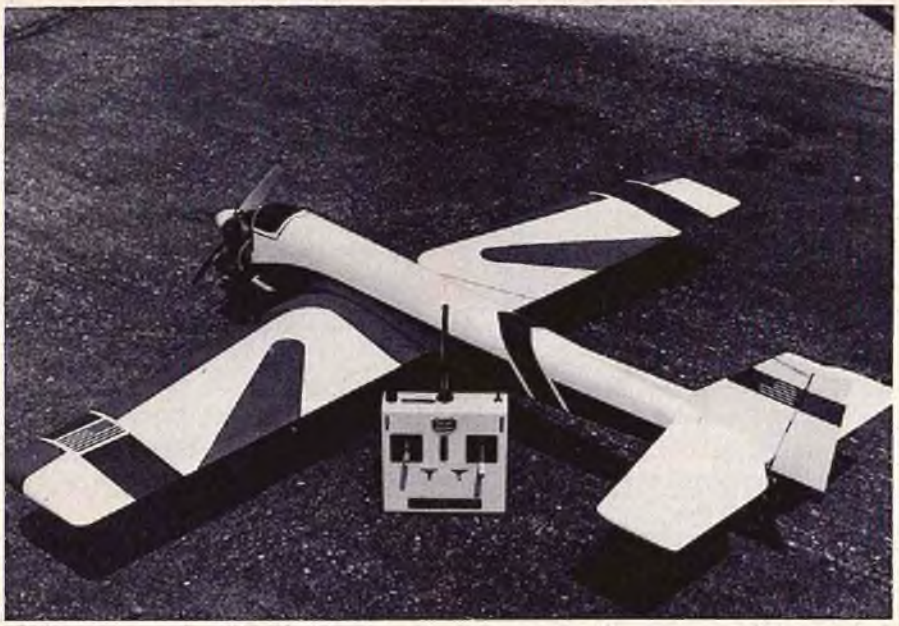
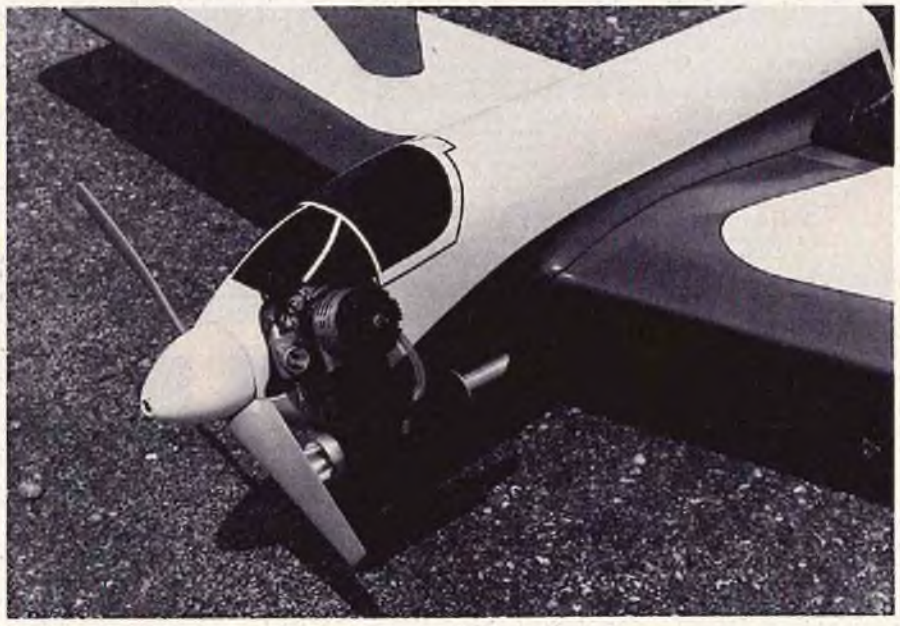
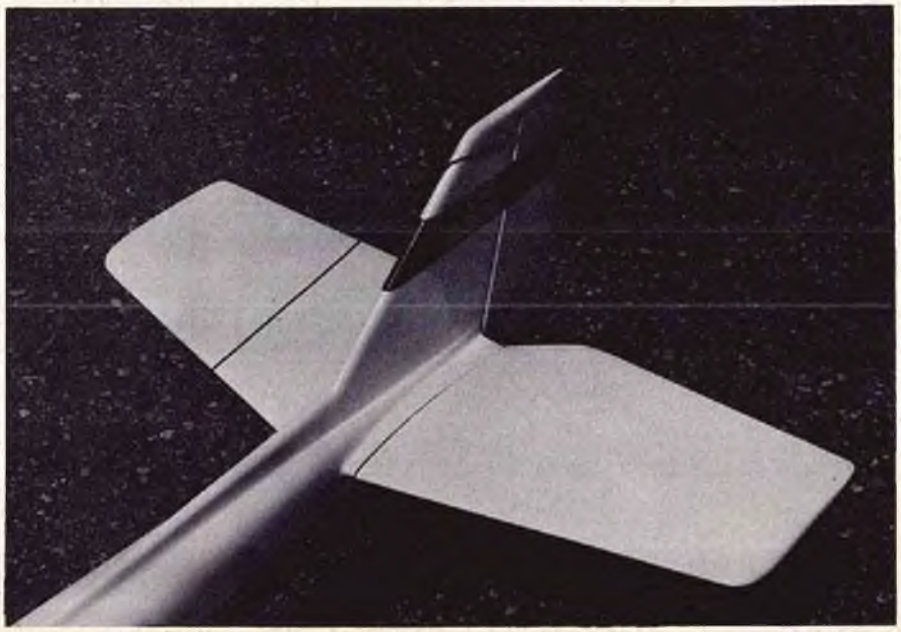
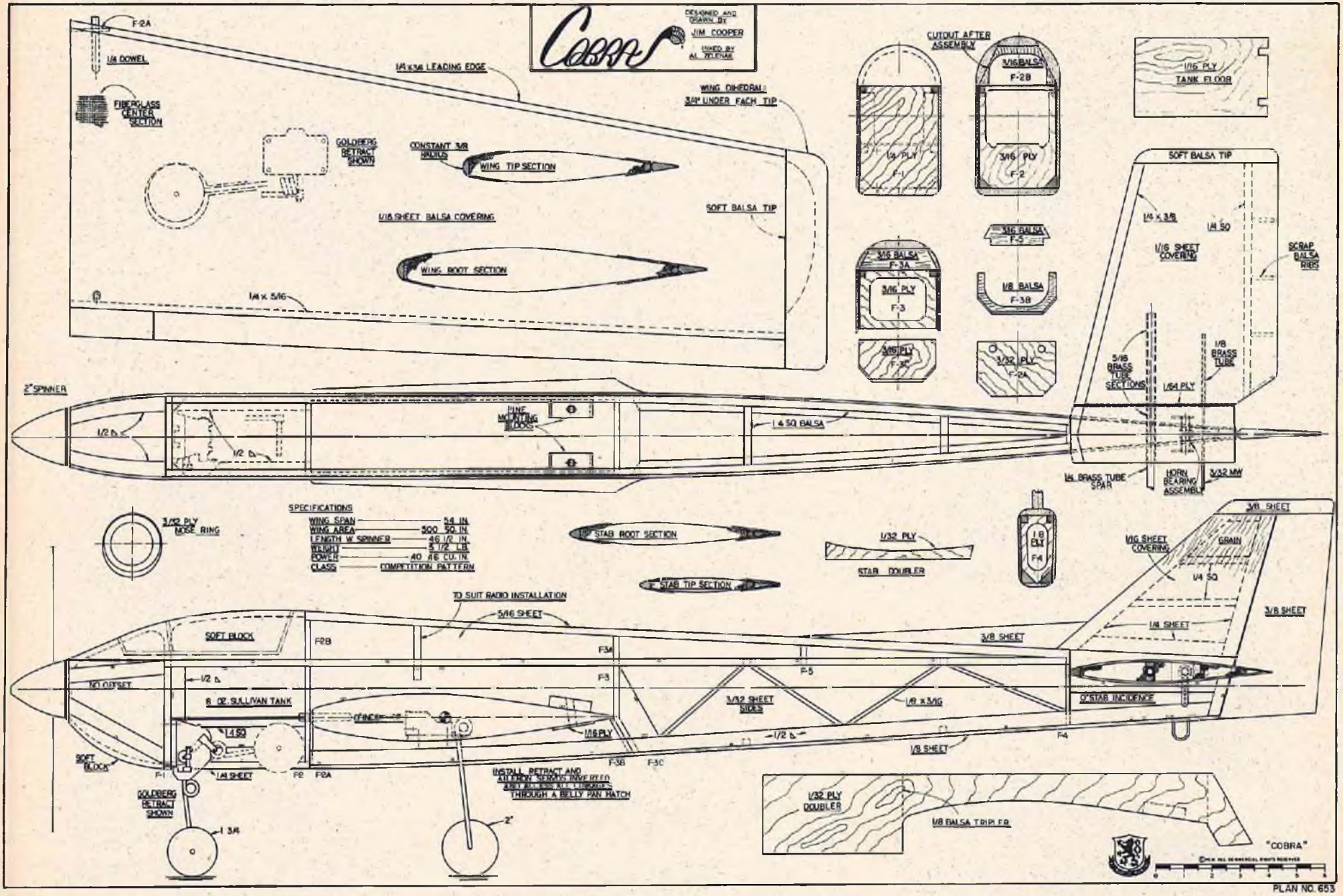






FULL SIZE PLANS AVAILABLE — SEE PAGE 174



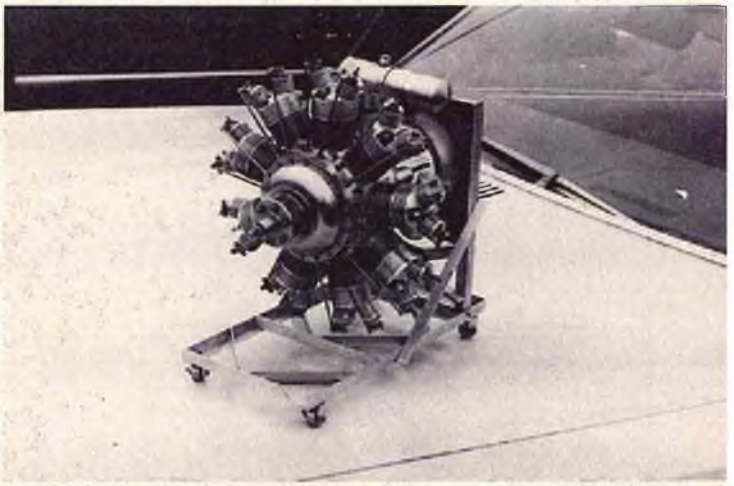
The Lanzo Record Breaker never looked so good! Cliff Schaible and his first place Texaco winner.

Talk about relaxing competition! Cliff really knows how to fly that baby!

Another winnah! Hugo and his Dallaire Sportster took first in Antique at Franklinville.

Watch out, Danny Sheelds, Gary Montana's giving you some stif competition with his GHQ Sportster!

First through Third winners at Franklinville: Kneeling are Hugo Mercoli and Steele Anzese. Left to right, Woody Woodman, Ted and Mark Patrolia, Cliff Schaible, Jim Clark, Al Schwankert, Joe Beshar, Gary Montana, and Larry Fair. Congrats, guys!



This interesting goody showed up at the meet in Franklinville Paul Daniels of Millville, N.J., took over a year to complete thi scale Wright Whirlwind. Ain't she a beauty! Not content with this he's even building a bigger one! Patience of a saint, I guess!

FOR OLD TIME'S SAKE

BY RANDY CARMAN

Ain't it amazing what one can whip up with a pair of knitting needles? Randy Carman, RCM's resident "old timer".

Well, until we start receiving input, or until we can afford weekend jaunts outside our 300 mile limit, you'll have to be content with East Coast happenings.

Spring Has Sprung

It's spring, the time when young and not-so-young men's fancy turns to flying! What better way to start the new season than with a contest! On April 25, S.A.M. Chapter 23 and the Clayton R/C Club of Franklinville, New Jersey hosted the first Old-Timer with R/C contest of the year. Twenty contestants from as far as Massachusetts showed with 31 entries — not bad when you consider Ma Nature was not cooperating. Rain threatened most of the day, but the contestants and spectators were undaunted! Intermittent drizzle forced many to occasionally seek shelter under the tents — although most sought the shelter for their planes, rather than themselves! One ingenious flier even resorted to a clamp-on umbrella to protect his "baby!"

Thermals were naturally hard to find and reports of a wind shear about 150 feet up were heard from several fliers. That didn't stop some, however, from getting good flight times. The average of the recorded flights ranged between 6 and 8 minutes! Hugo Mercoli showed 'em how to win First Place in Antique when he "maxed" (10 minute flight) with his gorgeous Dallair Sportster. Cliff Schaible put everyone in the Texaco event to shame with a 29 minute flight! Twenty-nine minutes on a rainy day! Just imagine what he can do on a sunny one! Out of those 29 minutes, the engine was reported to have run for 23! Must be that electronic ignition he's rigged up, the details of which will follow later this year.

Around noon, the "hostesses" arrived with all the fixin's for a picnic! Hamburgers, hot dogs, you name it, they served it! This club really knows how to hold a contest! When you're out in the middle of a 500 acre wheat field, they provide all the comforts of home — food and even a portable "necessary" building. More fields should come equipped with those — not all the spectators or fliers can run behind a bush! Especially in a wheat field! Enough editorializing!

There were no mishaps to mar the festivities. However, we did see one elderly gentleman with a .020 Fox that popped its gum bands on landing. He, despite his age, was too fast for us to get incriminating photos of the occurrence.

All the flights were in by 4 o'clock. While Assistant CD, Warren Avis, read off the winners, CD, Don Lamkin, handed out the trophies, walnut plaques with a Bicentennial motif, plus merchandise. The winners were:

Class A
1st — Gary Montana (Demon)
2nd — Mark Patrolia (Sailplane)
3rd — Herb Smith (Brooklyn Dodger)
4th — Woody Woodman (Sailplane)
5th — Andy Anderson (Playboy Jr.)

Class B
1st — Joe Beshar (Fox)
2nd — Jim Clark (Playboy Sr.)
3rd — Woody Woodman (Sailplane)
4th — Don Hartman (Eastern States Gas Champ)
5th — Hugo Mercoli (Buzzard Bombshell)

Class C
1st — Al Schwankert (Sailplane)
2nd — Ted Patrolia (Sailplane)
3rd — Larry Fair (Playboy Sr.)
4th — Bill Green (Playboy Sr.)
5th — Jim Clark (Playboy Sr.)

Antique
1st — Hugo Mercoli (Dallair Sportster)
2nd — Steele Anzese (Riser Rider)
3rd — Al Schwankert (Powerhouse)
4th — Howard Carman (Powerhouse)
5th — Joe Lachowski (Miss America)

Texaco
1st — Cliff Schaible (Lanzo Record Breaker)
2nd — Steele Anzese (Riser Rider)
3rd — Hugo Mercoli (Powerhouse)

As the tents were folded and the planes dismantled, the skies opened. At least Ma Nature waited until everything was over. It was a well-run meet and inspite of the weather, all enjoyed a day of good fun and good company. This great group will be hosting another meet on September 25th again at the Franklinville location. Plan to attend!

• •

10th Annual Champs

That's right! The Tenth Annual Old Timer Championships are coming! July 31, August 1 and 2 in Dayton, Ohio! The Central Ohio Free Flight Club will be hosting the three-day bash! Looks like they've got a full weekend on their hands, too! Friday, the 30th will kick things off with the traditional bean fest to be held at Wittenberg University's Rathskeller in Springfield, Ohio. This is the time when old friendships are renewed and new ones are made. Bob Laybourne of Donnelsville, Ohio is making all the arrangements for the fest. We're sure it will be as great as past ones!

Saturday, July 31st, the flying starts at Wright Field in Dayton, near the Air Force Museum. Class A Pylon, B Cabin, C Pylon and 30 second Antique (free flight events), R/C Texaco, R/C Antique, R/C Class B, will be the agenda. Sunday will see events in Class A Cabin, B Pylon, SCIFF .020 power, O.T. Scale, R/C Class A and C. That night, back at Wittenberg University (the S.A.M. Headquarters), the annual S.A.M. business meeting will be held at the student union. This year the new officers for the 1976-1978 term will be installed. This is also the traditional time for airing opinions (to some grievances). It's usually a good night of good discussion.

Monday's schedule will include Class C Cabin, Combined Rubber, and .049 powered old timers. Monday night will culminate the weekend with the Annual S.A.M. Banquet, again to be held at Wittenberg University's student union. Trophies will be handed out to the winners to third place in all events, plus special, traditional and perpetual awards. One special trophy has been donated by Woody Bartelt for the highest flight time for an ignition powered R/C assisted plane.

Speaking of donations, R/C Modeler, Flying Models, and Model Builder have all chipped in $250.00 a piece to be used for trophies! That's great! Many thanks to these publications for their support of S.A.M.!

Much credit should also go to those brave

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HALF-A

BY VINCE MICCHIA

SUPER SPORT TRAINER

The design goal for the 1/2A SST was to obtain the flight performance in a small, economical aircraft that is usually found only in the larger, more powerful R/C ships. Dozens of flights have proven that this little bird does just that.

There is an impressive speed differential between powered flight and glide. Several design factors contribute to this. These are the clean lines, an efficient wing with ample area, and overall light flying weight. Noticeably absent is the drag producing landing gear. To date there has been no problems with hand launching and landing on grass.

Another feature is the use of ailerons rather than rudder in a two channel ship. Besides smoother turns, ailerons allow a greater variety of maneuvers. Whether you want an aileron trainer or a super sport fun ship, you should give the SST a try!

Now for building this bird, we have placed the instructions, supplemented with illustrations, on the plans so there is no need to duplicate them in the text. The only thing we should mention concerns the wing. You can make templates for the airfoil and cut your own foam cores or you can buy a Sure Flite #206 constant chord wing kit for $7.95.

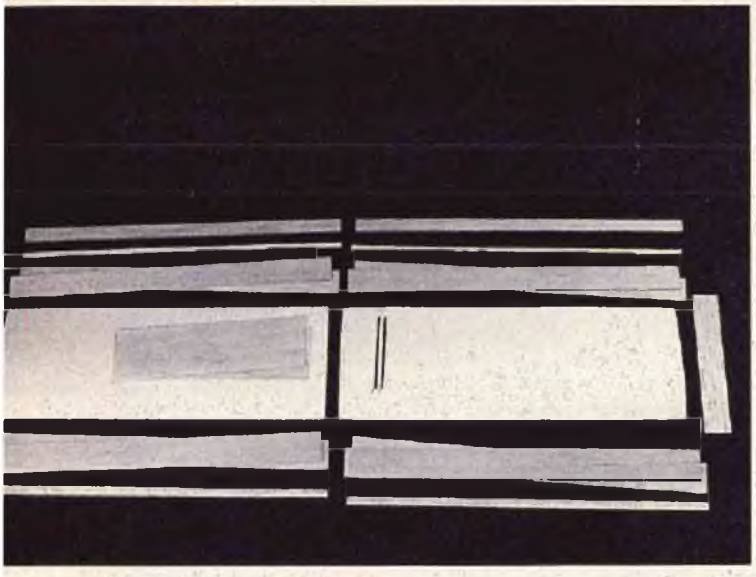
We hope you will enjoy the 1/2A SST as much as we have.

1/2A SST
Designed By: Vince Micchia

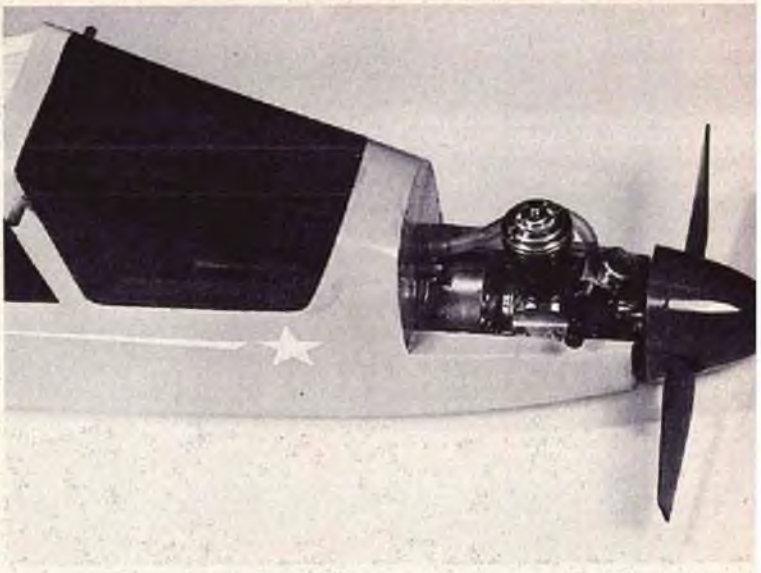
TYPE AIRCRAFT
1/2A Sport Trainer
WINGSPAN
33 Inches
WING CHORD
6-15/16 Inches
TOTAL WING AREA
242 Square Inches
WING LOCATION
High Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Constant Chord

DIHEDRAL, Each Tip
3/16 Inch
O.A. FUSELAGE LENGTH
31-3/16 Inches
RADIO COMPARTMENT AREA
(L) 7¾" x (W) 1⅞" x (H) 3"
STABILIZER SPAN
14¾ Inches
STABILIZER CHORD (Incl. elev.)
3¾" (Average)
STABILIZER AREA
53 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Bottom Area of Fuselage
VERTICAL FIN HEIGHT
4½ Inches

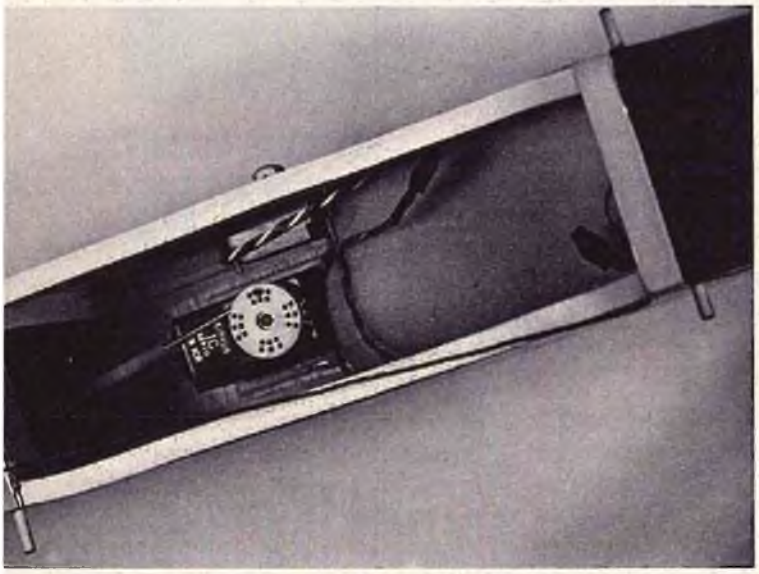
VERTICAL FIN WIDTH (Incl. rudder)
4¼" (Average)
REC. ENGINE SIZE
.049 — .051 Cu. In.
FUEL TANK SIZE
Sullivan R-2 (2 oz.)
LANDING GEAR
None
REC. NO. OF CHANNELS
Two
CONTROL FUNCTIONS
Aileron and Elevator
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa and Ply
Wing ..... Foam and Balsa
Empennage ..... Balsa
Weight Ready-To-Fly ..... 21 — 26 Ounces
Wing Loading ..... 12.5 — 15.4 Oz./Sq. Ft.



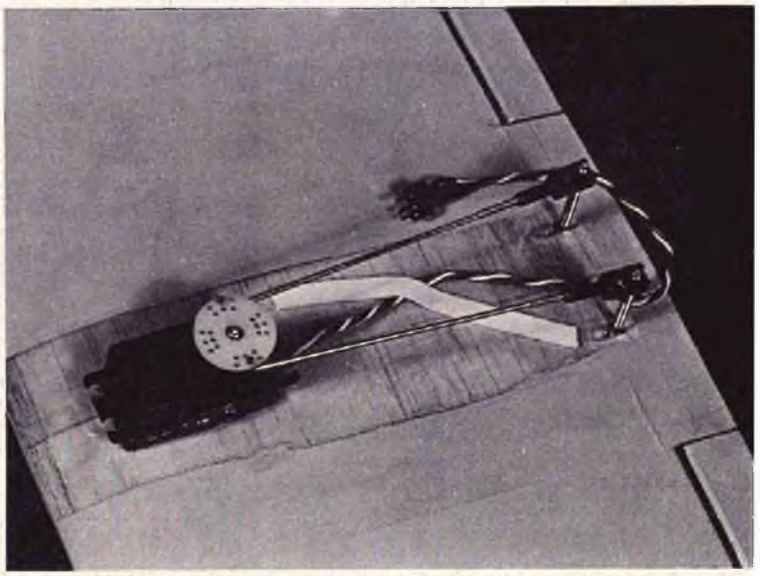
The SST wing cores can easily be cut, or are commercially available.



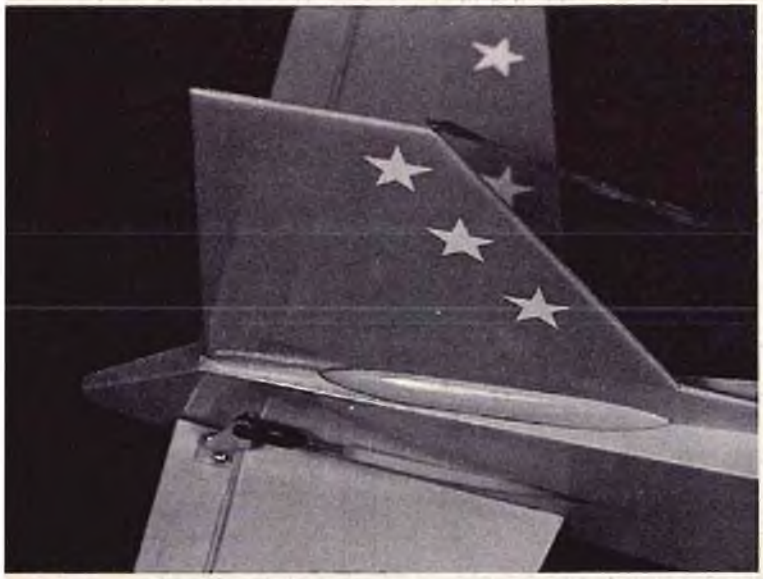
Cox .049 or .051 on Tatone mount is plenty of power for this low-drag machine.



Receiver packed in foam leaves plenty of room for the elevator servo.

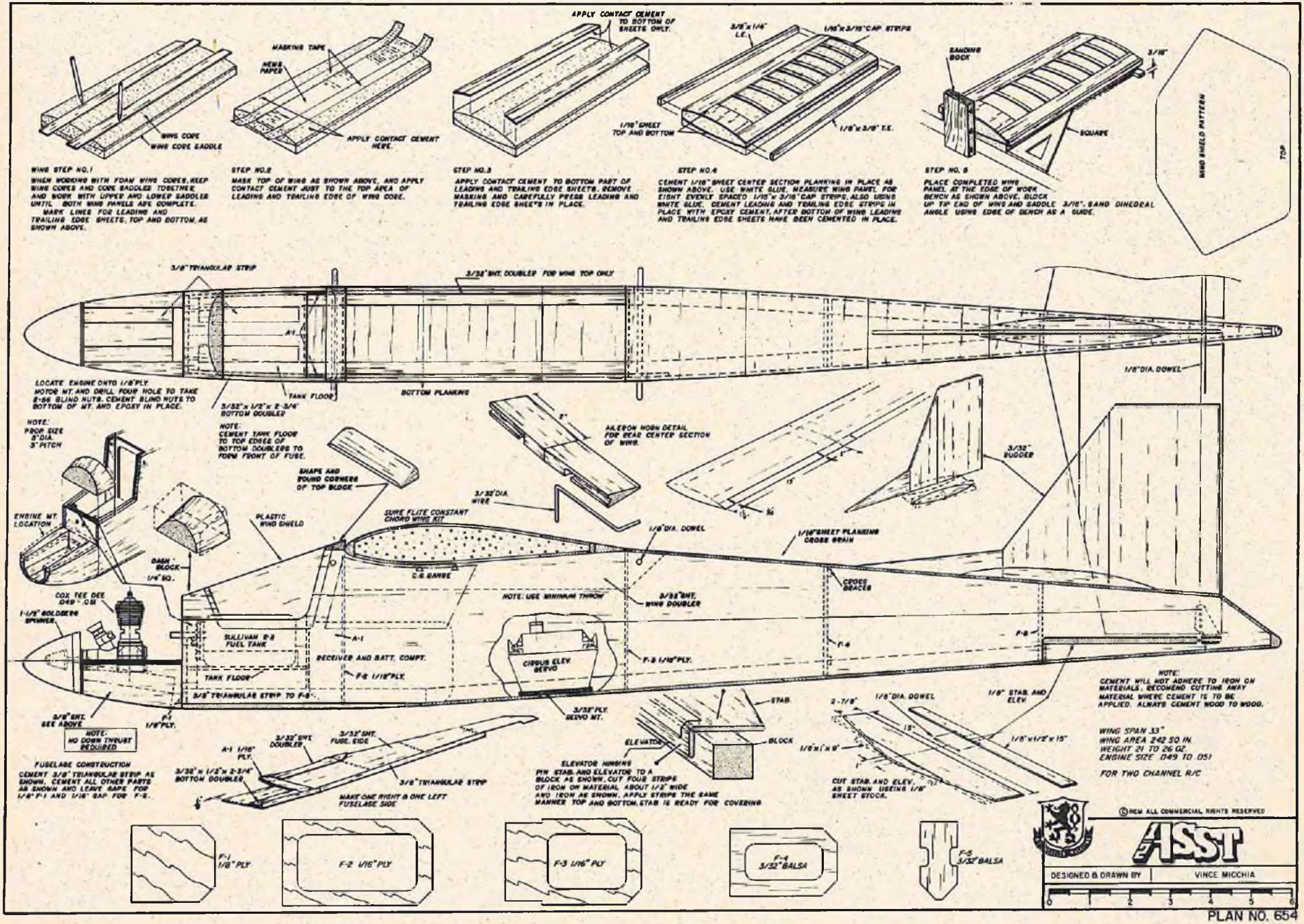


Aileron servo installation and linkage in the foam core wing.



Gold'N-Rod pushrod connection from servo to elevator. Note vertical fin supports.

Fast building, good looking, and no frills make the SST an excellent aileron trainer or sport ship.


WING CORE
WING CORE SADDLE
WING STEP NO. 1
WHEN WORKING WITH FOAM WING CORES, KEEP WING CORES AND CORE SADDLES TOGETHER AND WORK WITH UPPER AND LOWER SADDLES UNTIL BOTH WING PANELS ARE COMPLETE.
MARK LINES FOR LEADING AND TRAILING EDGE SHEETS, TOP AND BOTTOM, AS SHOWN ABOVE.
MASKING TAPE
NEWS PAPER
APPLY CONTACT CEMENT HERE.
STEP NO. 2
MASK TOP OF WING AS SHOWN ABOVE, AND APPLY CONTACT CEMENT JUST TO THE TOP AREA OF LEADING AND TRAILING EDGE OF WING CORE.
APPLY CONTACT CEMENT TO BOTTOM OF SHEETS ONLY.
STEP NO. 3
APPLY CONTACT CEMENT TO BOTTOM PART OF LEADING AND TRAILING EDGE SHEETS. REMOVE MASKING AND CAREFULLY PRESS LEADING AND TRAILING EDGE SHEETS IN PLACE.
3/8" x 1/4" L.E.
1/16" x 3/16" CAP STRIPS
1/16" SHEET TOP AND BOTTOM
1/8" x 3/8" T.E.
STEP NO. 4
CEMENT 1/16" SHEET CENTER SECTION PLANKING IN PLACE AS SHOWN ABOVE. USE WHITE GLUE. MEASURE WING PANEL FOR EIGHT EVENLY SPACED 1/16" x 3/16" CAP STRIPS. ALSO USING WHITE GLUE, CEMENT LEADING AND TRAILING EDGE STRIPS IN PLACE. WITH EPOXY CEMENT, AFTER BOTTOM OF WING LEADING AND TRAILING EDGE SHEETS HAVE BEEN CEMENTED IN PLACE.
SANDING BLOCK
3/16"
SQUARE
STEP NO. 5
PLACE COMPLETED WING PANEL AT THE EDGE OF WORK BENCH AS SHOWN ABOVE. BLOCK UP TIP END OF WING AND SADDLE 3/16", SAND DIHEDRAL ANGLE USING EDGE OF BENCH AS A GUIDE.
WING SHELF PATTERN
TOP
3/8" TRIANGULAR STRIP
3/32" SHT. DOUBLER FOR WING TOP ONLY
A-1
TANK FLOOR
BOTTOM PLANKING
1/8" DIA. DOWEL
LOCATE ENGINE ONTO 1/8" PLY. MOTOR MT. AND DRILL FOUR HOLE TO TAKE 2-56 BLIND NUTS. CEMENT BLIND NUTS TO BOTTOM OF MT. AND EPOXY IN PLACE.
3/32" x 1/2" x 2-3/4" BOTTOM DOUBLER
NOTE: CEMENT TANK FLOOR TO TOP EDGES OF BOTTOM DOUBLERS TO FORM FRONT OF FUSE.
NOTE: PROP SIZE 8" DIA. 3" PITCH
AILERON HORN DETAIL FOR REAR CENTER SECTION OF WING.
3/32" RUDDER
SHAPE AND ROUND CORNERS OF TOP BLOCK
3/32" DIA. WIRE
ENGINE MT. LOCATION
PLASTIC WIND SHIELD
SURE FLITE CONSTANT CHORD WING KIT
1/8" DIA. DOWEL
1/16" SHEET PLANKING CROSS GRAIN
DASH BLOCK 1/4" SQ.
C.G. RANGE
CROSS BRACES
COX TEE DEE .049 - .051
1-1/8" SOLDERED SPINNER
NOTE: USE MINIMUM THROW
3/32" SHT. WING DOUBLER
SULLIVAN 8-8 FUEL TANK
A-1
RECEIVER AND BATT. COMPT.
F-2 1/16" PLY.
CIRCUS ELEV. SERVO
F-4
F-5
TANK FLOOR
3/8" TRIANGULAR STRIP TO F-5
3/32" PLY. SERVO MT.
3/8" SHT. SEE ABOVE
F-1 1/8" PLY.
NOTE: NO DOWN THRUST REQUIRED
STAB.
ELEVATOR
BLOCK
2-7/8"
1/8" DIA. DOWEL
1/8" STAB. AND ELEV.
15"
1/8" x 1-1/2" x 15"
1/8" x 1" x 9"
NOTE: CEMENT WILL NOT ADHERE TO IRON ON MATERIALS. RECOMEND CUTTING AWAY MATERIAL WHERE CEMENT IS TO BE APPLIED. ALWAYS CEMENT WOOD TO WOOD.
WING SPAN 33"
WING AREA 242 SQ IN.
WEIGHT 21 TO 26 OZ.
ENGINE SIZE .049 TO .051
FOR TWO CHANNEL R/C
FUSELAGE CONSTRUCTION
CEMENT 3/8" TRIANGULAR STRIP AS SHOWN. CEMENT ALL OTHER PARTS AS SHOWN AND LEAVE GAPE FOR 1/8" F-1 AND 1/16" GAP FOR F-2.
A-1 1/16" PLY.
3/32" SHT. DOUBLER
3/32" SHT. FUSE. SIDE
3/32" x 1/2" x 2-3/4" BOTTOM DOUBLER
3/8" TRIANGULAR STRIP
MAKE ONE RIGHT & ONE LEFT FUSELAGE SIDE
ELEVATOR HINGING
PIN STAB. AND ELEVATOR TO A BLOCK AS SHOWN. CUT FOUR STRIPS OF IRON OR MATERIAL ABOUT 1/2" WIDE AND IRON AS SHOWN. APPLY STRIPS THE SAME MANNER TOP AND BOTTOM. STAB IS READY FOR COVERING
CUT STAB. AND ELEV. AS SHOWN USEING 1/8" SHEET STOCK.
F-1 1/8" PLY
F-2 1/16" PLY
F-3 1/16" PLY
F-4 3/32" BALSA
F-5 3/32" BALSA
©NEW ALL COMMERCIAL RIGHTS RESERVED
ASST
DESIGNED & DRAWN BY
VINCE MICCHIA
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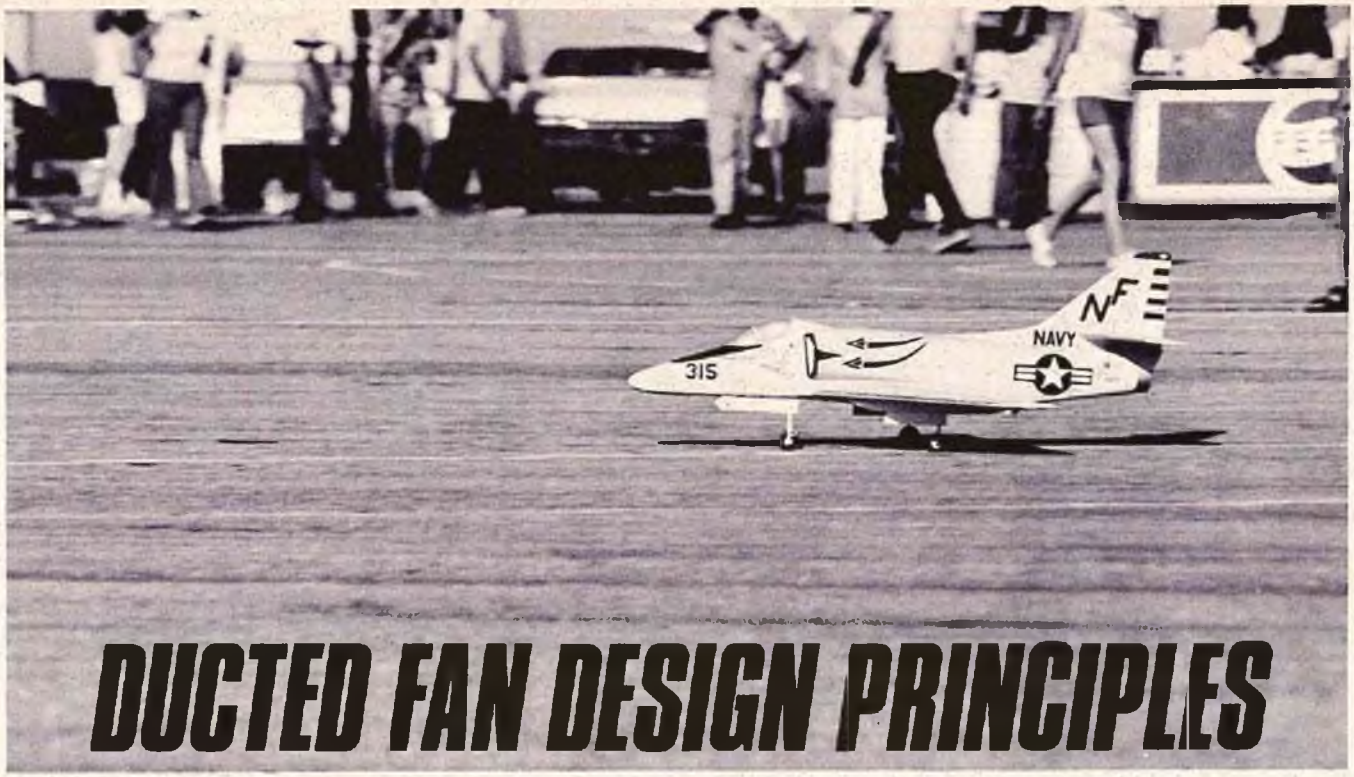
PLAN NO. 654



DUCTED FAN DESIGN PRINCIPLES

Stand-Off Scale A-4 Skyhawk designed and built by Bob Violett, taking off for demonstration flights at recent Bakersfield Formula I contest. All fiberglass fuselage and built-up wings. This has proven to be an extremely stable platform (much to our surprise) and is one which an average flyer could handle with a good power plant.

PART II

This is the second part of a three part series on ducted fans and their application to model airplane use. The first article dealt with the conceptual development of the Turb-Ax units, and the equations which relate thrust to known parameters. As was discussed in the first article, the way to achieve maximum performance is to put as much horsepower into a ducted fan as the state of the art will allow. This means using the racing 40's which are currently producing up to 2.5 H.P. at an engine weight of 10-12 ounces. This article will deal predominantly with the technique with which Bob Violett and myself have found to be the most effective method of throttling, muffling, and installing a fan unit within a fuselage. The last article will deal with the construction of the A-4 Skyhawk Stand-Off Scale fiberglass jet.

Before we start, I think it best to reiterate the main points brought out in the first article since they set the stage for the design philosophy of J.J. Scozzi, Inc., and Bob Violett:

1. A model jet must be capable of performing with the top pattern .60 size aircraft. We will not accept a lack-luster performance just for the sake of flying a Stand-Off Scale jet.

2. If you are looking for magic from a ducted fan, forget it, you're wasting you time. Spend more time maximizing your engine performance, correctly installing it into a fuselage (a clean installation), and construction methods which will keep your aircraft within an acceptable weight limit.

3. Static thrust only is important in the low speed categories. What is more important, is the dynamic thrust level. This is a very difficult thing to measure and to be sure the most effective way is how does the aircraft behave in the air.

4. The success of a ducted fan model is to keep the model small and light. A jet cannot be scaled 1 for 1. There must be some "cheating" done for the sake of a superior flying model. These areas primarily are the jet exhaust and the wings.

5. The air mass moving through a ducted fan is far less than a propeller. The velocity must be greater in order to end up at the same thrust levels as a propeller. Because of this fact, a slight disturbance (either upstream or downstream) will result in a thrust deterioration. Dcuted fan are very critical of any "off-design." You can take your Ugly Stik off the deck at half throttle, but you will not do it with a ducted fan. You can hang all sorts of disturbances in the slip stream of an 11" prop and it will get adequate performance. This again is not true of a ducted fan.

6. There is no such thing as an optimized ducted fan. The optimum propeller for a glider is not the optimum propeller for a pattern craft. The optimum transmission for a truck is not the optimum transmission for an Indy racer, etc., etc. There might be an optimized configuration for a specific application which might exist on a very narrow level. On a broader level, we can only speak of an effective compromise.

7. The equation was formulated which relates thrust to the basic parameters and that is:

$$T = 2.57\ (HP)2/3\ (D)2/3\ eff.$$

Where:
HP = the horsepower of the engine.
D = the exit diameter of your aircraft in inches.
eff. = the eff. of the fan system which is approximately 65 to 75% for a well designed fan.

With all of these points behind us, let's discuss the main points of this article:

Throttling

As was brought up, and hopefully the modeler will agree, the way to get maximum jet performance is to use engines which give the maximum horsepower for the least amount of weight. The route to take is to utilize the trememdous power of the racing .40's. There is one drawback, or that is, there used to be. The racing .40's do not come equipped with throttleablecarb simply because the people who used them in the racing circles have no need for them. They want only top end performance which means a straight open venturi, with as large a hole as engine design will allow. If a throttle carb were used, it would necessarily have to restrict the opening in order to allow for a reasonable idle. In the ducted fan world, this is disastrous. An engine which is normally capable of 20,000 rpm with the Turb-Ax I unit, would be cut down to approximately 17,500 rpm or 18,000 rpm by the addition of a carb which gave an adequate idle. The deterioration of performance is quite significant with a 2,000 rpm drop. We cannot tolerate this, as this will result in a severe performance loss in the

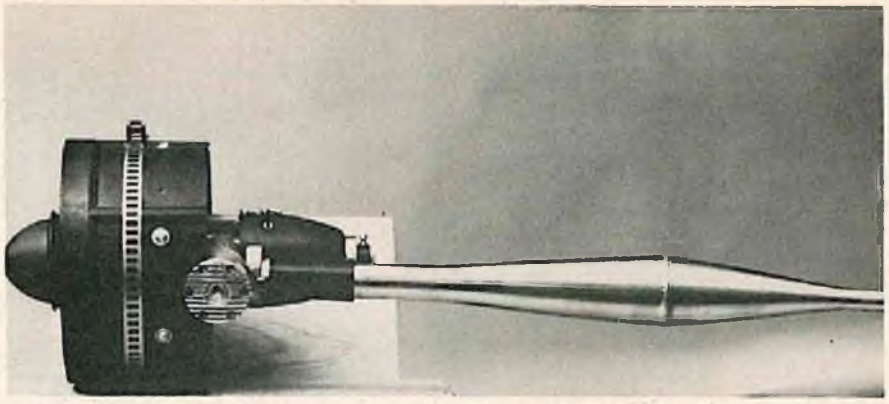
By James J. Scozzafava
President, J.J. Scozzi, Inc.

aircraft. The faster you can rotate that prop, the better off you are. There is another problem inherent in a ducted fan system, and that is location of the fuel supply. The ducted fan system does not lend itself to positioning the fuel supply directly behind the engine as in a classical propeller design. A remote fuel location is almost required. This means a pressurized fuel supply (crankcase pressure) in order to get an adequate supply to a large bore carb (which is needed for top rpm). With a large bore venturi under pressure, the top end is fine, however, when we come off the top end to an idle condition, the condition is aggravated by the fact that the fuel tank is under pressure (even though it is on idle) and then pumps an over supply of raw fuel into the engine and either kills the flame or makes the transition from idle to high rpm bumpy and discontinuous.

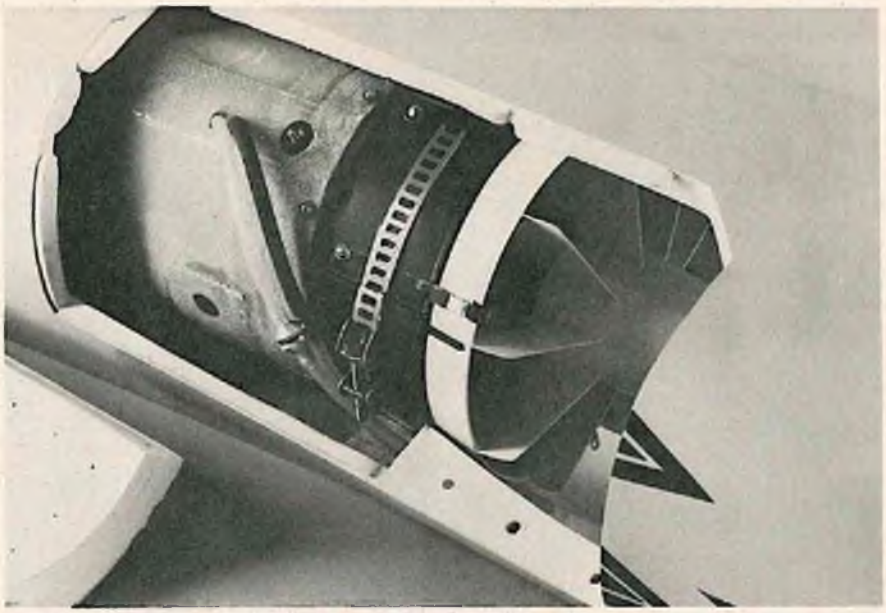
We have tried many different systems, and we are not saying they will not work. Almost anything can be made to work if you try long and hard enough, and to be sure, we do not want to discourage any experimentation on the modeler's part. The system which we have found to be the least critical, easiest to use, and one which does not compromise the top attainable rpm, is as follows:

We use the engine in its racing configuration; that is, an open racing venturi, or the venturi which is supplied with the engine. The bore is somewhere in the vicinity of 0.375". We must emphasize that there is no rotary barrels in the venturi, which means there is no hook-up to the carb which is in an inaccessible area (the tail cone). The way we throttle is via an exhaust baffle. This restricts the flow of exhaust gases and then limits the incoming gases which results in an idle capability. This has the added feature of keeping in the engine heat which prevents engine flame out. In addition, we need another item which is really the heart of the system. This comes in the form of a Perry fuel pump. We do not, however, use the pump portion. We not have a system which is automatically fuel controlled. The complete set-up is as follows. A racing engine is used with the open venturi and an exhaust restrictor. A fuel tank can be placed anywhere in the aircraft (another added feature of this system). The fuel tank is pressurized via the crankcase pressure from the engine. From the tank, we run a fuel line to the Perry regulator. From the Perry regulator we run a short fuel line to the venturi on the engine. The Perry regulator **is not mounted on the engine**, but in the tail cone. It is epoxied into place in a cut-out provided for it.

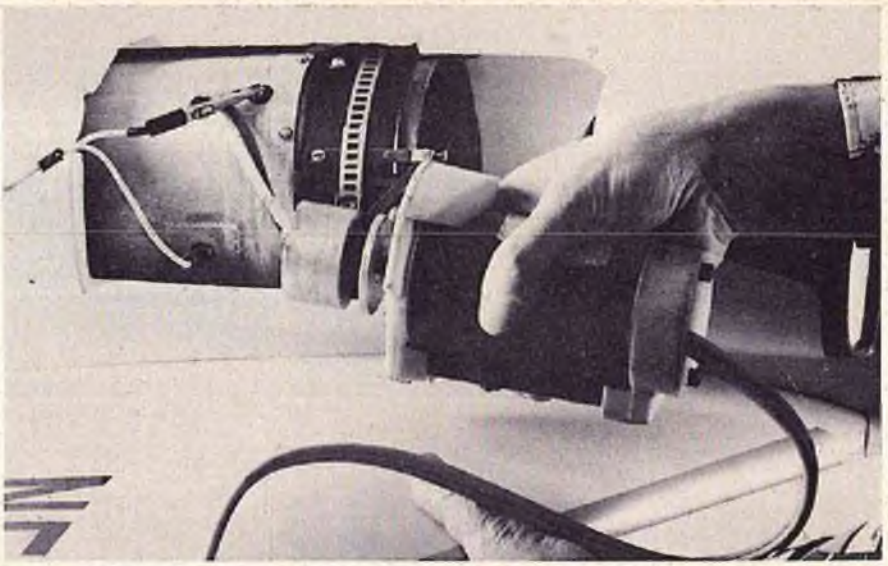
As can be seen in the photograph, this set-up is extremely clean and easy to operate. There are no hook-ups necessary in the tail cone area which means we do not have to cut into the tail cone for a linkage nor for carb adjustment. The only adjustment necessary is in the needle valve adjustment. The only hook-up which is needed is to the exhaust baffle arm, and in the rear rotor engines. This is in a very accessible area. There is another adjustment which is necessary, but this can be done on a workbench



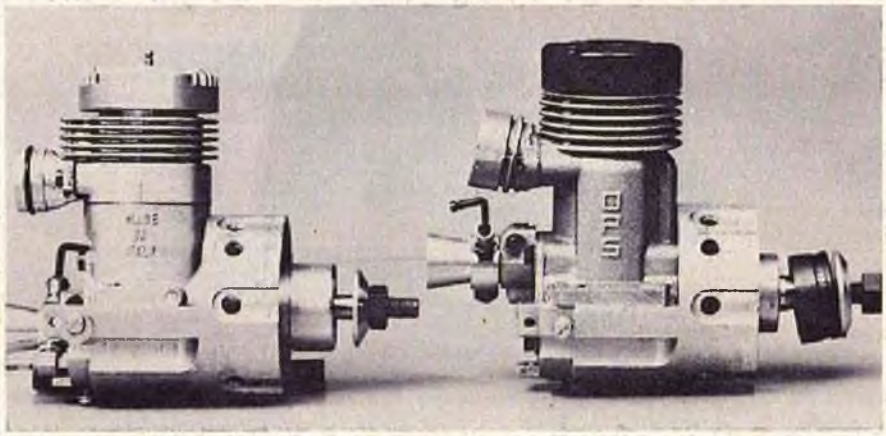
This is the method we use to throttle the racing .40's. A straight open venturi in combination with an exhaust baffle. The heart of the system is a Perry regulator epoxied in the tail cone. The system is completed by the addition of a tuned pipe which acts as a muffler. The completed system produces in excess of 2.4 HP and the all-up weight is approximately 28 ounces. The advantages of this system, as well as its use, is explained in the text.



We are currently evaluating Inlet Guide Vanes, shown by the white piece in front of the rotating prop. They are snapped into place with engine in idle condition, but will simplify for the modeler. The advantages are increased breathing capacity in a low speed condition, while not affecting high speed flight which is the case with highly curved starter vanes downstream of the rotating prop. Note the metal strap which is supplied with all Turb-Ax I units. The entire unit is attached with one screw.



This is the starting procedure we recommend. An electric starter is used with a belt around the knurled section of the Turb-Ax spinner.



This picture shows the correct installation of the Super Tigre X 40 and the OPS 40 for use with the Perry Pump. If you have a Turb-Ax I unit and wish to trade-up to a new model with pump, write to J.J. Scozzi, Inc., for details. Note that a new system is characterized by 5 mounting holes for the tail cone, and a 1¼" diameter hole in the tail cone rather than 3/8".

Checking the ducted fan A4D, prior to one of several demonstrations at Bakersfield. Built and flown by Bob Violett, the A4D awed the spectators, many of them seasoned race pilots.

prior to putting the unit into the plane. This is the setting for the Perry fuel pump. The instructions are in the package when the pump is purchased. The fuel pump can be purchased from J.J. Scozzi, Inc., slight modification is done to a stock Perry pump, so that it is ready for installation into the Turb-Ax unit.

At this point, it is well to touch on the subject of the engine rpm and what does it mean. In a ducted fan (not only Turb-Ax, but any ducted fan) the key to performance is high rpm. We cannot do it with any less. There is a significant difference in aircraft performance between an engine which swings the Turb-Ax prop 18,000 rpm and one which swings 21,000 rpm. The engine produces far more HP at 21,000 than at 18,000. How much power? With any propeller, the increased power required is proportional to the speed ratio cubed, so that the needed HP increase is:

$$\frac{21^3}{18} = \frac{21}{18} \times \frac{21}{18} \times \frac{21}{18} = 1.58$$

That means that if 1.3 HP were necessary to turn the Turb-Ax prop (or any prop) at 18,000 rpm, it would take an engine of 1.3 x 1.58 = 2.05 HP to turn it at 21,000 rpm. We can see that this is a tremendous HP increase. For all you people who have tacked their Turb-Ax units, we are getting 22,500 rpm at the top and 5,000 rpm at the lower end with the set-up pictured. This is equivalent to better than 7 pounds static thrust when measured on a test bench. The way this was achieved in a K & B SR II with a pipe (muffler) and the Perry fuel pump system described, and on 50% nitro. We estimate the engine is producing approximately 2.4 HP and we anticipate increasing the rpm by 1,000 rpm once we learn how to use the engine better. This is the power which is necessary to fly (and perform) a 9 pound internal jet. The Super Tigre X-40 and the OPS 40, in addition to the K & B 6.5cc are capable of these power levels. We recommend these three, not because they are the best .40's, but because they lend themselves to the complete system approach which included a muffler (pipe), which is the subject of our next discussion.

Muffling The Ducted Fan

Hopefully, the modeling world is convinced that horsepower and high rpm are the main ingredients to a performance Stand-Off Scale jet. We have shown you how we have throttled the unit without sacrificing a single rpm at the top end. We now must muffle the unit in order to be able to fly at normal club airfields. Again, this can be done, but normal mufflers rob you of 200, 300, or even 1,000 rpm, which we cannot tolerate in a ducted fan. There is a technique which is available, and that is using a tuned pipe which in effect, is a muffler. This muffler, however, gives us 1,000 rpm instead of decreasing it. Some of the reasons they have not been used in the past, is that modelers are unfamiliar with them, and another is that only recently engines are being made in the

rear exhaust version which is a natural for pipe installation. Boaters have been using them for a long time and they can tell you of the performance increase as well as the muffling effect. In the Turb-Ax installation, the pipe is supported by the tail cone.

So there it is, modelers. This is how we throttled the racing .40's and muffled them. To be sure, there are other ways, but we have found this to be effective and easy to use.

Installation Within A Fuselage

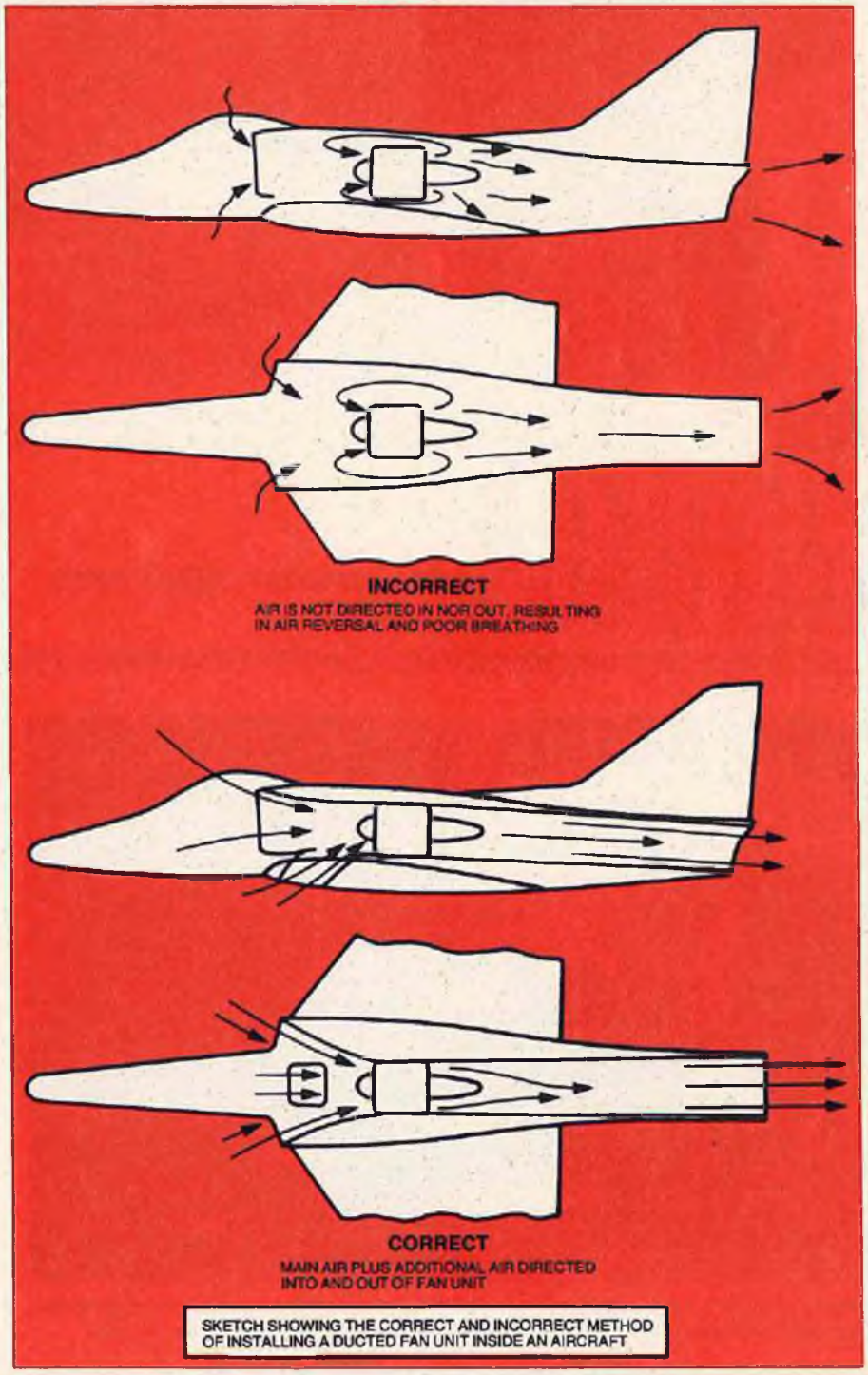
One of the most important aspects of a successful ducted fan aircraft is the method in which the unit is placed within a fuselage. We will touch on this subject in greater detail in the next article, but we will give the basis of what we have found to be the way. First, we must re-emphasize the fact that with a ducted fan we are moving a small amount of air to a great velocity. Any slight disturbance to a high velocity airstream has a greater thrust percentage reduction than the same disturbance has on a slower moving airstream. Because of this, we must "tell" air where to go. We must duct the high speed air from the rear of the Turb-Ax unit to the exit of the aircraft via an inner tube. In addition, we must provide an intake for the unit which is clean so that the unit is not starved for air. The included sketch shows the correct and incorrect way of installation. Note that the intakes are lined from the cheek cowls to the unit. This is so that the air is laminar as it enters the unit.

At this point, it would be well to touch on the subject of intake and exhaust areas. Since a ducted fan is a constraint mass device without any thermodynamic changes, the exit area should be the net area of the blade "swept" area. This works out to be approximately 4-4½ inches on the exhaust for the Turb-Ax I unit. This can be varied by a slight amount, but not too much. The intake air is another story. There is no such thing as "enough" intake air. The only limitation is that of a scale looking aircraft. In any ducted fan application, it is essential that one provide more intake air than scale craft will allow. For this reason, we have provided additional air on the bottom of the fuselage of the A-4. The total amount of intake area is approximately 28"^{2} between cheek cowls and the additional air scoop. Note, in the picture showing the inlet guide vanes, one can see how the intake is lined right up to the Turb-Ax unit. More will be written on the inlet guide vanes in forthcoming issues. We have found that these guide vanes in front of the propeller will improve the breathing capacity at low speeds, as well as not hindering high speed flight! This is directly opposed to highly curved stator vanes downstream of the prop, which also helps the breathing capacity at low speeds, but performance will rapidly degrade at high speed flight. This is as close to a controllable pitch propeller without any of the complexity of a mechanical device. We are evaluating this addition and trying to find a way to put it in the modelers hands.

We have not talked about a very small but important task; how does one start the unit? We start them with an electric starter with a belt, as in helicopter fashion. Once these .40's are broken in, we find they start quite easily. The K & B 6.5 cc when new, are extremely tight and must be loosened up by bench test running.

At this point, I would like to mention that all of the items mentioned in this article are available from J.J. Scozzi and if interested, you would obtain information by writing to J.J. Scozzi, Inc., P.O. Box 40152, Washington, D.C. 20016. In the next article, we will go into detail into the construction and flight characteristics of the Skyhawk A-4. □

Bob Violett's A4D flying at Bakersfield.



SKETCH SHOWING THE CORRECT AND INCORRECT METHOD OF INSTALLING A DUCTED FAN UNIT INSIDE AN AIRCRAFT

Here's the winner of the helicopter competition. It's called the Du-Baby. Du-Bro 500 fuselage fitted to a Schluter Heli-Baby mechanics. A beautiful job of combining two fine products. Du-Baby by R.L. Catt from Ohio.

NRCHA

BY GRADY HOWARD (N1C)

NRCHA Nationals booth. Mrs. Don Chapman behind Don's white-and-gold Jet Ranger and son's Heli-Baby. Bill Curtis' black Kavan Jet Ranger at left.

The Toledo Show had no real dramatic changes to offer in the field of helicopters this year, although there were many improvements unveiled to older models that will make these stand-bys much better machines.

For instance, Du-Bro introduced their new Shark .60, which is a .60 powered version of their very popular Shark. Considerable improvements were made to the overall linkages, as well as the addition of their new control "cans" which should make the Shark .60 an extremely popular helicopter in the months to come.

A collective pitch rotor head was also introduced on the Schluter Heli-Baby by Model Rectifier Corporation. The new system works off the motor servo so no fifth servo is needed. The new version is called the Super Baby and was mounted on Schluter's new training stand designed to ac-

comodate the Heli-Baby, or Super Baby, and allows you to control the helicopter in all axes, while mounted to the stand with no chance of damage to the chopper.

The Kavan booth sported the New Kavan model of the French Alouette II. This is a .40 powered scale helicopter that should be available by the time you read this column.

Model Rectifier Corporation also showed the new Kalt Baron, imported from Japan. This is also a .40 powered helicopter, featuring some excellent engineering techniques.

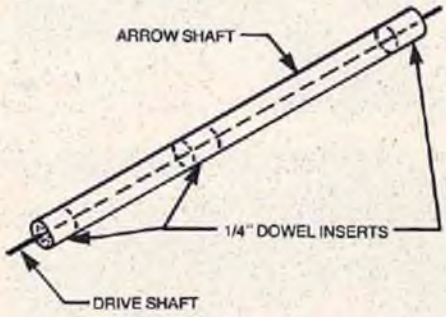
A new company was introduced this year at Toledo, along with its new American made helicopter. American R/C Helicopters, Incorporated, headed by John Simone of Mission Viejo, California, showed their new machine, the Rev-Olution. This is also a .40 powered helicopter that can be ordered in anodized red or blue colors, as a kit with, or without, K & B .40 engine, but complete with fuel tank and Semco muffler. In addition, the Rev-Olution is also available completely assembled or can be ordered assembled, radio installed, and test flown.

Another popular booth was the NRCHA Nationals display. Here, there were entry forms and contest schedules for the upcoming NRCHA Nationals, the nation's largest helicopter competition, to be held in Greenville, Pennsylvania.

◆ ◆

Chopper Hints and Kinks

Richard R. Radcliff of Mercerville, New Jersey, had trouble with his Kavan Bell Jet Ranger when installing the tail rotor drive shaft. The placement of the bulkheads was difficult, due to the flexing of the shaft. When the installation was complete, and the shaft seemed to run true, it would whip when de-accelerating and disengage from drive. Here's a solution that Dick suggests for the original installation of your drive shaft: Use a fiberglass arrow shaft as an alignment tool and as a guide tube for the shaft drive. The straightness of the arrow will make alignment easy and accurate. Add 1/4" doweling as bearings, as shown in the sketch.

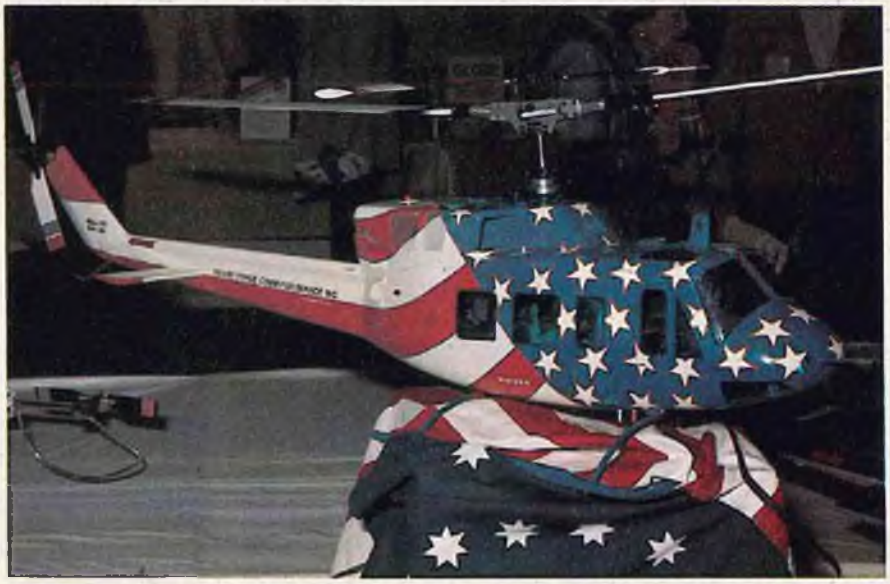


◆ ◆

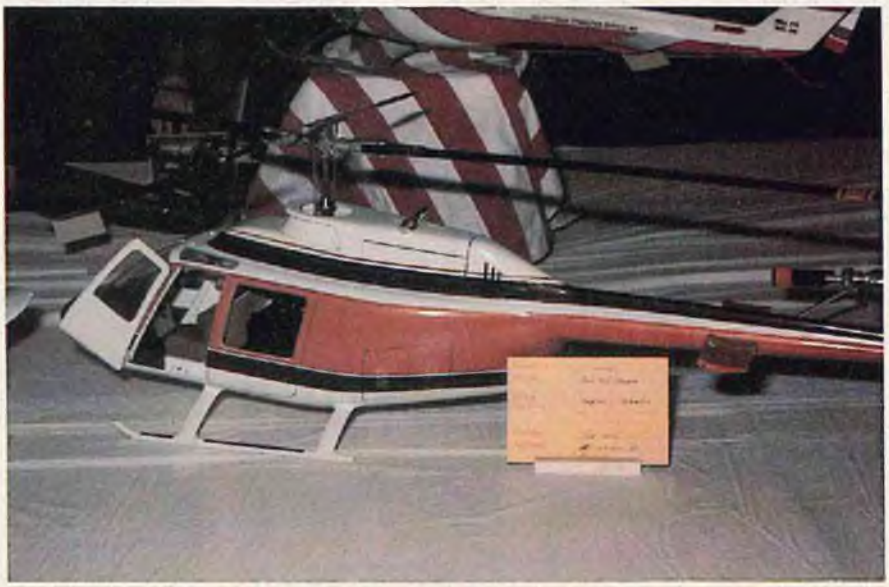
After flipping his Heli-Baby over a few times and breaking the blades and even the seesaw, Russell T. Morris of Maurice Town, New Jersey, thought he had better do something about it.

First, Russell obtained a piece of aluminum stock as close to 5/16" x 13/16" x 4⅛" as he could. He then milled it to the size shown in the drawing. Then he laid it

Tandem Rotor CH21 Shawnee was built by Al Doucette. Weathered look made it seem like a shrunk real helicopter.

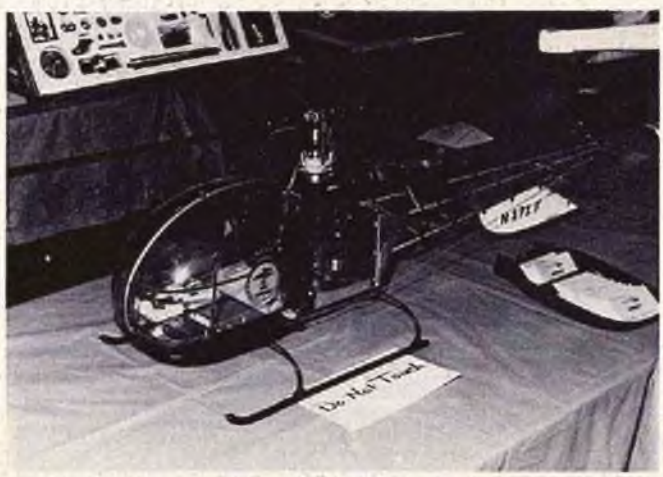


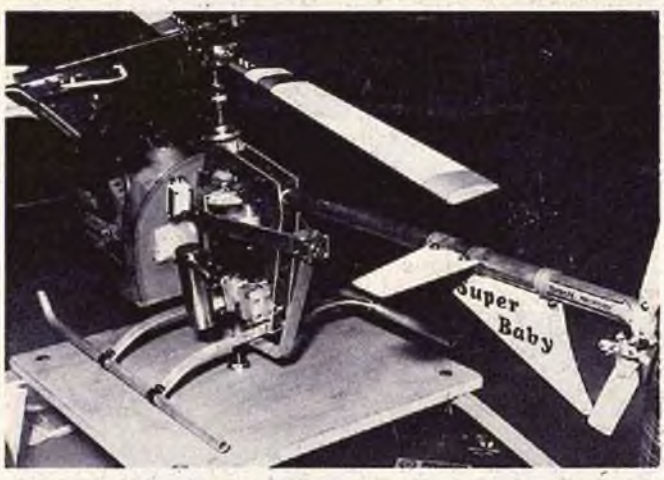
Walt George's beautifully painted Graupner Bell 212 was definitely the most colorful helicopter at Toledo.

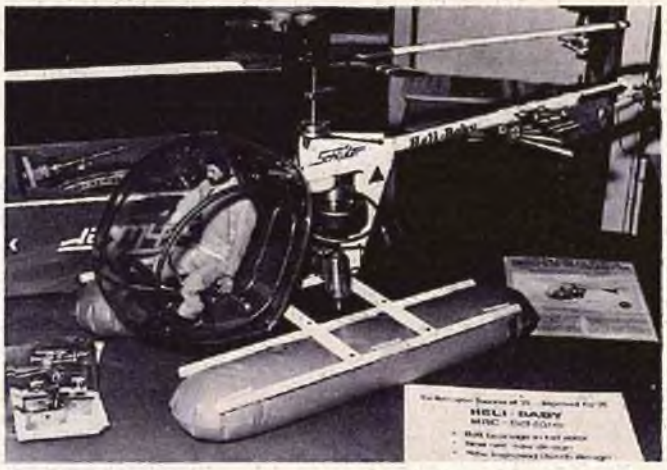


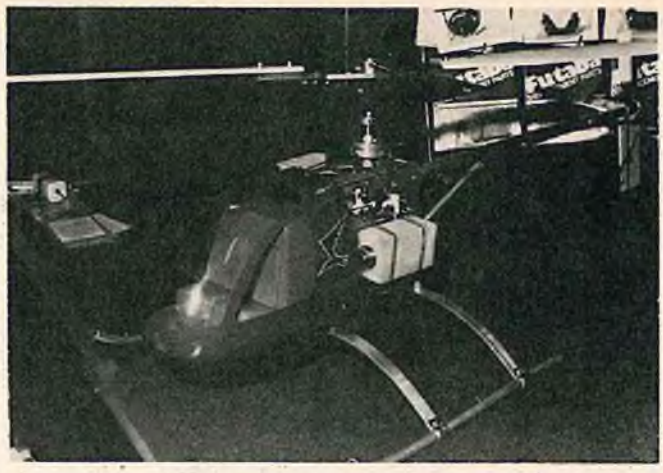
Tom Wells from Illinois had this beautifully detailed Kavan Jet Ranger. Leather seats and operational door.

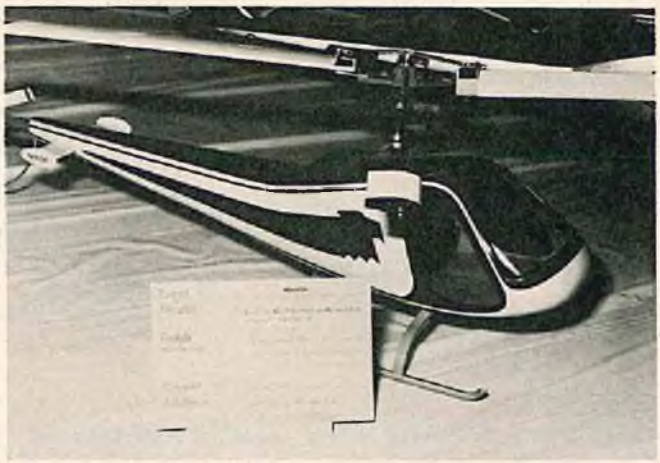
RIGHT: John Simone Jr., displays their new Rev-Olution. 2ND ROW (L): Kavan's Alouette II drew much attention. (R) Kavan's ever popular Bell Jet Ranger is always a show stopper. 3RD ROW (L): The Schluter Super Baby mounted on a new training table. This table is designed just for the Heli-Baby. (R) Here is standard Heli-Baby on floats. 4TH ROW (L): Dave Gray of Du-Bro Products holds their latest version of the Hughes 300. A fiberglass fuselage with panels and stringers molded in, offers a very good scale project. This fuselage fits the Shark 60 frame. (R) Du-Bro Products new Shark 60 drew lots of plus comments. A very stable and durable helicopter. Many improvements over the older O & R powered Shark.



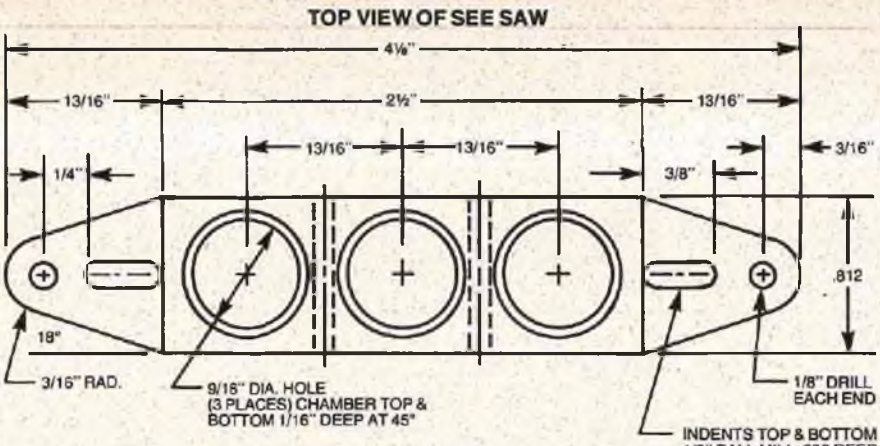


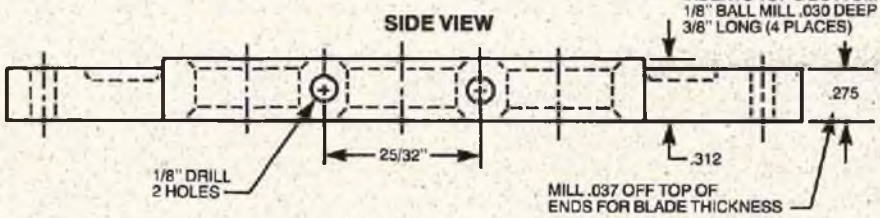


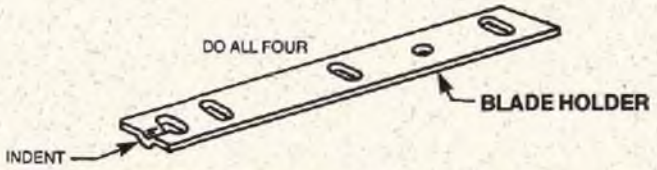


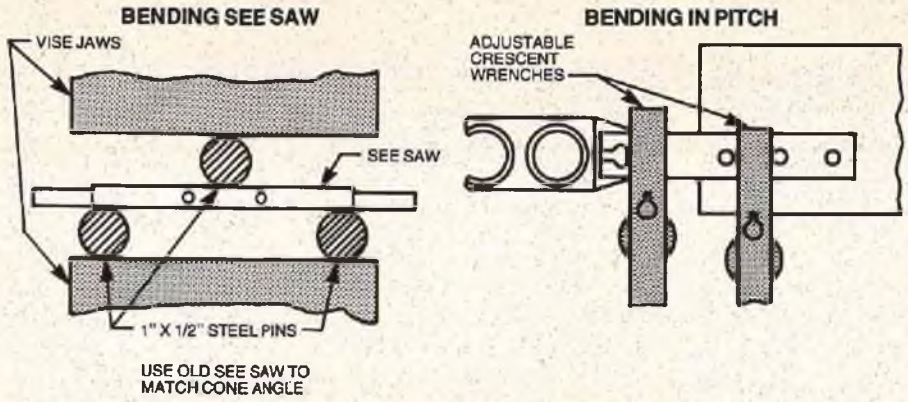


1ST ROW (L): MRC's Kalt Baron is a .40 powered import from Japan. (R) This helicopter was displayed at the Futaba booth but the attendants could offer no information on it. 2ND ROW (L): DS-22 Enstrom by Ron Kummer, Ohio. (R) A well-built Bell 205 by Elmer Nowak from Canada. Helicopter is scratch-built of plywood, balsa, and fiberglass. 3RD ROW (L): "Baby Jaws" was the name given to this small helicopter designed and built by Eugene Roc. Unique engine up front and controllable wings are for speed. (R) Another scratch-built helicopter by Peter Nill was this Enstrom using modified Polecat mechanics. LEFT: Kavan Jet Ranger by Roy Dietz featured blinking lights and detailed cockpit. Side door hides all of the switches and charging jacks.









out with the centerline lengthwise and one crosswise. From here on, you can follow Russell's print.

The second step was bending the blade holders. First, they were flattened out. Next, Russell fastened the blade holder through the second hole with one bolt onto the seesaw, making sure the blades were parallel with the sides of the seesaw and covering the indent on the latter. Next, he took a screwdriver approximately 1/4" wide and punched the section between the bolt hole and the end of the holder into the indent of the seesaw. This same step is done to all four blade holders.

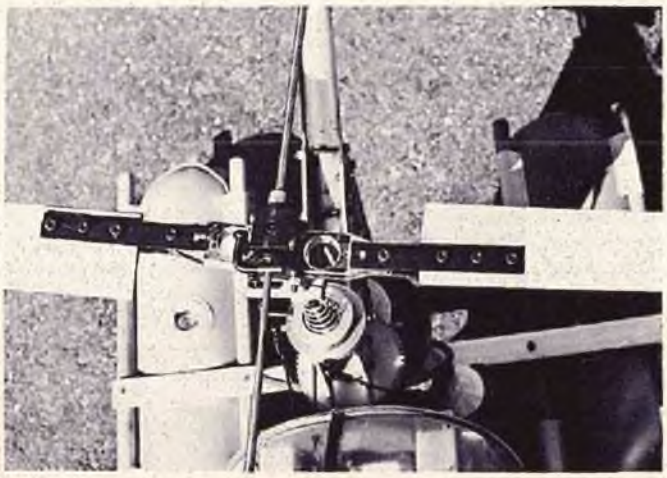
The final step is bending the cone angle into the seesaw. Using three pieces of 1/2" x 1" steel rod, place these and the seesaw in the vice jaws per the drawing. Finally, tighten up on the vice jaws to make the seesaw bend and match the coning angle of the old seesaw. If you intend to use cans on the flybars, instead of paddles, Russell suggests you inlay 1/32" wire on the trailing edge of the main blades to prevent nicks in the blades when they twist.

◆ ◆

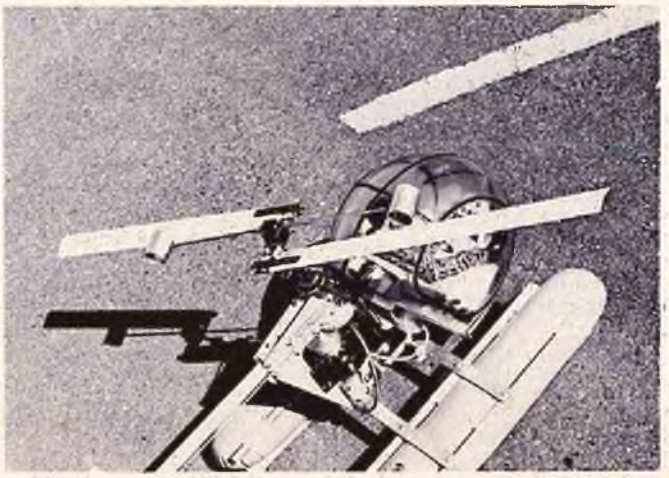
Caltronic Laboratory offers a complete line of quality stainless steel fasteners in small quantities ideal for model helicopters. The price structure and ordering procedures have been simplified, with all fasteners priced at $1.00 per package. The quantities in each package vary according to size and length. Sizes range from 0-80 to 10-32. Hex socket cap screws to 0-80 and hex head screws to 2-56 are stocked. In addition, precision miniature brass screws and threaded rods to 000-120 (.034 dia.) can be supplied.

All fasteners are of the highest obtainable quality and fully guaranteed. They are factory new, U.S. made, free from defects and made to Military Standards. As there are no minimum order requirements, purchases can be tailored to a specific project or as budgets permit. To reduce handling and shipping cost, a single charge of $1.00 covers any size order. A handy catalog is available for 25¢ each from Caltronic Laboratory, P.O. Box 36356, Los Angeles, California 90036. □

These photos of Russell Morris' modified Heli-Baby See-Saw show the unit mounted on the author's helicopter.

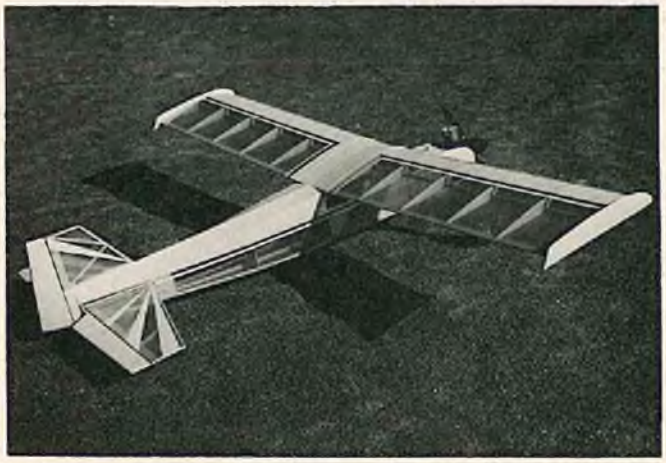


Here, the "break-away" mode is shown. Author recommends 1/32" wire inlay on blade T.E. if cans are used.



RCM PRODUCT TEST

BAUER MODEL AIRCRAFT
HARDWOODY



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

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

● The Hardwoody is a sport aircraft and basic trainer designed by Bauer Model Aircraft, 1025 Willow Lane, Howell, Michigan 48843. Priced at $26.95 it has a wingspan of 48" and a total wing area of 360 square inches and is designed for .15 to .19 cubic inch displacement engine. The recommended number of channels are three, operating rudder, elevator, and throttle. The kit is unusual in that it is constructed entirely of hardwood, utilizing spruce, bass and plywood in the fuselage; spruce, birch and plywood in the wing, and spruce tail surfaces. The kit hardware package includes landing gear, axles, and control horns. There is a five page instruction manual in addition to the plans. Although designed as a trainer, the plans fail to show any details concerning the mounting of radio gear, tank or engine. The fuselage construction, while unique, was quite difficult to align properly. The shaped parts were well finished and the instruction manual was extremely well done. The finished aircraft, covered with MonoKote, Solarfilm and trimmed with DJ's Multi-Stripe, was quite attractive and drew favorable comments at the flying field. With regards to the flight performance, it would be rated as excellent since the airplane is quite stable and responsive with an exceptional glide. However, because of landing gear location, take-offs were virtually impossible, due to ground looping tendencies and the airplane had to be hand launched. The position of the landing gear also adversely effects the Hardwoody on landings. Our protorype utilized an OS Max .25 Kraft radio, and weighed 40 ounces ready-to-fly for a wing loading of 19.6 ounces per square foot. We would recommend that the landing gear be moved rearward to a position under the leading edge of the wing. We would also recommend a more secure mounting of the tail wheel. The horizontal stabilizer should be of full-truss construction for warp-resistance. □

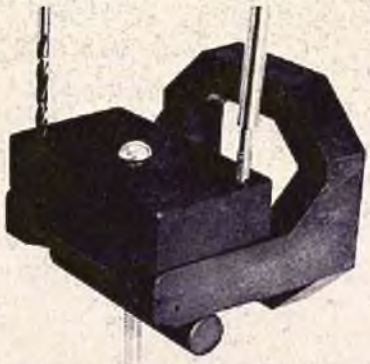
SPECIFICATIONS

Name	HARDWOODY
Aircraft Type	Sport Trainer
Manufactured by	Bauer Model Alrc. 1035 Willow Lane Howell, Michigan 48843
Mfg. Suggested Retail Price	$26.95
Available from	Both Manufacturer & Retail
Mfg. Recommended Usage	General Sport Aircraft
Wingspan	48 inches
Wing Chord	7½ inches
Total Wing Area	360 sq. in.
Fuselage Length	32¼ inches
Radio Compartment Dimensions	(L) 7⅜" x (W) 3"x (H) 4¼"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral (each tip)	1¼ inches
Stabilizer Span	20½ inches
Stabilizer Chord (incl. elev.)	6 inches
Total Stab Area	97 sq. in.
Stab Airfoil Section	Flat
Stabilizer Location	Mid-Fuselage
Vertical Fin Height	6½ inches
Vertical Fin Width (incl. rudder)	6¾ inches
Recommended Engine Size	.15 — .19
Recommended Fuel Tank Size	4 ounce
Landing Gear	Conventional
Recommended No. of Channels	1, 2, or 3
Recommended Control Functions	Rud., Elev., Throt.
Basic Materials Used In Construction:	
Fuselage	Spruce, bass, plywood
Wing	Spruce, birch, plywood
Tail Surfaces	Spruce
Hardware Included In Kit	Landing gear, axles, horns
Plan Size	Not given (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (5 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	40 — 56 ozs.
Wing loading based on rec. flying weight	16 — 23 oz./sq. ft.

RCM PROTOTYPE

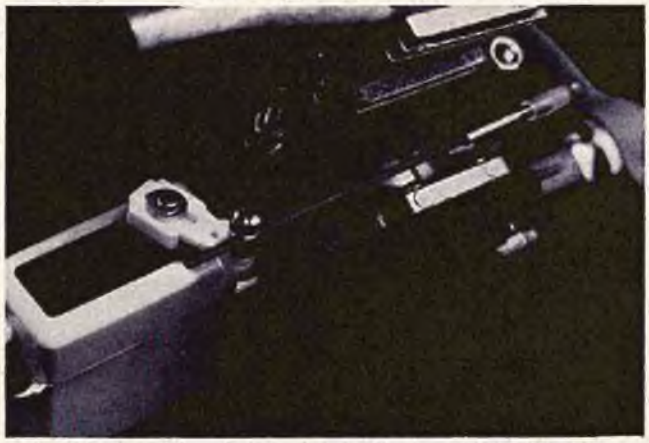
Weight, ready to fly	49 ounces
Wing Loading	19.6 oz./sq. ft.
Covering and finishing materials used	Solarfilm, MonoKote, DJ's
Engine Make & Disp.	O.S. Max 25
Muffler Used	No
Radio Used	Kraft
Tank Size Used	4 Ounce

DICK'S DISCOVERIES



Prather Products motor mount drill jig and tap guide takes the misery out of fitting mount to your engine. Sizes available for most popular engines.

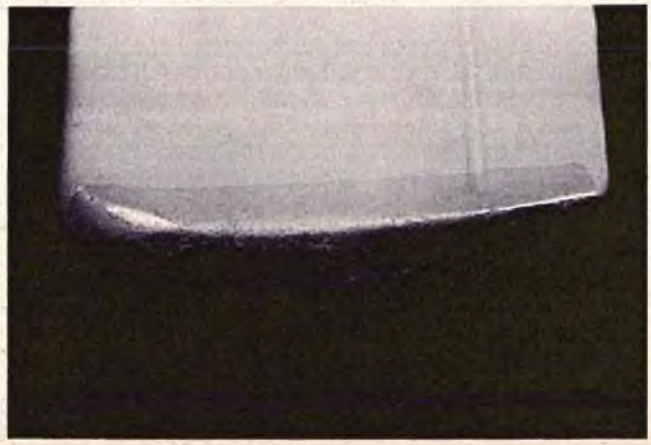
Dunham's adjustable servo arm is the easy way to match servo movement with throttle arm throw. Manufactured by Dunham's R & R.



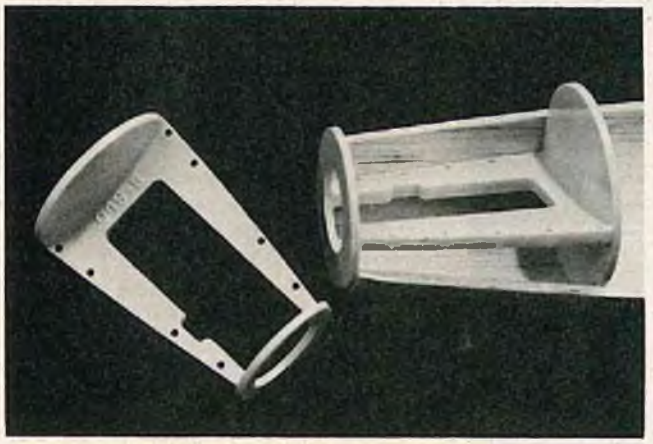
R/C MODELER MAGAZINE

D & B Model Aircraft has this Stand-Off Scale tail wheel fork. One side may be cut off for single yoke configuration.

Protection from runway rash is afforded by Scuff Guard from Allied Hobbies. It is a tough, transparent tape with an adhesive back. It protected the foam wings on our biplane.

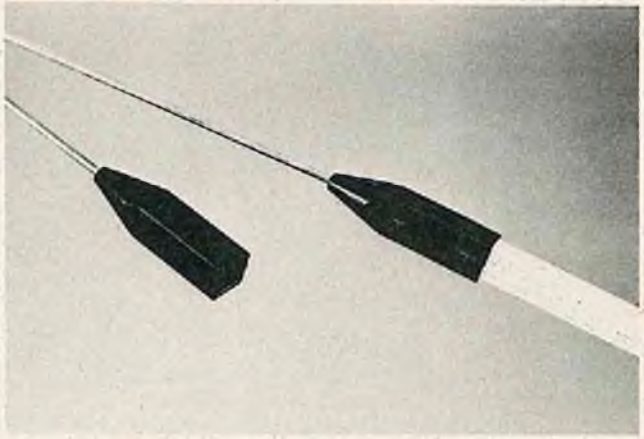


PRODUCT APPLICATIONS BY RCM'S PHOTO EDITOR, DICK TICHENOR



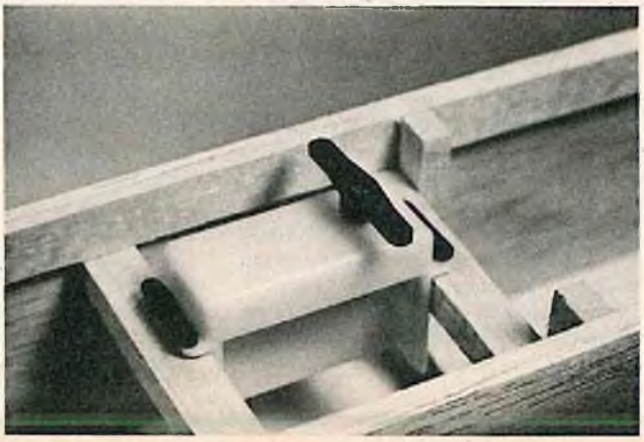
Power Cradle by Fourmost Racing Products makes spinner alignment easy for .049 engines. Primarily intended for 1/2A racers, but works well with any 1/2A ship.

Using instant pushrod ends from Rocket City Specialties will allow you to make the easiest and quickest pushrods known to man. Simply stick them over the end of 1/4 square strips.



X-Acto's part picker places small screws where you can't get your fingers. Most valuable in picking up screws, etc., that fall to the bottom of the fuselage.

Build up your control system with Rocket City Specialties' dummy servo. Drill guides are furnished to accurately locate mounting screw holes. This way you can fly your radio while you are building.



HERE'S HOW

BY JERRY SMI

Jerry Smith's Frequency Control Board with all frequencies displayed. During actual operation, only the frequencies in operation would be displayed while the blank side of open frequencies would appear on the FCB.

● If your club is like the one I belong to, there is a turn-over in membership every year. Some of the old familiar faces slip away and are replaced by new and eager RC'ers. All of these new faces have one thing in common with the older members; and that is, a frequency to fly on. The smaller clubs have fewer pilots on the flying field. These pilots become complacent with regard to frequency control simply because it's not a problem with them. But, as the club grows larger, so does the frequency control problem; a problem that can cause loss of property and create hard feelings between club members.

We were faced with this very problem at the beginning of the flying season. Our club had no frequency control system. With more pilots showing up at the flying field, we began to worry about the possibility of a frequency conflict. We had, in the past, used clothespins like many other clubs. But they always ended up broken or lost and nobody would bother to repair or replace them. It became a regular routine to walk the flight line and make certain those on your frequency knew you were going to fly. And, at the same time, you checked to see that they were "off". In order to survive, you made it your business.

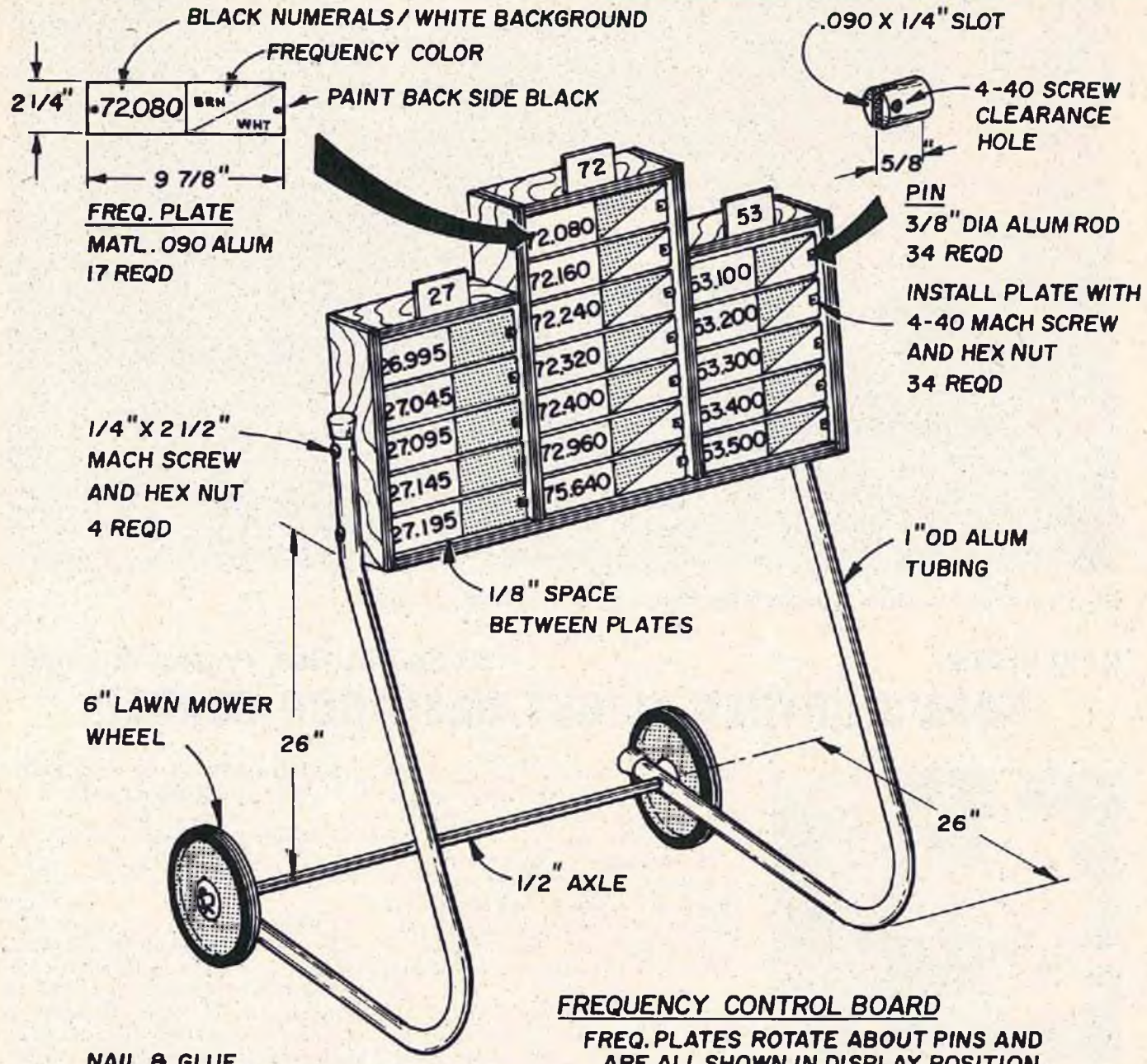
After careful consideration of our problem, I came up with a reasonable solution — a frequency control system with a different approach. Of course, I must admit it's not completely fool-proof. In fact, as long as the human element is involved, it is next to impossible to have a perfect system. Look at it this way: A traffic light doesn't keep you from going through an intersection, does it? But, it does provide you with a basic system to follow. And that's what we needed — a good basic system.

How does my system work? Very much like the traffic light at the intersection. When a pilot decides to fly, he first looks at the FCB (frequency control board). If his frequency is **not** displayed, he walks up to the FCB and rotates the plate bearing his frequency to the "display position." He then flies and, when completed (transmitter turned off), rotates his frequency off the FCB. Simple? OK, let's try a tougher situation. The pilot decides to fly and notes the FCB displays his frequency, but no one is flying. Could be the last guy to fly forgot to rotate the frequency off the board. Or, maybe the pilot is in the process of starting his engine. Or, the pilot had just rotated his frequency to "display position" and is walking back to start his engine. All these conditions are possible. What about the pilot wanting to fly? He now questions the use of his frequency. And that is exactly what we want him to do. **The pilot must question the use of his frequency for this system to be effective.** We also encourage pilots with like frequencies to group together on the flight line. When frequencies become crowded, all transmitters should be impounded with a man assigned to watch over the impound and FCB.

Another feature of this frequency control system is that it is self-contained. There are no parts to get lost or taken home. It should remain on the flying field at all times to be completely useful. Our FCB is layed down on the field and covered with plastic film for protection when not in use.

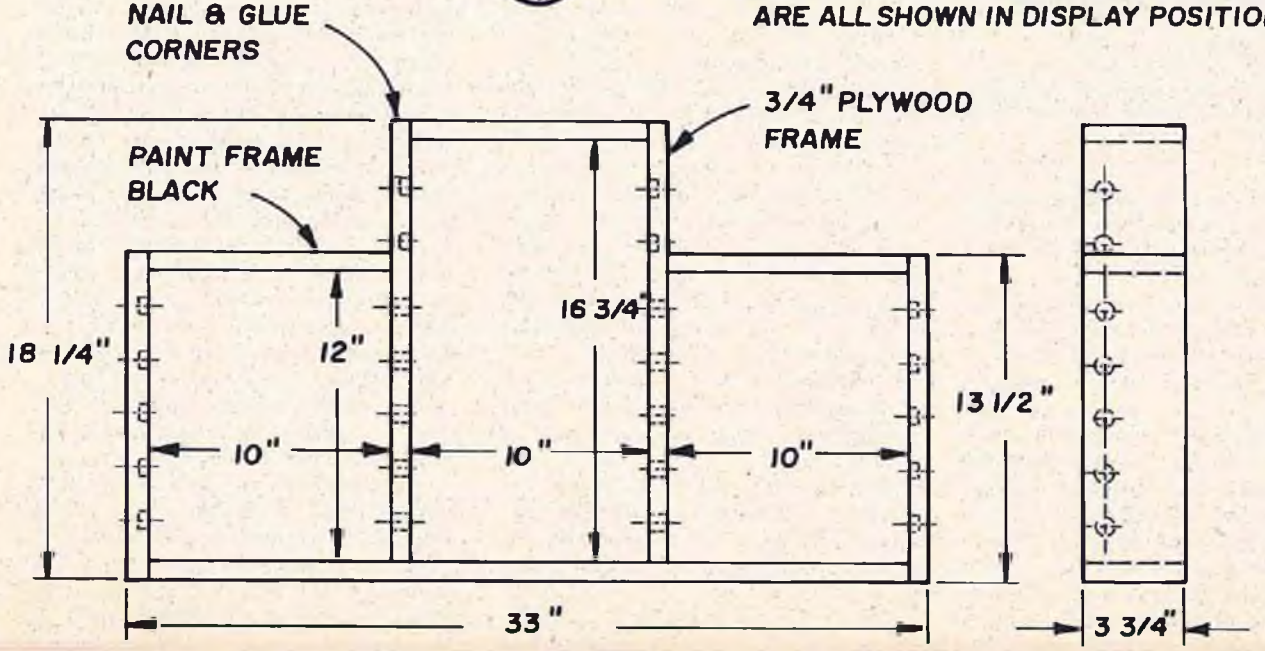
By far the best approach in building the FCB is to make it a club project. Go through the rank and file in your club and seek out their skills. I was lucky and found a machinist, a manufacturer of fabricated aluminum parts, and a wood worker - - - just the help I needed. When it came time to paint, the members were, again, polled for the different colors required to complete the project. This is an excellent way to keep the cost down and spread out the work.

The accompanying drawing will give you an idea of the FCB size. The fancy aluminum tubing support could be replaced by other means; however, I happened to run across that particular skill in my club and made use of it. The frequency control board, as presented here, may be just what your club needs. Does it sound interesting? Then give it a try! □



FREQUENCY CONTROL BOARD

FREQ. PLATES ROTATE ABOUT PINS AND ARE ALL SHOWN IN DISPLAY POSITION.



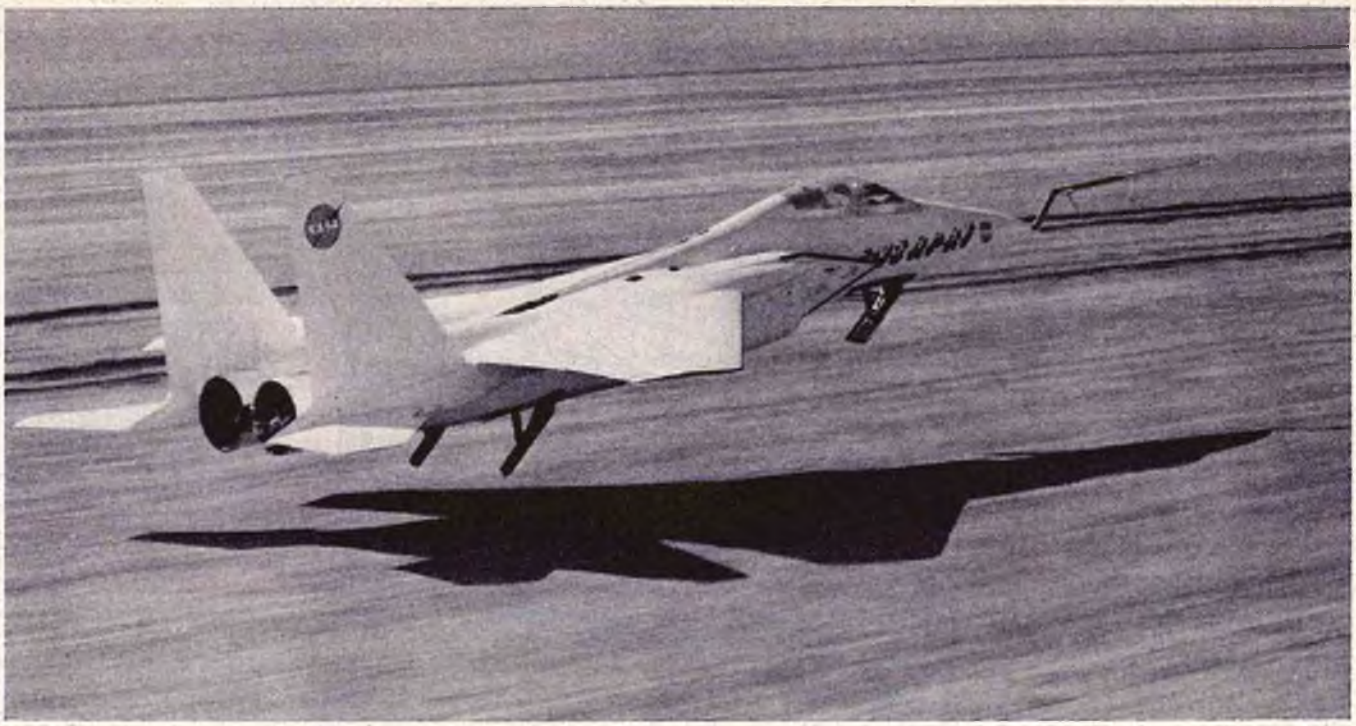


FIGURE 1: Scale F-15 model is probably the most complex R/C model in existence.

RCM VISITS

By Shu W. Gee, Project Engineer

NASA'S DRYDEN FLIGHT RESEARCH CENTER

ABOUT THE AUTHOR
The author, Mr. Shu W. Gee, NASA Project Engineer, former airline Captain and active R/C modeler, shown with a partially completed NASA stabilized floating wing project.

One of the fringe benefits of working for RCM is the opportunity to see so many fantastic things in person that are inaccessible to the average modeler.

Accepting an invitation by Mr. Shu Gee for Dick Kidd and myself to visit the Dryden Flight Research Center created the anticipation of a couple of little boys waiting for Santa Claus.

The agenda for our morning at the center consisted of briefings supplemented with movies and slides describing several of their major programs utilizing radio control. Each of the Project Engineers is first of all a highly qualified engineer in the sophisticated aerospace technical world. They are also licensed pilots with impressive flying backgrounds. On top of all that, they all fly R/C models for pleasure and no way can you beat a mutual hobby interest for establishing a pleasant comraderie.

Just imagine the comments from a bunch of modelers viewing movies of a beautiful scale Lockheed Jetstar model weighing 33 pounds, powered by two .40 ducted fan engines, as the landing was aborted and a go-around was executed. Every RC'er can relate to that situation.

After lunch came a tour of the facility. This was the opportunity to actually see the projects that were described during the morning. Our photos cover only a small portion of the exciting activity at the Research Center and I think the expressions on Dick Kidd's face will show you how much we were impressed.

NASA's policy of refraining from mentioning manufacturers' products prevents us from identifying the cost savings benefits effected by using many items found in most hobby shops. We will, however, say that John Brodbeck, Phil Kraft and Carl Goldberg can be proud of the application and performance of their products.

It is indeed gratifying to see that the sport of R/C modeling is being put to work and is serving the taxpaying public in a genuine manner.

RCM is most appreciative for the privilege of visiting the Dryden Flight Research Center and for the courtesies extended by the NASA officials and staff members.

- - - - Dick Tichenor

MODEL AIRCRAFT TECHNOLOGY APPLICATIONS AT NASA
By Shu W. Gee
Dryden Flight Research Center
Edwards, California

"Eighteen thousand . . . recover from your spin . . . the heading one-zero-zero please," says the controller of NASA 1 (Mission Control Center) as he watches the airplane on the TV monitor stop spinning and recover on downwind leg for landing. Engineers in the control room watch wiggly lines on the recorders that indicate the recovery is complete and the approach for landing had begun. Spectators watching the control room TV monitor through large windows, see the picture of the airplane brought in by an 80" telescope on the roof of the building. Minutes later, the research pilot, watching the TV monitor of the forward-looking camera in the airplane from his seat in the ground cockpit, brings the unpowered 3/8 scale F-15 airplane to a perfect landing (Figure 1) on the dry lake bed runway at Edwards Air Force Base. So ends another successful flight of a remotely piloted research vehicle (RPRV) at the National Aeronautics and Space Administration Dryden Flight Research Center.

The RPRV concept differs from the military drone, in that the pilot's skill is required to maneuver the RPRV, whereas the drone is controlled by a programmed autopilot. Pilot control permits flight of an RPRV into regions where controllability is

unpredictable and where control activity requirements change with changing flight conditions. RPRV's permit flight into environmental conditions that the human body cannot tolerate. Flight testing with RPRV's eliminates risk to pilots and reduces cost by elimination of man-rated systems. RPRV programs, designed to investigate particular aspects of flight, require varying levels of system complexity and pilot skill. Four of these programs are discussed to illustrate the application of model aircraft technology to aeronautical research at Dryden Flight Reaserch Center. Each of the project engineers — Garry Layton, Sam Brown, Dale Reed, and Ed Friend — is an active R/C modeler.

Scale F-15 Program

The scale F-15 is perhaps the most sophisticated application of model aviation today. The research objective of the program is to obtain spin aerodynamic data for various control positions. The 24', 2,000 pound scale F-15 model is piloted from a ground cockpit, which has conventional flight instrument displays and a TV monitor of a forward looking camera mounted in the airplane. Figure 2 is a simplified diagram of the up-link/down-link system. Airplane data, such as altitude, airspeed, attitudes, accelerations, rates, and control positions, are telemetered to the ground for recording and cockpit display. A TV picture is also down-linked. The pilot's commands from the ground cockpit are processed in a computer which is programmed with the aerodynamics of the full-scale F-15 airplane. The computer-generated signals, transmitted to the model, duplicate the full-scale flight response characteristics, causing the model to fly like the full-size airplane.

The F-15 model is carried up to and launched at 45,000 feet from an Air Force B-52 bomber. A typical flight consists of spins down to 18,000 feet and landing. The pilot's task is precise and demanding and uses the professional research pilot's skill to full advantage. The ground cockpit, shown in Figure 3, resembles the environment which is so familiar to the research pilot. Unlike the R/C pilot, the research pilot is never subjected to the left-right syndrome and does most of his flying by instruments, except for the landing, in which he primarily uses the forward-looking TV picture.

NASA's Piper Twin Comanche, which has a 36' wingspan and weighs 3,600 pounds, is shown in Figure 4. This twin-engine airplane was used as an airborne simulator to prepare the research pilots to land the scale F-15 model using the TV monitor. Landing with a forward-looking TV picture is difficult because the ballooning effect, due to over-rotation, is not perceptible in the TV picture, yet the flare is necessary to touchdown within the landing gear load limits. With a TV picture tube in his instrument panel, the left seat pilot flew and landed the airplane with curtains blocking his outside vision. The right seat was always occupied by a safety pilot.

Because this airplane has the avionics and

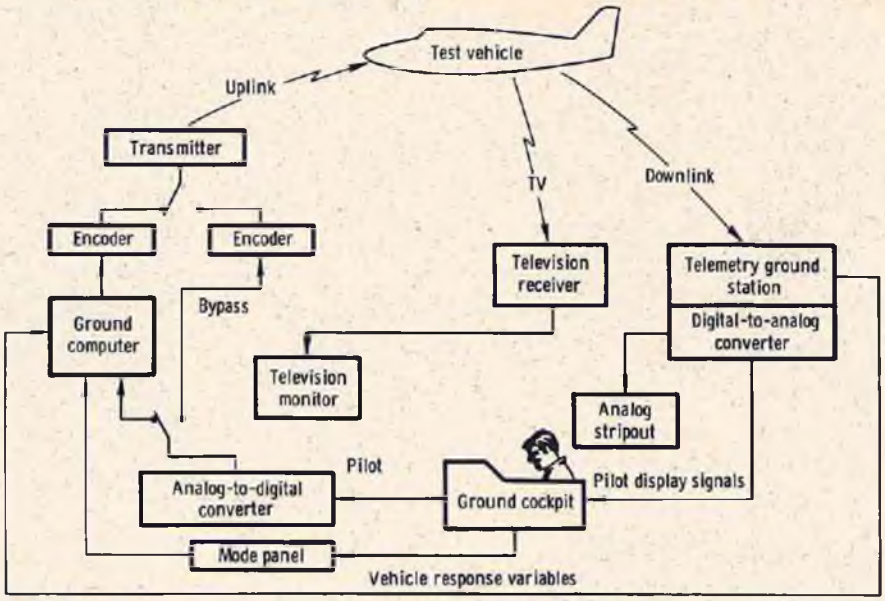


FIGURE 2: RPRV System Block diagram.

FIGURE 3: Ground cockpit, located inside a building, from which the more sophisticated models are flown!

FIGURE 4: NASA's Piper Twin Comanche used in training.

FIGURE 5: Scale Jetstar model with eight foot wingspan weighs 33 pounds.

FIGURE 6: ACT-configured Jetstar model has same wing area with ten foot span.

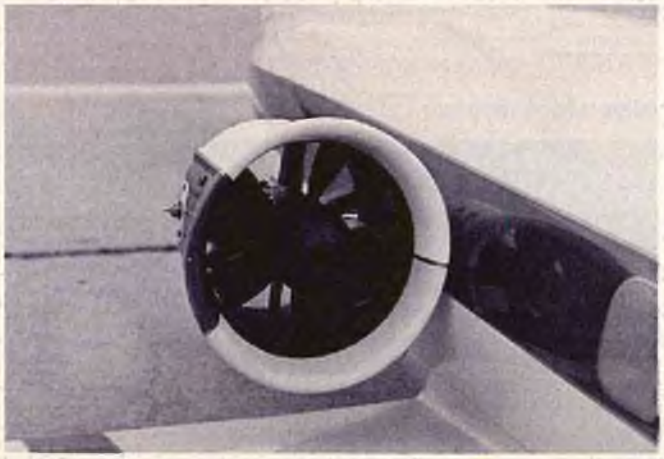


FIGURE 7A: Power pod is commercial ducted fan with additional leading edge ring.

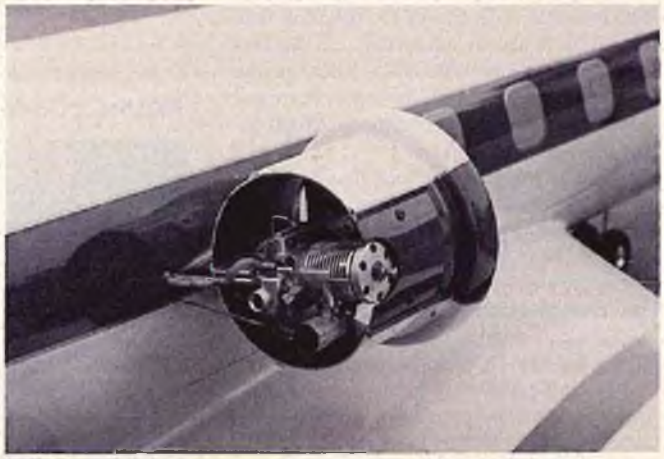


FIGURE 7B: Rear view of ducted fan power pod.

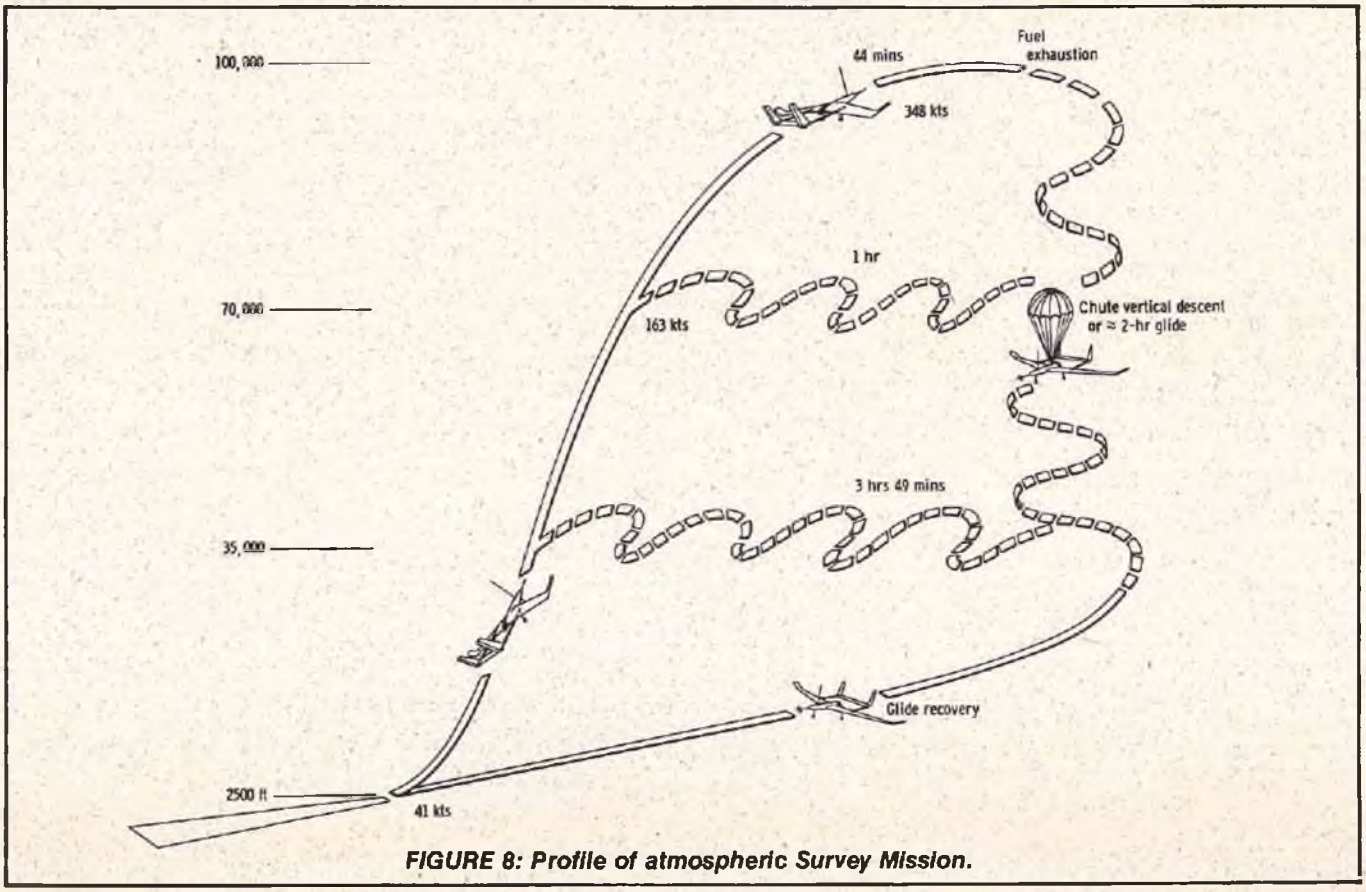


FIGURE 8: Profile of atmospheric Survey Mission.

FIGURE 9: Mini-Sniffer aircraft will perform atmospheric pollution sensing up to 100,000 feet altitude.

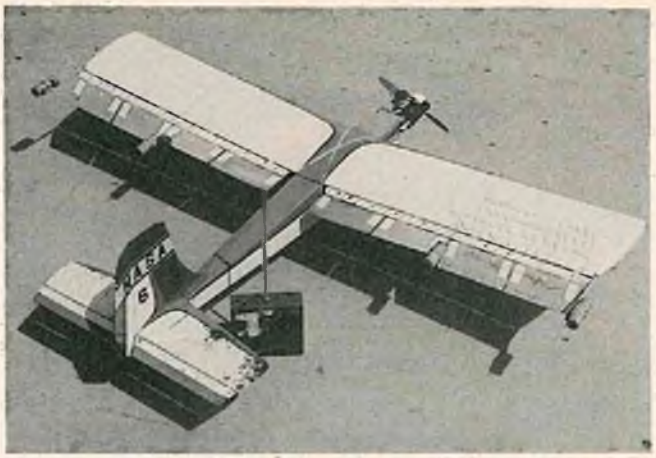


FIGURE 10: A popular aircraft with segmented flaps for wake vortex experiments.

FIGURE 11: Trailing vortex, approximately 2500 feet long.

FIGURE 12: Vortex cancelling 30 feet behind model.

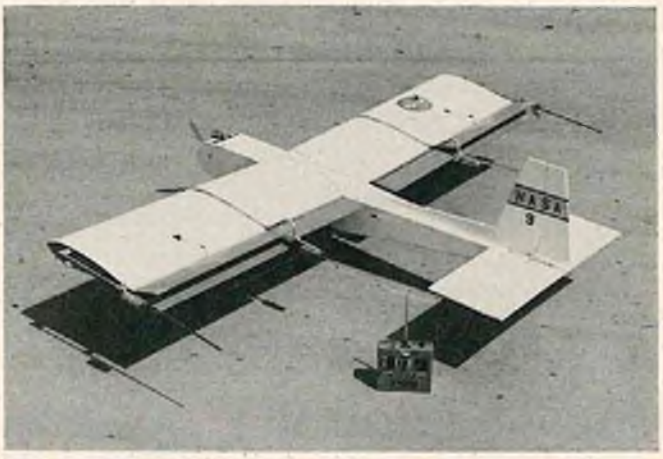


FIGURE 13: Model with clamshell flaps that open and close rapidly for vortex cancelling experiments.

Shu Gee explains the RC ground cockpit to RCM's Dick Kidd.

R/C systems necessary for it to be flown from the ground cockpit, it might be considered one of the larger R/C models of today. After the research pilot became proficient with TV landings from within the airplane, he piloted and landed the airplane by R/C from the ground cockpit until he was ready for the scale F-15 model.

The approach angle of the F-15 model is 13° to maintain the unpowered pre-flare speed of 210 knots and the flare time of approximately 20 seconds. In the Piper Twin Comanche there had always been a safety pilot on board, but with the F-15 model, the RPRV pilot knew he had only one chance to flare and land. Can you imagine his stress factor? An electrocardiogram of the pilot with a normal rate of 78 beats per minute, shows elevated rates of 110 to 120 during an RPRV flight, with a peak rate of 140 at launch and at landing! The F-15 model made 10 successful TV landings during the program.

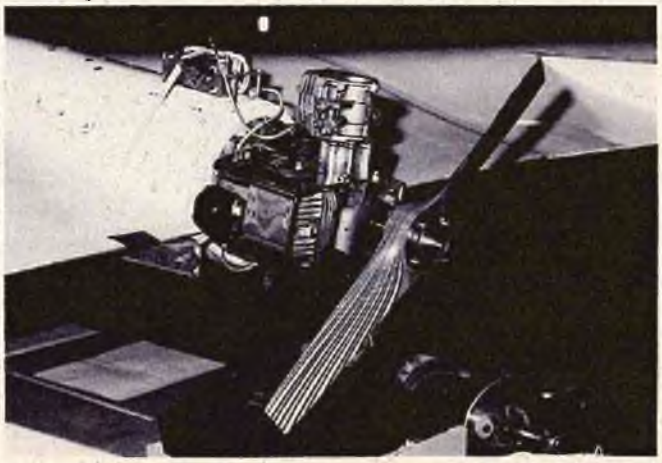
Active Controls Technology Program

Active controls technology (ACT) is an aircraft design philosophy that, in the preliminary design process, integrates the flight control system with aerodynamics, structures, and propulsion, to achieve such goals as improved performance, longer aircraft life, reduced fuel consumption, reduced noise, and improved passenger comfort. A scale RC model of the NASA Lock-

Dick Kidd is thrilled with the F-15 R/C model.

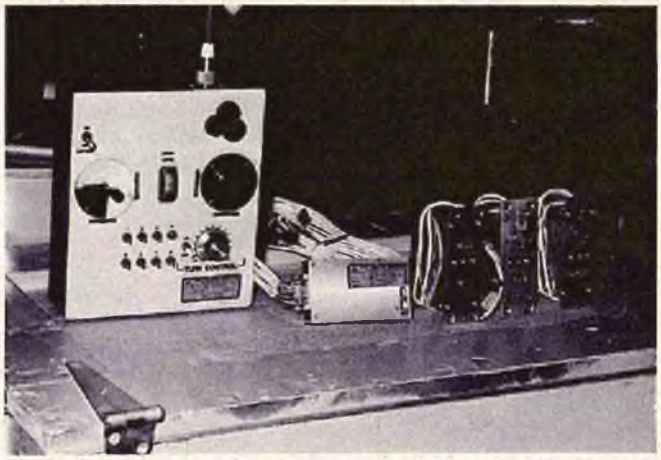
Lockheed Jetstar model is equipped with more efficient NASA designed active control surfaces. Interchangeable scale surfaces are being held.

Familiar engines mounted on large cargo carrying model.



This engine installation has flown Mini-Sniffer to 20,000 ft. altitude.

One of the R/C models in the pivoted skewed wing program.



A custom heavy duty radio system for the high altitude Mini-Sniffer built by one of the well known R/C designers.

heed JetStar was built and flown in unmodified swept-wing and modified ACT configurations as part of the ACT program for NASA documentary film purposes. The 8' span swept-wing configuration is shown in Figure 5. The ACT configuration, which uses an electrostatic autopilot with a more efficient 10' unswept high aspect ratio wing and a T-tail, is shown in Figure 6. The configurations are nearly identical in wing area, are made of fiberglass and foam, and weigh 33 pounds each. The 40 size engines in the fans turn up 21,000 rpm with 58% nitro fuel for 6 pounds of static thrust each. Close-ups of a fan engine are shown in Figures 7(a) and 7(b). From the modeler's standpoint, both configurations flew well and had pattern airplane-like performance; however, there was a noticeable improvement in handling and performance with the ACT configuration, as compared with the swept-wing configurations.

Minisniffer Program

The objective of the Minisniffer program is to sense atmospheric pollution from ground level up to approximately 100,000 feet, and to measure the fine structure and chemical composition of the wakes of stratospheric aircraft. A mini-RPRV has been developed and is presently being flight tested. The profile of an operational mission of the air sampling airplane is shown in

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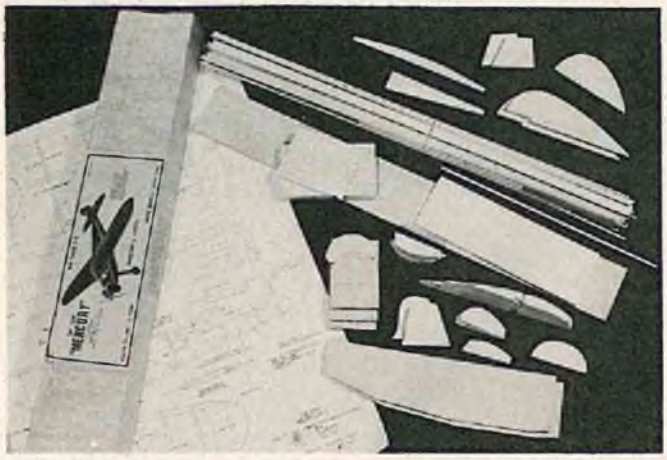
RCM PRODUCT TEST

MICRO MODELS 1938 MERCURY



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

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

● The 1938 Mercury is a 5/8 scale Old Timer R/C from Micro Models, P.O. Box 1273 Covina, California 91722. This appealing aircraft, with all the nostalgia of the free flighters of the 30's, will also double as an excellent basic powered trainer or general sport aircraft. It has a 45" wingspan and a total wing area of 300 square inches. The manufacturers recommended engine range is .049 to .15 cubic inch displacement utilizing either two or three channel radio operating rudder, elevator and throttle. Basic materials used in construction are balsa, spruce and ply. The acetate for the windshield, wing dowels, 1/8" diameter music wire for the main gear and 1/16" music wire for the tail skid are included in the kit. The plan sheet measures 24" x 36" and there is a three page instruction manual in addition to the plans. All parts are pre-cut and sanded and were beautiful to say the least. One interesting feature was a list of accessories needed to complete the model printed on the outside of the box. Our prototype weighed 34 ounces for a wing loading of 16.3 ounces per square foot. The fuselage was covered with transparent orange and opaque yellow Flite-Kote while the wing and empennage were covered with transparent orange Flite-Kote. An OS Max .10 engine with expansion type muffler was used for power while a Kraft radio was used for guidance. The only modification we recommend has nothing to do with the flying characteristics of the 1938 Mercury, but is simply for appearance. The single wing dowel protrudes through the acetate windshield and, if the wing bends under load, this will deform the windshield and possibly crack it loose. We epoxied a 1/16" plywood washer, 3/8" in diameter over the wing dowel against the windshield, taking the wing band pressure off of the acetate windshield. We found that the muffled OS Max .10 is more than sufficient power for all kinds of flying. This aircraft is stable in all modes but sensitive to rudder. For general sport flying, we would recommend using a tail wheel instead of a skid for ground control. Being of "stick-and-stringer" construction, the 1938 Mercury is a little harder for a beginner to build but very definitely easy for the novice to fly. It is a very

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SPECIFICATIONS

Name	1938 MERCURY
Aircraft Type	Old-Timer R/C
Manufactured by	Micro Models P.O. Box 1273 Covina, California 91722
Mfg. Suggested Retail Price	$24.95
Available From	Both Manufacturer & Retail
Mfg. Recommended Usage	General Sport Aircraft
Wingspan	45 inches
Wing Chord	6.6 inches
Total Wing Area	300 sq. in.
Fuselage Length	32 inches
Radio Compartment Dimensions	(L) 7.5" x (W) 2.2" x (H) 4.5"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Double Taper
Dihedral	2-9/16 inches
Stabilizer Span	17.5 inches
Stabilizer Chord (incl. elev.)	5 inches
Total Stab Area	87.5 sq. in.
Stab Airfoil Section	Symmetrical
Stabilizer Location	Top of Fuselage
Vertical Fin Height	4 inches
Vertical Fin Width (incl. rudder)	6 inches
Mfg. Rec. Engine Range	.049 — .15
Recommended Fuel Tank Size	2 oz.
Landing Gear	Conventional
Recommended No. of Channels	3
Recommended Control Functions	Rud., Elev., Throt.
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Spruce, Balsa, Ply
Tail Surfaces	Balsa
Hardware Included In Kit	Acetate for windshield, wing dowels, 1/8" music wire for main gear, 1/16" for tail skid
Plan Size	24" x 36" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (3 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. rec. flying weight	28 — 32 ozs.
Wing loading based on rec. flying wt.	15.4 oz./sq. ft.

RCM PROTOTYPE

Weight, ready to fly:	34 oz.
Wing Loading	16.3 oz/sq. ft.
Covering and finishing materials used	Flite-Kote, K & B Superpoxy
Engine Make and Disp.	O.S. Max .10
Muffler Used	Expansion
Radio Used	Kraft single stick
Tank Size Used	2 ounce

On his way to Grade Level I and a nervous collapse, the Great Hacker makes a 20 second hover over a ten foot spot.

FLIGHT TRAINING SEMINAR

IN THIS INSTALLMENT, HE WHO SPEAKS WITH GREAT AUTHORITY, HAS TO PUT HIS HELICOPTER WHERE HIS MOUTH IS . . . By Don Dewey

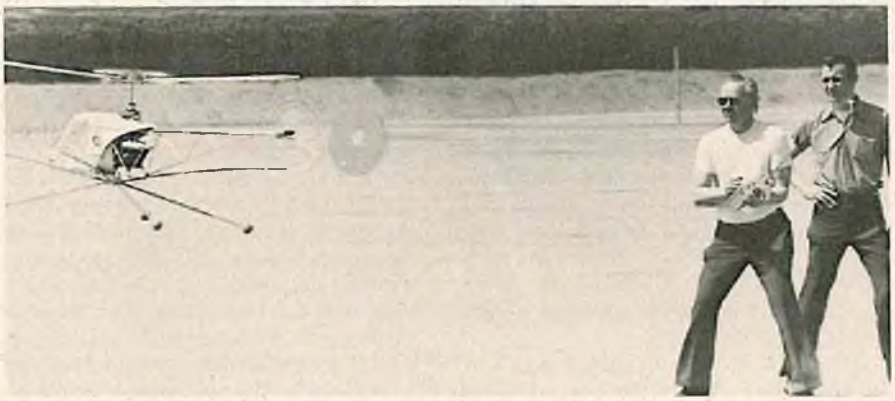
The beginning of the first 60 second flight required for Grade Level I – and a nervous breakdown for Dewey.

● In the last installment of the Flight Training Seminar, we showed the system designed by Dave Gray, which allows the beginner to survive his initial attempts at hovering without tipping over. In fact, this training gear has been designed so that when fitted to the new Shark .60, or Hughes 300 converted to a .60, anyone can learn to fly a helicopter in a very short time, and most important, it will allow you to actually get into the air on your first tank of fuel. The training gear has some very unique features which makes it, in our opinion, the best training method yet developed. When used as instructed, you will learn to fly the helicopter in a minimum amount of time with little or no damage to the machine itself - - - and that is very important from a psychological standpoint, as well as the standpoint of your pocketbook.

Since this issue of RCM contains several articles designed for the novice fixed wing pilot, this is an appropriate time to show you the beginning stages of learning helicopter

. . . . HELP! Dewey tries to enlarge the opening in the front of the World Engines transmitter with the stick as the Shark responds immediately to the pilot's finesse. With wide stance and grim determination, our intrepid student somehow gets it back under control. Why does Dave Gray look ready to run? Why does Dewey wish he was in Madagascar?

The first day, and Dewey displays the calm poise and fearless attitude for which he is infamous. After all, he's written about this for years and it lifts off just like manual says. So what's so hard about - - -



Somehow the hacker manages to gain some semblance of control on subsequent flights although Dave still looks somewhat doubtful. Would you believe Grady took these pictures, standing between Dewey and the Shark? That's guts!

flying with this new type of training gear. Now, let's clear up one point at the beginning - - - in most cases a magazine editor is a "clearing house" for information on any given subject. While we may not be proficient at the subject on which we are discussing; we have access to information provided by experts in each individual phase of our sport, and it is our function, as a writer or editor, to present this information in a concise and understandable form so that you, the reader can benefit from these individuals expertise. And, the bigger the magazine gets, the more the demands on our time, and the less flying time we actually have. For example, if we go out to fly a fixed wing aircraft, it is usually one built from a brand new kit that has never been flown before, usually with a new radio installed in which a manufacturer wants a flight test report, and often with a new engine that has only a minimum amount of break-in time. After ringing out the airplane for about an hour, this is about the end of our flying time with this particular machine and we pass it on to another member of our staff for further tests. Thus, each time we go out to fly (and that becomes more and more infrequent with 10 to 12 hour working days seven days a week) we never really get to know an individual aircraft and its individual characteristics as well as you would flying the same plane over a longer period of time.

Now, when it comes to helicopters, I have built close to two dozen, either for photo reviews, as have been presented in RCM during the past years, or to check out instruction manuals for a manufacturer prior to the kit release in order to detemine if there are any omissions or particular areas that would be confusing to you, the purchaser of the kit. If we find any areas where we feel that instructions could be clarified, or where a particular construction step is difficult to understand, we report this to the manufacturer prior to the kit release date. Thus, while I have built a great number of helicopters, and set them up, the flight characteristics, when reported upon, have come from an experienced helicopter pilot. The minimal amount of time that I have spent with a helicopter has consisted of breaking a dozen or more sets of rotor blades, twisting a few flybars up like pretzels, and incurring other various and sundry damages without actually having attained any degree of proficiency in flying. This is simply due to the fact that, when a beginner helicopter pilot is learning to fly, he should attempt to fly an hour a day, if at all possible, for the first month or two. Flying one hour every couple of weeks simply will not enable you to learn how to fly a helicopter. And, the first step that you must learn is hovering since this is the most difficult phase of your helicopter training program. Don't be tempted to fly around for, no matter how good you think you are, there is little chance of surviving the flight without the model sustaining some damage. As an example, on one of the rare occasions I had a chance to go out and put in a few minutes on the helicopter, I put it into forward flight, made a couple of laps around the field and then realized that the only way I could land it was like an airplane. Consequently, the helicopter was relegated back to semi-kit form! Thus, the easiest way to learn, as Dave Nieman, writing in one of the British magazines states, "is to start at the beginning. There is far less loss of face by exercising a little restraint than confidently hurtling around the sky for a few brief moments, only to end up by plowing the model into the ground. Flying around is relatively easy, it is on the approach and landing where most people come unstuck. In forward flight a model helicopter behaves in much the same way as a fixed wing model. It is the type of flying that is peculiar to helicopters that the fixed wing pilot has to learn, i.e. hover, vertical, lateral, and backwards flight. As most take-offs and landings employ at least one of the aforementioned, you can see the folly in prematurely flying around the field."

Thus, it was a pleasant surprise to this writer, when our Executive Editor, Pat Crews, got together with Dewey Broberg of Du-Bro Products and arranged to have Dave Gray and Grady Howard, two of the countries top helicopter pilots, accompany Dewey to Southern California for the purpose of getting yours truly to actually practice some of what I have been preaching!

Without further ado, the trio showed up at my house with two Shark .60's and proceeded to check out the one that I built, and for the next two days, I became "Johnny on the spot!" And, all of the information, theories, and practical applications that I have passed on to you over the months from some of the nation's top helicopter pilots somehow disappeared, leaving a giant vacuum between my ears, and turning my legs into pure jelly. So from this point on through the rest of the article, it's one beginner talking to another on how to get through your initial helicopter frights!

First of all, as we have pointed out about the new Shark .60 training gear, the five fiberglass landing legs give the helicopter a 4' platform to land on and absorb shock — such as cutting the throttle at 5' altitude and letting the model fall. The rods are extremely strong and will withstand much abuse. They are the heart of the training system and will be the last part to be removed in the training process.

Next, the four 3/8" diameter wood dowels and the cord linking them to the fiberglass rods, form a tripod with two of the fiberglass rods and prevent the helicopter from tipping over when you are first getting the feel of the machine. These will be the first parts removed as you learn to fly.

Last, that all important tail fin. One of the most difficult aspects of learning to fly a helicopter for a beginner, is to maintain a constant heading. This requires a quite skillful control of the tail rotor at a time when you have your hands full just trying to coordinate all of the other functions of the machine. The 12" diameter corrugated cardboard disc, extending out beyond the tail of the machine on a hardwood dowel, is designed to fly the tail for you. When the model is flown in a light wind, from 5 to 10 mph, the fin will keep the model pointing in one direction without any help from the pilot, actually causing the machine to "weathervane" into the wind. If you fly in an area that has no wind, or wind that is under 5 mph, you can increase this disc to 18" in diameter, using a light material such as 1/4" thick foam board. While the tail will not weathervane without some head wind, the disc will slow down the reaction of the tail, due to torque when the throttle is advanced or retarded. In other words, when the model is flown in a light wind, the fin will keep the model pointing into the wind without any help from the pilot.

Finally, when you can control the cyclic control well enough to keep the model in the air and under control, you can make the fin smaller by reducing the size of the cardboard, or foam board disc so that you will start to get the feel of the tail rotor, but slowly, and not all at once. Soon, you will not need the fin at all.

As an added note, it is a good idea, in the beginning, to adjust your engine, or add weight to the model, so that it will only lift 4 or 5 feet with full throttle. That way, it will not be necessary to use the throttle control or the tail rotor control. Then you can concentrate simply on left and right and fore and aft cyclic. By the way, the easiest way to install the giant "tarantula" like training gear on your machine is to simply leave the training gear completely assembled and bolted in place with the two long bolts through the aluminum block onto the bottom plate of the helicopter. When you are through for the day, remove the aluminum block by removing the two bolts and reinstall the conventional skids. The easiest way to do this is to mount the bottom plate with longer than normal bolts and secure the bottom plate in place with elastic stop nuts. Then, when the training gear is removed, the skids can be simply slipped over the protruding bolts and a couple of regular nuts hand tightened into place, so that the skids will remain in place while transporting the helicopter back to your home.

But now back to the saga of Dewey and the Infernal Machine. After praying all night for rain, the morning finally arrived and it was ideally suited for the purpose at hand. And, to guys like Dave and Grady, both wearing NRCHA Grade Level III pins (and both very close to Grade Level IV), my feeble excuses about having a combination of the flu and a dead starting battery were to no avail. The time had come!

Once at the field, Grady demonstrated the inherent stability of the machine by lifting it up into a hover, approximately 6' off the ground, and taking his hands off the transmitter while the helicopter remained virtually stationary at that altitude. At that point, I decided it wasn't going to be so difficult after all. Finally, I started the motor, placed the model on the ground with the nose pointing into a very slight wind and stood about 10' behind it and slightly to one side. From

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LEFT: The second day, and with renewed confidence, Dewey prepares the Shark while Dick Kidd mentions to Grady that perhaps the other side of the fence would be safer. ABOVE: Earning a straight "A" in Body English, our hero does it again!

As the day progresses, Dewey finally gets his act together . . .

. . . Along with his usual BS as he decides to help out Grady.

POWER BOATING

BY DAVID THOMAS

The start of a local endurance race near Paris, France.

● Let's start this month with some more general information, and a bit of theory. First of all — the information. Like a lot of other people, I have a Taipan Goldhead 3.5cc marine engine, and a little beauty it is, too. And, like a lot of other people, I always want to go faster, so I have been playing around with it. I started off by changing the compression ratio, then I polished everything, and chamfered all the leads to the ports. Some small change in power output was noticed, but hardly enough to justify the amount of work.

Then, leafing through a model magazine, I came across the mention of a guy in the U.K. who had just set up a very small business, making chromed cylinder liners and ringed pistons for the Taipan (principally for the R/C car boys). All I had to do was to send him my existing cylinder/piston assembly and about $25.00. This I did, and a few weeks later I got it all back. It was immediately put back into the engine, which was re-installed in my Gazelle. I ran it in on a small prop for about an hour, then changed back to the normal prop — an Agnew 1815 — and tried tuning the engine. Much to my horror, I found that the engine just would not swing the prop! Then it occured to me — I remembered that the advert had said that with this set-up, the Taipan would peak at about 22,000 rpm. So I changed down to a 1515, and, after bending and filing the blades, I got the beast going properly. And it really does go. Out came the stop-watch, and I did some comparative tests. First, I timed the boat over my timing strip with the Taipan, and then I changed the engine for my Veco/McCoy, and timed that. There was something like an 18% advantage in speed with the Taipan, but at the same time, the fuel consumption was up about 25%. Well, you can't have it all ways, can you?

I must admit that my first reaction, on thinking about the high peaking speed of this motor, was to consider fitting gears. And this is where the theory comes in. A lot of people talk happily about gears — and some even use them — without considering why gears are necessary — if indeed they are. So let's see what it is all about.

Everything is linked to the speed, in rpm, at which an engine develops its peak power. If you take a look at a range of engines, you will find that the smaller the capacity, the higher the speed at which the motor peaks. Now then, nearly all — if not all — marine engines started life as air-cooled plane engines. This is very logical if you think about it. The market for plane engines is perhaps ten times the size of that for marine engines. Consequently, a manufacturer will bring out an aero version, and then, if he thinks it is a good idea, a marine version. Two prime examples of this are the O.S. SPR and the K & B RS III, both of which are conversions of pylon engines.

An aero engine turns a propeller which has a relatively large diameter — even for the smallest sizes it is rarely less than 5", and which works in air — a compressible medium. The marine engine, on the other hand, turns a prop which has a maximum diameter, for a 60, of about 2½" and which turns in a completely incompressible medium — water. In addition, the larger the diameter of a water screw, the higher its efficiency, but the more power it requires to turn it.

So, as you can see, we are up against a set of irreconcilable facts. We need to turn a relatively large prop pretty fast in an incompressible medium. Now, if the engine concerned is a .60, there is no real problem. In the first place, the .60 will probably develop maximum torque, and maximum power, at around 14,000-16,000 rpm. This is quite compatible with a two-inch prop of fairly heavy pitch, or even bigger, in the case of the latest Schneurle-port engines. However, if we drop down to the 15c.i. size, it is a different matter. Take the case of the Rossi, or X 15 Super Tigre, or even worse, the new HGK 15 Racing, a Japanese motor which is reputed to turn at 38,000 with a tuned pipe. The Rossi and Super Tigre peak at about 24,000-27,000 rpm using air-screws. In order to get the same engine, in marine form, to peak at the same rpm, it would be necessary to reduce the diameter and pitch of the water-screw to such an extent that it would have an extremely low efficiency — so low that it would be just as well to use an ordinary .15 size engine with a larger prop.

I should digress at this stage, and mention that experiments have recently been carried out, concerning the new Jumbo Jaguar — a large circuit racing mono-hull, in conjunction with a very hot Webra Speed .60 WR. It has been found that there is a definite connection between the size and weight of the hull, and the mass of water displaced by the prop. Be careful, all you experts, I said nothing about speed/mass ratios, just pure mass, although I would be the first to admit that there is a connection. Anyway, working on a conjectured slip figure of 75% , it was discovered that a 2225 prop will push the Jumbo along faster than a 2025 turning at higher rpm's, which, on paper, gave the same theoretical top speed. These tests were very rough and ready, and no accurate figures were recorded, but they do point out the advantage of the bigger prop.

Right, now we come back to our 15c.i., and ask ourselves what we can do about it. Well, very obviously, we can use gears, in order to keep the engine revs up, whilst allowing the use of a bigger diameter prop. It can be seen that gearing such an engine 1.5:1, we can have a prop turning at 16,000, whilst the engine is allowed to rev up to 24,000, which is quite near to the optimum peak revs. The net result is a faster boat.

Great, power for next to nothing, and now everyone rushes out to buy themselves a set of gears for their boat! But whoa, there! Before you dash off, stop and think a minute. There is always some sort of a snag when it comes to developing power, and there are several in this case. First of all, it is pointless gearing any engine above 15c.i., because most of them are capable of swinging a big enough prop in direct drive. I say this because there have been several instances over here of people using gears on .60's, notably the OPS and Webra, in a mistaken attempt to get their boats to go faster. I say a mistaken attempt, because any

slight speed increase is automatically negated by several side effects.

In the first place, the gears themselves: These have to be very accurately cut, thus very expensive, and they have to be case-hardened, in order to stand up to the very heavy loads imposed on them. Secondly the engine uses a lot more fuel than in direct drive, and on a .60 this can mean quite a lot of money. And thirdly, and perhaps the worst effect, is that of torque. All action has an equal and opposite reaction, according to Newton, and it holds good for our model boats. The prop has a tendency to push the starboard side of the boat downwards. Taken to extremes, this will render the boat unstable. Consequently, a geared boat needs a broader beam, with an inherent increase in weight and wetted area. See? Whatever was gained is already well on its way to being lost. One final point. A geared motor turns faster, therefore it is noisier. Or if not actually physically noiser, then the frequency is higher, something I call the "annoyance factor", and if there is one thing we must all do, it is to be careful to keep the annoyance factor as low as possible, otherwise we are going to loose more and more lakes. I'll come back to torque effects and noise another time.

And there we are. It is imperative to gear a very high-revving .15 engine, if you want really high speed. But for bigger motors, or for ordinary use, my personnal advice is to leave gears alone. They are more trouble than they are worth. Mind you, don't let me put you off if you want to try them, go right ahead, but be prepared for a lot of hard work, a lot of experimenting, and some cash outlay.

Okay, then let's get back to that boat we are building. We have got the engine and prop-shaft installed, and are ready to go on fitting out. The next thing I always do is to fit bulkheads. Now, if you are using a wooden hull, it is almost sure that you have bulkheads already in place; this bit is destined more for those people using a fiberglass hull. There is a need for two bulkheads, one just forward of the engine, and another aft of it, making sure to leave enough room for the tank.

The bulkheads can be made of a good quality marine ply, or they can be made of glass fiber. If you are using ply, you should cut them from quarter-inch material, making sure that they fit the inside of the hull snugly. There are two ways of fixing them; either by the use of an epoxy glue, or by putting a strip of glass fibercloth around the edges of them, where they touch the hull, overlapping onto the hull itself. Then take a small paint brush and run plenty of polyester resin into the cloth, on both sides of the bulkhead. But before using either method, it is very important to clean the hull, otherwise you will find the glue, or resin, will not stick very well. The reason is that when polyester resin polymerizes, a sort of wax deposit is usually left on the surface which was in contact with the air. (The surface in contact with the mold is quite free from this, for

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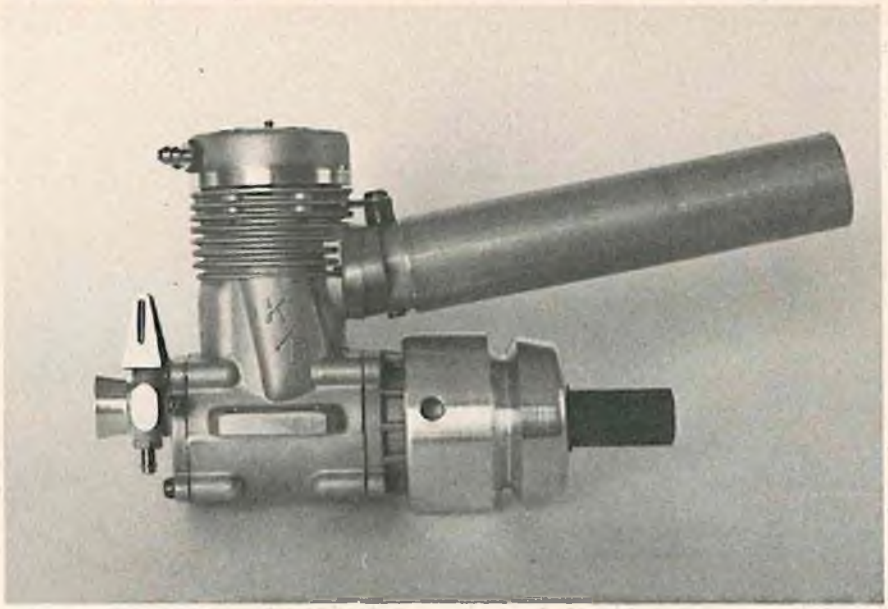
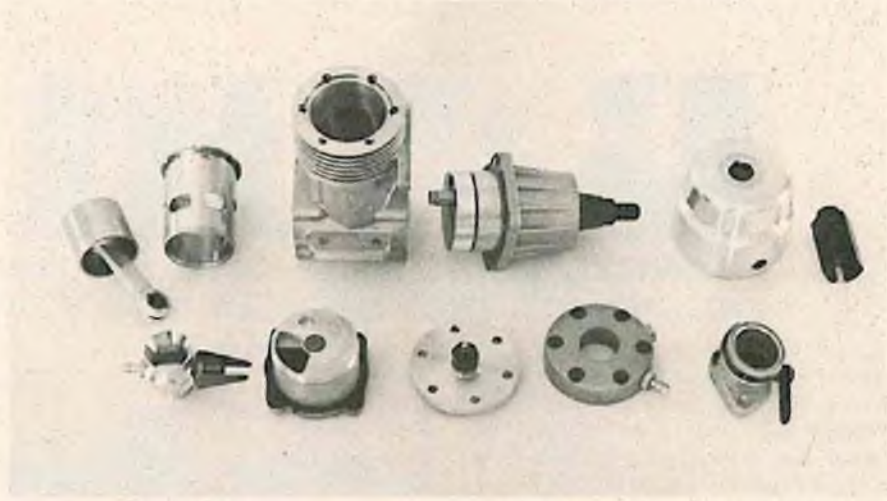
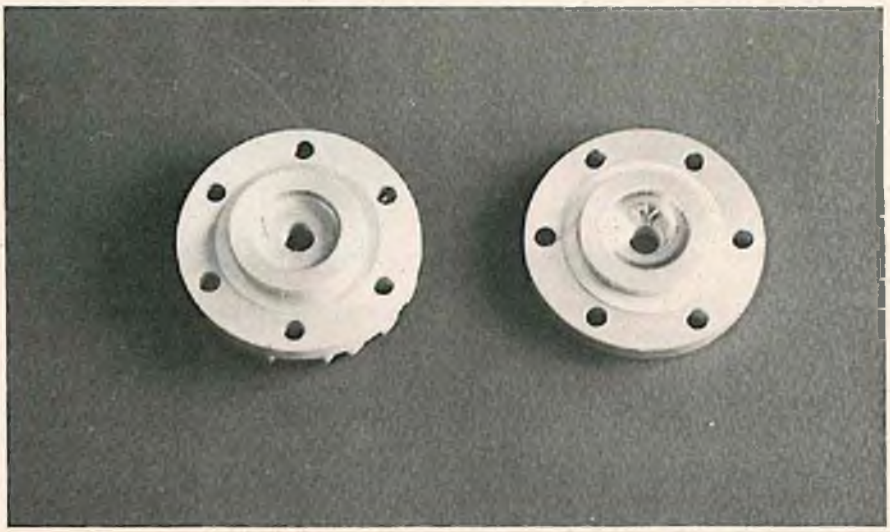


New K & B .40 RS III marine engine is tremendously powerful.



Parts of K & B .40 RS III. Note the exhaust brake in the manifold.



Stidwell Hemi-head for Webra Speed .60, shown on right, is good for an extra 600 rpm. Available from Racing Models, 3, High Street, Teddington, Middlesex, England.

BAMBI

A RUGGED, ROUGH FIELD, .19 TO .30 POWERED THREE CHANNEL TRAINER THAT HAS BEEN USED TO TEACH BEGINNERS SINCE 1971.

BY HARRY MONTGOMERY

It was early spring of 1971, and R/C flying time was here after a cold and snowy Pennsylvania winter. I was entering my second term as President of the Penn-Ohio Radio Kontrol Society (P.O.R.K.'S). As President, I should have been a proficient stick jockey, but such was not the case. The basement family room was filled with a multitude of scale ships which their owner hadn't the nerve to fly, plus an old and battered "Royal Coachman", which had borne the brunt of my flying attempts the previous season. In short, I needed a rugged trainer, easily and quickly built.

Many suggestions were given by the club members as to the type and manufacturer of such a trainer kit, but none really suited me. At club meetings, I had bragged that I could design and build a trainer from a simple three view sketch on a letter size sheet of paper and the total cost, less equipment, would not exceed five or six dollars. In a club well represented with sixty dollar ARF's this met with some comments based on my sanity - - - or lack of it! The die was cast and the sketch was made in the form you see presented with this article. Detailed full size drawings are available for those who don't wish to transfer outlines to the wood by scaling dimensions from a small three view as I did. Five years later, many individuals have learned to fly on the Bambi, and it is still a good, rugged trainer, ideally suited for rough fields.

Plywood has always been my favorite building material. The model which was affectionately named "Bambi" was built mainly of 1/8" soft poplar plywood which can be ordered from any lumber yard in 4' x 8' sheets for a cost of approximately $6.50. One sheet will build seven or eight of these models with wood to spare. Weight wise, it is comparable to the harder grades of balsa but it is many times stronger. Cutting was done with a small magnetic type jig saw. If ordered from Sig, it is called "Lite-Ply."

Construction

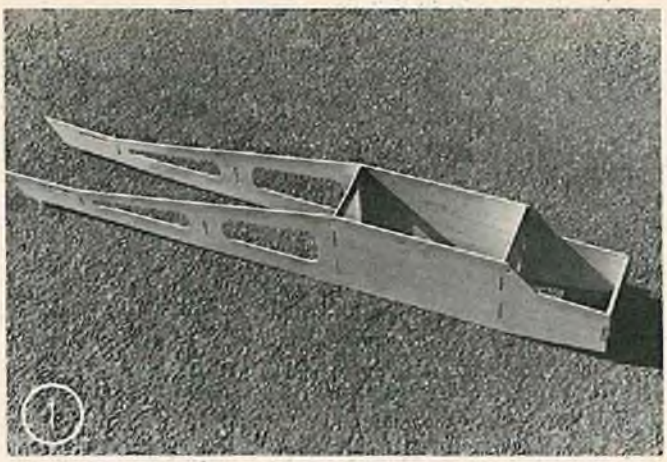
Since this is a trainer type aircraft, I will outline the basic building steps for the novice and the experts will have to bear with me.

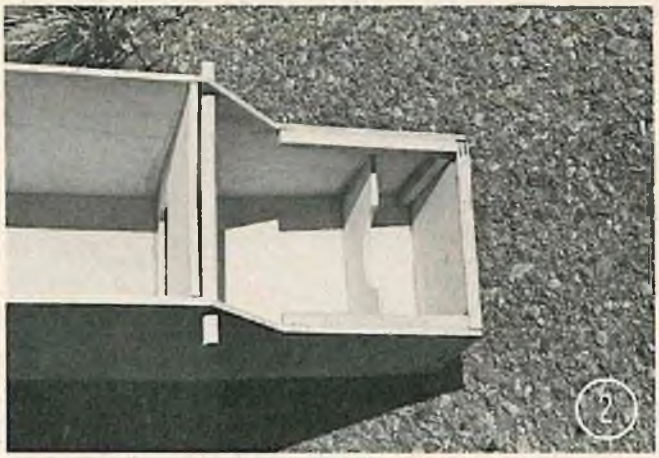
Fuselage:

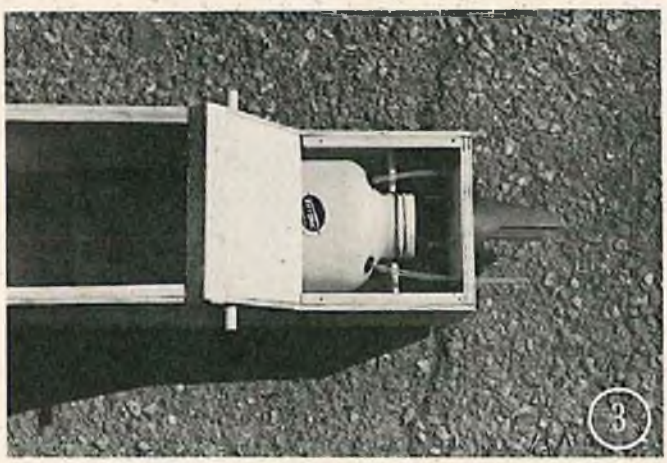
Transfer the outlines of all indicated parts to the ply sheet with carbon paper. In the case of the fuselage sides, trace one side only and rough saw outside of the actual outline. Pin this to a second blank and saw to the traced outline, thus assuring two identical sides. Saw the former slots before separating the panels. The slots and the formers with the matching keys assure a perfectly aligned fuselage. Sand all parts to outline before assembly. The firewall former "A" is cut from 1/4" plywood. Would you believe a scrap of walnut paneling left over from improvements in the home?

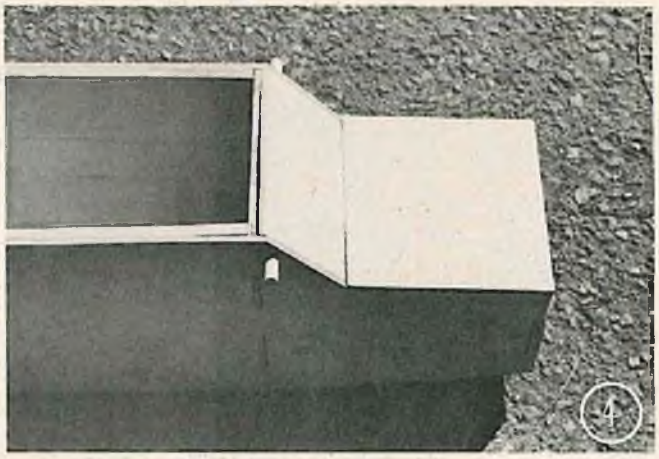
With sides and formers ready for assembly, lay one side flat on the workbench and, using five minute epoxy, cement firewall "A" and formers "B" and "C". A small drafting triangle will check for a true upright condition of the formers. Alignment will be guaranteed if the slots in the sides and the key lugs on the formers and firewall were accurately cut.

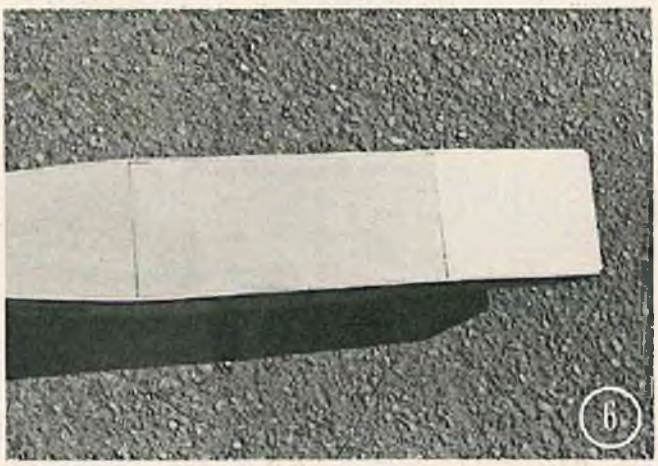
When this assembly has set, place the





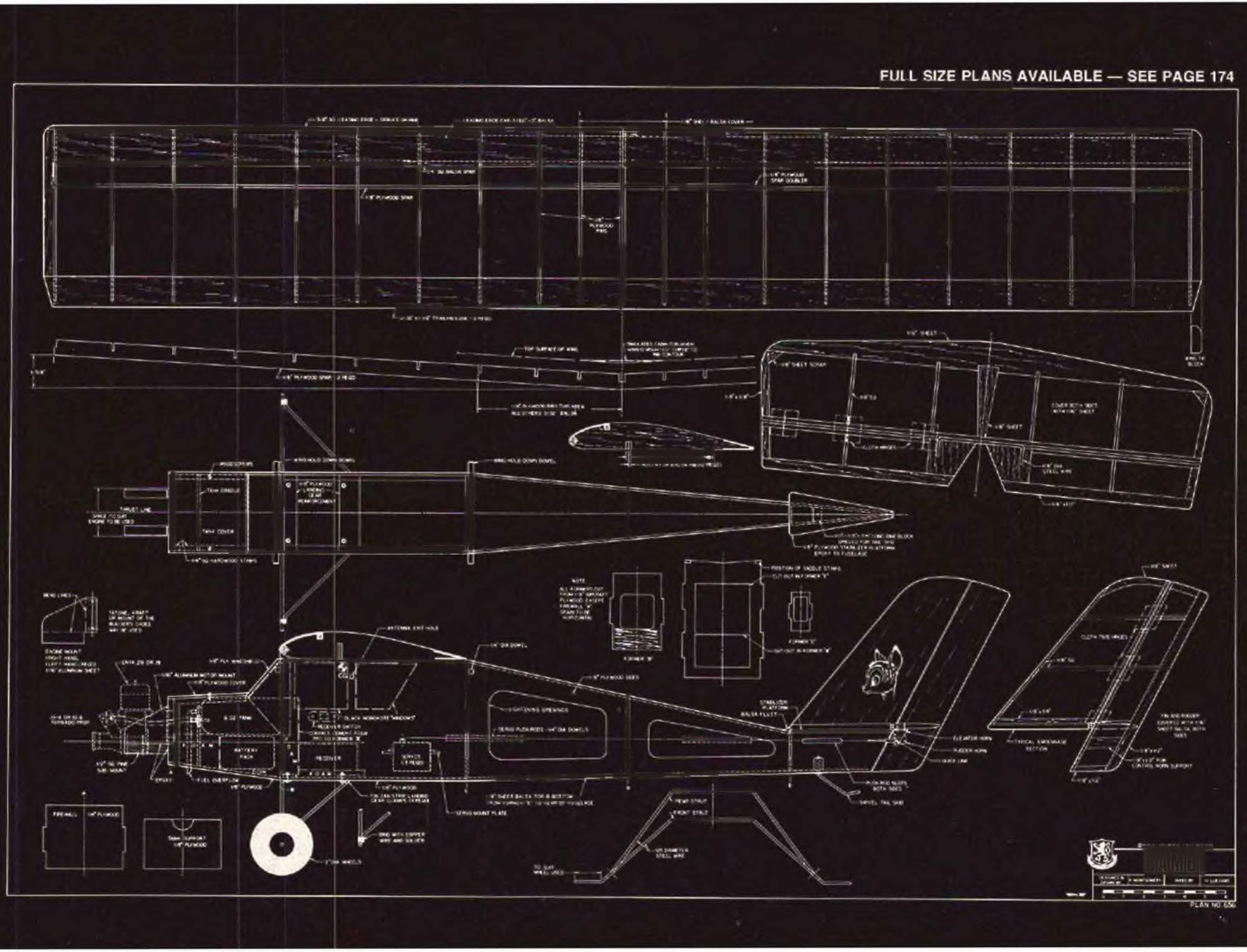


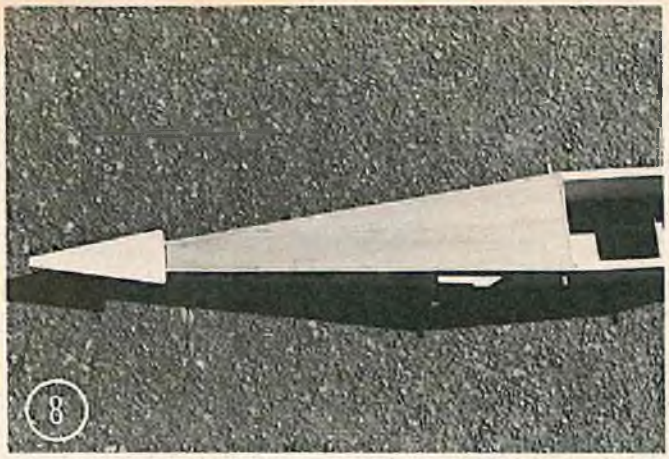


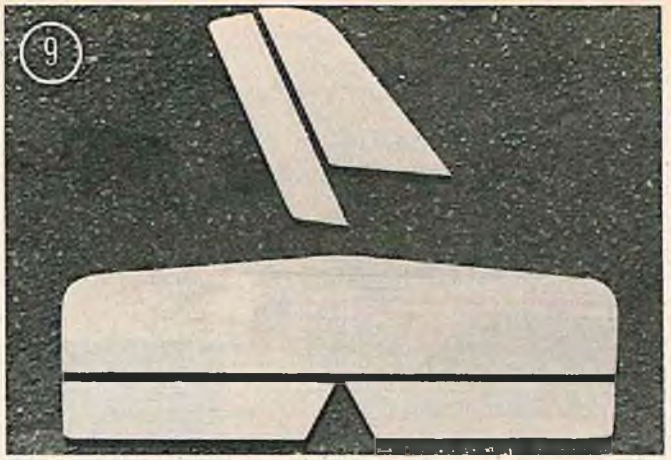


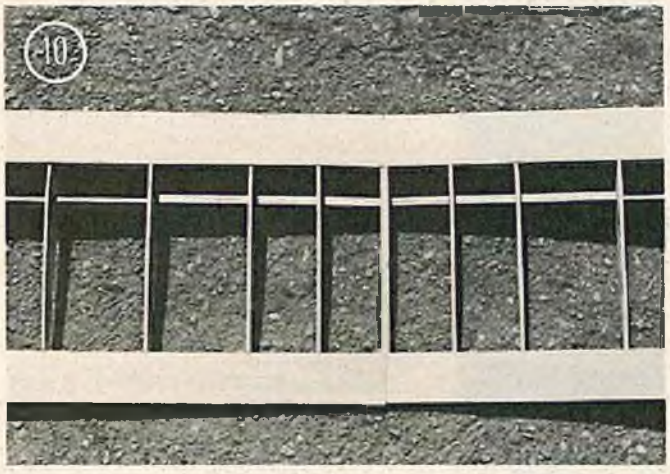
(1) The basic lightweight plywood fuselage sides joined together with the firewall and two main bulkheads. Note lightening holes in aft fuselage sides. Interlocking formers insure easy, true alignment. (2) View of tank and battery compartment. Tank half-former is cut to fit your particular tank contour. (3) Tatone stick-a-tube tank used in this particular installation. Pilot holes drilled for hatch hold-down screws. (4) Hatch mounted in place. (5) Kraft-Hayes motor mount in place on firewall. (6) Bottom sheeting completed. Note that it is inset between fuselage sides, again insuring alignment. (7) Stab mount glued in place prior to sheeting top of fuselage.

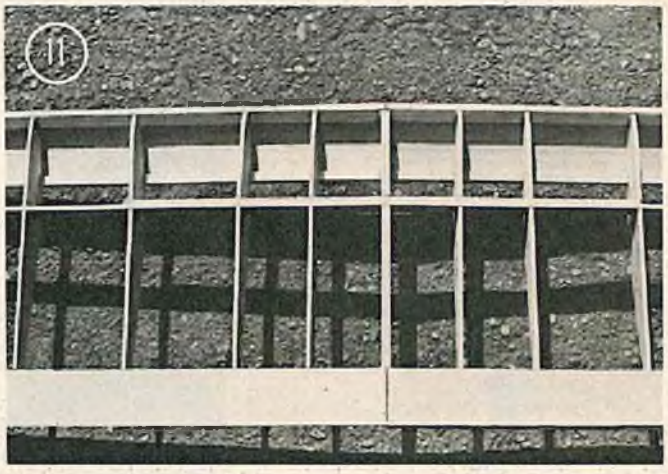
FULL SIZE PLANS AVAILABLE — SEE PAGE 174

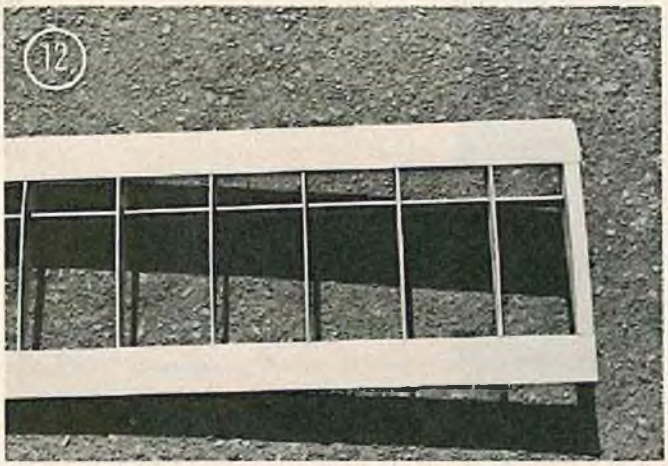


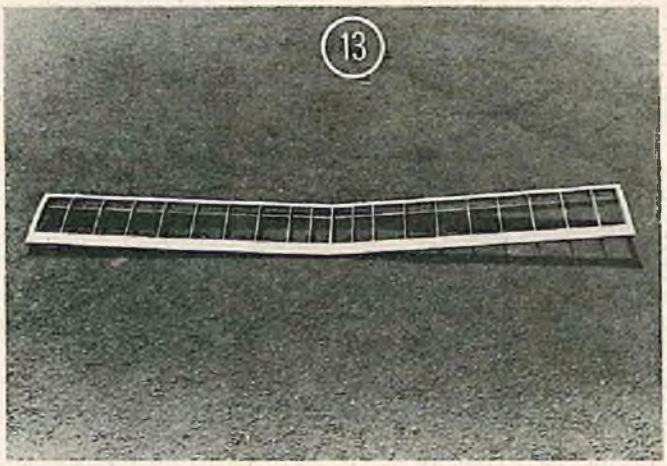


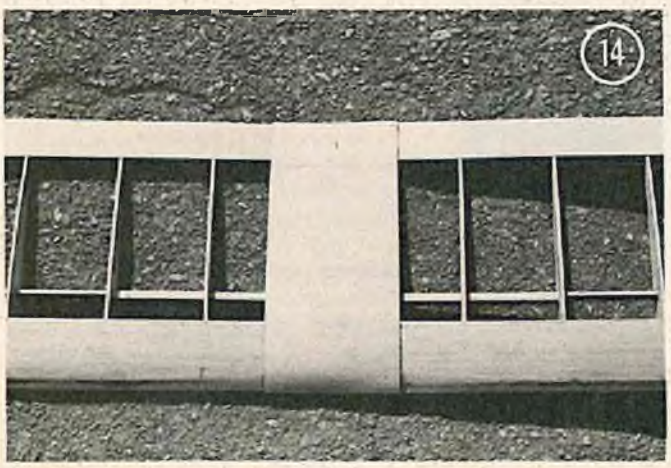












(8) The top fuselage sheeting in inset between the sides after the stab rest is glued in place. (9) The sheet balsa tail pieces are now cut to shape. (10) View of the wing center section – a simple to build, flat bottom airfoil. (11) Bottom view of the wing center section. Note basic simplicity of structure. (12) Wing tip view. Note thick tip rib. (13) Completed wing, both panels joined together, but minus center section sheeting. (14) Wing center section sheeting covers leading and trailing edge sheeting and simulates a cabin top when the wing is mounted on the fuselage.

other side flat on the bench and epoxy to the other sides of the formers. After the epoxy has cured, we now pull the sides together at the rear, align, pin and cement. Eyeball the assembly to make sure no misalignment is present. Formers "D" and "E" are now cemented and snapped into place in their correct positions. These, too, will be held and aligned by the slots in the fuselage sides. Cut and epoxy the ply stabilizer support plate in place. Be sure level alignment is identical to the top of the fuselage between formers "B" and "C". Add 1/4" square pine vertical strips behind the firewall. Cement 1/4" dowels in place in the previously drilled holes in the fuselage sides, cut to the length shown.

The fuselage bottom from firewall "A" to former "C" is cut from two pieces of 1/8" plywood. Fit between the sides and epoxy. The remainder of the bottom of the tail is 1/8" balsa sheet cemented with Wilhold Aliphatic or Titebond. The top of the fuselage from former "C" to "E" is also 1/8" balsa cemented between the sides. The front hatch cover for fuel tank and battery access is cut to fit from 1/8" ply with 1/4" square strips cemented to the fuselage sides. Small wood screws through the hatch cover into the strips secure the hatch and gives a much neater appearance than the dowel and rubber band method.

Cut and install the front tank support former. This outline will vary depending on the tank used. The outlet line should be slightly below the needle valve level. The original "Bambi" has a standard six ounce rectangular plastic tank and the former is cut to support the neck of the tank and prevent its forward movement in case of a crash. The foam wrapped battery pack under the tank, supports it in a level attitude. Remember to enclose your battery in a "Baggie" or plastic wrap to prevent fuel seepage in case of tank rupture.

Back to the fuselage construction. Bend the forward and rear landing gear parts to the outline shown from 1/8" diameter piano wire. Bind with fine copper wire at the lower ends but do not solder yet. Cut the landing gear clamp straps to size from tin can stock, form around the wire, and drill each clamp for a bolt. Invert the fuselage and place the landing gear in the location shown. Slide the clamps to the desired position and mark and drill holes through the plywood bottom for the mounting bolts. Note that, in the bottom area covered by the landing gear wire, inner ply doubler pieces are added for extra support. The mounting bolts pass through both layers of ply. A Hallco B-105-5 commercial dural gear can be substituted if desired. Now add the 1/8" x 1/4" top cabin area wing support strips. Tilt these strips to the angle defined by the "V" at the top of the formers "B" and "C". These parts, as well as the front windshield cover, are cut from 1/8" plywood.

Add the servo mounting bars to suit your equipment. My "Bambi" uses a Kraft Gold Medal series radio with three KPS-10 servos mounted side by side in the Kraft plastic tray. The tray may be supported by two 3/8" square hardwood pieces mounted across the fuselage and epoxied in place or with a plywood plate. Drill the fuselage sides for wood screws to more firmly anchor these pieces in case of a crash.

To simplify engine mounting, a Tatone or Kraft type mount may be used but, to cut costs, a scrap piece of 1/16" thick aluminum was sawed to shape as shown. Make two, and bend one right hand and one left hand, using a vice and a hammer. Drill for firewall mounting and for the engine mounting bolts. Bend the aluminum accurately to assure both sides are aligned identically to each other. No offset thrust is built in, either down or right. After mounting, add 1/2" square sub-mounts under the aluminum to dampen vibration and prevent stress cracks. Epoxy the sub-mounts to the aluminum and to the firewall. Using the pre-drilled holes in the aluminum mounts, drill down through the wood sub-mounts. Coat the firewall, sub-mounts and the internal area of the fuel tank and battery cavity between "A" and "B", with epoxy.

BAMBI
H.T. Montgomery

TYPE AIRCRAFT
Sport & Club Trainer
WINGSPAN
56 Inches
WING CHORD
9 Inches
TOTAL WING AREA
504 Square Inches
WING LOCATION
Top of Fuselage
AIRFOIL
Clark Y
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1⅝ Inches
O.A. FUSELAGE LENGTH
37" From Firewall
RADIO COMPARTMENT AREA
(L) 12" X (W) 3" X (H) 3"
STABILIZER SPAN
22 Inches
STABILIZER CHORD (incl. elevator)
6¾ Inches Average
STABILIZER AREA
148.5 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7⅛ Inches
VERTICAL FIN WIDTH (incl. rudder)
5½ Inches Average
REC. ENGINE SIZE
.19-.30 Cubic Inch
FUEL TANK SIZE
6 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rudder, Elevator, & Throttle
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Poplar, (Sig Lite Ply)
Wing	Balsa & Ply
Empennage	Balsa
Weight Ready-To-Fly	56-66 Ounces
Wing Loading	16-18.85 Oz./Sq. Ft.

The fuselage is covered with acetate sheath dress lining material which may be purchased at any fabric or yardage store. This silk-like material comes in 45" widths and sells for about sixty cents a yard. "Bambi" was completely covered with this fabric and it must be used to be appreciated. It is much more durable than silk, easily filled with dope, and shrinks with one coat like a drum. Three coats will fill the weave and it produces a scale-like appearance. The increase in weight on a finished airplane over silk is very slight and the cost of covering even a large model is less than a dollar. CAUTION! Be sure you purchase ACETATE sheath. It is also sold in a heavier cotton based version which is not suitable. MonoKote or Solarfilm may be used, if desired.

After covering the fuselage, mount the landing gear. Align the struts to assure correct wheel tracking, and solder the ends of the wrapped wire. The wheels are held with soldered washers. A slight wheel toe-in is desirable to improve tracking.

Tail Surfaces:

The basic construction is 1/8" hard balsa covered with 1/16" balsa sheet. No difficulty should be experienced here. Join the surfaces with cloth tape hinges which I have found to be more reliable than the plastic type, but here again "You pays your money and you takes your choice."

Wing:

A simpler structure with equal strength would be hard to build. It is a constant chord, 56" span, with a Clark "Y" airfoil. The area is 504 square inches. Saw cut the center section ribs spanning the length of the dihedral doubler from 1/8" ply. The rest of the ribs are 3/32" balsa. The leading edge is 3/8" square spruce, or pine, and the trailing edge is two 1½" wide strips of 3/32" balsa. The full length spar, cut in two halves is cut from 1/8" ply. The dihedral doubler is also 1/8" ply and is notched to accept the ribs. The tips are sawn from 1/2" balsa stock to the outline of the rib and shaped as shown. The leading edge cap sheeting is 3/32", two inches wide. The ribs are notched for the ply spars and doublers, the trailing and leading edges, and the 1/4" square top spar which supports the rear of the leading edge sheeting.

Build the wing on an absolutely flat surface. Cover the plan with plastic wrap and pin down the lower half of the trailing edge. Pin the half spar (ply) in position and epoxy the ply dihedral doubler to it. The outer end of this part will be tilted up at the end and will form the correct angle for the other wing panel. Add the ribs, leading edge, 1/4" spar, cap sheeting and upper trailing edge half. The tip block completes one half of the wing. When the glue is dry, tilt and block the panel at the correct angle determined by the doubler, and build the other

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HAVE YOU TRIED THESE USES FOR CYANOACRYLATES?

The introduction of cyanoacrylate adhesives have virtually revolutionized the construction of model aircraft. With several companies now producing the cyanoacrylate adhesives, we would like to pass on the following hints and kinks for using these adhesives as submitted by RCM readers.

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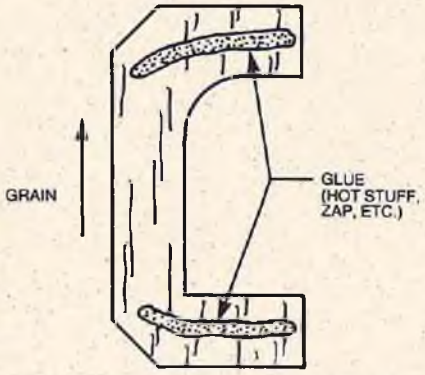
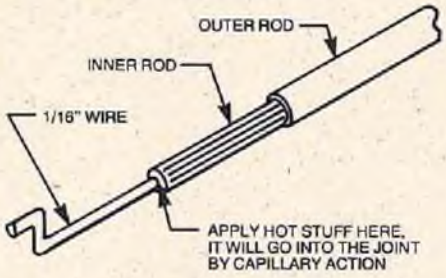


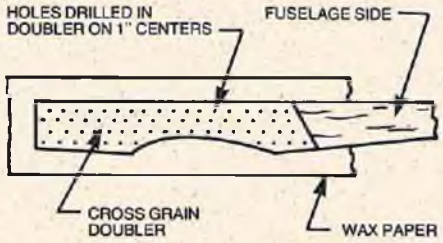
William T. Stanton of Ardmore, Oklahoma, says that it is far easier to remove parts from die-cut sheets without breaking them, if you run a small amount of cyanoacrylate across the grain. This strengthens it so that it will not break and is illustrated in the accompanying sketch.



If you're looking for an easy way to connect a metal adapter into the inner rod of a NyRod, Gold'N-Rod, etc., and do not have a threaded 2-56 rod the proper length, hunt no more. Simply clean the outside of an unthreaded 1/16" length of music wire with alcohol, insert the wire about 1" into the hole into the inner rod, and hold in place with alpha-cyanoacrylate adhesive. You may not think it will work, but the joint is stronger than the NyRod and this method has been used over and over again without any failure occuring when used on nose wheels, rudders, or elevator control linkages. This method was suggested by Tony Scribner of South Charleston, West Virginia.

★ ★

Scott W. Orten of Grafton, Wisconsin, suggests that, for those of us who cannot make perfect butt joints on balsa blocks, save the balsa sanding dust when you sand the blocks to shape. Fill the joint line with this dust and then simply apply your cyanoacrylate adhesive and you will have a clean joint ready for sanding. If the gap is large, add additional sanding dust and repeat the procedure.



You can bond a fuselage doubler to your fuselage sides using the new cyanoacrylate adhesive instead of contact cement, as has commonly been used in the past. First, drill 3/32" diameter holes on 1" centers over the entire doubler. Place the doubler in position on the fuselage side and, with the Teflon applicator, place a drop of cyanoacrylate adhesive in each hole. The capillary action of the adhesive will spread it and assure a strong bond. Be sure to use wax paper below the fuselage sides, as it is possible to bond the sides to your workbench! The three primary advantages of this method are: no waiting for glue to dry, no warping caused by the adhesive and, since the parts are mated dry, there is no possibility of contact cement grabbing the doubler in a crooked position. This suggestion was submitted by James Fuller of Roswell, New Mexico.

★ ★

Another use for the cyanoacrylate adhesives was suggested by Carl Holand of Jupiter, Florida. Needing to mount a wing with 8-32 nylon bolts to a plywood plate, Carl observed how the new adhesives would plasticize porous woods and seal them. First, he drilled a #29 hole in the plywood and applied 1 drop of alpha-cyanoacrylate on each side of the hole and let it cure. He then ran an 8-32 tap through the hole and found that it would thread just as clean and sharp as in metal or plastic. Even the soft, lightweight plywoods will drill and tap sharply and cleanly if the holes are first saturated with cyanoacrylate adhesive.

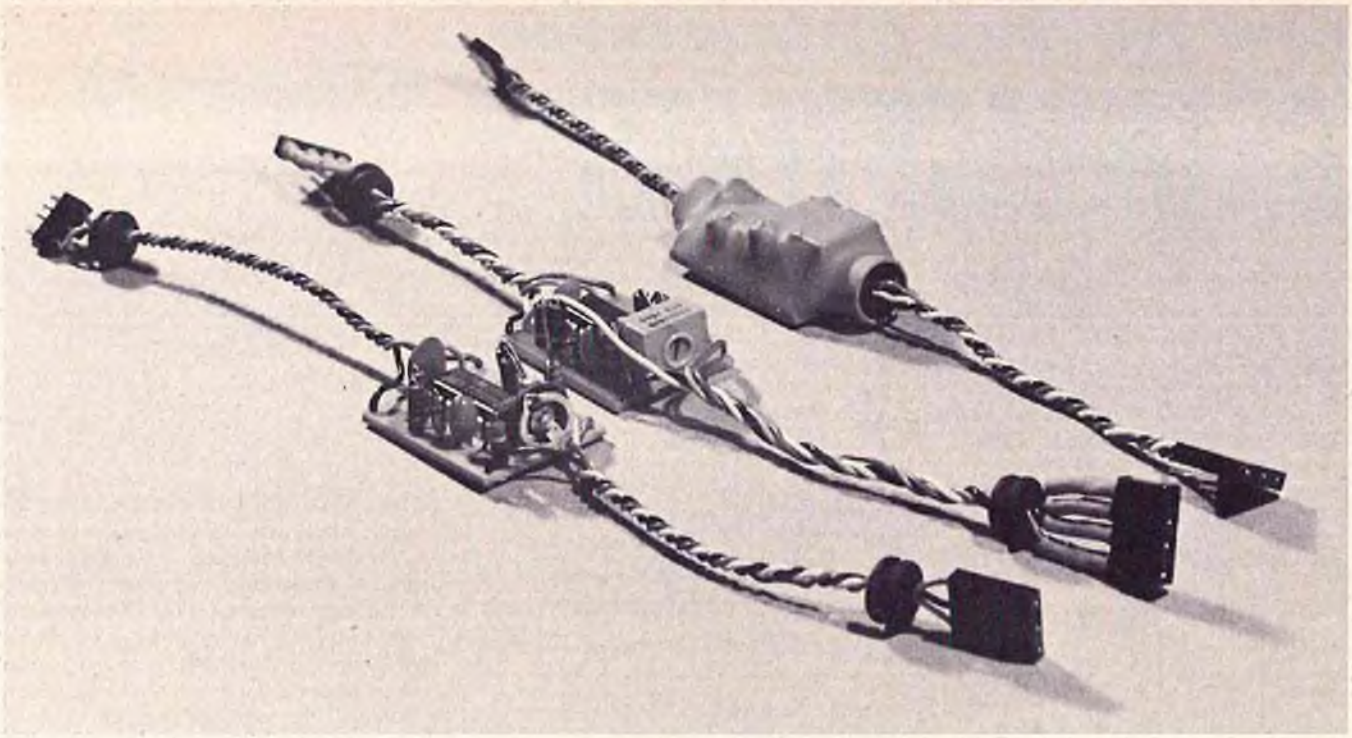
★ ★

Another use for these new adhesives is for bending 1/16" or 3/32" balsa sheeting completely around the leading edge of a symmetrical wing from spar to spar with absolutely no glue joints. First, measure the distance around the leading edge from the edge of the top spar to the edge of the bottom

spar. Next, select a sheet of balsa of the desired thickness and width. Usually a 4" wide sheet is sufficient to completely wrap around the leading edge. Next, soak the balsa sheet in hot water for 15 minutes and don't worry about the curling you will soon observe. The fourth step is to remove the sheet from the hot water. Shake the excess water off the sheet and immediately bend around the leading edge. Holding the edge of the balsa sheet flush with the top spar, and with moderate pressure on the sheet, apply a drop of cyanoacrylate to the edge of the spar and the sheeting. Almost like magic, the cyanoacrylate travels through the water, pulled by capillary action, creating an extremely strong bond. Move along the top spar with your bottle of cyanoacrylate adhesive, applying it until the sheeting is completely bonded to the spar. Then, turn the wing over and repeat for the bottom spar. The entire process for the top and bottom spars for an RCM Trainer wing took exactly 4 minutes. Finally, holding the wings vertical (leading edge down) place a few drops of cyanoacrylate on the inside rib sheeting junctions for bonding. This procedure, used by Al Sievers of Portland, Oregon, can also be used to repair small cracks in the sheeting by first wetting the area and then applying a drop of cyanoacrylate in the area. The adhesive also tends to make visible any "would-be" cracks adjacent to the actual damaged area. According to information we received from a chemist, the water apparently creates an ionic bridge for the cyanoacrylates which, due to their low viscosity, permits rapid wood penetration.

★ ★

Finally, Don Swinehart of Ashland, Ohio, writes that, while he uses the cyanoacrylate adhesives, he worries about his kids getting into it. Also, since most manufacturers recommend that it be kept in the refrigerator, so for some very cheap peace of mind, Don found that the druggist will supply the "child proof lids" type of pill bottles in a large enough size to completely enclose your bottle of cyanoacrylate adhesive. These were priced at 8¢ each at the local drug store and would also be excellent for use in the field box, since your bottle of adhesive is often left open and unattended. □



Completed Servo Reversers showing different types of pots that can be used.

DOUBLE SR

BY GEORGE STEINER

SERVO REVERSER

Throttle linkage bent in a big "Z" to clear the forward bulkhead, nose gear linkage in the way of receiver and battery pack, aileron linkage makes a big criss-cross X? All this because a servo goes backwards!

How can I reverse the direction of my servo you ask? Familiar words of frustration! This comes to mind after you have installed your RC gear in your new production.

One way is to have the servo operated on by the handy RC'er who knows electronics. Another way is to send it back to the RC manufacturer for modification.

What have you when you get it back? The problem is solved for sure, but how about when you use your RC gear in the next project? Same old song, second verse.

All these problems are typical. How about a device that, by a simple insertion between the servo and the receiver, reverses the rotation electronically? No re-soldered modification, no waiting for a servo operation and better yet, everything back to normal anytime you want. Servo reversers are not new. Presently several people manufacture such a device at a cost of about $14.00. If you are like me, you are a bit of a skeptic when it comes right down to acquiring one. Mainly because you want to know how it works first.

Giving it some thought one day I came up with an idea that could work. (See Fig. 1) The block diagram shows the basic concept and construction would be very simple. Clearing the bench of balsa wood I started in.

Selecting four different type of IC's to work with seemed to be a good idea. This would keep me out of a corner. By using the four in different ways I could select the best one to do the job. Although there is probably a hundred ways to accomplish the basic concept with other IC's I stuck to what I was most familiar with. Starting with two TTL IC's, a 7400 positive Nand Gate and 7402 positive Nor Gate, two RTL positive Nor Gates, one a HEP C2003P and the other a HEP C2502P, otherwise known as a MC 717P. Although the state of the art has advanced even beyond using the TTL and RTL type I stuck with what I had. I found the TTL's were voltage sensitive to the design. The RTL became the preferred IC and the old standby MC 717P came out on top when it came to stability and low power consumption. If you are still with me, let's get with it on how it works. (Fig. 2). This is for the challenging young electronic engineers whose minds never sleep.

The positive going pulse out of the receiver is capacitively coupled to a base of a transistor in the IC through pin 1. This is the trigger transistor which turns on momentarily due to this pulse. This starts the one-shot monostable multi-vibrator that make up pins 2, 3, 5, and 7 of the IC. When this takes place, the collector on pin 3 goes negative and the charge on the 2.2MF C2 timing capacitor holds collector on pin 5 in the off position until the charge can bleed off through the timing resistor network. The timing is partly dependent on the position of the Pot. D1 diode blocks the capacitor from being charged from the common collector voltage within the IC out of Pin 3. The end result is a 3 mill second generated negative going pulse out of pin 3 of the IC. This signal is fed through 6.8K resistor R2 to the base input on pin 10. The receiver output pulse is also fed through the 4.7K resistor R1 to the same gate input on pin 9. This forms a summing action combining the positive 1.5 MS pulse with the generated 3 MS negative pulse. At the same time the signal is inverted with the remainder and appears at pin 8 of the IC as a positive going pulse. Any expanded pulse out of the receiver becomes a smaller one out of pin 8 to the servo. This is the reversing action needed to make the servo go in the opposite direction.

The 1000 Ohm resistor R4 is to increase the gain of the last stage so the output pulse will equal the input pulse. P to P voltage wise. One section of the IC is not used. (Pins 12, 13, and 14.) Those of you who want to

drive a servo that takes a negative pulse can modify the output to run through this unused section. The PC board can handle this.

Remember this device is for positive going input pulse RC gear. It has been tested with older 3 wire and 4 wire systems with good results, Heath, Kraft Sport Series, World, EK, Orbit and Royal. Unfortunately, some of the newer RC gear will not tolerate the double SR unit, so build it and use it with discretion.

Constructing the Double SR can go in several ways. Fig. 4 gives the PC board positive for you to make to your liking. When reduced to the 1-3/16" x 13/16" it is still spacious and easy to work with but small. Drill the holes in the board with a #67 drill. If you go too big with the holes you might just drill out all the copper land. Be careful.

The selection of parts is not critical with the exception of C2, the 2.2 MF capacitor. Use a small tantalum of 10 or 25 volt range and good quality. Some tantalums you will get will be the axial lead type. The one I used in the prototypeswas a dip tantalum as shown in Fig. 3. Either one is acceptable but be sure the positive lead of the capacitor is placed in the PC board as indicated in Fig. 3.

The parts list will differ a bit depending on what IC you end up using. The schematic in Fig. 2 shows parts for the HEP C2502P or MC717P chip. These parts can all be purchased from Ace R/C of Box 511, Higginsville, Mo. 64037. If you use some other IC chip like the HEP C2003P or MC724P the following resistors will have to be different. Referring to Fig. 3 for parts location R2 will have to be 4.8K R4 a 330 or 470 Ohm and R6 3.6K Ohm.

Remember, when placing the IC in the circuit that it also has a polarity. The indent end goes towards C1 in the PC board as seen in Fig. 3.

Trim pots come in so many sizes and shapes it is hard to recommend any one kind. Just find a small one and use it. That is why the notation in Fig. 3 referring to trim pot location. It could be placed flat against the back side of the PC board if it is a large one (that is just one idea). PC board holes will match 80% of the ones made. The trim pot from Ace R/C (part #29K37) is of the smaller size. Its basic set up won't fit the holes in the PC board so you will have to modify by soldering wire leads on the trim pot terminals. Use excess leads cut off the resistors for wire for this. Bend these leads to match the holes in the PC board.

All resistors are 1/4 watt at 10% and DI is a general purpose low power silicone switching diode. Be sure the banded end is connected to pin 3 of the IC.

Wiring the servo plugs to the PC board, one male and one female will be required. If it be a Deans, Multicon or Brunner, make them short. No longer than three inches is adequate for each connection. For using the 4 wire servo don't forget to use the tie point on the Double SR board for the center tap battery, (white wire).

(continued on next page)

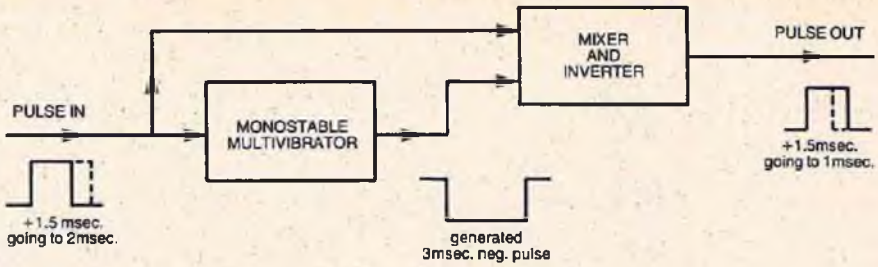


FIGURE 1
FUNCTIONAL BLOCK DIAGRAM OF SERVO REVERSER

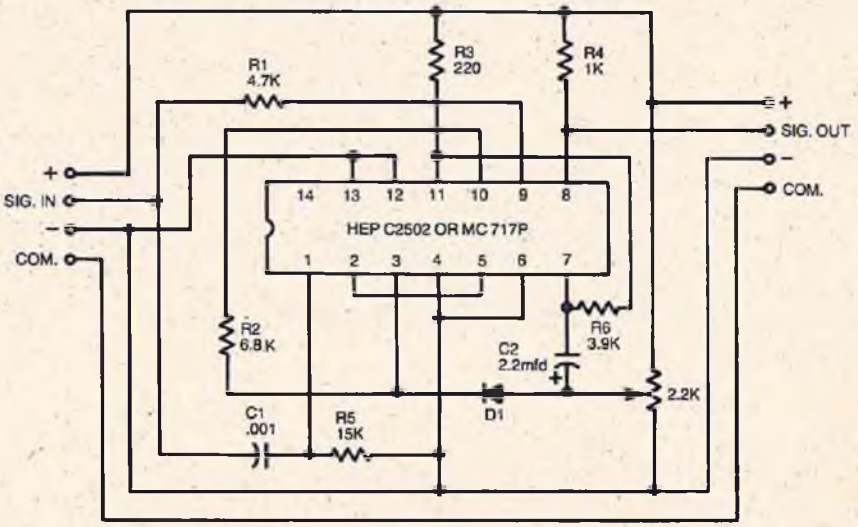


FIGURE 2
SCHEMATIC

Servo Reverser parts layout using Ace R/C components, Multicon connectors.

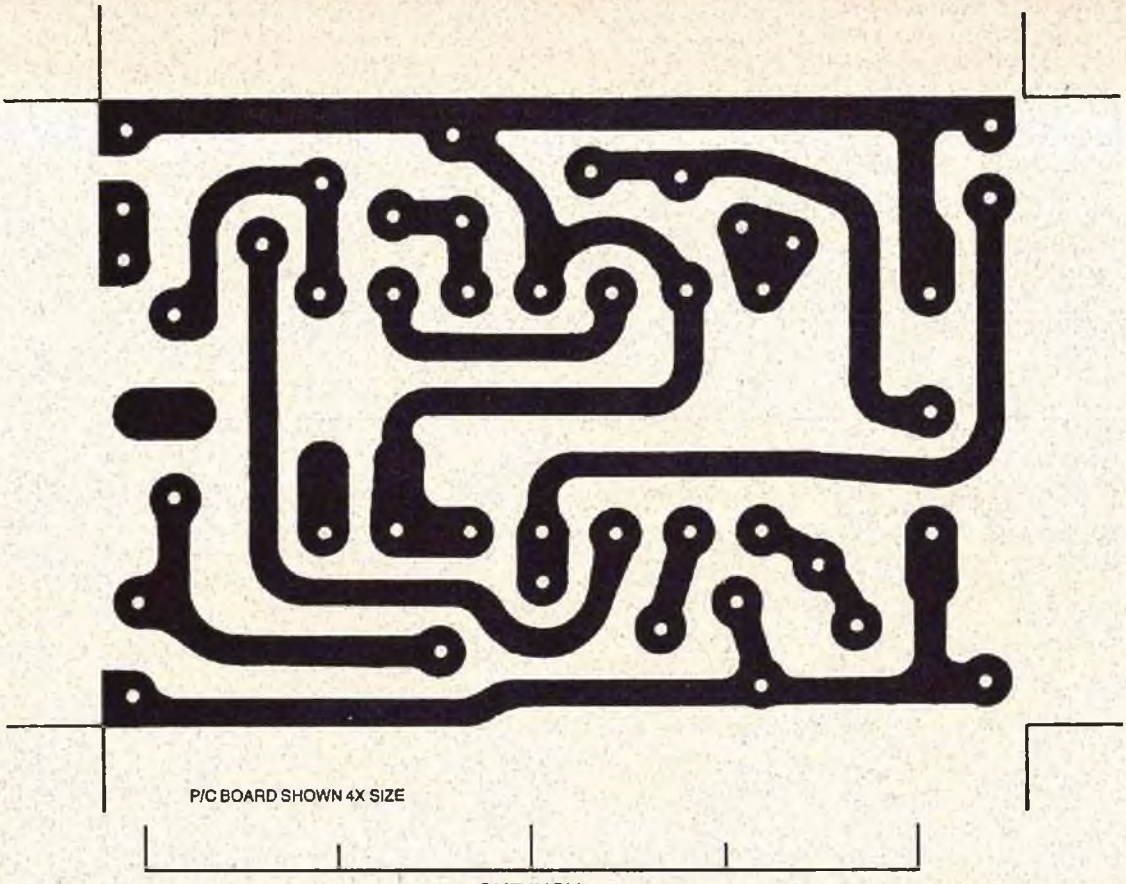


FIGURE 4

Testing (The Smoke Test)

Prior to plugging in your servo reverser unit, set the trim pot mid range. If you have use of a scope it is the preferred method for checking the unit out. Another method will be explained later.

Turn on your transmitter and receiver. Unplug one of the servos and place to one side. Do not plug in your servo to the Double SR at this time. Plug in the Double SR unit in the plug that you just removed the servo from. Now place the scope leads between positive and the output of the Double SR, (across R4). You should observe a positive going pulse. If you are not sure what a positive pulse looks like, observe what is coming out of the receiver at the Double SR input across R1. After establishing what a positive pulse is and you find you have a negative pulse at the Double SR output - - - **stop.** Check over your wiring and soldering, looking for some mistake. The negative pulse indicates the unit is not working. If a positive pulse is observed move the trim pot from one side to the other. You will observe the pulse on the scope expand and contract accordingly. Set the pulse as close as you can at 1.5 MS on the scope screen. Now plug in your servo and center it with the 2.2K trim pot. Move your transmitter stick and observe the **reversed** direction of your servo.

For those who do not have a scope we can do it another way — that is if you have a VOM (volt-ohm-meter). Set the meter on a low DC volt scale like 10 volts. Plug the Double SR into the receiver and turn on the transmitter and receiver. As I said before don't plug the servo in just yet. Take your (VOM) meter and measure the voltage across R4 positive meter lead to positive red wire and the black negative meter lead to pin 8 of the IC chip.

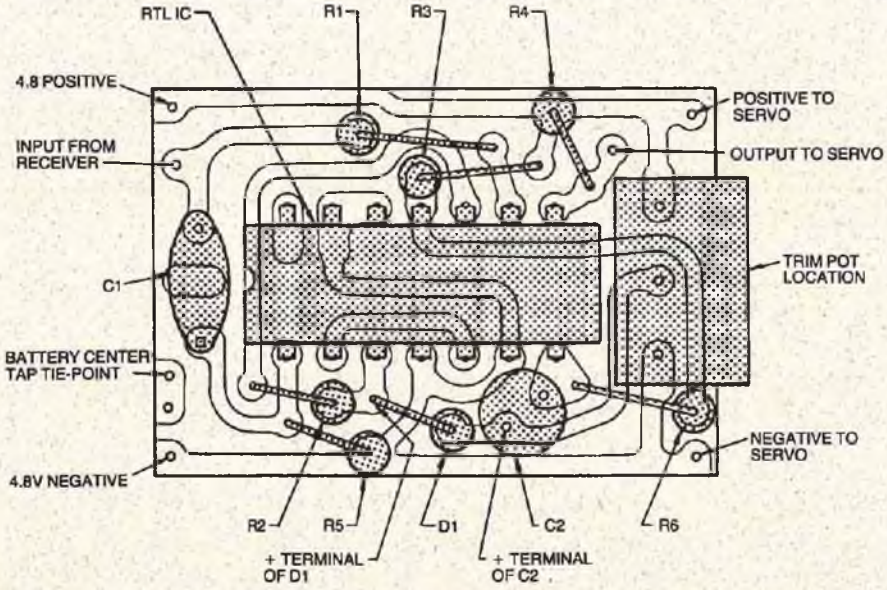
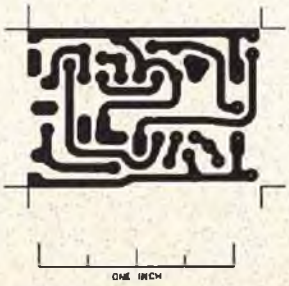


FIGURE 3
TOP VIEW
PARTS LOCATION



PC BOARD ACTUAL SIZE

A reading of about 4.5 volts will be normal. Now move the 2.2K Ohm trim pot back and forth past center. A slight voltage change will be observed on the meter. Turning the pot clockwise makes the voltage decrease or go lower. If it didn't move - - - **stop** and check your work as stated before. If it did move then move the stick in the transmitter. Likewise the measured voltage should move up and down in a slight manner. Now remember we are only looking for two or three tenths of a volt movement. Not a movement that will swing across the face of the meter. If all the above checks out then re-center the trim pot and plug in your servo. Immediately center the servo with the trim pot. Don't leave the servo stalled at one end too long otherwise permanent damage will result.

To encase the whole unit I used a 2-1/4" long by 1" OD heat shrink tubing. The MonoKote heat gun did the rest. You can see the results in one of the photos.

Two rubber grommets 11/32" OD x 1/8" ID were used to plug up the holes through which the servo plug wires pass through the heat shrink.

You should end up with one of the handiest RC tools you have ever had. You can now make a mistake and cover it up with ease.

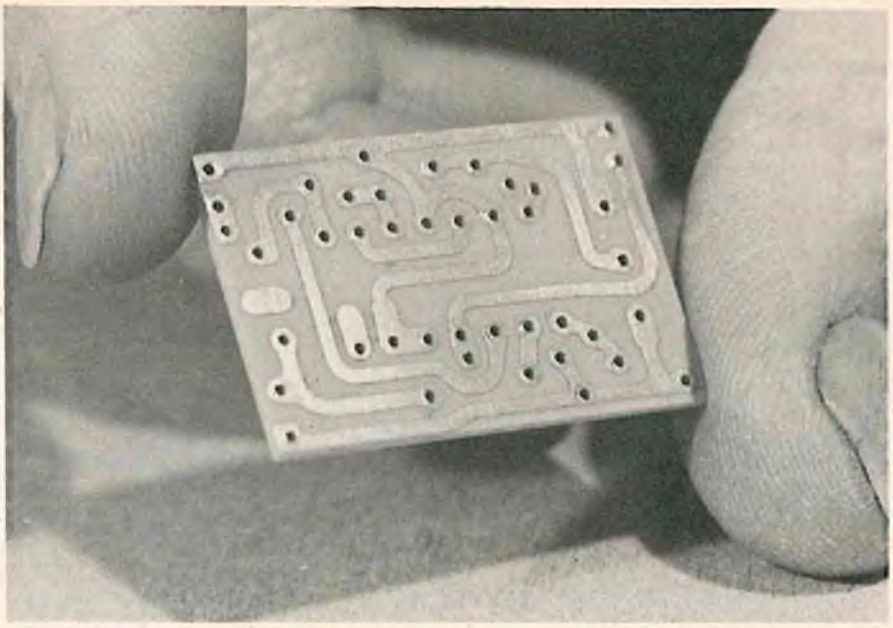
Have you ever tried to reverse a KPS9 (capacity feed back)? You just cannot do it. The only way is with a servo reverser and that is one on the reasons that prompted me to start this project. Hope it does for you what it did for me eliminating the last minute frustrations.

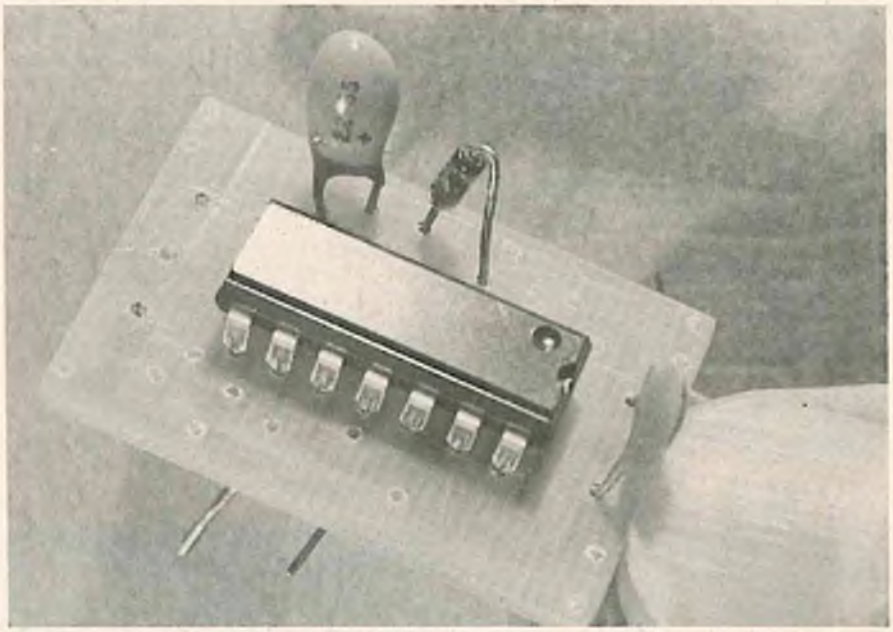
PARTS LIST
From Ace Radio, Box 511, Higginsville, Mo. 64037

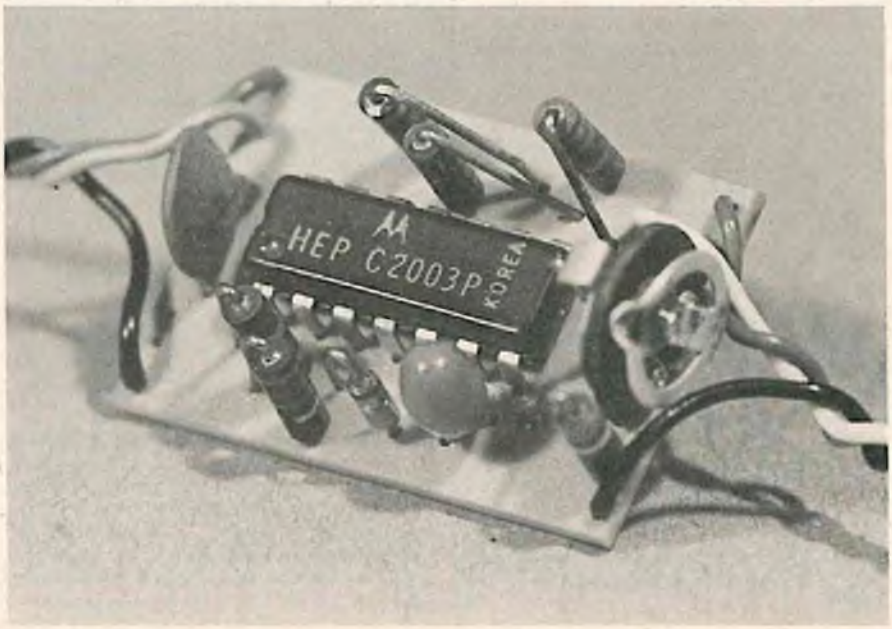
$2.10 — Integrated circuit MC717P (HEP C2502P).
30¢ — Diode (D1) IN3068.
25¢ — Capacitor (C1) DISC .001MF #18K7.
90¢ — Capacitor (C2) Tantalum 2.2MF @15V #18K41.
— Resistors #29K20.
20¢ — R1 4.7K Ohm.
20¢ — R2 6.8K Ohm.
20¢ — R3 220 Ohm.
20¢ — R4 1000 Ohm.
20¢ — R5 15K Ohm.
20¢ — R6 3.9K Ohm
89¢ — Trip Pot 2.2K Ohm #29K37

I want to again thank my fellow RC'ers in Sacramento for their encouraging help on this project. They are the ones that dubbed it the Double SR. What is a Double SR? "Steiner's Servo Reverser".

For those who want a PC board, I have a few. They can be had for $2.50 each, along with a self addressed stamped envelope. I will even throw in a piece of 1" heat shrink tubing. Any other questions that might come to mind, I will do my best to answer. My address is as follows: George P. Steiner, 2238 Rogue River Drive, Sacramento, California 95826. □







Now this is the way to go slope soaring - - - with lovely Lindsay Bloom!

PRACTICAL SLOPE FLYING

BY BILL EVANS

PHOTOS BY BRUCE ROBERTSON & MILT LEWIS

Prologue . . .

It has been said too many times that the sport of Slope Flying R/C gliders is restricted to those parts of the country which afford high cliffs and strong winds. Though it is true that some parts of our country have terrain and wind that produce excellent slope flying conditions; it is also very true that no matter where you live there is a wind swept hill near, on which you can enjoy the excitement of Slope Flying.

● The first hurdle to overcome is to realize that you can successfully slope fly your glider in your locality. The idea of putting aside your hi-start and the thrill of throwing your glider off a hill into the wind is one you will always remember and swell you with a feeling of accomplishment.

The best description for those who first experience a two minute, ten minute, one hour or even four hour slope flight, is disbelief.

Since my first twenty years were spent in the Midwest and the last sixteen on the West Coast, I have corresponded regularly with my old Midwest R/C flying companions. Our correspondence has been chiefly about R/C gliders. Though I use the hi-start and winch, I have a great tendency to use the slopes of Southern California to launch my ships off of and work into thermals.

Generally my letters to flyers in the Midwest about slope soaring were answered

The author and friends ready for flying session.

Checking the control surfaces prior to flight.

The launch - - - Bill launches his RCM 'Gus'.

Flying straight out from the hill.

A left turn away from the hill.

Flying parallel to the hill.

A right turn away from the hill.

A 'Cumulus' turning in a thermal.

Landing – setting the 'Gus' up for a hand catch.

with "We don't have slopes to fly from." They never believed how easy slope flying could be until several of them made the trip to the Coast and made one and two hour slope flights themselves. Their reaction was "though it's fine for the Coast we can't do the 'slope thing' in Indiana."

In the past two years I have had the opportunity to make three trips to the Midwest, each time I made sure to take along a couple of R/C gliders. On each of the trips, after scouting out the area on the southern tip of Lake Michigan and Northern Indiana, I trudged up the sand dunes with my ships, accompanied by doubting glider flyers from the area. The results were very satisfactory, though we braved rain, light wind four to six miles per hour, and heavy wind up to fifty-five miles per hour, flights ranged from two to twenty minutes. The Silent Squire did very well as did the Slope Squire (low wing, symmetrical airfoil). One of the Indiana flyers put up his Cumulus and in a few minutes became well oriented to Slope Flying.

Since their exposure to the practicability of slope flying, in their own area, some of the Indiana flyers are scouting for new hills to fly from and they are now providing stimulus for growth of the sport. As an analogy it was interesting that when I made a recent call to Indiana to the home of Bill Braatz, his wife Agnes answered with, "He is out slope flying," and she had noticed that the strong north winds which for years produced a glum look (because he couldn't go out hi-start flying) were the same winds which gladdened Bill's heart as he raced for the dunes, flight box and gliders in hand.

It has been my habit on long car trips to carry with me a ship or two. Whenever I see a likely looking rise in the terrain, especially when there was a hawk circulating overhead, I stop the car and scramble, ship in

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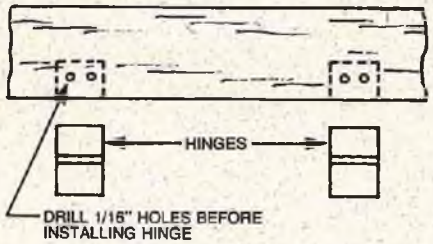
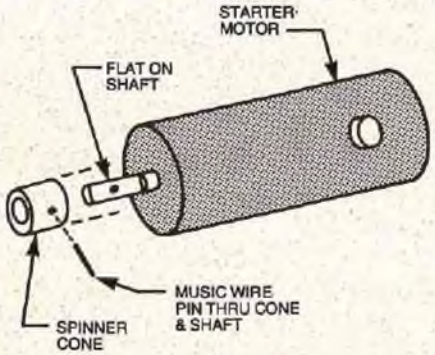
FOR WHAT IT'S WORTH

Here is a suggestion from Ray Christensen of Great Falls, Montana, regarding the installation of hinges using Hot Stuff cyanoacrylate adhesives. First, cut a slot in the balsa to fit the hinge you intend to use. Next, check the hinge for a proper fit, then remove it. Drill two 1/16" holes all the way through the wood, then slide the hinge back into the slot and align properly. Apply a drop of Hot Stuff to both holes on each side. After the glue has cured, re-drill the holes through the hinge and pin with toothpicks. The main advantage to this method is that it allows all hinges to be aligned and glued at the same time with no glue getting in the hinge pin itself.

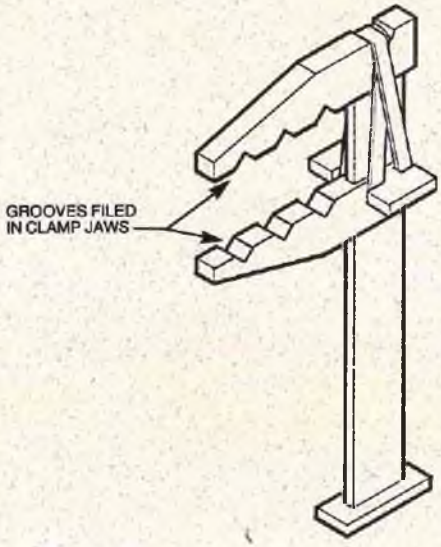


After years of dependable service, the older model of the Sonic Tronics electric starter, belonging to J. Wine of Honolulu, Hawaii, finally stripped its plastic cone where it plugs into the shaft of the starter motor. The shaft of the motor has a flat on it and this mates with the plastic cone, preventing slippage. An easy and quick way to fix this is to drill a 3/32" hole through the plastic and the flat of the motor shaft. Be absolutely certain the drill is kept exactly perpendicular and through the center of the shaft. Now, pin in place by driving a piece of music wire into the hole. This should be a snug fit. With a drop of epoxy, you'll find your older model Sonic Tronic starter is as good as new.



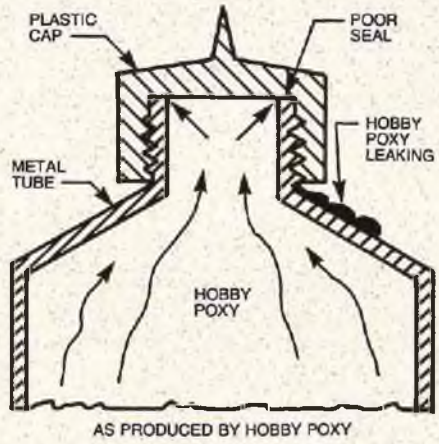
John Jurgensen of South Beach, Oregon, writes that, while strictly a Ukie stunt man, he always reads RCM for the construction and finishing techniques, as well as advertising items that apply to all phases of modeling, not to mention that he likes the covers! In any case, John passes on the hint regarding the use of Fuller's Earth, a super absorbent powder which is readily obtainable at most drug stores, and which soaks up oil like a sponge. Out of curiosity, John packed some in a hole, added a drop of Hot Stuff and — pow! — that stuff turned to stone! It is a little heavier than the micro-balloons, but a good alternative for instant fillets, dings, and sloppy joints. Try it, but be sure you get it where you want it and don't pick up any with the teflon tube and don't let the smoke get in your eyes!

Don White of Houston, Texas, submitted the following sketch of a modification he makes to the popular Kraft building clamps. By filing grooves in the jaws of the clamps, they will hold much better on some of the odd-ball shapes we glue together in the shop. The resulting "teeth" are very easy to cut and the sketch is self-explanatory.

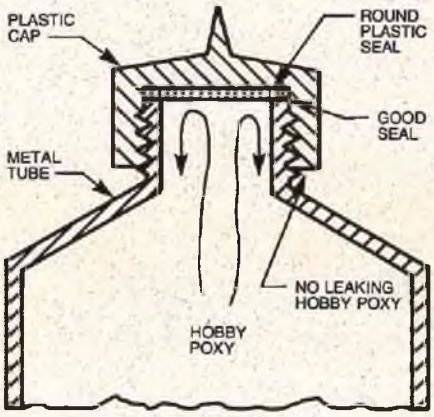


Large contact cemented joints, such as fuselage doublers and wing skins, too often result in a bad mis-match. If the problem has caused you to slice, fill, or even make new parts, here is a technique suggested by Don Blucker of Orange, California, which will end your troubles. After coating both parts with contact cement, allow the drying time necessary for both surfaces to lose their "tack". Lay one part on your bench and cover the cemented area with overlapping strips of wax paper. Plastic wrap will stick — do not try it! Now, place a second part in position. The paper prevents sticking and allows visual reference to the part below. When the parts are perfectly aligned, use pins, one hand, or a helper, to maintain alignment. Starting at one end, gently slide out one strip of paper and press the exposed area together lightly. Continue this process across the joint, one strip at a time. When the entire joint is mated, apply firm pressure to assure total contact. Try it — you'll ask, "Why didn't somebody tell me sooner?"

Most of us use Hobbypoxy glues for construction and quick field repairs. The problem Vincent Stagnaro of Seal Beach, California encountered, and solved, was that the plastic caps would not seal 100% and the Hobbypoxy would leak out of the metal tube around the cap. Vincent solved the problem by making round seals which fit into the plastic caps. He took a soft plastic top from a throw-away butter container and punched out round seals, using a three hole paper punch. The results are no more leaking Hobbypoxy tubes which can now be laid on their side, rather than standing up against a shop wall.



AS PRODUCED BY HOBBY POXY



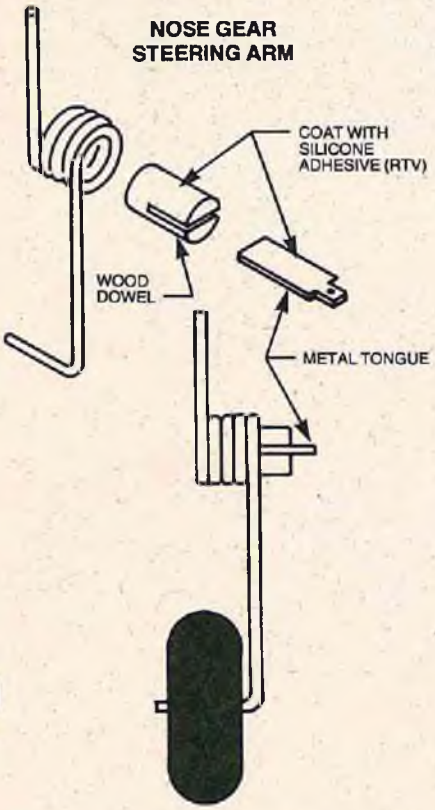
WITH ROUND PLASTIC SEAL

Dean F. Poeth of Columbus, Ohio, writes that a successful R/C model requires a straight and warp-free wing and vertical and horizontal tail surfaces. However, not all balsa wood, or other building materials, are straight when purchased. When pinned down on a flat building board, these crooked pieces generate built-in stresses in the structure and, because most of the model glues dry to a flexible joint, these flexible glue joints allow the built-in stresses in the wood to relax when the structure is un-pinned from the building board, resulting in a warped wing. However, if the top and bottom balsa sheeting are fastened with an epoxy glue (which makes a solid inflexible joint), the curved balsa sheets then hold the finished wing to its original pinned-down shape and result in a warp-free structure. This is, of course, assuming that your building board is flat and straight. While Dean uses aliphatic glues for most of his model construction, the use of epoxy glue, to attach the final balsa sheeting, has resulted in wing and tail srufaces which are free of warps. He has used this building technique for the past five years and has found it to be a superior and trouble-free method.

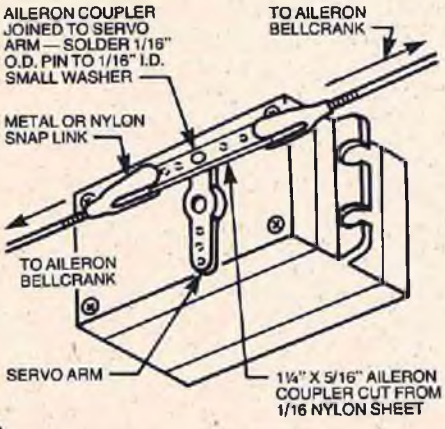
Send your Hints & Kinks to RCM, P.O. Box 487, Sierra Madre, Ca 91024 — Win a free subscription to R/C Modeler Magazine.

FOR WHAT IT'S WORTH

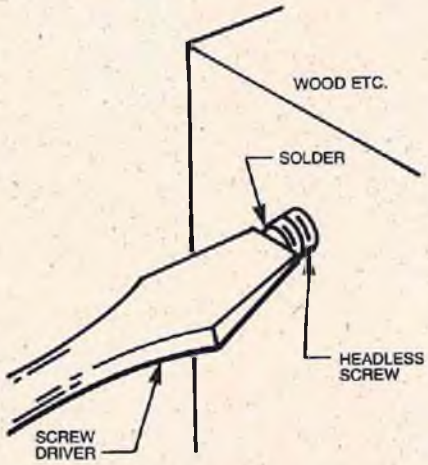
Bart Draper of Waco, Texas, submitted this sketch of a nosegear steering arm that he has found to work quite well. It is better to have the connection outside on trainer type of models for ease of adjustment. It is also important to use a silicone type of adhesive so that the landing gear remains flexible.



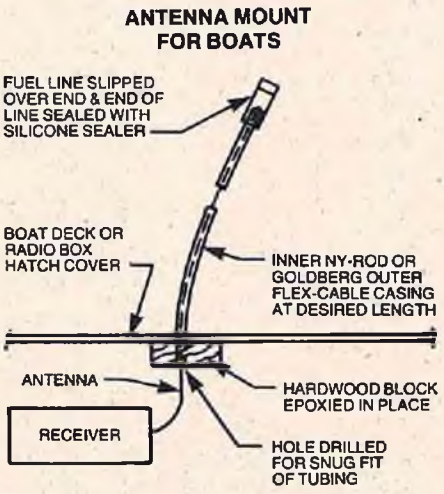
Here is a simple and effective aileron coupler submitted by Fernando Rodriquez of Colombia, South America. With this system, each aileron can be adjusted individually and more easily than with any conventional linkage. Disassemble the servo arm and "quick solder". Assemble the coupler pivot on the servo arm carefully and accurately.



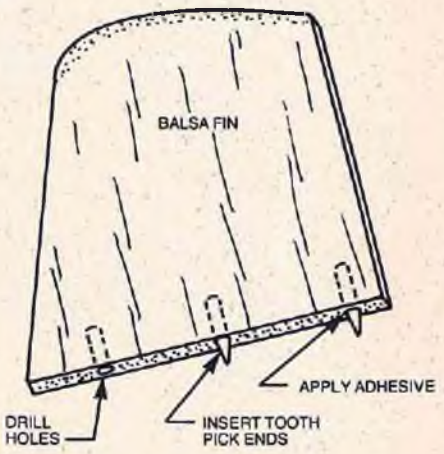
Have you ever experienced the agony and frustration of having the head of a screw pop off after you tried to tighten it just a bit too much? Bruce MacDonald of Ontario, Canada did, but found an easy way of getting the headless screw out. Take an old screwdriver and butt it up against the screw. Put some flux on the screwdriver and then melt some acid-core solder on the tip of the screwdriver and the screw. The solder will adhere to both, but not to the wood. Now, when you turn the screwdriver, the screw will come out and you can replace it with a new one. The solder is easily removed from the screwdriver by heating it and wiping immediately. The next time your pliers can't grip a broken screw, try this method — you'll find that it works.

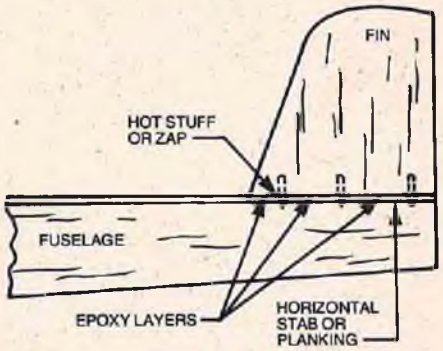


Dennis K. Green of Boone, Iowa, submitted the following idea as an antenna mount for boats. The most important advantage of this installation is that the antenna does not have to be cut to length to compensate for an otherwise steel wire antenna extension. The antenna is merely threaded through the outer casing and held in place by cutting a slit in the end of the casing. Next, slide the wire into the slit and then bend down the side. A piece of fuel tubing with the end sealed with silicone is then placed over the end to make it water-tight. This makes an unbreakable whip antenna at minimal cost, without cutting off your receiver antenna.



Here's a quick way to install an all-balsa fin on a fuselage that is self-aligning and much stronger than the traditional method of butt-joining, as suggested by Harvey Mitchell of Lubbock, Texas. After the final preparation of the fin for joining to the fuselage, drill a 1/16" hole about 1/2" deep every inch along the bottom of the fin as shown in the drawing. Next, cut round toothpick ends to fit the holes so that the pointed ends extend when inserted into the holes. Use Hot Stuff to secure the toothpicks in the pins. Next, draw the fin location centerline on the fuselage and, using the fin as a pattern, mark wherever the toothpicks will enter the fuselage. Apply epoxy layers between the toothpicks on the fin. Align the fin and press into place on the fuselage, hold vertical, and apply Hot Stuff or Zap to the junction where the toothpicks enter the fuselage and, in 10 seconds you're through!





When drilling a hole near the edge of a piece of plywood or other material that might break through, first drill a small pilot hole, then put in a drop of Hot Stuff or Zap, then drill the final size hole. This will greatly strengthen the wood around the hole and prevent breaking through the edge. This idea was submitted by Robert Govro of Albany, Oregon.

When cutting fiberglass cloth, the ends usually unravel, making it difficult to handle, according to Martin Kriegsman of Waltham, Massachusetts. To solve this problem, Martin runs a few drops of Hot Stuff, along the line to be cut. It dries instantly and, once cut, there's no frizzy ends.

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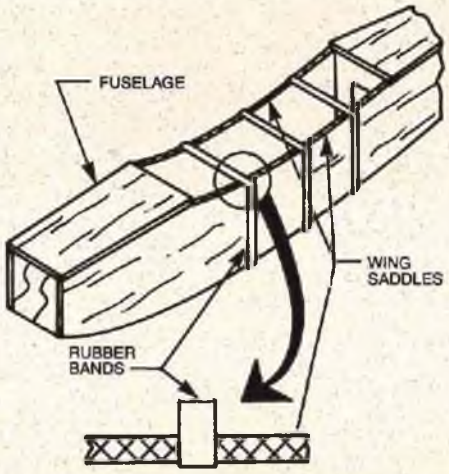
FOR WHAT IT'S WORTH

from page 87/86

Major Bill Bynum of APO, New York, writes that he likes silicone rubber wing saddles, but every time he tries to apply them, he runs into two problems. First, he has trouble getting the silicone to stick, and secondly, when he straps the wing over the liquid rubber to form the saddle, the rubber squeezes out the sides, leaving practically nothing to protect the wing. These problems have been solved by sanding the wing saddle well and cross-hatching the area where the silicone is to be applied with an X-Acto knife, making the cuts approximately 1/32" deep. Next, apply a thin coat of silicone rubber with a flat piece of balsa, pressing the liquid well into the cuts. Immediately place three clean rubber bands around the fuselage and across the wing saddle, so that they divide the saddle area into approximately four equal areas. Now gob on the silicone rubber along the entire saddle area over the rubber bands and all. Before the silicone sets-up, cover it with a piece of Saran Wrap, place the wing in place, and strap it down with a couple of weak rubber bands. Wipe off the excess rubber, let the whole mess sit for 24 hours, then trim away the rubber bands where they extend past the wing saddles. The cross-hatch cuts provide a grip for the silicone rubber, and the rubber bands give the wing support so that all of the rubber is not squeezed out. If the explanation is confusing, the accompanying sketch should be of help.



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SHOWCASE '76

from page 94/80

Wisconsin. Called the Model 232 Moto-Flex Tool, it has a lightweight and slim grip handpiece which permits the user to perform hundreds of intricate operations in hard-to-reach areas. With it you can grind, drill, polish, buff, carve, sand, sharpen, deburr, engrave with speed and precision on metals, wood, glass, stone, plastics. The ball bearing handpiece is 5⅝" by 23/32" in diameter and knurled for positive finger grip. It contains a 1/8" collet and accommodates all of Dremel's 1/8" diameter accessories. Other optional collet sizes are also available (3/32", 1/16", and 1/32"). It is powered by a 25,000 RPM 1/15th HP 1.0 amp., 115V AC Universal motor and comes complete with a 34" long vinyl covered flexible shaft with ball bearing handpiece and a 360° swivel base for bench use and a handy hanger bracket for overhead mounting. To extend its versatility, Dremel also has available two solid state speed controls which can regulate the motor speed from 0 to full RPM. The No. 217 is foot operated and has a retail price of $21.95. The No. 219 is manually operated and has a retail price of $19.95. Both units enable the user to control the motor speed to match the material and accesory being used. The new Model 232 Dremel "Moto-Flex Tool" is available at hardware, hobby and crafts retail stores selling Dremel creative power tools. Suggested retail price $59.95. For free literature, please write to Dremel Manufacturing Division of Emerson Electric Co. Dept. PR., 4915-21st St., Racine, Wisconsin 53406.

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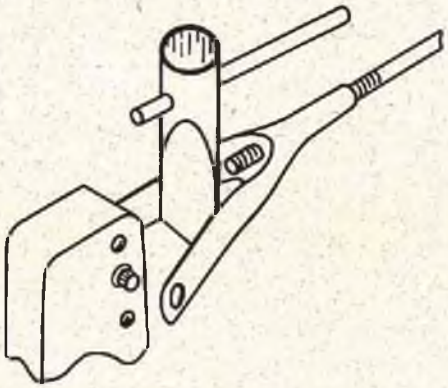
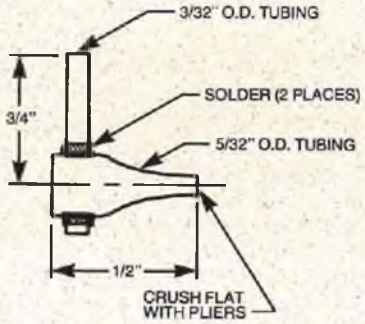
FOR WHAT IT'S WORTH

from page 90/86

Here is the "key" to the problem of connecting and disconnecting spring steel pushrod connectors, as suggested by Daniel L. Curtis of Twin Lake, Michigan. Construct the "key" according to the sketch, then just insert it between the two flat sides of the connector and twist it 90° to the position shown. Music wire can be substituted for the 3/32" O.D. tubing. The dimensions aren't critical, and Dan made his to fit in tight places. □





PRACTICAL SLOPE FLYING

from page 85/84

. . . . hand, to the rise, check to see if the wind is blowing at the face of the hill, and toss the glider into the air. I have done this all along Route 66, through Texas, Oklahoma, Missouri, Illinois, and Indiana, with almost always good results.

For you to have a better idea of the limits of Slope Flying, I once slope flew off of a thirty foot high dirt mound, raised by construction of a park on Lake St. Clair near Mt. Clements, outside of Detroit. On this particular occasion I really wasn't thinking of flying, but when the youngsters of the family we were visiting saw the Slope Squire resting under the back window of my Chevy they prompted me to go in search of a hill. In the limited time available we managed to locate a dirt mound about thirty feet high and sixty yards long which faced the east wind blowing off Lake St. Clair. The results with the sixty inch symmetrical airfoil Slope Squire (using ailerons and elevator) were good. We managed to get fifteen to twenty passes back and forth before altitude loss made landing necessary.

In your search for a slope flying hill, whether

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PRACTICAL SLOPE FLYING

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you find the tornado-like winds of the Pali in Hawaii, which return a silver dollar when thrown off the edge, or that excavation mound on Lake St. Clair, first keep in mind, that slope flight is practical at either extreme.

You should look for a hill that has a face width of forty yards or more, the angle of the face should be about thirty degrees. The height will vary depending on the locale; if you find one with a height of twenty-five feet and the wind hits it dead on, give it a try. Winds from four to six miles per hour can work well — we have flown in gusts up to fifty-seven miles per hour. Fairly light warm winds will sometimes produce better results than strong cold winds. Your choice of glider should fit your lift conditions. Large ships (one hundred inches plus) work well but best results usually come with the smaller aircraft under one hundred inches. Smaller craft have the ability to make the tight turns sometimes necessary to stay in the cone of lift which is just in front and just above the peak of the slope. We have seen most every sailplane that is kitted flying off the slope.

Once you have selected your hill and the ship ready, check for wind blowing at the face of the hill. Launch your ship directly into the wind and, when airborne, go easy on the control commands and make a gentle turn to the right and fly parallel to the hill with the ship at or just above your eye level. Make your next turn left away from the hill and again fly parallel. When approaching the left end of the hill, make a right turn and again fly parallel. Repeat the left and right turns away from the slope. Your first landings can be made by letting the ship settle in front of you, down the slope. With practice you can easily make hand catches. There are just a few don'ts and they are:

(1) Don't let the ship get behind you — remember that as the lift pushes up the face of the slope it is also pushing down the slope behind you. If the ship does get behind you it will lose altitude and this will force a landing.

(2) Be careful on the up elevator — don't pull up elevator if the ship is losing altitude. This will only produce drag and more altitude loss; instead, use a little down elevator with which to increase speed and produce more lift.

(3) Make sure that your control surfaces are firm — that is, check to see if your control surfaces are fairly rigid. If they can be moved easily by putting finger pressure on them with the receiver off, check your linkage and torque rods to see if they are flexing excessively. If they are, correct it by stiffening or bracing.

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When writing to RCM, don't forget Zip Code.

PRACTICAL SLOPE FLYING

from page 100/84

(4) Do not turn into the hill. A turn into the hill produces the effect of a down wind turn which creates altitude loss and stall tendency. Add to this the fact that when flying towards a hill, your height above the surface is being decreased, by the angle of the hill and - - - crash! Save turns into the hill until you become proficient and more familiar with the conditions of your slope!

I have received reports of excellent slope flying conditions from almost every state as well as Australia, Canada, Europe, and South America. Before this year is out I hope to have a list of places to fly slope and possible names of persons for contact in those areas. I will try to work out a way to make Slope Flying sites known to those having the interest.

Feel free to contact the author c/o R/C Modeler Magazine, if you have specific questions about Slope Flying, or have a site in your area at which you would like to have listed.

Good Lift. □

BAMBI

from page 74/70

. . . . panel. Add the 1/16" sheet center cover which simulates a cabin top when the wing is in place on the fuselage.

Assembly:

Epoxy the fin to the center of the stabilizer, vertically aligned with a square or triangle. Epoxy this assembly to the top of the stab support plate, again checking for squareness and alignment. Fillet the leading edge to the fuselage with plastic wood. Brush or spray your finish on all parts.

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BAMBI

from page 104/70

Two coats of clear and two coats of color were used on the original. "Bambi" was doped gold overall with red trim on the wing leading edge and on the fin and rudder. Windows, ala "Curtiss Robin" on the wing and fuselage are from black MonoKote trim sheet.

The original was powered by an Enya .29 TV but a good .19 will provide plenty of power. The engine throttle rod is piano wire passing through drilled holes in the firewall and former "B". The elevator and rudder rods are 1/4" dowel with piano wire bound to the front to connect to the servos with Kwik Links at the rear.

Flying

Balance "Bambi" at about 30% of the chord with the fuel tank empty. Before flying, pack that radio equipment in all the foam cushioning you can shove in, and be sure to range check your equipment.

Adjust the control surfaces for neutral with your transmitter trim settings also in neutral.

Take-offs, because it is a tail dragger, require back stick to make "Bambi" track straight until sufficient ground speed is built up. Slight rudder correction may be necessary but, strangely enough, it usually requires a touch of left rather than right.

The climb-out with the Enya .29 is usually steep and altitude is grabbed quickly. Down elevator trim is necessary to prevent climb under full throttle, with the C.G. shown.

The ship, when trimmed properly, is a hands-off flyer and will return to level flight from any attitude upon releasing the sticks. Loops are as tight as a "ukie" model. Because of its inherent stability, the ship does not spin easily and must be fully stalled to enter a spin attitude.

The glide is fantastic! With a dead engine at 300' altitude, she will stay in the air two to three minutes, depending on the pilot. At the time of writing this article, "Bambi" has taken a third place in our annual club contest. This, in spite of its owner's shaky hands.

Go ahead - - - build a "Bambi." Would you believe ten of them for the price of one prefab pattern ship? □

POWER BOATING

from page 69/68

. . . . some chemical reaction reason that I don't pretend to be knowledgeable enough to understand, much less explain!) So, take some acetone on a rag, and give the area where you are going to stick the bulkhead a good rub. Better still, give the whole area a good rubbing over with some heavy glass paper, make it rough and dry. When you have done that, go ahead and stick the bulkheads in place. In the case of ply, it is a good idea to paint the whole surface of the bulkhead with resin, to make it both fuel-and-water-proof.

Maybe some of you don't know too much about using polyester resin, so let's talk about that a bit. But I must point out that I do not know any of your American products from experience. These notes must be considered as guide-lines. When you buy the materials, check with the shop on the exact usage. But certainly the methods I describe are applicable to any make of glass-fiber.

The easiest way of doing this is to consider the making of a sheet of polyester, which can be used both for the bulkheads and for the deck if you are

going to use a flat deck. Calculate the size you will require, and then get hold of a sheet of glass a bit bigger all around. Any glass will do, the stuff used for windows is great. (Don't do as I did, and "borrow" the full-length mirror off the wardrobe door, your wife might not appreciate it, mine didn't!) Make sure it is quite clean, and then cover it very thinly with a separating agent. Professional fiberglass molders use candle wax, which is very cheap, but pretty tricky to use. I would advise either a polyvinyl or wax or separating liquid, of a commercial brand. Whatever you do, avoid silicone wax like the plague, or you'll be very sorry! It is most important that the glass is completely covered, or the sheet will be ruined. (In fact, if it is not, the sheet will stick, but can be pried off using a wide-bladed and sharp wood chisel, but it will spoil the surface of the sheet.)

Next, mix up some gel-coat, accelerator, and catalyst (hardener), together with some coloring pigment, and spread it as evenly as possible on the glass, using a wide paint brush. This should be done at room temperature, because if it is too cold, you will have trouble spreading it. But don't do it indoors, because it makes quite a powerful smell, and you will definitely not be popular! Do it in the garage or the garden shed. When it is dry, mix up some ordinary resin, and paint a layer of it onto the gel-coat. Now lay onto it the sheet of glass-fiber cloth you have already cut. Using the brush loaded with resin, go over the whole thing, not as though you were painting, but jabbing down onto the cloth with the point of the bristles. Go over it, fairly quickly, until the cloth is completely impregnated (this is quite obvious, it acquires a "wet" look when it is.) Then check for air bubbles. This is the hardest part. There are two ways of doing this. If, whilst you are tapping with the brush, you notice that the area adjacent to the jabbed spot seems to heave or ripple, then there is sure to be an air bubble just there. The other way is to look for areas that seem to be more translucent than their surroundings. These too are probably air bubbles. To eliminate them, simply jab away at the area until they disappear. If they are really stubborn, make a hole with a pin, and then drive the air out through the hole.

When it is all dry, lay down a second layer, and leave it for at least 24 hours. If it is possible to store it for a couple of days next to the central heating system, so much the better. To take the sheet off the glass, insert a sharp knife under the edge, and run it all the way around. Then get a hold of the two corners and slowly lift it off. If it is stubborn, use a couple of long, flat pieces of wood with the ends sharpened like chisels, and lever it off, gently. The result, if you have done it properly, is a perfectly flat sheet of high-gloss glass-fiber, which you can now cut up like plywood. Do remember, though, that the same rule applies when using it, do remember to clean the rough side, and also the gloss side, because some of the separating agent is sure to remain on it. Use acetone for this, and also for cleaning the brush, and your fingers. I always wear a pair of heavy-duty rubber kitchen gloves when using glass-fiber and you can clean them whilst they are still on you hands with acetone, and the loss of tactile sense is not at all important for this job. And I am not a sissy, either, just wait until you get your hands covered with the stuff, and you'll see why I do it!

■ ■

I have just received an interesting little item from John Stidwill of Racing Models, England. As you can see from the photo, it is a cylinder head for a Webra Speed .60. John got the idea of checking the compression ratios of several motors, and found that the Webra varies enormously, between 9.5:1 and 13:1. He decided to

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POWER BOATING

from page 107/68

make a new one, and whilst he was at it, tried several new combustion chamber shapes. The one shown has been tried out on my own engine, and gives an automatic increase in power of about 8-10%, on straight fuel. These heads are going onto the market soon, at about $8.00 a piece. A good buy for the racing fraternity.

Tail Tip:

How many of you have found yourselves in the annoying position of having your boat engine stall when the boat is out of the water? Especially when there is no wind to make it drift in! Here's what I have been doing for the last five or six years — you might like to try it.

Get a hold of an old, six foot glass-fiber spinning rod, and a free-running casting reel. Treat yourself to about 75 yards of 20 pound breaking strain nylon monofilament line, and run it onto the reel. Now buy a small child's sponge rubber ball, a bit smaller than a tennis ball. Make a hole in it, across the diameter, and insert a lead fishing weight. Use a fairly heavy one, but make sure that the ball will still float. Put the end of the line through the hole in the weight, and tie it securely. Now, about a foot above the ball, tie a big sea-fishing triple hook, and you're all ready.

When your boat breaks down on the water, cast the ball out, beyond the boat, and in its general direction. The beauty of this is that you don't have to be accurate, just so long as the ball goes out further than the boat. 'Now just walk along the bank, until the ball and the boat are in a straight line with yourself. All you then have to do is tighten the line slowly, flick the rod so that it falls over the boat, and then reel in very slowly, until the triple hook catches in some part of the boat. And that's it! With my old rod, I can cast way out beyond the top buoy on the Naviga speed triangle, making a cast of some 50-60 yards.

Good Fishing! □

1938 MERCURY

from page 63

. . . . forgiving and stable aircraft and our prototype was flown by experts and pure novices with marvelous success. The engine was throttled off after four or five minutes of power and the Mercury left to float and soar. 12 to 15 minutes of flight are easy as the model is light and thermals in the lightest of air. One maneuver it will do extremely well under power is true axial spins. This model meets the requirements for SAM Class A-Cabin. The 1938 Mercury by Micro Models is a terrific change of pace for the pattern and racing pilot, an excellent trainer for the beginning pilot, and a nostalgic trip for anyone who remembers the great free-flighters of the 30's. □

RCM VISITS NASA

from page 62/58

. . . . Figure 8. The fiberglass and foam airplane, which has a 21' wingspan and weighs 168 pounds, is shown in Figure 9. With a modified R/C system and a 12 hp engine, the airplane has been flown to 20,000 feet. A new radio system designed to operated in the extreme flight environment at 100,000 feet is now being flight tested. A monopropellant hydrazine reciprocating engine with a 6' diameter variable pitch propeller, will be used for the high altitude flights.

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RCM VISITS NASA

from page 110/58

One of the design goals of the Minisniffer is free-flight model-like stability so that the pilot's workload for flights of long duration is minimal. During development, aileron control was found to be unnecessary and only an occassional rudder input was needed to change course. The pilot's workload for flying this airplane is in direct contrast with that for flying the F-15 model, and might be described somewhat like Sunday soaring with stable, docile gliders as compared to competition pattern flying with high speed, highly maneuverable aerobatic ships.

Wake Vortex Program

How many times have you been flying your model and encountered a momentary pitch, wing rock, or tail shake that you thought was caused by a radio glitch? It is just possible that you had encountered your own (or someone else's) wake vortex. Wake turbulence is a public safety problem in aviation, particularly around major airports, and is of national concern. One of the goals in NASA's wake vortex program is to develop techniques for rapid vortex attenuation. R/C models were used as part of exploratory tests of potential dissipation devices, such as segmented flaps, clamshell (oscillating) flaps, serrated leading edges, and vortex tubes. Smokers installed at the wingtips and at a flap segment junction were used to make the wake vortex visible. Figure 10 shows a modified model aircraft with segmented flaps deflected and smokers installed. Figure 11 illustrates a vortex pattern for a flap-up case showing a trailing wingtip vortex approximately 2,500 feet long. Figure 12, in which the outboard flap segments are deflected, shows vortex formation at each end of the deflected flap and the resulting canceling interaction approximately 30 feet behind the model. Figure 13 shows a large model with open clamshell flaps and smokers. The clamshell flaps open and close at 0.5 to 5.0 hertz to generate a vortex-canceling turbulence.

Vortex generation and strength are dependent upon many factors, such as the airplane's lift coefficient, size, geometry, gross weight, and landing gear location. There are also scaling effects, which cannot be easily defined. The R/C model tests, however, did provide a better understanding of techniques for determining vortex formation and break-up, the importance of smoker location, and the general effect of segmented flap deflections in the formation and dissipation of the vortex. These results, combined with results from wind tunnel analytical, and full-scale flight studies, led to flight programs such as the Boeing 747 airplane flight test, which incorporated selected flap and spoiler modifications for further study of the vortex phenomena.

Through the applications of radio control model aircraft technology to aeronautical research, Dryden Flight Research Center has gained valuable free-flight data which was previously not available and would be impossible to obtain from wind tunnel tests. As a supplement to full-scale flight tests, the R/C model tests are advantageous in the elimination of risk to the pilot and the reduction of cost. Operationally, model aircraft are given almost the same care and treatment as full-size aircraft. The development and execution of comprehensive pre-flight and post-flight procedures is probably the strongest contributor to program success. Althoughs scaling problems are evident, R/C model texts are useful in providing early indications of flight characteristics. □

FLIGHT TRAINING SEMINAR

from page 66/64

. . . . this vantage point, I could easily see in which direction it was going to move when I lifted off. I opened the throttle slowly until the model became light and started to skim about just above the asphalt. Since Grady had previously trimmed the tail rotor to a point where it would hover briefly without any control input at all, I advanced the throttle and immediately found myself thrashing about erratically trying to hold a hover over one spot. The helicopter was moving in all directions at once, standing on its tail, then on its nose, while I performed every known type of gymnastic possible, commonly referred to as "extreme body english!"

Finally, in desperation, I cut the throttle from approximately 6' or 7' altitude and the new training gear proved its nettle. The chopper simply dropped down to the ground without any damage. Right then and there that new gear was worth no less than one set of main rotor blades, a flybar, and a set of control cans.

"You're over-controlling and your reflexes are behind the machine," Grady stated calmly. Once again, they demonstrated the proper technique for hovering the Shark .60, and once again, I repeated my comic routine. After several attempts in this fashion, both the transmitter and myself were covered with perspiration and the training gear was now worth approximately 8 sets of rotor blades, flybars, and an equal amount of control cans and possibly a broken fuselage. That $29.95

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FLIGHT TRAINING SEMINAR

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training gear had paid for itself several times over in the first couple of hours!

During this entire program, Grady Howard and Dick Tichenor were taking photographs of exactly what was occuring and these photographs are presented with this article. You will see the over-control, the body english, as well as the grim look on the face of yours truly, which started out as pure fright, and ended up as pure determination. In-between hopping around, Dave and Grady would put on flying demonstrations with their Shark .60's, which included consecutive stall turns, consecutive loops, and even true rolls with this outstanding new helicopter. They would go so far as to make full speed pylon turns to the left and right with the blades almost at right angles to the ground and at an altitude of no higher than 5', followed by extremely precise maneuvers, such as hovering the helicopter and walking around it while it remained stationary, describing a 50' square at an altitude of 5' with 450° hovering turns at each corner of the square and, all-in-all, making the whole thing look really simple!

During the two days of actual flying, I probably "crashed" the helicopter at least a dozen times, but absolutely no damage was sustained, due to the new type of training gear. Finally, in what seemed to take ages, progress began to take place. The Shark .60 suddenly would be airborne and steady for 15 or 20 seconds and increasing a little bit in flight duration with each successive "hop". As each flight took place, my own tendency to over-control on the transmitter became less and less, and I suddenly began to feel that the helicop-

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FLIGHT TRAINING SEMINAR

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ter was responding to what I was telling it to do. What I hadn't realized was that it was responding to what I told it to do from the very beginning — it was simply that what I was telling it to do was incorrect. Once you begin to over-control, you set up an oscillatory mode where the helicopter is swinging back and forth, in one or more directions and, as you frantically try to correct these oscillations, you become further and further behind in response time. As the flights progressed, I gradually sensed the mistakes I was making and knew instinctively the percentage of time that I had it under actual control. Finally, after becoming slightly more proficient with the throttle, rather than simply cutting power from 6' and letting it drop to the ground, I began to ease the helicopter back down and the training program was truly underway.

The next step was to break out the stopwatch, and begin on the tasks in Grade Level I. Needless to say, the first 60 second flight was an absolute thrill, although I was certain that I had been airborne for at least an hour and a half! During the course of the weekend, Dave and Grady would put on more flight demonstrations with their Shark .60's, and this simply added to my own determination to get through the tasks in Grade Level I. Finally, after the 20 second precision hovers over a 10' square area were accomplished, I felt that I had made a major break-through in beginning to master this machine. The second 60 second hover proved that the first was not really an accident, "as I had assumed", and Grade Level I was becoming a reality.

Finally, by the time Dave and Grady and Dewey were ready to return to Chicago, Grade Level I had been achieved, except for a 2 minute flight, which I had missed by 10 seconds. During this entire time, I estimated that the new training gear had saved close to $200.00 worth of repair parts and an untold number of hours in the shop repairing the damage that a normal machine would have sustained had it not been for this unique training system. As a matter of fact, the Shark .60 itself, is extremely rugged and even easier to repair when damage does occur. As an example, one demonstration flight ended with one of the Sharks wrapped around a tree, looking like a mangled piece of junk. In reality, the total repair time, before it was back in the air, was only 2 hours! This could never have been accomplished with a scale machine with one of the highly detailed fiberglass bodies where all of the internal mechanisms are virtually part of that body.

The pictures accompanying this article will tell the story of how the Great Hacker made it to Grade Level I. The paramedic unit standing by, complete with cardiac unit, was deliberatley omitted from the photographs! The point of this article is that **it can be done**. If I can do it — so can you. I may never have the time to become as superbly proficient as Dave Gray (who has been flying helicopters since 1956) or Grady Howard, but at least I know that it can be done. And **you** can do it too — it takes time, patience, perserverance, and dedication. As Dave Gray once said, "If you think you might want to fly a helicopter, you probably won't. However, if you **really** want to, you **can**."

The new Shark .60 and its uniquely designed training gear will enable you to get there faster and with an absolute minimum of damage and subsequent repair time. And, once you have mastered the training phase, the machine is capable of

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FLIGHT TRAINING SEMINAR

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exceeding the potential of even the most experienced flier.

So this month, we laid it on the line. You'll see the fright, the over-controlling, the near crashes, and some progress. If you've been thinking about getting started in helicopters, you will see from the photographs that they do really fly. You will also learn that editors (at least this one) are not experts.

So, now it's your turn - - - get in there and keep trying, and let us know how you make out. □

FOR OLD TIME'S SAKE

from page 39

. . . . souls who are handling the different aspects of the Champs. Dick Smith of Worthington, Ohio is Contest Director. He's being aided by Free Flight Director, Walter Chambers of Columbus, Ohio and R/C Director, Woody Woodman of Saddle Brook, New Jersey. Bill Hale of Donnelsville, Ohio is the Contest Coordinator. Send your questions to him at 334 North Remington Road, Columbus, Ohio 43209, and be sure to include a self-addressed stamped envelop to speed things up.

Lest we forget, the non-fliers will also have a full schedule of activities which are being planned by Mrs. Robert (June) Laybourne. The scheduling will be left up to the non-flier to take at their

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R/C MODELER MAGAZINE'S
MODEL OF THE MONTH CONTEST

The Model of the Month Award Program is designed to encourage the sport and novice competition flier to submit details of his most recent kit or scratch-built model to RCM in order to encourage general model craftsmanship and the overall promotion of R/C flying.

Each month Dremel will award a 371 Variable Speed Moto-Tool as illustrated in the photograph. The second and third place winners each month will receive a one year subscription to R/C Modeler Magazine or, if they are a subscriber, an extension of their current subscription. **See the June 1976 issue of RCM for rules and prizes!**

AUGUST WINNERS

1ST PLACE

Msgt. James L. Hilmes
1836 E.I.S.
CMR Box 3628
APO New York 09332

"Sun Ray" built from RCM plans.
Wingspan: upper 51" — lower 38".
Wing Area: 700 sq. in. Weight: 7½ lbs.
K & B .61 engine. Heathkit radio.
Finish: Solarfilm, MonoKote, D.J. Trim.

2ND PLACE

Nigel R. Jones
5870 Oxford Drive, Prince George
British Columbia, Canada V2N 2EG

Scratch-built "Tiger Panzer" scaled down to .40 size. Wingspan: 46¼"
Length: 41". Weight: 5 pounds.
Max .40 engine & Kraft Sport 5 radio.
Superpoxy, MonoKote, D.J. Multistripe

3RD PLACE

Stephen K. Atwater
1801 Gough #604
San Francisco, California 94109

"VK Neiuport 17" built from VK kit
Scale: 2"-1'. Span: 54". Wt: 5½ lbs.
Power: HP 61. Radio: Kraft 74. Muffler adapted from Tatone exhaust manifold.
Finish: MonoKote, aluminum Aerogloss.

FOR OLD TIME'S SAKE

from page 122/39

own pace. June tells us she is gathering information of fun things to see and do around the area: Ohio Caverns, tours through Wittenberg University, the German village and French Market in Columbus, King's Island Park, to name a few.

Sounds like the Champs will again be a time of good friends, good food, good flying and good fun! After all, that's the purpose of all the activities - - - to have fun!

Coming Attractions

Next month, we'll have the report on the "Old Timer Bash" sponsored by Joe Beshar, S.A.M. President at Lakehurst, New Jersey.

'Til then, happy landings! □

COBRA

from page 36/33

. . . . proper alignment, then tape the wing to the fuselage. With the wing in place, epoxy F-2A and F-3B to the wing, taking care not to epoxy the wing to the fuselage. After installing a hatch in the belly pan floor through which both the retract and aileron servos can be installed and serviced, glue the belly pan to the wing and formers F-2A and F-3B. Cut the necessary access holes for the wing bolts and the assembly is complete.

Add wing and tail fairings using your favorite materials. Keep them light and don't leave them off.

Radio and engine installations are routine with the exception of the inverted aileron and retract servos as I have previously noted. The only difficulty you may encounter in equipment installation is that of a nose wheel steering pushrod because of the high wing and low nose gear. This problem was quite effectively solved by Bob Knoll, in his Yankee article in AAM dated Sept. '74. His system works very well and I recommend it highly.

Generally speaking, the most important, single aspect in the construction of any pattern airplane is correct alignment. The Cobra is no exception. Each flying surface must be free of any warps or irregularities and aligned precisely with the fuselage. The fuselage, itself, must be straight and present a solid, true structure for surface attachment. Don't accept anything less for your airplane or it will never fly with its full potential. Nor, for that matter, will you.

Another important factor to watch is the weight. Both total weight and weight distribution. The prototype Cobra weighs in at 5½ pounds ready-to-fly. With the proper selection of wood, good gluing techniques, and a reasonably light finish, 5½ pounds shouldn't be hard to achieve, but attention must be paid to detail. A light airplane is achieved through hundreds of small weight savings throughout the construction sequence.

Proper weight distribution merely implies that the farther away from the C.G. one gets, the lighter the structure should become. This is particularly true along the span of the wing. Good rolling maneuvers are impossible if the wing tips are too heavy. Mass in a wing tip is hard to start rolling and, once rolling, difficult to stop quickly.

Finish

The original Cobra was covered with silkspan. Dope and baby powder were used to fill the silkspan, followed by one coat of grey automotive primer. The color coats can be any of a number of

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SUNDAY FLIER

from page 16

Picture No. 7 — Ken Willard anxiously reassembles his racer after mid-air crash in first race. Note Bondo patch and fill on right wing, which buckled slightly. Great repair job by Angus Foss.

Picture No. 8 — Rick Walters, last year's champion, and brother Jeff, hurriedly transfer their radio to Ken Willard's "Dude" back-up plane, which he loaned to Rick after Rick had a mid-air. Rick won his next two races with it. Ken was glad he didn't have to race Rick with it — might have been beaten with his own airplane! Rick had bad luck this year — but he'll be back next year. With two legs on the RCM Trophy, he could retire it by winning. So could Jerry Arana. Wait 'til next year!

☆ ☆ ☆

The weekend following the RCM Trophy Races provided the opportunity for some relaxed recreation, even though it was sort of a postman's holiday for me. I went down to Santa Ana for the 1976 MACS (Model Airplane and Crafts Show) staged by the Orange County Radio Control Club. As in the past two years, it was well attended by the public and modelers, although it was interesting to note that there were fewer exhibitors in the crafts areas.

The miniature airplanes, model airplanes (there is a difference, in case you've forgotten) boats and cars were there, and this year the model rocket show was quite spectacular. And from an R/C enthusiast's viewpoint, it was a first class event. The dealers, distributors, and manufacturer's booths were loaded with goodies, and the display models were the equal, if not superior to, those that are shown anywhere in the world. Col. Bob Thacker's Baby Bowlus glider was at least equaled, if not surpassed, by his latest creation, a scale model of the De Havilland twin engine model 88, which raced in the famous England to Australia event many years ago. And there were numerous other models which were spectacular in their own right.

The air show, in the parking lot, was outstanding. The power plane demonstrations were exciting, the race cars banged into each other without serious damage, the crowd loved the control-line combat, and were fascinated to watch Rick Pearson actually slope soaring his glider in the lift provided by the wind blowing against the auditorium wall. He went back and forth for about 7 minutes, then came down because his time was up. There were two unfortunate helicopter crashes, both due to radio interference, which is always a risk in that area. But no one was seriously injured, luckily. There will have to be an answer to that problem before next year, though. And there will be. The OCRCC is a resourceful bunch.

On Sunday, May 2nd, after contemplating all the entries, I reached my own personal conclusions regarding "Best in Show." In the aircraft

realm, it was Don Harris's exquisite biplane, scratch designed and built by Don personally. Picture No. 9 shows Don with the two trophies he

collected, and Picture No. 10 is a close-up of the plane. We have persuaded Don to publish the plans in a future issue of RCM. Watch for it.

As impressive as the planes were, there was one model that I just had to give my own "Best in Show" for all categories combined. It was an 8 foot model of a Cris Craft offshore cabin cruiser. The full size cruiser was about a fifty footer, and the detail in this model just left me breathless — even to the fishing rods, carefully stowed in the container and ready for instant action when it showed. I almost felt like trying to get down into the cabin, just to see if the bunks were made up. Picture No. 11 shows the model, but you really had to see it to believe it.

All in all, it was a good show — but I think it would be better if it were held at a different time — Maybe in November, or December, or even January. By May, most exhibitors are pretty pooped out — and the competition with Disneyland visitors for airline and hotel reservations is pretty fierce.

Would Long Beach be a possibility?

Sure would for me.

Then I could go fishing after the show. □

COBRA

from page 126/33

products, however, Hobbypoxy was used on this airplane. If you use this finishing method, be very sure that the dope is thoroughly dried and sanded before proceeding with any other finishing material. Whatever finish you decide upon — keep it light! Several thin coats are far superior to a few thick ones.

Flying

Because the Cobra was designed to fly much better than I do, help was sought in evaluating its flying qualities. I'm lucky to live in the same community with Don Lowe, and his help was solicited in the flight evaluation. After several shakedown flights and initially setting the control to my satisfaction, I asked Don to put it through its paces. The pleased smile he had on his face while flying the Cobra said it all. The only adjustment he felt necessary was an increase in the elevator throw.

As I've implied earlier in this article, no airplane will make you a better flyer. Only practice can do that. Too many times, would-be pattern flyers will attend a contest, then rush to the nearest hobby shop to buy a kit of the winning design. Hours of practice cannot be packaged along with the balsa in an airplane kit. The most anyone can ask of any design is an honest response to control inputs. The Cobra is just such an airplane. An airplane that will do exactly what you transmit to it. Whether or not the end result is a contest-winning performance is up to you. □

NORTHROP N1-M

from page 29

. . . . faster!

Please forgive the step-by-step building description which follows, since this is the building sequence which worked well for us, and I think it will work out for you, too.

First, you are going to need a flat building board 2 feet wide and 6 feet long; in fact, 3' x 7' would be even better. Rig it on some sawhorses or orange crates so you can get all around it, and make sure it is flat. Any warps in your board will be built into your wing.

When cutting out the ribs you might decide to build up some of the bigger ones — go to it — the price of balsa being what it is these days, you might find it worthwhile. Keep in mind that we are fighting a tail-heavy tendency and be careful with your glue and your lightening holes.

Next assemble each wing panel from rib #1 to #10, flat over the plans, gluing all the ribs in place to the spar caps and leading edge, except rib#1 and #10. Plank the leading edge on one surface only (this will eventually become the bottom surface). All the ribs are symmetrical (except #1) so you don't have any problems with "right-side-up" while installing them.

Remove the two floppy wing panels from the flat board and hang them up in a safe place. We now come to the unique part - - - the dihedral jigs. The two jigs can be cut out of any flat material available, corrugated box stock is really quite good enough, while Masonite or plywood isn't really any better, but it is more expensive. If you do go the corrugated route, I suggest you run the grain vertically and, if you can't find pieces long enough, piece together what you need from the boxes at hand, no sweat! Cut them out per the dimensions on the plan and crease the leading edge jig at each dihedral break point. The trailing edge jig doesn't need any crease at the center and

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NORTHROP N1-M

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just a little at each outboard dihedral break.

Install the jigs on the building board, over the plans if you prefer, (I don't), and gusset them with blocks and pins and glue so they stand up vertically. Now, if you have a good imagination,, you will see what the basic shape of the glider will look like - - - it's weird!

Take your wing panels and set them into the jig **planked side down.** More than likely it will take some twisting and bending to get them to slide in. Put a few pins on the leading and trailing edges of each panel (at the center line of each rib) to keep the panel from falling to the bottom of the jig.

Trim and fit both panels at the center until rib #1 fits okay, then glue it in well, making sure that the rib is aligned vertically. This has set your dihedral angle.

The drooped tips can now be built onto your wing panels. I think the easiest way is to fit the leading and trailing edges and the tip rib first, then the bottom spar, the ribs and the top spar. The spar attachments at the dihedral break should be neatly done, for these tips take an awful beating during the landings!

Finally we get to the fun part, fitting the radio gear and the control runs. Our plans show the Heath GD-47 installed. This was one of their early efforts and the receiver is really a monster, compared with the newer gear available now. Put your gear as far forward as possible, since it will take the place of some of the ballast we will possibly need. Your control runs can now be let in, in any fashion you prefer. We show NyRods, but anything goes, whatever you are used to is the best.

The only things left to do is to fit your hatch opening as you require and to plank the spar web and the upper leading edge. Once you close up the leading edge "D" section, you will find that the required twist is built into the wing automatically.

Now for the big moment! Lift it off the jig and admire it - - - isn't it something else? Do you think you will have trouble mixing it up with someone else's in the air? Not a chance! There isn't anything nearly resembling this wing design at all!

When you are done "playing aeroplane" it's time to get back to business. Plank the rest of the center section aft of the main spar. One of the real problem areas with this type of machine is tearing the bottom to shreads during a landing. There is no fuselage to take the wear and tear of grinding along the ground. The center skid takes some of the beating but there are still going to be rocks or sticks which jump up just as your glider comes in. This is why I recommend plywood for the bottom surface.

Well, that's all there is to it. Covering is strictly up to whatever you can work with best. Our model is covered with orange MonoKote up to the spar line and white all the rest of the way. We used a thin black line to separate the two colors. We wanted high visibility and this seemed nice. You might find that you have trouble spotting whether the model is coming toward you or flying away. A contrasted colored panel on one wing panel or wing tip might help. We relied on the difference between orange and white for our visual orientation.

FLYING

Balance the model about 1/4" forward of the position shown on the plans for the first couple of flights. Trim the ailerons about 1/8" up to start with and adjust this amount as you need to get a

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NORTHROP N1-M

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good smooth flight path. Then gradually move the C.G. aft as you get more experience with your N1-M.

We had no problem snagging wing tips as long as we came in level. Thanks to its great stability this was mostly the case, but if you find yourself coming in one wing low you might as well expect to cart-wheel on your landing approach! Maybe you more experienced builders will want to make some sort of a knock-off wing tip arrangement, so go to it, but watch your weight!

COMMENTS

You braver souls might care to experiment with a different airfoil section. The symmetrical shape we have used works well, but like most reflex shapes, is a bit of a bear to cover over. I, personally, am not convinced that the reflex really helps that much at these sizes, so you might consider a straight line from maximum rib height back to the trailing edge.

For you purists, I must mention that the skid on rib #1 is there as an aid to launching only (there is no way to hold the model without it). If you can come up with some other way of launching the model — go to it — but remember to use some Celastic or fiberglass on the bottom to protect it.

After watching this model fly and studying its characteristics, I am convinced that the wing tips can be reduced by one bay. The model's directional stability is so positive that I am recommending this modification to Nick, who built the model you see in the pictures.

In closing, I must thank Nick Nickolin for having faith in my design and the conviction to carry it through. M.G. (Jerry) Hubin is the fellow who wrote an excellent article in our club magazine on how to balance flying wing designs and gave me much valuable advice on the subject. Thank you, Jerry! And to "Johnny" Johnson who flew in some of the real flying wings, but now flys R/C, a special nod of appreciation for his comments and suggestions. □

RACING AT RANDOM

from page 22/18

Figure 4) and then on the Heat Cards (see Figure 5).

The Information Cards should then be filed in the order of their Code Numbers. If there is a Public Address Announcer, these cards should be given to him for each heat.

For Round 2, move column 2 up one row, column 3 up two rows and column 4 up three rows as follows:

	Round No. 1 (ref)		
1	8	15	22
2	9	16	23
3	10	17	24
4	11	18	25
5	12	19	26
6	13	20	27
7	14	21	28
	Round No. 2		
1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	22
6	14	15	23
7	8	16	24

Match and record them on the Round/Heat List and Heat Cards as in Round 1 and then juggle the numbers the same way for Rounds 3 and 4. For example, the race coding list is:

	Round 1		
1	8	15	22
2	9	16	23
3	10	17	24
4	11	18	25
5	12	19	26
6	13	20	27
7	14	21	28
	Round 2		
1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	22
6	14	15	23
7	8	16	24
	Round 3		
1	10	19	28
2	11	20	22
3	12	21	23
4	13	15	24
5	14	16	25
6	8	17	26
7	9	18	27
	Round 4		
1	11	21	24
2	12	15	25
3	13	16	26
4	14	17	27
5	8	18	28
6	9	19	22
7	10	20	23

Carry on through Round 6. After Round 6, contestants will begin repeating heats with contestants whom they have previously raced. There is no way to avoid this, so this is a good time to start reshuffling codes and groups to fill in for the attrition. □

RADIO SPECTRUM

from page 12

. . . . A quick check told the answer. The receiver battery pack had gone dead (3.8V). But this was impossible. I had checked it this morning on my Expanded Volt Meter (EVM) and it read 5.2V. A reading now showed it at 3.8V just 30 minutes later. It must be a dead cell I thought, but after a 3 hour charge, it showed 5.2V again on the EVM. A little experiment showed me the problem. Let's start at the beginning. After purchasing the EVM and reading the instructions, I tested my battery pack. The instructions showed a typical discharge rate as noted in Figure 1.

My battery showed a similar discharge rate to Figure 1, so all was well. Then I made a disastrous **incorrect** *mental assumption. I said to myself that if a battery that has been used last weekend is quick charged (3 hours), so that it registers 5.2V on the EVM, it will discharge*

approximately like Figure 1. This is not the case though. In fact, when I made a test, I found it discharged like Figure 2, which is a vastly different case.

Well, I said to myself, this must be an idiosyncrasy with my battery pack, so I tested several other packs and they all did the same thing. The moral is, if you do not charge the battery long enough, it will not discharge at the rate you expect, no matter what the reading is on the EVM. The reading on the EVM does not tell how much life is left in the battery pack, unless the battery is fully charged (like overnight). Try it on your pack on the bench, not in the air, it makes a terrible sound when it hits.

Yours truly,
Jed M. Casey
Camarillo, Calif.

It sounds like Jed came in after we talked about the use of expanded scale voltmeters in the April 1975 issue. We specifically warned that voltage alone cannot predict the remaining capacity. In big bold print we said, "If you start with a **known** charge each time, your pack will follow essentially the same curve each time it is discharged under the same conditions." It is very important to use a charging technique you know has charged the battery. If you ever change your charging technique, such as fast charging, run the discharge curve on the bench first like Jed says. And remember, you can't take it out if you don't put it in. If you charge at 50ma for 3 hours, you put in 150 mah. If you discharge at 250ma, you can expect to get 150/250 equals .6 hrs. Sounds like Jed charged at slightly less than 50ma. If he had

truly quick charged (150ma), he would have put in 150 × 3 = 450 mah. He then could expect to get 450/250 equals 1.8 hrs. at a 250ma discharge rate. If Jed had tested between flights, he would have detected the abnormally fast decrease in voltage and would have saved the Kaos. If the instructions you get with your meter are not clear, go back and read the April 1975 issue of RCM.

For all of you who are becoming battery "nuts", you must read a paper given by Messrs. Hodge, Bonnaterre and Putois of the Saft Battery Company on the theory and practice of fast charging. They discuss the various techniques, but the interesting thing is their experimental results. I quote:

"Besides the obvious benefit resulting from the enormous reduction in the time needed to recharge a battery, sealed Nickel-Cadmium cells which have been fast charged show improved characteristics compared with conventional charging at .1C, particularly in respect to capacity at high temperatures, service life, and reliability."

Their high temperature chart looks like Figure 3: Service life looked like Figure 4:

Their Summary was this:

Technical Advantages:

a) Fully charged batteries are available at short notice, without the complication of leaving batteries on permanent trickle charge.

b) Fast charging can be carried out safely and effectively over a very wide temperature range (−20°C to +50°C).

c) Higher capacity is available at higher temperatures (+40°C/+50°C).

d) Battery Service Life is practically doubled at normal temperatures (0°C to +40°C).

e) Battery reliability approaches that of electronic components.

This paper is part of a bound book "Power Sources" by D.H. Collins. There is also an interesting paper on Nickel Hydrogen Cells which some people think are the coming thing.

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On May 1, I made my annual trek to the Anaheim Convention Center for the MACS Model and Craft Show, put on by the Orange Coast R/C Club and the Southern California Hobby Industry Association. There were many new goodies like Zinger Props and CB Aluminum Spinners, but I'll confine my comments to the electronic stuff.

If there was a star of the show it had to be the Cannon Mini System. It features a set of servo mechanics tooled by Bob Dunham that measure about 1.3 x 1.3 x .63 inches, neglecting the mounts and output mechanism. It is powered by a 12mm Swiss motor that Bill says costs three times as much as the Japanese servo motors. Somehow he stuffs a 12 pin dual in-line IC servo amp in there too. The receiver and battery pack are of a similar small size. If the system works as well as it looks, it is going to make a lot of 1/2A flyers happy.

Kraft seems to be going the other way. His new modular receivers are bigger than his previous line of receivers, but they do give both the modeler and the dealer a lot of flexibility. The ceramic I.F. Filters allow changing frequency (by changing RF modules) without retuning. The transmitters also contain plug-in RF modules so a modeler can switch frequencies, even from one band to another, at the field. Any transmitter on a standard frequency will work any receiver with a module for that frequency. Kraft has come a full 180 degrees since the introduction of the Gold Medal Series back in 1968. All 1976 transmitters feature open stick transmitters. The new gimbals are a combination of metal and plastic and I couldn't feel any slop in the neutrals. Wire wound

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. . . . cause of wrist pin slop, should the sleeve and rings be replaced automatically? (2) Where should the ring gaps be positioned in relation to the sleeve ports in reassembly? (3) What are the indicators of worn crankshaft bearings? (4) When should you throw the darn thing away and buy a new one?

Your comments on any or all of these problems will be appreciated. You'll be encouraged, I hope, to know that none of these problems keep me from flying and enjoying.

Best regards,
Jerry A. Pope
Raleigh, North Carolina

The tendency for the engine to go slightly rich through the mid-range has always been a characteristic of the Webra carburetor and many others for that matter. It is actually desirable to have the engine go slightly rich rather than slightly lean. However, going excessively rich can be a problem. In the past the exhaust baffle helped the mid-range richness problem but with the elimination of the exhaust baffle on many engines, in order to use a muffler, the problem has been more pronounced. As the carburetor is opened the barrel moves sideways withdrawing the idle mixture needle from the end of the spray bar. The richening tendency is caused by the idle mixuture needle withdrawing too rapidly. This can be helped by changing the taper of the needle. Less taper means slow withdrawal. Also, as you say, many times the idle mixture needle will withdraw completely from the end of the spray bar between 1/2-3/4 throttle, causing the sudden richening. Screwing in the spray bar itself one turn, will help this situation.

Taking your other questions in order: (1) If the wrist pin holes in the piston are badly worn then it is safe to assume that the other parts have worn also. Generally speaking, it is always best to also replace the rings, sleeve and con-rod. Many times sleeves that appear to be okay will actually be barrel shaped at the port windows due to wear of the webs separating the windows. (2) The ring gaps should be spaced 180° apart with one facing straight forward and the other straight backward so that the gaps run in the cylinder space between the exhaust port and bypass port. You never want the ring gap or gaps to be lined up with one of the port windows when the rings are new. (3) Worn crankshaft bearings (ball bearings) will feel rough and be noisy. (4) As long as an engine has never been crashed it can be re-built indefinitely. However, this can get pretty expensive if you start replacing all of the internal parts.

Dear Clarence:

My interest in brewing my own fuel has increased in direct proportion to the rising cost of commercial fuels. I would like your opinion on a new oil I am considering using in my fuel. A motorcycle racing buff tells me that Castrol Synthetic 2-Cycle Oil is the best thing yet.

He says it is exceptionally clean running and does not leave varnish as castor does. He also says he has no rusting problems with the new oil, but other synthetic oils do have this problem. According to Castrol, the new oil can be used in much leaner mixtures than other oils, in cycles 40:1 instead of 20:1, etc.

I do not have the knowledge or the equipment to test the oil. I hope that you will test it and let me know of the results. The Castrol Synthetic is widely available at motorcycle shops.

New subject: The other night I read an article

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RADIO SPECTRUM

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pots should provide very good linearity. The Signature Series retains the all metal gimbals. The seven channel system uses the same basic encoder as the Signature Series but does not provide the control panel with reversing switches and rate control trimmers. The encoders are plug-in modules, but I'm not sure the modeler can buy them separately. Seems like they're missing a good bet because it would be ideal to have a separate encoder set up for each airplane. With the present Signature Series you need a complete new transmitter for each airplane.

At the Ace Radio Control booth, I had an interesting talk with Fred Marks who used to do a similar column in American Aircraft Modeler. Fred thinks the RC industry ought to get together and write a spec for batteries and buy them on a sort of co-op arrangement. Fred feels we buy enough batteries as a group that we should get better leverage in having batteries produced that meet our tough environmental requirements.

Sid Gates of Royal Electronics showed me the super transmitter designed by Sid Kaufman that we talked about in previous columns. I guess Sid has been under the weather lately, but he still expects to publish the construction article in RCM. Royal has a new transmitter that provides non-linear stick sensitivity. It looked like about 3/4 stick movement to get the first half of the servo travel which makes the system less sensitive around neutral. The final quarter travel of the stick gives the remainder of the servo travel for high roll rate or quick pull-ups when the ground is coming up too fast.

RS is back in business in Maryland and is producing the same basic system that was previously produced in California. New President, Frank Goodwin, has a number of improvements planned, including some new battery options.

At the Heathkit booth we discussed the problems the guys have been having with the new plug-in module system in the Sepulveda Basin here in California. There is some thought that radio station KMPC is getting in to the receivers. Heathkit has a modification which they think might cure the problem. Apparently the radios work fine at other flying sites, but if you are having a problem, drop Heathkit a line.

Bob Elliott of EK Products was concerned over the potential loss of the 27 MHz band for RC and was attempting to organize the industry in order to provide an interface to work with the FCC on obtaining new frequencies and developing specifications that won't cause undue expense in transmitter and receiver design. I couldn't get to the Sunday morning meeting so I don't know how it came out but we'll keep you posted on the frequency situation.

On the way home, I mentioned that I was surprised Proline wasn't at the show and was quickly informed that they were and I must have missed them. I was thinking about that and also how tiring it must be to explain the same things over and over each time someone new comes up to your booth. A great solution, to both problems (I hope all you trade show organizers are listening) would be to schedule presentations in the various auditoriums in the same building, where the manufacturer can give his spiel to a large group all at once and then entertain a question and answer period. All would then get the benefit of questions asked by other people. If that is too big an order, at least some kind of program should be printed telling you who is displaying equipment so you can make sure you've covered the ground.

One of the highlights of the show for me occur-

red when a modeler introduced himself and told me he had built the fluidic sensor wing leveler and mixer circuits presented in this column.

It sure is nice to get feedback to find out someone is really getting something out of my ramblings. I was particularly impressed with anyone working on these two projects because in neither case was enough information presented to go out and build a functional product. Both required additional engineering and someone must be very interested in the idea to devote his time to finishing the job. I ntoiced Don Lowe mentioned the fluidic sensor in his column in RC Sportsman. Seems the RPV guys at Wright-Patterson have built them and flown them with success.

Getting back to the trade show, we got a look at some of the Futaba Radios marketed in other countries. A dual rack linear servo similar to the EK MIII looked good. Cox/Sanwa will also market a small two channel system that will let you get an airplane in the air for under $100.00. I hate to think of the gobs of non-modelers who will be cluttering the air but I'm sure it will bring in a lot of true modelers who couldn't afford the higher prices.

I missed John Maloney at the World Engines booth. Their Expert Series radio was all buttoned up so I don't have much to report. I have noticed a few more appearing in West Coast contests.

One of the most interesting displays at the show was put on by Lyman RC, Box 6192 Los Osos, California 93402. They build a glow plug driver they call the Glow Plug Sensor. It is a variable pulse width power supply that senses the glow plug temperature and automatically adjusts the duty cycle. As the plug gets cold, the pulses get longer. If the plug overheats, the pulses get shorter. This was demonstrated by displaying the pulses to the plug on an oscilloscope and then blowing on the plug through a soda straw. Another unit powered a glow plug that was submerged in fuel. Both plugs glowed brightly. One feature of this unit is the fact the adjustment is on the inside and requires a screwdriver to change nominal pulse width. This makes it less likely to accidently burn out a plug with a high setting.

For those of you looking for a high power actuator for your sailboat, Probar Design, P.O. Box 639, Escondido, California 92025, has a unit which will supply 40 lb.-in. torque. It is driven back and forth by a normal RC servo and will run for as long as you command it until it hits its limit switches. Of course you can stop it at any point in-between.

I also saw old friends Cliff Weirick of Kraft Great Lakes and Bill Johnson of Kraft Southeast. Both said their systems, which are manufactured by Kraft, have been very reliable. They have the advantage of a tried and proven design.

These trade shows are really great whether you're in the market for new equipment or not. You've just got to get turned on a little bit when you see the enthusiasm and shiny airplanes. If you didn't make it to the show in your neighborhood this year, be sure to catch it next year.

• •

I thought I'd start a new feature this month that we'll try to continue if you guys out there send me your experiences. We might call it , "Crashes that could have been avoided," or, "How to read your radio."

We ventured to Santa Clara this past weekend and enjoyed a fine pattern contest that was put on by the Pioneers. The weekend was marred by the crash of good friend Bill Simpson, the world's oldest novice (I guess he's an expert this year, since they changed the names). Early in the contest Bill told me his battery had only been good for two flights without a recharge. He also said it wouldn't take a slow charge. Now that's what I call a radio talking to you. I asked him why he

didn't change it and he said it was stuffed up in the canopy of his Dirty Birdy and he'd have to take half the equipment out to get it out. Well, Bill was cruising in first place when the radio quit. The plane crashed and then it was real easy to get the battery out. The expanded scale voltmeter had told him something was wrong, but he didn't have time to fix it. I wonder where he's going to get time to build another plane?

• •

A few months ago we mentioned a circuit to control the RPM of your engine. As a result I've been corresponding with Mr. Al Irwin of Champaign, Illinois, who promises to revolutionize helicopter flying with his patented Tach-Tron system. This electronic governor will hold the rotor RPM essentially constant on collective pitch machines which gives super response. A complete construction article will be featured in RCM which will also allow you to build an auto-collective version in which the load is varied as a function of what the engine can deliver. Even if you are not a helicopter pilot, I'm sure you will find Al's circuits interesting and applicable to other RC projects. □

ENGINE CLINIC

from page 146/10

about "de-burring and removing flashing" from engines. I disassembled my Ross .61 to check it and did find some small burrs where the boost port is cut through the sleeve. The engine has a chromed aluminum sleeve and I am worried about chipping the chrome. If de-burring causes a break in the surface of the chrome, could this lead to flaking or peeling of the chrome?

Sincerely,
John Cone,
Lubbock, Texas

Quite a few guys have written and asked about Castrol's synthetic oils. I am afraid it hasn't worked out too well in model fuel usage. The viscosity seems to be too thin. This is a problem with many of the synthetics intended for automotive, motorcycle, snowmobile, etc., use. Many have a viscosity in the SAE 20-30 range. As a comparison, castor oil would be the equivalent of SAE 60. Many of the synthetics are multi-purpose with viscosity ratings of 20-40, 30-50, etc. Those in the 30-50 range such as Klotz Special Formula are acceptable. Klotz also has a 20-60 motorcycle oil, but I have found the 30-50 to be better for model fuels due to the basically heavier viscosity.

As long as you are careful you can remove the burrs. Even though breaking through the chrome at this point it will not peel unless, of course, the chrome was not bonded properly to begin with. Be sure and stone the edges smooth. Rough edges could promote pealing or score the piston.

Dear Clarence,

I have a problem! That's nothing new to my flying buddies! But seriously, I have a problem which I have been "stewing about" for two years now. I have one of the first K & B .15 R/C Schnuerles. From the first day, it has absolutely **refused** *to idle. As it was designed for 1/4 midgets, idle is of primary importance. As it is, the engine is absolutely useless and has been occupying a spot in my engine drawer for two years now. I have threatened to send it back to K & B but was afraid I'd never see it again. I have threatened to use it for a trout line weight but felt that was a bit harsh. I have even threatened to sell it to my best buddy but I'm not that cold hearted. Consequently, I still have the useless little hunk of metal.*

Let me tell you what I've done to try to make it

do what it is **supposed** *to do. First, someone said "your carburetor is dirty." I cleaned it. Then, somebody said "you have a hole in the fuel line" so I replaced it. Another wise soul said "relieve the crankcase pressure" so I put a gasket between the back plate and crankcase. A few other suggestions were: "hotter plug"; "colder plug"; "standard plug, short"; "standard plug, long"; "R/C plug (long and short)"; "more nitro"; "less nitro"; and the inevitable "Aw heck, it just ain't broke in yet!" Well, after all of these wonderful suggestions were tried, and over* **one and a half gallons** *of fuel run through it on the bench, I gave up! Do you blame me? Oh yes, I tried props all the way from 6 x 10 to 9 x 4.*

Help! I really would like to use the little devil for something other than a conversation piece! What should I do with it? I'll do everything you tell me. Except **that!**

Thanks,
Jim D. Slaughter
APO New York

Jim, trying to get an engine intended for racing purposes to idle is always a touchy problem, and the smaller the engine the larger the problem. The smaller displacement engines do not generate enough heat to keep the glow plug lit. Add to this a gas tank that is too high or low, too far from the engine, foreign matter in the fuel, etc., and you can expect to have trouble. Everything has to be exactly right. The relationship between the opening of the carburetor and exhaust baffle is very important and quite often overlooked. Be sure that, with the carburetor cracked open just enough to maintain an idle speed in the 3500 range, that the exhaust baffle is closed (straight up and down). Here again many fellows try to get the engine to tick over at 2500, or lower, which is simply asking for trouble. This has led to all kinds of rule infringements. If the model is required to remain stationary with the engine idling fliers have used hooks on the tail skid, etc.

Many of the first K & B .15's did go out with a lot of discrepancies. The pistons were too soft which resulted in premature wear. Many of the sleeves had flanges that were not parallel with the sleeve wall, resulting in distortion when the head was tightened. Some of the early .15's could be broken in and worn out all in the same run. Possibly you may have one of these. You should have returned the engine to K & B a long time ago when parts were readily available.

As for prop sizes — you should have been running either a 7-6 or 7-5. A 6-10 would not have enough flywheel action and a 9-4 just too much prop for the engine. Allowing the engine to over-heat with too much prop could have permanently damaged it.

Send the engine back to K & B for rebuilding. When you get it back use a 7-5 prop until it is broken in. Use a K & B idle bar glow plug. A non-idle bar plug will seldom idle properly. Be sure your tank is placed as close to the engine as possible and that there is no dirt in the fuel or carburetor. Follow these recommendations and you should end a lot of your trouble. Incidentally, an airborne NiCad battery that cuts in at idle is of immense help in keeping the .15's idling. See the last letter in the column for more details on this.

Dear Mr. Lee,

I have an overheating problem with my S.T. G.20/.23 engine on an original design helicopter. The engine is about 8 years old, but has not been used much until recently on the helicopter. The fuel I have been running in it is K & B 500 with synthetic lubricant. Helicopters with gear ratios and rotor sizes similar to mine, have been successful with engines in this displacement range.

For cooling, I have tried using a 3½" diameter aluminum fan, and a 4" diameter cut-down 9/6

plastic propeller with 3 blades. A heat sink similar to the type used on model cars and a shroud around the fan was used in both cases.

I understand that any engine will run hotter in a helicopter, due to less available cooling airflow. But in my case, the engine is overheating to the point where it sags and seizes up after about 5 minutes of continuous running.

My latest attempt has been to install an oversize heat sink and to eliminate the fan completely. The theory is that a fan imposes an extra load on the engine in itself, thereby causing more heating than the airflow of the fan will cool the engine. However, I have never gotten the engine started with this set-up, presumably because it has been ruined from the previous overheating. I have seen a design fly for about 10 minutes continuously with nothing more for cooling than a model car heat sink.

I would appreciate any general tips you could give me for how to keep a helicopter engine cool. Also, could my problem be that this particular make and model engine has the wrong horsepower curve for gear ratios that work well with other engines? Incidentally, before the engine overheated on each flight, it gave good power and very smooth running. A Calumet muffler was used on the engine.

Sincerely,
Robert G. Benson
Cedar Grove, N.J.

Bob, the old G 20/.23 Super Tigre was never noted for its low end or lugging ability. This engine was always happiest with a small propeller that would let it turn up. This, plus the fact that you are using an out-dated engine, is a lot of your problem. You can't expect engines produced eight years ago to be competitive power-wise with our present day engines. You are trying to get more out of the engine than it is capable of producing and, in the process, probably running it a little on the lean side.

Proper cooling of helicopter engines is always a problem, but the first thing is to use an engine capable of producing enough power for the intended machine. If an engine has sufficient power, it is not going to work itself to death. Slightly more power than is necessary is desirable as the engine is then "loafing" so to speak.

Fuels with synthetic oils do run slightly hotter than castor oil based fuels. So you might try using a fuel with castor oil.

Dear Mr. Lee:

I am going to be using a K & B Schnuerle .40 engine in an RC boat – my question concerns throttle control. I am planning to run a tuned pipe, large bore venturi pressure (throttle response can be minimal – just to slow the boat enough to get it through the corners) and to kill the engine when coming in. Would the use of an exhaust baffle alone accomplish this?

The type would be very similar to a conventional throttle barrel located between the engine and the pipe. Several questions do come to mind however:

1. Will it work?

2. Will it cause any damage to the engine when running with a restricted exhaust, even for extended periods?

3. If the barrel were closed enough to kill the engine, would the back pressure be damaging? Or would a separate fuel shut-off be a better idea for stopping the engine?

Thank you very much for your time and consideration of my questions – I am looking forward to hearing you opinions on my ideas.

Sincerely,
John T. Oian
Indialantic, Florida

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Fellows have been using exhaust baffle throttles on boats for many, many years and they work fine as long as you do not expect a tick-over idle. I would recommend a separate fuel cut-off for stopping the engine, however. The baffle throttle could be used and many fellows are doing so but, if you fit the baffle tight enough to kill the engine, there is always the possibility of excess fuel build-up resulting in a hydraulic lock. With an engine turning 20,000 or even higher — and the exhaust suddenly blocked off — a lot of excess fuel is going to be trapped in the engine. If you do use the exhaust baffle throttle to kill the engine, be sure to reduce rpm slowly.

Our final letter this month is another handy hint sent in by Duie Matenkosky. I have mentioned the use of a Nicad battery to keep the glow plug hot at idle for scale models, Quarter Midgets, inverted engine installations, etc., many times in the past. Duie has a slight modification of this idea in using that Nicad as a self-contained starting source. Even though I have mentioned the use of a self-contained Nicad in the past, as the old saying goes — a picture is worth a thousand words.

With the present trend toward lighter radio systems, more powerful engines, and electrtic starters, I have begun using the following method of providing the necessary voltage to the glo plug on my airplanes.

Permanently install a single Nicad battery within the airplane, connected to the glo plug through a normally-off push button, located near the nose, in such a position so that the hand that

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holds the airplane can push the switch, providing voltage to the plug. Connection to the plug is best done by using a 1/16" wheel collar with a wire soldered to it, leading to the inside of the airplane. A plastic/fiber insulator washer is necessary between the wheel collar and the base of the glo plug. Ground is merely a wire connected to an engine mounting bolt.

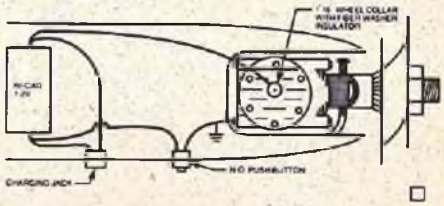
To start, prime engine, grasp airplane in such a manner as to close push button switch, and use electric starter as before.

A modern airplane can easily carry the extra few ounces of weight, and you gain a tremendous safety factor, in that you no longer must be concerned with dangling glo plug wires once your engine starts; you simply release finger contact with the push button switch!

Since an electric starter usually can start any engine in seconds, and the Nicad can easily take the few seconds of high-amp load, one charge will easily last for dozens of flights.

A second option is to wire a second micro switch along the throttle pushrod to provide glo plug heat during idle, if needed.

Duie Matenkosky
Pittsburgh, Penn.



□

CUNNINGHAM ON RC

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Well, the answer is that it's simple to scale a set of plans either up or down if you want to do so. It's kinda' like scratch-building a model, it's tough to do the first time, but then you wonder why you haven't been doing it this way all of the time.

Let's assume that you have been taken by the appearance of a small aircraft, but would like to scale it up for a .40 size engine. First, you must decide just what wing area you are going to use on your finished aircraft. Again, let's assume that, for your purpose, and in keeping with the type of aircraft that you are going to scale up, you decide upon a wing area of 600 square inches. Now, the original aircraft that you are working on is designed for an .049 engine, and carries a wing area of 200 square inches. You might think that you would multiply everything on the small aircraft by 3 to scale it up, but, 'taint so.

Yes, the wing area is 3 times larger for the larger aircraft, but you can't change the dimensions by 3 and come up with this figure. Rather, we have to work on the relation of the wing chord to the wing span to determine how the original 200 square inches is found. Since we are assuming that the small aircraft has 200 square inches, then let's assume that the wing span is 31", and the wing chord is 6.5". These two, multiplied together, will give us a wing area of 201.5 square inches and, when the span is divided by the chord, in this case 31"/6.5", the aspect ratio is 4.77:1.

Okay, to find the correct dimensions for the larger wing to keep it to the same scale, we will have to find out what two numbers will, when

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multiplied together, give us 600, and divided one by the other, will give us a ratio of 4.77.

Remember your high school algebra? Let's let x = wing span, and y = wing chord, then x times y, or xy = total wing area. For the aspect ratio x/y = 4.77 (which we found on the smaller model). Then, to carry the math just a bit farther, we have xy = A, and x/y = 4.77. If we substitute x = 4.77y in the first formula, we have $4.77y^2 = A$, or $y^2 = A/4.77$. Using 600 square inches for the area, we then have $y^2 = 600/4.77 = 125.78$, and the square root of 125.78 is just a shade over 11", call it 11.2". This, then, is the wing chord for the larger wing, and the wing span then becomes 4.77 times 11.2", which equals 53.42". Read through the above one more time, and you will see just how simple it really is to scale up or down a wing, based upon the wing area and the relation between the span and the chord.

Next, we find the relation between the span on the smaller model to the larger, and we find that the larger is 1.723 times larger than the smaller. The same for the wing chord, it is 1.723 times larger than the smaller. So, you see, we have scaled up the model by 1.723 times, or not quite twice as large to arrive at a wing area that is three times larger than when we started. This scale factor can then be used to scale up the fuselage, the horizontal stab, and everything on the aircraft. If you have proportional dividers, this makes it very easy to do or, if you have a pocket calculator (and who doesn't today), you can simply work out all of the dimensions to arrive at the new figures.

Let's look at the fuselage. On the original small model the length of the fuselage from the back of the prop spinner to the elevator hinge line is 25". If we apply our scale factor to this, we have a new fuselage length of 1.723 times 25" or 43" long. The nose length, or the length from the back of the prop washer to the leading edge of the wing, was 6" on the smaller, so now, on the larger, we have a nose length of 10.34". And so on through all of the dimensions of the aircraft. Once you find this scale factor, you can scale away to your hearts content. Once, I worked out the scale factors on a Fokker D-VII from a small magazine three view from a .15 model, up to a super size bipe of 1500 square inches. It just took a little time, a calculator, and a sheet of paper.

Of course, the same method can be used in scaling down a larger aircraft to get a smaller one. Say, you like a .61 aircraft, but you would really like to have it in a .19 size. Okay, let's assume that the wing area of the .61 ship was 700 square inches and you wanted a duplicate at 350 square inches for the .19. Also, let's assume that the wing has a tapered plan form. We find that the root chord is 14", the span is 64", and the tip chord is 8". With a little bit of math, you find that the average wing chord is 11" (root chord plus tip chord, divided by 2), and the aspect ratio is 5.82:1. Then, to apply the same formulas that we used earlier, we divide the wing area (350) by the aspect ratio (5.82) and get an answer of 60. Take the square root of this number and we have the average chord of 7.75". Multiply this by the aspect ratio of 5.82, and we have the new span of 45". Since the larger wing is tapered, and the smaller is to be a replica of it, we now need to find the root and tip chords. Simple - - - we need to find the scale factor between the average chords and we will have the answer. Divide the new average chord by the larger, and we have 7.75"/11" = .70, which is our scale factor. Now,

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multiply the large root chord of 14" x .70, and we get a new root chord of 9.8" and a tip chord of 8" x .70 for 5.6". You can determine the amount of sweepback of the leading edge in the same way. If it is 2" on the large model, then it will be 1.4" on the smaller. Same thing on the fuselage. If the length of the large one was 54", then the smaller will be 70% of this or 37.8". Keep it up and you will soon have a new, .19 size Super Snarf.

It really isn't hard once you get the hang of it. A lot of fun can be had by building an aircraft in the size that you want. The only thing that I haven't touched upon is how to scale up or down the airfoil. For this, I would like to refer you to an excellent article by Will D. Mitchell in the June 1972 issue of RCM called "Airfoil Scaling". I suggest that if you are seriously interested in scaling up or down your aircraft, you go back and re-read this issue.

I can see it now — someone will be sending in a picture shortly of his Airtronics Q-T, scaled up to a 10' wing span, and running a chain-saw engine in it for power.

Good luck, and keep your hand out of the prop. □

FROM THE SHOP

from page 2

. . . . mitter away from me three times. Finally, after about five minutes or so, I settled down a bit and actually had the airplane flying me fairly well. After this baptism of fire, I was seriously considering going back to surfing. Rather then explain it all to my wife, I decided to go ahead and give it a try. So I'm a little chicken when it comes to my wife, we all have hang-ups, mine is hot breakfast and clean laundry.

I finally felt at ease enough with the group at the field to take my plane down and let them laugh at it. But this was not the case, I told you they were a bunch of nice guys. Somehow, probably due to my previous experience with U-Control, I had not committed too many errors in constructing the airplane. I saved them all for the flying. So, equipped with my new airplane, radio, tote box, electric starter, batteries, fuel, four lucky rabbits feet, and the new station wagon (that we had desperately needed anyway), I headed for the field. You can always tell when it's really nice flying weather at our field, that's because there's always a traffic cop directing traffic in our parking lot. Everybody was there with all their friends, relatives, and some even had their wives.

Now, being basically a shy person, my first inclination was to return to the house and trade everything off for a 650 Yamaha. Since I don't look good in a crash helmet, and was evidently a bit more curious than shy, I found a parking place, with the help of the traffic cop, and walked over to the field. Tom, my trainer, was there and asked where my stuff was. I told him it was in the car, but I thought the field was pretty busy for a training session, looking to me like La Guardia International the day after a three month pilots' strike ended. Tom confidently told me that the other fliers would look out for us and to get my gear if I wanted to try it. Well, it was that do it or get off the pot type situation, so I unloaded my stuff.

Tom checked the plane and radio installation all out, started the engine, adjusted the idle a little and said it appeared to be ready to fly.

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He taxied it out and lined it up and away it went, nice and straight and, to my surprise, lifted off beautifully; I remember saying something super intelligent like "I'll be damned, it flies" or something like that.

The session went real good and we had three more successful flights that evening. Tom would take it off and put it up there, trim it out and let me have it. After getting over the basic tendency to over control, it was not too bad. Tom would talk me through some turns, and even a couple of loops now and then, to get over that walking on eggs feeling. He would let me bring it in pretty low on approach, about 500 feet up, and then he would bring it on in.

At the end of the evening, as I was driving home, I really felt good; satisfied that eventually I could learn to fly them just like the big guys. The next three weeks went really well and I even made two or three landings under Tom's expert guidance. I lost two weeks of flying when my radio developed a problem and had to be sent in for repair.

Now there's an experience I could have done without. I was in a nice flat left bank when the old Fledgling rolled completely over and started falling out of the air like a shot duck. I yelled for Tom, who had his eye on another aircraft that was coming close to us on a rather shaky approach. He took the transmitter and straightened the airplane out nicely as he always does and asked what happened, as he didn't see the beginning of the problem. I told him I had it in a left bank and it rolled on over. He put it through a couple of maneuvers and it handled nicely, so he passed it back to me.

Tom was watching the next time and it happened in exactly the same place and in the same way. He took the transmitter again and brought it under control, flew it in close for a looksee. When he had it about 50 yards away, he pointed the antenna directly at the airplane and got an immediate shot duck response. He swung the antenna away and the plane recovered its composure, mine was never quite the same although.

Tom brought it in, he was as nervous as I've ever seen him get. In his highly excited state, he was talking to the airplane, softly whispering, "Now just don't do anything dumb airplane." Chanting this magic incantation of his, he greased it right in and taxied it right up to the pits. Smooth, that's all I can say for Tom, he's just what I want to be when I grow up.

We field checked everything and could find no reason for the apparently large hole in the antenna propagation pattern, so it went back to the shop. It turned out to be that the flight pack was not coming up to snuff; I replaced it and never had another problem. With the radio that is.

Now we come to my first major mistake, or as I fondly refer to it as "Stupid Saturday". Usually, I was flying in the evenings after work, as the winds were usually subsided by that time. But one Saturday morning I had some free time, having caught up with the yardwork for a change, looked like the grass could wait for another few days is more like it, besides there were some weeds I wanted to let get big enough so I could pull them. As it ended up, I should have stayed home and watched them grow.

I arrived at the field and didn't believe my eyes, it was empty, not a soul. I looked all over for some danger signs or radioactive contamination warnings, but found none. I guess it was just one of those natural phenomena that will go down in history unexplained. I unloaded my gear and

started checking it out, knowing that somebody would show up shortly that could give me a hand if I got into trouble. Twenty minutes later and I still had it all to myself, so I decided to start the engine and check the idle and stuff. That took another two minutes. Well, I'll just practice taxiing and keep it straight on take-off runs for awhile, I knew I was kidding myself because I had been doing all my own take-offs for sometime now.

I probably don't have to tell you what happened next, but as it would be hard to finish the story right now, I will anyway. Yeah, the devil made me do it, I had no intention of giving it that up elevator, must have been that reaction flying I had been reading about and trying to develop. Anyway, it was up there and I was feeling just great, for about five minutes, then I started to think about getting it down. I wasn't real worried, there was no wind, no other airplanes; I could come in on the open side of the field away from the trees at the other end of the landing area and that gave me a lot of space to get it lined up with the strip and it wouldn't require a great deal of accuracy.

Okay, I'm ready to give it a try. I kept it high and made a couple of lineups coming out right on the money, plus or minus ten or fifteen yards. No sweat, I'll bring it down a little. Let's see, I'll make the final right bank right over those kids in the approach area. Those what in the where? Now where did they come from? I took a chance and looked over my shoulder at the parking area for the inconsiderate owner of those menaces to navigation out there in my flying area, which at this point I will mention is fenced and posted with warning signs. Mine was still the only car there though, so they must have come out of the woods, or ground, or something. Well they were too far away to hear me and I was really a little too busy to carry on any running conversations at the time. I made a couple of wishes but they didn't dematerialize or anything so I guess my only alternative was the wooded side of the field. This was going to be fun, almost as much fun as getting your thumbs caught between two red bricks while killing Northern Ohio mosquitos.

To get it in I had to come over the top of the cornfield straight at the trees, cut a left bank away from the trees, line it up and drop a lot of altitude in a hurry to get it down with enough run out area left before the end of the field. All in all I had a lot of luck on my side; there wasn't any wind, which if there would have been I think I would have just turned off the transmitter, and hoped I wouldn't have to watch the crash at least.

Well I'd better do it now because I'm getting low on fuel and I don't want a dead stick on top of everything else.

I lost a little too much altitude on my first turn but I still had enough to work with. I was heading for the woods now a little low but I was really thinking good and got it around again headed away from the woods and nice and level, man was I feeling good. I was a little farther to the right than I had planned on, but I still could hit the field if I held a little left ariel on into it. I brought it on around nice and level and I had it made. I had it about thirty, maybe forty feet from touchdown and was ten feet up; no make that nine feet eleven and one-half inches up, because the club field sign I hooked my left main wheel on was ten feet high.

That's right, the club sign flew right into my airplane. I swear to this day that was the first time I had ever noticed that sign. Probably because it was spitting out pieces of my airplane all over the field, it still had a big chunk of "Fledgling" in its mouth. The rest of it was cartwheeling down the field losing two to six ounces of balsa, Monokote, blood, sweat, and tears with every flip. It

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the field at the time and it was just about dusk. It was a nice feeling watching my battered but true flying bird against a summer sunset with the silhouetted woods and; the silhouetted woods, oh no! not the woods at dusk! What a lousy sound that is when a model airplane flys into a full scale woods. All eyes were on the woods, or me, I kind of wished I was in the woods and the airplane was out here taking all this optical abuse. Nobody said too much, most of us just started for the woods. Someone said they had a flashlight and went to get it.

Tom came over and asked me why I flew my airplane into the woods. I was immediately reminded of the little kid of "Stupid Saturday" asking "What happened mister?". "I had the airplane under control it must have been the woods that went berserk", I replied. Tom asked me if I remembered what he had told me flying close to the woods in the late evening and I told him that I had about two seconds before they grabbed my airplane. The rule being, as any experienced flyer knows including myself now, is to keep daylight between the airplane and the woods. Somehow, I think this is indelibly printed in my mind in large print.

After about an hour and three thousand mosquito bites, we located the airplane about 85' up in the top of a tulip tree. The tallest tree in the woods and I was right in the top of it. I couldn't help but think that if there had been just one year of drought in the past fifty years I would have probably cleared the whole woods. Having been a lineman for the telephone company at one time, I decided to try and climb the tree. That was my second mistake of the evening. I did manage to get within fifteen feet or so from the airplane, but there were no branches or anything in the last stretch of tree so I had to give it up. By now it was totally dark and I had about sixty or seventy feet of tulip tree to negotiate in the dark. True, I had been a lineman for the phone company but that was almost fifteen years ago. Since I didn't make a habit of climbing giant tulip trees my legs were letting me know that they they didn't appreciate this sudden attempt at reversing the sands of time.

New rule: Thirty-nine year old men do not attempt to retrieve their aircraft from tulip trees.

I did pretty good. I didn't get stuck until I was about fifteen feet from the bottom of the tree. I thought about jumping out but it being dark, I would have probably landed on the club president and been the first man to be drummed out of the organization.

Someone said something about calling the fire department and this renewed my energy and initiative. With the help of good old Tom, I hung from the lowest branch and he reached up and lowered me down. I was sure glad I had lost forty pounds the previous year. Tom was even gladder.

I decided that I would call a buddy of mine in the morning. He had a brother who was a tree trimmer and maybe he could help me.

I didn't even tell my wife that I had to leave the airplane in a tulip tree that night. We were just getting over the radio-versus-the-dryer-thing anyway.

Right after work the next evening my buddy, Jim, and his brother, Hank, came down and retrieved my airplane with no trouble at all. The airplane was broke in two just aft of the wing, but easily repairable, so Jim, Hank and myself sat at the edge of the field and drank a cool one. Some of the other members of the club were flying and it

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SHOWCASE '76

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NEW SAFETY SHEAR RUDDER ASSEMBLY

Marine Specialties, P.O. Box 588, Saratoga, California 95070, announces their new Safety Shear Rudder Assembly. After three years of testing and development, the Safety Shear Rudder is a reality. Made of precision die cast aluminum for .40 to .60 boats, the SSRA offers a degree of safety for your boat never before available. The two piece rudder blade is assembled with an aluminum shear pin that is designed to release the rudder blade upon impact thereby permitting the blade to swing back out of the way. The Safety Shear Rudder Blade may be reset for operating by simply replacing the shear pin and flattening the end of the pin with pliers to prevent it from vibrating loose. The Safety Shear Rudder Assembly contains extra shear pins. Additional pins, rudder blades and all component parts may be purchased separately. The Safety Shear Rudder Blade is interchangeable with the standard Marine Specialties 2AR and 3AR Rudder Blades and can be used in the 2/3 AR and HBR Rudder Assemblies. For a complete catalog of boating items, send $1.00 for the Marine Specialties Catalog. □

Answers to the July crossword puzzle. See September '76 issue for the July winners!

B	A	L	S	A	■	S	O	S	■	C	■	I
■	L	■	I	C	■	U	■	P	Y	L	O	N
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A	■	R	O	G	■	■	■	L	■	P	■	F
N	E	O	■	■	■	T	H	E	■	■	R	C
D	■	N	O	I	S	E	■	V	T	O	■	C

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seemed like everybody was having a bad evening. Two airplanes collided, two went into the cornfield and one busted up on takeoff pretty bad.

Jim had never been able to understand my passion for toy airplanes in the first place and Hank had never seen them before, so I had been taking a little good natured ribbing from both of them. Hank finally topped it off after the third crackup at the field that evening; he said something I shall always remember, "So this is fun is it? What do you guys do in the winter for enjoyment, sit around and hit yourself on the hand with a hammer?"

Well now I can add to my list of things I don't like: 85' high tulip trees and Hank.

Once again I rebuilt the old "Fledgling" and had a few more weeks of decent flying.

Then one evening it was too windy to fly, at least too windy for me. For some reason I talked myself into the fact, that if I was going to be afraid of wind in this part of the country, I was going to miss out on a lot of flying. So off to the field I went.

Home again I came with a basket full of airplane, the result of making a landing by touching down with a wingtip first.

Wind went to the top of my list.

So my first summer went on with no more major crackups until the elevator problem in October, which finally laid my gallant first R/C trainer to a well earned rest. I think by the end of its existence it must have weighed a good pound more than it did originally due to the repairs, splices and small fortune in epoxy it took to keep it flying for the whole summer. I would have weighed it after the final crackup, but I couldn't find a gram scale to weigh the pieces.

The final conclusions of the summer were easy to sum up. I was hooked on R/C airplanes and had developed a general dislike for anything that interfered with my new addiction. I had also developed some new skills. I now could hold a smile on my face (no matter what) for at least fifteen minutes, this being how long it would take me to drive home from the field and lock myself in the "Dungeon" where I could jump up and down and pull my hair out without fear of being committed.

I also had become very proficient at jigsaw puzzles of any kind. I could tell whether a bird was flying toward me or away from me at two hundred yards. I can spot a one inch square piece of balsa or MonoKote in eight to twelve inches of grass from fifty feet. I am now an expert at trailblazing through cornfields, and can also identify six different type of corn blight. I am also skilled at scratch building. This being the fine art of looking at a pile of busted balsa and scratching your head simultaneously. I have made a lot of new friends, which is good because I was kicked out of the ski club for doing East Indian fair weather chants in front of the fireplace.

Oh yes, I can also spot billboards, plaques, and signs of any size or shape and automatically, mentally calculate their height within one quarter inch.

So the Summer was not wasted as you can see.

The Winter, just coming to an end, has been productive for me also. I'm going to cheat this year. I have two airplanes ready to go, of course, I never let them see each other; nor do I let them in the corner of "The Dungeon" where I have erected a shrine with busted props and pieces of Fledgling.

Well I have to wind this up now as I'm going to be late for Therapy. □